

**CLEAN DEVELOPMENT MECHANISM  
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)  
Version 03 - in effect as of: 22 December 2006**

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**Revision history of this document**

| <b>Version Number</b> | <b>Date</b>      | <b>Description and reason of revision</b>   |
|-----------------------|------------------|---|
| 01                    | 21 January 2003  | Initial adoption  |
| 02                    | 8 July 2005      | <ul style="list-style-type: none"> <li>The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.</li> <li>As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <a href="http://cdm.unfccc.int/Reference/Documents">http://cdm.unfccc.int/Reference/Documents</a>.</li> </ul> |
| 03                    | 22 December 2006 | <ul style="list-style-type: none"> <li>The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.</li> </ul>  |

**SECTION A. General description of small-scale project activity****A.1 Title of the small-scale project activity:**

5.1 MW bundled Wind Power Project in Tirunelveli (Tamil Nadu).

Version: 04

Date: 15/12/2008

**A.2. Description of the small-scale project activity:**

The project activity is a bundled wind power project activity consisting of five machines of M/s Surana Corporation Ltd and one of M/s Vayu Energy (I) Pvt. Ltd, each of 850 kW rated Gamesa Eolica make Wind Turbine Generators (WTG's).

The total installed capacity of the project is 5.1 MW and it is expected to generate 12600MWh per annum. The project is situated in Tirunelveli district, Tamil Nadu. M/s Surana Corporation Ltd has installed 5 numbers of 850 kW rated Gamesa Eolica make wind turbine generator and M/s Vayu Energy (I) Pvt. Ltd has installed 1 number of 850 kW rated Gamesa Eolica make wind electric generator in the district of Tirunelveli.

The objective of the wind power project is to generate renewable electricity using wind power resources and to sell the generated output to the Tamil Nadu State Electricity Board. The project activity is expected to generate 12.6 GWh per annum.

The details of the sub-bundled components of this project activity are as follows:

| <i><b>Project</b></i> | <i><b>Owner</b></i>           | <i><b>Location</b></i>   | <i><b>Capacity of each turbine</b></i> | <i><b>No. of Wind turbines</b></i> | <i><b>Total capacity of wind mills</b></i> | <i><b>Date of commissioning</b></i>                         |
|-----------------------|-------------------------------|--------------------------|--|------------------------------------|--|---|
| Project 1             | M/s Surana Corporation Ltd    | Tirunelveli (Tamil Nadu) | 0.85 MW                                | 5                                  | 4.25 MW                                    | 3 of them on 23.03.2007, 1 on 28.03.2007 and 1 on 30.3.2007 |
| Project 2             | M/s Vayu Energy (I) Pvt. Ltd. | Tirunelveli (Tamil Nadu) | 0.85 MW                                | 1                                  | 0.85 MW                                    | 23.03.2007  |

In the absence of the project activity equivalent amount of electricity would have been generated by the operation of grid connected fossil fuel based power plants or fossil fuel based captive power plant. The Project activity will thus reduce the anthropogenic emissions of greenhouse gases (GHGs) in to the atmosphere associated with the equivalent amount of electricity generation from the fossil fuel based grid connected power plant. The project would be generating 11700 CERs/ annum.

**Contribution of the project activity to sustainable development**

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Ministry of Environment and Forests, Govt. of India has stipulated the social well being, economic well being, environmental well being and technological well being as the four indicators for sustainable development in the host country approval eligibility criteria<sup>1</sup> for Clean Development Mechanism (CDM) projects.

**Social well being**

- As the Project activity involves the use of renewable energy which is free and not dependant on any other factors like political/ social etc., it avoids the price and supply risk associated with fossil fuels. Thus it adds to the energy security of the region.
- Project activity promotes Infrastructural development in the areas around the Project
- The project activity generated employment opportunity for local residents and appreciation & realisation of good prices for the lands.

**Environmental well being**

- It is safe and clean energy
- CO<sub>2</sub> abatement and reduction of GHG emission through development in use of renewable energy.
- The noise emissions associated with WTGs are minimized due to the aerodynamic blade tip and mechanical component design<sup>2</sup>.

**Economic well being**

- The project activity results in generation of additional employment opportunities directly and indirectly which helps improving the standard of living of the people in and around the project activity location.
- The land prices surrounding the windmill have risen as a result of this kind of project activity.
- CDM provides financial incentives, which encourage channeling more investment into cleaner energy projects and also result in improved returns to the project stakeholders.
- It also promotes industrial growth by catering to the energy needs arising out of the supply-demand gap of electricity.

**Technological well being**

- Wind farm ‘marks step towards cleaner and inexhaustible source of energy’
- This is a clean technology demonstration by introducing state-of-the-art renewable wind energy generation technology

**A.3. Project participants:**

&gt;&gt;

| Name of Party involved (*)<br>((host) indicates a host<br>Party) | Private and/or public entity(ies)<br>project participants (*) (as<br>applicable) | Kindly indicate if the Party<br>involved wishes to be<br>considered as project<br>participant (Yes/No) |
|--|--|--|
| Government of India<br>(Host)                                    | Private Entity: M/s Surana<br>Corporation Ltd                                    | No   |

<sup>1</sup> [http://cdmindia.nic.in/host\\_approval\\_criteria.htm](http://cdmindia.nic.in/host_approval_criteria.htm)

<sup>2</sup> Technical brochure of the equipment supplier

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|                               |   |    |
|-------------------------------|---|----|
|                               |   |    |
| Government of India<br>(Host) | Private Entity: M/s Vayu Energy<br>(I) Pvt. Ltd | No |
| UK                            | Cantor Fitzgerald, Europe                       | No |

**A.4. Technical description of the small-scale project activity:****A.4.1. Location of the small-scale project activity:****A.4.1.1. Host Party(ies):**

India

**A.4.1.2. Region/State/Province etc.:**

Tamil Nadu

**A.4.1.3. City/Town/Community:**

Poigai Village, Tirunelveli District.

**A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity:**

The project activity is located in the Village Poigai, Tenkasi Taluk at Dist Tirunelveli in Tamil Nadu, India. It is located 20 km away from NH7 highway. The nearest railway station is Tenkasi and nearest airport is Trivandrum. The geographical location of the wind power generation plant is given below.

| S.No.       | SF. No  | HT. SC. No | Latitude     | Longitude      |
|-------------|---|------------|--------------|----------------|
| 1           | 59/3  | 2219       | 09° 02' 21"N | 077° 23' 27"E  |
| 2           | 174/2A,2B,2C,2D,2E,<br>2F,3A,3B,3C,3D,3E,3F<br>,3H,3I,3J    | 2293       | 09° 02' 69"N | 077 ° 23' 20"E |
| 3           | 47/2,46/4B  | 2259       | 09° 02' 47"N | 077 ° 23' 49"E |
| 4           | 52/3,52/4   | 2218       | 09° 02' 47"N | 077 ° 23' 49"E |
| 5           | 202/3,202/4,202/5,202/<br>6C                                | 2217       | 09° 02' 27"N | 077 ° 23' 52"E |
| 6<br>(Vayu) | 170/4,170/5,170/6A,<br>170/6B,170/7,170/8A,<br>170/8B,170/9 | 2292       | 09° 02' 08"N | 077 ° 23' 54"E |

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**A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:**

Project has applied approved methodologies available for small-scale CDM project at UNFCCC website under Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

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**Project type & category:**

|  |
|--|
| <b>Project Category</b>  |
| <b>Type I: Renewable Energy Projects</b>                                       |
| <b>Category I D: Grid connected renewable electricity generation</b>           |
| <b>Sectoral Scope: 1, Energy industries (renewable/ nonrenewable sources).</b> |

**Technology of the Project Activity**

The project activity involves 6 windmills of 850KW capacity each. These windmills are of Gamesa. The project participant generates a 3-phase power at 50Hz, 400V which stepped up to 33 KV and connected to grid

Technical details are as under:

| Sr. no. | Item                 | Description                          |
|---------|----------------------|--------------------------------------|
| 1.      | Make                 | Gamesa                               |
| 2.      | Model no.            | G58                                  |
| 3.      | Rating in KW         | 850                                  |
| 4.      | Rotor diameter       | 58 m                                 |
| 5.      | Rotor Swept area     | 2.642 m <sup>2</sup>                 |
| 6.      | Type of tower        | Tubular                              |
| 7.      | No of blades         | 3                                    |
| 8.      | Voltage              | 690 V ac                             |
| 9.      | Frequency            | 50 Hz/ 60 Hz                         |
| 10.     | Protection class     | IP 54                                |
| 11.     | Rotational speed     | Rated 1.620 rpm                      |
| 12.     | Rated Stator Current | 670 A @ 690 V                        |
| 13.     | Gearbox Type         | 1 planetary stage / 2 helical stages |
| 14.     | Length of the blade  | 28.3 m                               |
| 15.     | Total Blade weight   | 2,400 Kg                             |
| 16.     | Airfoils             | NACA 63.XXX + FFA-W3                 |

Gamesa has developed the Gamesa NRSTM noise control system which permits programming the noise emissions according to criteria such as date, time or wind direction. This achieves the goals of local compliance. This shows that the Gamesa has installed windmills that are environmentally safe and sound. Installation and operation of the windmills do not pose any environmental hazards. The technology of harnessing wind power through windmills is environmentally safe and sound. The host Government also agrees to this fact and does not ask for Environmental Impact Assessment for this type of projects. As supplier of wind energy converters (wind mills), Gamesa Elocia is well known in the market. They have a strong R&D back up.

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**A.4.3 Estimated amount of emission reductions over the chosen crediting period:**

Total no of crediting period is 10 years which aggregates to 117000 tCO<sub>2</sub> e.

| Years   | Estimation of Annual Emission reductions in tonnes of CO <sub>2</sub> e |
|---|---|
| 2008-09   | 11700   |
| 2009-10   | 11700   |
| 2010-11   | 11700   |
| 2011-12   | 11700   |
| 2012-13   | 11700   |
| 2013-14   | 11700   |
| 2014-15   | 11700   |
| 2015-16   | 11700   |
| 2016-17   | 11700   |
| 2017-18   | 11700   |
| Total estimated reductions (tonnes of CO <sub>2</sub> e)                              | 117000  |
| Total number of crediting years   | 10  |
| Annual average of estimated reductions over the crediting period (tCO <sub>2</sub> e) | 11700   |

**A.4.4. Public funding of the small-scale project activity:**

Public funding such as grants from official development funds is not involved in this project activity.

**A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:**

As mentioned under *Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project Activities*, the following results into debundling of large CDM project:

“A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.”



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With reference to points of de-bundling, none of the aforementioned conditions are applicable to the project activity and therefore, the project activity is not considered as a component of large project activity and is a small scale CDM project activity.

## **SECTION B. Application of a baseline and monitoring methodology**

### **B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:**

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Project has applied approved methodology available for small-scale CDM project at UNFCCC website under Appendix B of the simplified modalities and procedures for small-scale CDM project activities

**Type I: Renewable Energy Projects**

**Category ID: Grid connected renewable electricity generation**

**Reference: I.D./Version 13**

**Scope: 1**

**EB36.**

**Valid from 14<sup>th</sup> December 2007**

**Title: “Tool to calculate the emission factor for an electricity system”**

**EB 35**

**Annex 12**

### **B.2 Justification of the choice of the project category:**

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The project activity involves generation of electricity by the means of renewable energy, wind. The project activity falls under the small scale projects. The methodology chosen for the project activity and its applicability to the project activity is discussed below.

**Type I: Renewable Energy Projects**

**Category D: Grid Connected Renewable Electricity Generation**

#### **Technology/measure**

1. This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.
2. If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small- scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel<sup>3</sup>, the capacity of the entire unit shall not exceed the limit of 15MW.
3. Combined heat and power (co- generation) systems are not eligible under this category.

<sup>3</sup> Co-fired system uses both fossil and renewable fuels.

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4. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct<sup>4</sup> from the existing units.

5. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.

This project activity comes under point number 1 of the technology /measures of AMS I-D. The applicability of this methodology may be explained through the following arguments

- The project activity involves electricity generation using renewable energy which is based on wind power and sale of the electricity generated to the Tamil Nadu State Electricity Board. This project activity displaces the equivalent amount of electricity generation through the operation of existing/proposed fossil fuel based power plants connected to the Grid.
- The project activity involves installation of renewable energy generation units only (Wind Turbine Generators)
- The project activity doesn't involve cogeneration system. The project activity involves electricity generation from the Wind Turbine Generators.
- The project activity doesn't involve addition of renewable energy generation units at existing power generation facility. The project activity involves installation of 6 numbers of 850 kW Wind Turbine Generators.
- The project activity doesn't seek to retrofit or modify an existing facility for renewable energy generation.
- The project activity involves installation of 6 numbers of 850 kW Wind Turbine Generators. The total installed capacity of the project activity is 5.10 MW which is less than the eligibility limit of 15 MW to qualify as a small scale project activity under Type I of the small scale methodologies Also no additional WTGs will be added to the project activity during its lifetime; Hence the project activity will remain under small scale project activity during every year of crediting period.

Hence it can be concluded that the selected methodology, AMS I D – Grid Connected Renewable Electricity Generation is applicable to project activity

|  |
|--|
| <b>B.3. Description of the project boundary:</b> |
|--|

>>

According to the methodology, the project boundary encompasses the physical, geographical site of the renewable generation source.

The project boundary encompasses the physical, geographical site of the 5.10 MW project activity at the project location as specified in Section A.4.1.4 above. It includes the wind turbine installations and pooling and the sub-stations.

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<sup>4</sup> Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered “physically distinct”.

**B.4. Description of baseline and its development:**

&gt;&gt;

As per the methodology AMS I.D, the applicable baseline scenario for the project activity is:

*For all other systems, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO<sub>2</sub>e/kWh) calculated in a transparent and conservative manner as:*

*(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system'*

*OR*

*(b) The weighted average emissions (in kg CO<sub>2</sub>e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.*

The emission reductions occur as the project activity generates electricity by the renewable energy, wind energy, and the sale of electricity generated to the respective state electricity boards.

In the absence of the project activity the equivalent amount of electricity would have been generated by the operation of existing/proposed grid connected power plants that are predominantly GHG intensive Thermal power plants. The Project activity will thus reduce the anthropogenic emissions of greenhouse gases (GHGs) in to the atmosphere by displacing the equivalent amount of electricity generation through the operation of existing fossil fuel based power plant and future capacity expansion of fossil fuel-based power plants connected to the respective Grid.

Hence the emissions in the baseline scenario would be the emissions from the equivalent amount of electricity generated by the prevailing generation mix of the southern grid.

Since the CDM project is connected to the regional grid it is also preferred to take the Southern 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.

The Operating Margin calculated as the generation-weighted average CO<sub>2</sub> emissions per unit net electricity generation (tCO<sub>2</sub>/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units using the CEA data base for the Southern Grid (for the years 2004-05, 2005-06, 2006-07) the value is 1.0030196 tCO<sub>2</sub> e/MWh and the build margin for the Southern grid is 0.7054597 tCO<sub>2</sub> e /MWh.

| Variable   | Data Source   |
|--|---|
| EG <sub>y</sub> – Electricity generated  | Records maintained by project proponent                                     |
| Parameter  | Data Source   |
| EF <sub>OM, y</sub> - Build Margin Emission Factor (tCO <sub>2</sub> /MWh)     | CEA Data, version 3 dated 15/12/2007  |
| EF <sub>BM, y</sub> = Operating Margin Emission Factor (tCO <sub>2</sub> /MWh) | CEA Data, version 3 dated 15/12/2007  |
| EF <sub>y</sub> – Grid Emission Factor   | Calculated as the weighted average of the operating margin and build margin |

**B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:**

In the absence of the project activity the equivalent amount of electricity would have been generated by the operation of grid connected power plants that are predominantly GHG intensive Thermal power plants. The Project activity will thus reduce the anthropogenic emissions of greenhouse gases (GHGs) in to the atmosphere associated with the equivalent amount of electricity generation. The project developer has a DG set which is being used in case of emergency.

**Additionality**

The following paragraphs have been detailed on project additionality.

In accordance with simplified modalities and procedures for small-scale Clean Development Mechanism (CDM) project activities, a simplified baseline and monitoring methodology listed in Appendix B may be used if project participants can demonstrate that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in attachment A of Appendix B. Similarly, for the identified CDM project, following barriers have been overcome during project planning and execution:

The barriers that were considered are listed

**Technological barrier:**

**Evacuation of Power**

The problem of evacuation of power is prevalent in the state of Tamil Nadu. The Wind Turbines are even asked to shut down during the peak season conducive for operation. This is mainly due to the peak performance of the thermal power stations during that period leading to high frequency in the grid which doesn't allow export from the grid. In the last week of May 2006 the Wind Turbine Generators were asked to shut down for a period of 9 to 20 hours<sup>5</sup> and it can be noted that the May is the conducive month for wind electricity generation due to the high wind speeds.

**Other Barriers:**

**Financial Resources**

There is a variation in the project cost estimated by different agencies/entities for investment in wind power projects. The estimated project cost has been referred from the figure which was given by the supplier as a realistic approach.

The project costs associated with the project activity are the initial investment that is incurred by the project proponent for the supply, commissioning and erection of the wind mills. This includes the cost that was paid to the manufacturer of the turbine (cost of the machine and charges for erection) and also to TNEB (infrastructure and development charges).

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<sup>5</sup> <http://www.thehindubusinessline.com/2006/05/31/stories/2006053103621900.htm>

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The rate per unit of electricity for the selling of power has been considered as INR 2.90. The Project owners are /would be selling electricity to the GRID.

There are two sub projects in the project activity i.e. sub project 1 comprising of 5 numbers of 850 kW Gamesa Elocia make Wind Turbine Generators by M/s Surana Corporation Ltd and sub project 2 comprising of 1 numbers of 850 kW Gamesa Elocia make Wind Turbine Generators by M/s Vayu Energy (I) Pvt. Ltd.

For the investment analysis of this project each sub project activity has been individually considered. The financial indicator, namely the Project IRR was considered and calculated. The investment analysis has been developed for each sub projects as they are unique in their own nature. The Project IRR has been developed by the developer and compared to the interest rate of 9% as specified in TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants”.

For the long term debt the interest rate is  $\pm$  certain percentage above the BPLR with a regular term of few years and upfront fee of 0-1%. Commercial Banks in India lend at different interest rates and it varies from banks to banks and from year to year. Hence the interest rate as specified by TNERC is taken as the reference point for benchmarking the Project IRR.

All relevant costs (including, the investment cost, the operations and maintenance costs), and revenues are included.

The following table illustrates the parameters used for the investment analysis. Some of these parameters are common for all sub projects. Some of the parameters are specific to sub projects. The use of these parameters indicating if they are assumed or based on actual figures is explained in the table.

| <b>Techno Economic parameters for 5 numbers of Gamesa 850 KW machines</b> |  |             |   |
|---|--|-------------|---|
|   |  |             | Sources   |
| Capacity of machine   | 850  | kW          | Invoices  |
| Number of machine   | 5  | Number      | Invoices  |
| Project capacity in MW  | 4.25   | MW          |   |
| Total Investment  | 303.97   | Million INR | Invoices  |
| Insurance charge per annum  | 0.75% of the capital cost with a decrease of 0.5% every year after 5 years | Percentage  | Insurance Charges TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants” |
| Operational and Maintenance per machine +Overheads                        | 1.1% of plant cost (O & M ) with 5% escalation every year after 5 years    | Percentage  | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants”                   |
| 1 Euro  | 58   | INR         |   |
| Price of CER  | 14   | Euro        |   |
| Equity /Debt ratio  | 30/70  |             | TNERC order no 3 dated 15/05/2006, “Order on purchase   |

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|   |                            |            |   |
|---|----------------------------|------------|---|
|   |                            |            | of power from NCES based Generating Plants”   |
| Interest rate   | 9 %                        | Percentage | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants” |
| Income Tax Depreciation Rate (Written Down Value basis) |                            |            |   |
| on Wind Energy Generators                               | 80                         | Percentage |   |
| Book Depreciation Rate (Straight Line Method basis)     |                            |            |   |
| on Wind Energy Generators                               | 4.5                        | Percentage | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants” |
| Book Depreciation up to (% of asset value)              | 90                         | Percentage |   |
| Income Tax  |                            |            |   |
| Income Tax rate   | 30                         | Percentage |   |
| Minimum Alternate Tax                                   | 10                         | Percentage |   |
| Surcharge   | 10                         | Percentage |   |
| Cess  | 2                          | Percentage |   |
|   |                            |            |   |
| Working capital   |                            |            |   |
| Receivables (no of days)                                | NIL                        |            | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants” |
| O & m expenses (no of days)                             | NIL                        |            | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants” |
| Working capital interest rate                           | NIL                        | Percentage | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants” |
| Loan Processing Charges/ Upfront Fees                   | 1% of the total loan taken | Percentage | IREDA Guidelines for loan assistance  |

**Techno Economic parameters for 1 numbers of Gamesa 850 KW machines by Vayu Energy (I) Pvt Ltd.**

|                     |     |        |          |
|---------------------|-----|--------|----------|
|                     |     |        | Sources  |
| Capacity of machine | 850 | kW     | Invoices |
| Number of machine   | 1   | Number | Invoices |

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|   |  |             |   |
|---|--|-------------|---|
| Project capacity in MW                                  | 0.85   | MW          |   |
| Total Investment  | 60.80  | Million INR | Invoices  |
| Insurance charge per annum                              | 0.75% of the capital cost with a decrease of 0.5% every year after 5 years | Percentage  | Insurance Charges TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants” |
| Operational and Maintenance per machine +Overheads      | 1.1% of plant cost (O & M ) with 5% escalation every year after 5 years    | Percentage  | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants”                   |
| 1 Euro  | 58   | INR         |   |
| Price of CER  | 14   | Euro        |   |
| Equity /Debt ratio                                      | 30/70  |             | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants”                   |
| Interest rate   | 9 %  | Percentage  | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants”                   |
| Income Tax Depreciation Rate (Written Down Value basis) |  |             |   |
| on Wind Energy Generators                               | 80   | Percentage  |   |
|   |  |             |   |
| Book Depreciation Rate (Straight Line Method basis)     |  |             |   |
| on Wind Energy Generators                               | 4.5  | Percentage  | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants”                   |
| Book Depreciation up to (% of asset value)              | 90   | Percentage  |   |
| Income Tax  |  |             |   |
| Income Tax rate   | 30   | Percentage  |   |
| Minimum Alternate Tax                                   | 10   | Percentage  |   |
| Surcharge   | 10   | Percentage  |   |
| Cess  | 2  | Percentage  |   |
|   |  |             |   |
| Working capital   |  |             |   |
| Receivables (no of                                      | NIL  |             | TNERC order no 3 dated  |

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|                                       |                            |            |   |
|---------------------------------------|----------------------------|------------|---|
| days)                                 |                            |            | 15/05/2006, “Order on purchase of power from NCES based Generating Plants”                        |
| O & M expenses (no of days)           | NIL                        |            | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants” |
| Working capital interest rate         | NIL                        | Percentage | TNERC order no 3 dated 15/05/2006, “Order on purchase of power from NCES based Generating Plants” |
| Loan Processing Charges/ Upfront Fees | 1% of the total loan taken | Percentage | IREDA Guidelines for loan assistance  |

| Type of machines   | Project IRR   |                      |                   |
|--|---------------|----------------------|-------------------|
|  | Interest rate | Without CDM Benefits | With CDM Benefits |
| Sub Project 1: 5 × 850 kW Gamesea Machines by M/s Surana Corporation Ltd   | 9.0%          | 6.84%                | 9.62%             |
| Sub Project 2: 1 × 850 kW Gamesa Machines by M/s Vayu Energy (I) Pvt. Ltd. | 9.0 %         | 6.88%                | 9.63%             |

The Project IRR for the project activities are 6.84 % & 6.88% without the CDM benefits which is less than the benchmark interest rate.

As per guideline provided by EB in meeting no. 41 annex 45 the criteria for choosing the sensitivity analysis parameter is:

*Sensitivity analysis*

**16. Guidance:** 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 (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets.. Where a DOE considers that a variable which constitute less than 20% have a material impact on the analysis they shall raise a corrective action request to include this variable in the sensitivity analysis.

The project activity involves the sale of electricity to the grid; hence it is the sole source of revenue for this project. This revenue is based on two parameters namely, the tariff & the power generation.

The tariff is fixed without any escalation. Also, +/- 10% variation in either of these parameters would be affecting IRR to the similar extent.

Similarly the parameters which can affect 20% of the total cost for this case is only the investment cost. Since the investment costs were considered on the purchase order. There were no possibilities of this cost getting reduced. Hence the sensitivity analysis would have to be performed only for an increase in capital cost which would result in decreasing project IRR further and make CDM revenue all the more important to make project happen. Hence this analysis has not been presented.

Thus PLF is considered to be the only parameter which required to be checked for sensitivity analysis.



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The sensitivity analysis has been carried out & the following results are obtained. This has also been included in the PDD.

## Sub Project 1: 5 × 850 kW Gamesa Machines by M/s Surana Corporation Ltd

| Parameters      | PLF     | IRR    |
|-----------------|---------|--------|
| PLF (Base case) | 28.20 % | 6.84 % |
| PLF (+10%)      | 31.02%  | 8.28 % |
| PLF (-10%)      | 25.38%  | 5.55 % |

## Sub Project 2: 1 × 850 kW Gamesa Machines by M/s Vayu Energy (I) Pvt. Ltd.

| Parameters      | PLF     | IRR    |
|-----------------|---------|--------|
| PLF (Base case) | 28.20 % | 6.88 % |
| PLF (+10%)      | 31.02%  | 8.28 % |
| PLF (-10%)      | 25.38%  | 5.58 % |

As evident in the above table, it is demonstrated that the IRR does cross the benchmark of 9 % even when the PLF is increased by 10%.

In the EB 47, the Executive board agreed to register the “5.1 MW bundled Wind Power Project in Tirunelveli (Tamil Nadu)” (2370) if the project participants and DOE (TÚV-NORD) submit a further revised PDD and the corresponding validation report, which further confirms:

- (i) Whether the IRR would cross the benchmark if a sensitivity analysis is conducted with respect to both the tariff and investment cost; and
- (ii) The probability of the occurrence of the assumed variations of the parameters in the context of the project activity.

**Project Proponent Reply:**

- (i) The IRR does not cross the benchmark even after conducting the sensitivity analysis on project cost and tariff.

## Sub Project 1: 5 × 850 kW Gamesa Machines by M/s Surana Corporation Ltd

| Parameters          | Project Cost   | IRR    |
|---------------------|----------------|--------|
| Base case           | 303.97 Million | 6.84 % |
| Project Cost (-10%) | 278.38 Million | 8.94 % |
| Project Cost (+10%) | 334.60 Million | 5.16 % |

## Sub Project 2: 1 × 850 kW Gamesa Machines by M/s Vayu Energy (I) Pvt. Ltd.

| Parameters          | Project Cost  | IRR    |
|---------------------|---------------|--------|
| Base case           | 60.80 Million | 6.88 % |
| Project Cost (-10%) | 54.68 Million | 8.94 % |
| Project Cost (+10%) | 66.92 Million | 5.20 % |

## Sub Project 1: 5 × 850 kW Gamesa Machines by M/s Surana Corporation Ltd

| Parameters | INR/kWh | IRR   |
|------------|---------|-------|
| Base Case  | 2.90    | 6.84% |

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|               |      |        |
|---------------|------|--------|
| Tariff (-10%) | 2.61 | 5.54 % |
| Tariff (+10%) | 3.19 | 8.29 % |

Sub Project 2: 1 × 850 kW Gamesa Machines by M/s Vayu Energy (I) Pvt. Ltd.

| Parameters    | INR/kWh | IRR    |
|---------------|---------|--------|
| Base case     | 2.90    | 6.88 % |
| Tariff (-10%) | 2.61    | 5.57 % |
| Tariff (+10%) | 3.19    | 8.30 % |

It is evident from the above tables that the IRR does not cross the benchmark of 9 % even after increasing the project cost and by 10 % respectively.

- (ii) The probability of the occurrence of the assumed variations of the parameters in the context of the project activity.

As per guideline provided by EB in meeting no. 41 annex 45 the criteria for choosing the range of sensitivity analysis is:

**17. Guidance:** *The DOE should assess in detail whether the range of variations is reasonable in the project context. Past trends may be a guide to determine the reasonable range. As a general point of departure variations in the sensitivity analysis should at least cover a range of +10% and -10%, unless this is not deemed appropriate in the context of the specific project circumstances. In cases where a scenario will result in the project activity passing the benchmark or becoming the most financially attractive alternative the DOE shall provide an assessment of the probability of the occurrence of this scenario in comparison to the likelihood of the assumptions in the presented investment analysis, taking into consideration correlations between the variables as well as the specific socio-economic and policy context of the project activity.*

The sensitivity analysis has been carried out on +/- 10% as per the EB guidelines. However, the probability of the assumed variation of the parameters in the context of the project activity is explained below.

The parameters on which sensitivity analysis has been conducted in the context of the project activity are given below.

1. PLF
2. Tariff
3. Project cost

**PLF:** The Tamil Nadu regulatory Committee had conducted many public hearings & subsequently calculated average the Plant Load factor at 26.7 %. The project proponent has considered the plant load factor of 28.20% based on the P.O of the supplier. Hence the PLF considered by the project proponent is on a higher side and probability of the any increase in the PLF is very low as it is already based on the estimated generation of units given by the supplier.

**Tariff:** The project IRR does not cross the benchmark even after increasing the tariff by +10 %, which is very unlikely. The tariff order, “TNERC Order No 3 “Order on purchase of power from NCES based Generating Plants” dated 15/05/2006” states that.... “Since the agreement period proposed in this order is

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twenty years, the terms and conditions including the purchase rate, ordered now will continue to be applicable till the end of agreement period.” Reference: Page 27/ 114 & 36/114 of the order & <http://www.teda.gov.in/page/Wind-Ann9.htm>

The new tariff order, Comprehensive Tariff Order on Wind Energy, dated 20.03.2009 which has come into effect recently states the following

“.....The wind mills commissioned between 15-5-2006 and 18-9-2008 shall be eligible for a tariff of Rs.2.90 per unit.”

Hence there is no chance of any escalation in the tariff. The subsequent tariff orders that is released by the Tamil Nadu Regulatory Committee (TNERC) have revised the tariff of the wind mills commissioned after 18-09-2008. However since the project activity was being commissioned in 23-03-2007 to 30-03-2007, the tariff has not increased. Hence the probability of increase in the tariff for the project activity is very low.

**Project Cost:** The project cost is based on the final negotiated value, which can be checked from the P.O which has been verified by the DOE. Hence there is very less probability of any increase or decrease in the project cost.

The project IRR calculated by the project proponent is conservative and does not cross the benchmark of 9 % even after conducting the sensitivity analysis.

The carbon revenue from the project activity would provide significant amount of returns from the sale of the Emission Reductions accrued from the project activity as shown above. The revenue from CDM credits would result in increased cash flows of the project activity and higher Internal Rate of Return and in turn increase the financial attractiveness of the project activity and hence make the project activity more financially viable.

In spite of the low returns for the Project activity the Project participants have made the investment only in lieu of the due consideration of the CDM benefits that are available for the wind power projects under the Kyoto Protocol. Hence it is evident that without the GHG emission reduction credits the project activity wouldn't have been taken up.

The arguments in the above paragraphs with respect to the financial analysis of the project activity and the barrier due to the problem with evacuation augment the fact that generation of electricity through wind energy is not a business as usual scenario and hence the project activity can be deemed additional.

The sequence of events presented below demonstrates that there were real and parallel action by the project proponent to avail CDM benefit for the project activity:

| Date     | Project related activity | CDM related activity  | Evidences submitted to the validator |
|----------|--------------------------|---|--------------------------------------|
| 30/10/06 |                          | Surana Board Meeting to consider CDM revenue for the project activity | A copy of the minutes of the meeting |

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|          |                                    |  |   |
|----------|------------------------------------|--|---|
| 31/10/06 |                                    | Vayu Energy Board Meeting to consider CDM revenue for the project activity | A copy of the minutes of the meeting                |
| 01/12/06 | Purchase order for Surana turbines |  | A copy of the purchase order                        |
|          | Purchase order for Vayu turbines   |  | A copy of the purchase order                        |
| 4/01/07  |                                    | Telephonic enquiry about development of CDM project                        | Reference of the telephonic conversation in the LOI |
| 15/01/07 |                                    | Proposal from Consultant for CDM project of Surana Corporation             | A copy of the proposal                              |
| 15/01/07 |                                    | Proposal from Consultant for CDM project of Surana Corporation             | A copy of the proposal                              |
| 12/02/07 |                                    | LOI from Surana Corporation to consultant for development of CDM project   | A copy of LOI                                       |
| 15/02/07 |                                    | LOI from Vayu Energy to consultant for development of CDM project          | A copy of LOI                                       |
| 23/3/07  | Commissioning of 3 Surana turbines |  | Commissioning certificate                           |
| 23/3/07  | Commissioning of 1 Vayu turbines   |  | Commissioning certificate                           |
| 30/3/07  | Commissioning of 2 Surana turbines |  | Commissioning certificate                           |
| 22/05/07 |                                    | Information from Surana Corporation for PDD development                    | A copy of the mail                                  |
| 22/06/07 |                                    | Invitation for stakeholder meeting   | A copy of the invitation                            |
| 06/07/07 |                                    | CDM Stakeholder meeting  | A copy of the minutes of the meeting                |
| 08/08/07 |                                    | Information from Surana Corporation & Vayu Energy for PDD development      | A copy of the mail                                  |
| 17/08/07 |                                    | Draft Contract from consultant   | A copy of the mail                                  |
| 29/08/07 |                                    | Discussion regarding the IRR of the project                                | A copy of the mail                                  |

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|          |  |  |                                     |
|----------|--|--|-------------------------------------|
| 01/09/07 |  | Discussion regarding the IRR of the project                                      | A copy of the mail                  |
| 05/10/07 |  | Surana Corporation's consent mail to the consultant for signing the contract     | A copy of the mail                  |
| 1/11/07  |  | Contract with Consultant for developing the CDM project for Surana Wind turbines | A copy of the contract              |
| 14/11/07 |  | Contract with Consultant for developing the CDM projects for Vayu Wind turbines  | A copy of the contract              |
| 07/01/08 |  | Quotation from SGS (Validator)   | A copy of the proposal              |
| 30/1/08  |  | Quotations from TUV Nord (Validator)   | A copy of the proposal              |
| 01/02/08 |  | Contract with validator  | A copy of the contract              |
| 29/02/08 |  | Webhosting of PDD for global stakeholder   | UNFCCC site                         |
| 17/03/08 |  | Host Country Approval meeting  | A copy of the invitation letter     |
| 9/04/08  |  | Host Country Approval  | A copy of the host country approval |
| 29/04/08 |  | Site visit for Validation  | Copy of the mail                    |
| 12/12/08 |  | UK DNA Approval  | Copy of the approval                |

These series of events along strongly prove that the funds from CDM were seriously considered before the investment decision is being made.

**B.6. Emission reductions:****B.6.1. Explanation of methodological choices:**

&gt;&gt;

The project activity involves generation of electricity by the renewable energy, wind energy, and the sale of electricity generated to the state electricity board. In the absence of the project activity equivalent amount of electricity would have been generated by the current grid mix which is predominately connected by the thermal power stations, which is the baseline scenario.

**Baseline Emissions:**

$$BE_Y = EG_Y \cdot EF_Y$$

$EG_Y$  = electricity produced by the renewable generating unit (kWh)

$EF_Y$  = Combined Margin emission factor of the grid (tCO<sub>2</sub>e/MWh)

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Calculation of combined margin emission factor of the grid

As stated earlier in section B.4 of the PDD, for calculation of emission coefficient, option (a), combined margin consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the “Tool to calculate the emission factor for an electricity system” is chosen. The combined margin has been estimated by the Central Electricity Authority (CEA) of India and the same has been used for estimating the baseline emissions for this project activity.

$$EF_y = w_1 \times EF_{OM,y} + w_2 \times EF_{BM,y}$$

$EF_{OM,y}$  = Build Margin Emission Factor (tCO<sub>2</sub>/MWh)

$EF_{BM,y}$  = Operating Margin Emission Factor (tCO<sub>2</sub>/MWh)

As per “Tool to calculate the emission factor for an electricity system”

*“For wind and solar projects, the default weights are as follows:  $w_{OM} = 0.75$  and  $w_{BM} = 0.25$  (owing to their intermittent and non-dispatchable nature).”*

$$w_1 = 0.75$$

$$w_2 = 0.25$$

The Operating Margin calculated as the generation-weighted average CO<sub>2</sub> emissions per unit net electricity generation (tCO<sub>2</sub>/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units using the CEA data base for the Southern Grid (for the years 2004-05, 2005-06, 2006-07) the value is 1.0030196 tCO<sub>2</sub> e/MWh and the build margin for the Southern grid is 0.7054597 tCO<sub>2</sub> e /MWh.

$$\text{Emissions Reductions} = \text{Baseline Emissions (BE)} - \text{Project Emissions (PE)} - \text{Leakage (L)}$$

**Leakage**

In accordance with methodology AMS I.D, leakage is to be considered only if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity.

This is not applicable here so  $L_y = 0$

**Project Emissions**

$$PE_y = 0$$

Hence,

$$ER_y = BE_y$$

The actual emission reductions will be calculated in each year of the crediting period based on the monitored net generation and combined margin emission factor of the southern grid (Ex-ante approach).

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**B.6.2. Data and parameters that are available at validation:***(Copy this table for each data and parameter)*

|  |  |
|--|--|
| <b>Data / Parameter:</b>   | $EF_{OM,y}$  |
| <b>Data unit:</b>  | tCO <sub>2</sub> /MWh  |
| <b>Description:</b>  | The Operating Margin emission factor of Southern grid  |
| <b>Source of data used:</b>  | CEA Data, version 3 dated 15/12/2007   |
| <b>Value applied:</b>  | 1.0030196  |
| <b>Justification of the choice of data or description of measurement methods and procedures actually applied :</b> | The value is calculated as average of the last three years of the Operating margin provided by CEA |
| <b>Any comment:</b>  | Fixed ex-ante and will remain same over the crediting period                                       |

|  |  |
|--|--|
| <b>Data / Parameter:</b>   | $EF_{BM,y}$  |
| <b>Data unit:</b>  | tCO <sub>2</sub> /MWh  |
| <b>Description:</b>  | The Build Margin emission factor of Southern grid            |
| <b>Source of data used:</b>  | CEA Data, version 3 dated 15/12/2007                         |
| <b>Value applied:</b>  | 0.7054597  |
| <b>Justification of the choice of data or description of measurement methods and procedures actually applied :</b> | The data has been provided by Central Electricity Authority  |
| <b>Any comment:</b>  | Fixed ex-ante and will remain same over the crediting period |

|                                       |  |
|---------------------------------------|--|
| <b>Data / Parameter:</b>              | $EF_{electricity,y}$   |
| <b>Data unit:</b>                     | tCO <sub>2</sub> /MWh  |
| <b>Description:</b>                   | Combined margin emission factor  |
| <b>Source of data used:</b>           | Calculated   |
| <b>Value applied:</b>                 | 0.92863  |
| <b>Justification of the choice of</b> | Calculated as the weighted average of the build margin emission factor |



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|  |  |
|--|--|
| data or description of measurement methods and procedures actually applied : | and operating margin emission factor of the southern grid    |
| Any comment:   | Fixed ex-ante and will remain same over the crediting period |

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

&gt;&gt;

Baseline Emissions:

$$BE_Y = EG_Y \cdot EF_Y$$

$EG_Y$  = electricity generated by the renewable generating unit (kWh)

$EF_Y$  = Combined Margin emission factor of the grid (tCO<sub>2</sub>e /MWh)

Calculation of combined margin emission factor of the grid

$$EF_Y = w_1 \times EF_{OM,Y} + w_2 \times EF_{BM,Y}$$

$EF_{OM,Y}$  = Build Margin Emission Factor (tCO<sub>2</sub>/MWh)

$EF_{BM,Y}$  = Operating Margin Emission Factor (tCO<sub>2</sub>/MWh)

As per “Tool to calculate the emission factor for an electricity system”

*“For wind and solar projects, the default weights are as follows:  $w_{OM} = 0.75$  and  $w_{BM} = 0.25$  (owing to their intermittent and non-dispatchable nature).”*

$$w_1 = 0.75$$

$$w_2 = 0.25$$

the Operating Margin as calculated by CEA for the Southern Grid is 1.0030196 tCO<sub>2</sub>/MWh and the build margin for the Southern Grid is 0.705497tCO<sub>2</sub>/MWh.

$$EF_Y = 0.75 \times 1.0030196 + 0.25 \times 0.705497 \text{ tCO}_2 \text{ e/MWh} = 0.92863 \text{ tCO}_2 \text{ e/ MWh}$$

Electricity generation per WTG (as per the purchase order) =  $2.1 \times 10^6$  kWh/ annum

Number of WTG= 6

Therefore, total electricity generated ( $EG_Y$ ) =  $2.1 \times 10^6$  (KWh) \* 6 =  $12.6 \times 10^6$  kWh/ annum

$$BE_Y = 12600 \times 0.92863$$

$$= 11700 \text{ tCO}_2 \text{ e/ annum}$$

Emissions Reductions = Baseline Emissions (BE) – Project Emissions (PE) – Leakage (L)

In accordance with methodology AMS I.D, leakage is to be considered only if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity.

This is not applicable here so  $L_y = 0$

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Project Emissions  $PE_y = 0$ 

Hence,

$$ER_y = BE_y$$

$$ER_y = 11700 \text{ tCO}_2\text{e}$$

**B.6.4 Summary of the ex-ante estimation of emission reductions:**

&gt;&gt;

| Year                                | Estimation of project activity emissions (tCO <sub>2</sub> e) | Estimation of baseline emissions (tCO <sub>2</sub> e) | Estimation of Leakage (tCO <sub>2</sub> e) | Estimation of Overall Emission Reduction (tonnes of CO <sub>2</sub> e) |
|-------------------------------------|---|---|--|--|
| 2008-09                             | 0   | 11700   | 0  | 11700  |
| 2009-10                             | 0   | 11700   | 0  | 11700  |
| 2010-11                             | 0   | 11700   | 0  | 11700  |
| 2011-12                             | 0   | 11700   | 0  | 11700  |
| 2012-13                             | 0   | 11700   | 0  | 11700  |
| 2013-14                             | 0   | 11700   | 0  | 11700  |
| 2014-15                             | 0   | 11700   | 0  | 11700  |
| 2015-16                             | 0   | 11700   | 0  | 11700  |
| 2016-17                             | 0   | 11700   | 0  | 11700  |
| 2017-18                             | 0   | 11700   | 0  | 11700  |
| Total (tonnes of CO <sub>2</sub> e) | 0   | 117000  | 0  | 117000   |

**B.7 Application of a monitoring methodology and description of the monitoring plan:****B.7.1 Data and parameters monitored:**

|  |   |
|--|---|
| <b>Data / Parameter:</b>   | EGy   |
| Data unit:   | KWh   |
| Description:   | The Net Electricity generated by the renewable generating unit  |
| Source of data to be used:                                       | Meter Readings of TNEB.   |
| Value of data  |   |
| Description of measurement methods and procedures to be applied: | The net electricity supplied by the each individual wind mill of the project activity is measured using the meter installed at the project site. The total net electricity generated from the project activity is calculated as the summation of the measured net electricity generation of the wind mills in the project activity. |
| QA/QC procedures to be applied:                                  | The data is used directly to calculate the emission reductions, hence the data is checked for accuracy with the sale of receipts to the grid to decrease the uncertainty  |

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Any comment:

**B.7.2 Description of the monitoring plan:**

&gt;&gt;

The project activity is operated and managed by the project proponent with the help of site incharge (personal from the project proponent) and site O & M contractor (personal from the wind turbine manufacturer). For the accurate execution of the Project activity a project team has been constructed. The wind power project abides and will abide by all regulatory and statutory requirements as prescribed under the state and central laws and regulations. The project team is delegated with the responsibility of monitor and document the electricity generated and also safe keeping of the recorded data. The electricity being generated is monitored at each wind mill using an electronic Trivector Export Import meter of 0.05% accuracy which is installed and owned by TNEB. This meter records the electricity generated on a continuous basis. Since, these meters are installed at the receiving end; they thus absorb the losses from the generation point (wind machine controller) until the grid interconnection point (sub station). These losses include the line losses from point of generation to the point of metering and the transformer losses (losses due to stepping up of generation voltage to meet grid discipline and transmission losses until interconnection point).

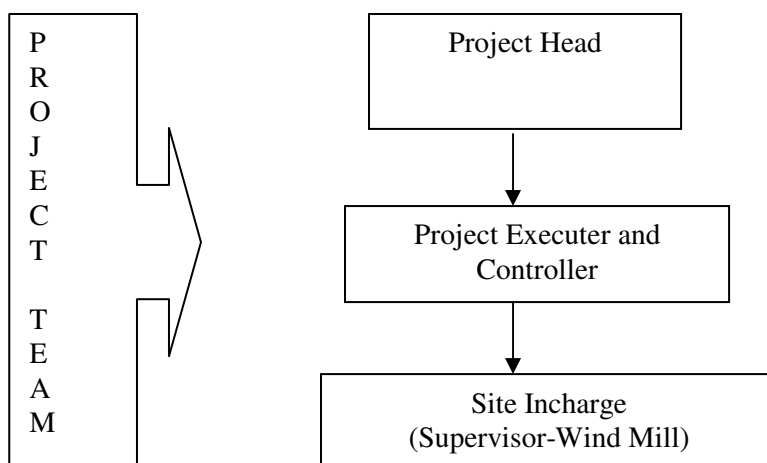
The WTGs also does not produce any units of electricity during non availability of wind and during planned and unplanned maintenance, however, they will draw current from the grid during initial phase of operation from stand still condition. Thus the grid code has made provisions for metering system at the receiving end adopted at wind sites to measure both import and export of electricity. The figures from these meters will be taken to measure the exact amount of electricity produced by a wind machine against which the state electricity utility is liable to make payments to the owner of wind machine. These meters are tested by TNEB before commissioning. At the time of commissioning the meter is sealed by the TNEB Officials. Every month TNEB Officials visits each Wind Mill in the presence of O&M team of Wind Mill Supplier and the meter reading is taken jointly and recorded by TNEB. The said meter readings are reported by the TNEB Field Officer to the concerned distribution circle who in turn informs to the consumption circle of TNEB, which is authorised to prepare the Bill and give the credit for the energy generated by the Wind Mills.

The project team is also responsible for calculation of actual creditable emission reduction in the most transparent and relevant manner. All the monitoring data is stored /will be recorded and kept under safe custody of the project head. All the monitoring data is stored /will be recorded and kept under safe custody of the project head for a period of crediting period (10 years fixed crediting period) + 2 years. Installed meters have been calibrated annually by state electricity board as per the standards.

| Designation                     | Responsibilities  |
|---------------------------------|---|
| Project Head                    | Registration<br>Project Execution   |
| Project Executor and Controller | <ul style="list-style-type: none"> <li>Recording</li> <li>Verification</li> <li>Storage of Data</li> </ul>  |
| Site Incharge                   | <ul style="list-style-type: none"> <li>Operation, Monitoring and Verification of Data</li> <li>Data Recording</li> <li>Storage of data</li> </ul> |

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|                                      |  |
|--------------------------------------|--|
| Operation and Maintenance Contractor | <ul style="list-style-type: none"> <li>• Operation and Maintenance</li> <li>• Storage of data</li> <li>• Data Recording</li> </ul> |
|--------------------------------------|--|


**B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)**

&gt;&gt;

Surana Corporation Ltd and Vayu Energy (I) Pvt. Ltd

The entities are also project participants and their details have been furnished in Annex 1.

**Date of completing the final draft of this baseline section (DD/MM/YYYY): 28/01/2008**

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**SECTION C. Duration of the project activity / crediting period****C.1 Duration of the project activity:****C.1.1. Starting date of the project activity:**

15/12/2006.

**C.1.2. Expected operational lifetime of the project activity:**

20 Years

**C.2 Choice of the crediting period and related information:****Fixed Crediting Period****C.2.1. Renewable crediting period**

Not Applicable (NA)

**C.2.1.1. Starting date of the first crediting period:**

NA

**C.2.1.2. Length of the first crediting period:**

NA

**C.2.2. Fixed crediting period:**

10 Years

**C.2.2.1. Starting date:**

01/05/2009 or Date of registration are whichever is later.

**C.2.2.2. Length:**

10 years 0 months

**SECTION D. Environmental impacts**

&gt;&gt;

**D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:**

As per the Ministry of Environment and Forests (Government of India) notification the project activity does not fall under the purview of the Environmental impact Assessment thus the project activity is exempted from the environmental clearances.<sup>6</sup>

It should be noted here that though EIA is not a regulatory requirement in India for wind energy projects. There are no negative environmental impacts that are envisaged due to the project activity. The following are the positive impacts due to the project activity.

- *Impact due to Noise:* The noise emissions are minimal due to the use of state of art technology comprising of Aerodynamic blade tip and mechanical component design.
- *Impact on air and water:* wind energy is renewable electricity generation; hence there would be no release of GHG into the atmosphere. Also as there is no fuel used for electricity generation, there aren't any effluents discharged into the water.
- *Socio economic impact:* The project activity helps the upliftment of skilled and unskilled manpower in the region. The project will be providing employment opportunity to not only during the construction phase, but also during its operational life time. The project activity improves employment rate and livelihood of local populace in the vicinity of the project. Moreover, the project generates eco-friendly, GHG free power, which contributes to sustainable development of the region.

**D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:**

The Environmental Impacts are not considered significant both by the project participants and also the host party.

<sup>6</sup> <http://envfor.nic.in/divisions/iass/notif/eia.htm>

## **SECTION E. Stakeholders' comments**

### **E.1. Brief description how comments by local stakeholders have been invited and compiled:**

Stakeholder Consultation meet was organized on 6.07.2007 at the Panchayat building Poigai village. Surana Corporation Ltd and Vayu Energy (I) Pvt. Ltd identified the local villagers, site incharge, the maintenance personnel and the land owners of the wind mill sites as the major stakeholders and all the stakeholders were informed beforehand about the stakeholder consultation process. Comments of stakeholders were recorded during the stakeholder meeting.

The stake holder meeting process is followed in the following sequence

- Election of the Chair of the meeting and approval of the proposed Agenda
- Presentation of the CDM-Kyoto Protocol and role of local stake holder
- Presentation of the Projects completed or undertaken by Surana Corporation Ltd and Vayu Energy (I) Pvt. Ltd
- Discussion and Articulation of concerns
- Chair summarizing the local stake holder concerns
- Vote of Thanks followed by Lunch

Mr. Annamalai (Village President) was elected as the chairman for the stakeholder meeting.

The language used for the presentation, sharing and responding to the questions was in Tamil. The summary of the meeting was recorded - copy of which will be made available to Designated Operating Entity during validation process. The list of participants with their signature is kept for record and photographs of the event were also taken.

The stakeholder meeting commenced with welcome address made by Mr. T.V Sankaran (Consultant, Wind Mills). Then the agenda and purpose of meeting i.e. to receive understand record and address the concerns of stakeholders for CDM project activity was presented and got approved.

Mr. Sankaran started the presentation with a brief introduction of Surana Corporation Ltd., Vayu Energy (I) Pvt. Ltd, their activities and various initiatives taken by Surana Corporation Ltd in the field of CDM. This was followed by a brief introduction on climate change, global warming, Kyoto protocol and the CDM process. Mr. Sankaran also briefed on the working of the Windmill and its positive impacts on the environment. The benefits of the erecting and operation of the wind mill to the local villagers was also discussed upon.

The participants were then requested to share their views or concerns.

Mr. Annamalai, the Chairman, in summarizing the discussion lauded the management of both Surana Corporation Ltd and Vayu Energy (I) Pvt. Ltd for their efforts in generating electricity using the renewable energy source, namely Wind. He emphasized that this kind of stakeholder consultation would help the local villagers to articulate their concerns and will have a positive effect in increasing the cooperation between the local stakeholders and management of Surana Corporation Ltd and Vayu

## CDM – Executive Board

Energy (I) Pvt. Ltd. Such efforts would collectively help to improve the overall local as well global environment.

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| <b>E.2. Summary of the comments received:</b> |
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After a brief discussion regarding the pros and cons of this project the comment pertaining to project activity were received and were answered in the meeting. The stakeholders viewed Project proponents as a reputed group of companies contributing to the local economy. The participants sought clarifications on Kyoto Protocol and Clean Development Mechanism processes. Overall there was agreement that the proposed project is a beneficial project activity.

A brief summary of the queries raised by the local stakeholders are presented below:

1. Question: Does the ground water level comes down on the installation of the wind mill  
Ans: the installation of the windmill doesn't affect the ground water level
2. Question: Does the strong earthing done by the manufacturer have some implication on ground water level  
Answer: The earthing is done only for the safety of the wind electric generator at the time of lighting, thundering. The earthing doesn't have any effect on the level of the ground water. The depth of the earth rod is a maximum of 30 feet and not above 100 ft as felt by the villagers.
3. Question : Does the operation of the wind mill effect the agriculture crops  
Answer: The operation of the windmill doesn't affect any agricultural crops as it generates electricity by harnessing renewable energy, namely wind in the region and there is no effluent discharge or any other side effects. In some areas people do agriculture activities inside the wind energy premises.
4. Question: Will the sound made by the wind mill effect human lives  
Answer: The Wind Turbine Generators installed by Surana Corporation Ltd and Vayu Energy (I) Pvt. Ltd is of latest technology and doesn't produce any major sound effect other than the sound made by cutting the wind by blades which is negligible. The noise levels are extremely low and conform to international standards and don't have any side effects.
5. Question: What are the benefits to the local villagers  
Answer: It was informed that the villagers are going to get benefited by employment opportunities, good roads and development of welfare activities.

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| <b>E.3. Report on how due account was taken of any comments received:</b> |
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All the stakeholder concerns were answered satisfactorily by the project proponents.



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**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

|                  |  |
|------------------|--|
| Organization:    | Surana Corporation Ltd   |
| Street/P.O. Box: | 29, Whites road ,Royapettah  |
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| URL:             | <a href="http://www.surana.org.in">www.surana.org.in</a>           |
| Represented by:  | Mahaveer surana  |
| Title:           | President  |
| Salutation:      | Mr.  |
| Last Name:       | Surana   |
| Middle Name:     | -  |
| First Name:      | Mahaveer   |
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## CDM – Executive Board

|                  |                                |
|------------------|--------------------------------|
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| Street/P.O. Box: | 8/4 Home finder estate, ,60089 |
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| Represented by:  | Amit Swarnnkar                 |
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| Middle Name:     |                                |
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|                  |  |
|------------------|--|
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| E-Mail:          | msnelling@cantor.co.uk                                 |
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| Represented by:  |  |
| Title:           | Director Legal (Europe and Asia) and Company Secretary |
| Salutation:      | Mr   |
| Last Name:       | Snelling   |
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**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

Public funding from Annex I and diversion of official development assistance (ODA) is not involved in this project.

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**Annex 3****BASELINE INFORMATION**

| <b>Variable</b>  | <b>Data Source</b>  |
|--|---|
| EG <sub>y</sub> – Electricity generated  | Records maintained by project proponent                                     |
| <b>Parameter</b>   | <b>Data Source</b>  |
| EF <sub>OM, y</sub> - Build Margin Emission Factor (tCO <sub>2</sub> /MWh)     | CEA Data, version 3 dated 15/12/2007  |
| EF <sub>BM, y</sub> = Operating Margin Emission Factor (tCO <sub>2</sub> /MWh) | CEA Data, version 3 dated 15/12/2007.                                       |
| EF <sub>y</sub> – Grid Emission Factor   | Calculated as the weighted average of the operating margin and build margin |

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**Annex 4**

**MONITORING INFORMATION**

Please Refer to Section B.7.2

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