**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**

| Version Number | Date | Description and reason of revision |
|---|---|---|
| 01 | 21 January 2003 | Initial adoption |
| 02 | 8 July 2005 | • The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.<br>• As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>. |
| 03 | 22 December 2006 | • 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. |

## SECTION A. General description of small-scale project activity

### A.1 Title of the small-scale project activity:

>>

**13.95 MW grid connected wind electricity generation by SRF Limited**

Version: 05

Date: 27/03/2009

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

>>

**Objective of the Project**

The project activity has been essentially conceived to implement and generate GHG free electricity from the Wind Turbine Generators (WTGs). The generated electricity from the implemented machines will be supplied to the southern regional grid of India through the nearest grid sub station. The generated electricity that is supplied to the grid will then be wheeled to SRF's units for their technical textile business (plants).

**Nature of the Project**

The project activity comprises of 6 no's of 1.5 MW, S82 type of WTGs of Suzlon make and 3 no's of 1.65 MW, V82 type of WTGs of Vestas make. The electricity generated from the Suzlon WTG's would be supplied to the Udayathoor site sub-station and the electricity generated from the Vestas WTG's would be supplied to the Veeranam site substation, through local transmission lines duly metered and measured at the individual dispatching transformers at each WTG.

**Contribution to GHG emissions reduction**

The project activity harnesses wind energy to generate and supply electricity to the southern regional electricity grid of India. The Project displaces fossil fuel based electricity generation that would have otherwise been provided by the operation and expansion of the fossil fuel based power plants in southern region electricity grid, thereby leading to reduction in emission of greenhouse gases associated with fossil fuel based electricity generation.

**Contribution to Sustainable Development**

The project activity contributes towards sustainable development of the country and the state of Tamil Nadu by reducing the dependency on fossil fuel based electricity generation, which ultimately leads to reduction in greenhouse gas emissions. The project also fulfills several other sustainable development objectives as set out below:

- Contribution towards the objectives of incremental capacity from renewable sources;
- Contribution towards reducing the electricity deficit in Tamil Nadu;

- $CO_2$ abatement and reduction of greenhouse gas emissions through development of renewable technology;
- Reducing the average emission intensity ($SO_x$, $NO_x$, PM, etc.), average effluent intensity and average solid waste intensity of power generation in the system;
- Conserving natural resources including land, forests, minerals, water and ecosystems; and
- Developing the local economy and create jobs and employment, particularly in rural areas, which is a priority concern for the Government of India;

**A.3. Project participants:**

>>

| Name of party involved (*) ((host) indicates a host Party) | Private and/ or public entity(ies) project participants (*)(as applicable) | Kindly indicate if the Party involved wishes to be considered as project participant (Yes/ No) |
|---|---|---|
| Government of India | Private entity.<br>SRF Limited | No |
| (*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required. | | |

The contact information of the project participant has been provided in Annex-I to this PDD.

**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):**

>> Government of India.

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

>> Southern Region/ Tamil Nadu.

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

>> District: Tirunelveli

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

>> The project activity spreads across two locations – Radhapuram and VK Pudur Taluk, both in Tirunelveli District in Tamil Nadu. The district is well connected by railways and national highways. The villages are well interconnected by metalled and un-metalled roads.

The unique identification for the different WEGs that are part of the project activity are as follows:

| SF. No. | Location | WTG | Village / Taluk | Latitude | Longitude |
|---|---|---|---|---|---|

| | No | HTSC No. | | dd° mm' ss.s" | dd° mm' ss.s" |
|---|---|---|---|---|---|
| 2/3 (P) | Site 2/3 | 2550 | Navaneethakrishnapuram, V K Pudur | N 9 00 57.9 | E 77 28 49.8 |
| 12 (P) | Site 12 | 2583 | Navaneethakrishnapuram, V K Pudur | N 9 01 07.9 | E 77 29 07.5 |
| 69/1(P), 70/1(P) | Site 69/70 | 2622 | Melakalangal, V K Pudur | N 9 01 45.2 | E 77 28 46.1 |
| 54/1B1(P) | R231 | 2536 | Thiruvambalapuram, Radhapuram | N 8 15 26.5 | E 77 45 58.5 |
| 494/1A (P) | R404 | 2537 | Thiruvambalapuram, Radhapuram | N8 15 32.8 | E77 48 14.1 |
| 224/2(P) | R352 | 2551 | Thiruvambalapuram, Radhapuram | N 8 15 58.4 | E 77 47 43.9 |
| 433/1A1 | R308 | 2626 | Thiruvambalapuram, Radhapuram | N 8 13 45.6 | E 77 46 46.4 |
| 302(P) | R325 | 2633 | Thiruvambalapuram, Radhapuram | N 8 14 55.1 | E 77 47 11.7 |
| 125/1B(P) | R367 | 2538 | Thiruvambalapuram, Radhapuram | N 8 14 15.9 | E 77 46 25.2 |

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

>>

**Project Type and Category:**

The type and category of project activity as per Appendix B to the simplified modalities and procedures for small-scale CDM project activities is as under:

Project Type: I, Renewable energy project

Project Category: D, Electricity generation for system

Version: 13, EB 36

**Technology of the small scale project activity:**

In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy. The technology is a clean technology since there are no GHG emissions associated with the electricity generation.

The Project involves 6 (WTGs) of Suzlon (Model S-82) and 3 (WTGs) of Vestas (Model V-82) type of Wind Turbine Generators (WTGs) with internal electrical lines connecting the project with the local evacuation facility i.e the Udayathoor and the Veernam substations respectively. The WTGs generate 3-phase power at 690 V, which is stepped up to 33 kV.

Other salient features of the technology are:

**Technical Specification of Suzlon S-82**

**Wind Energy Generation Particulars**

| | |
|---|---|
| Rotor Diameter | 82 m |
| Hub height | 78.5 m |
| Power Regulation | Independent electromechanical pitch system for each blade |
| Rated Voltage | 3 Phase 690 V AC |
| Cut in wind speed | 4 m/s |
| Cut out wind speed | 20 m/s |
| Rated wind speed | 14 m/s |
| Survival wind speed | 52.5 m/s |
| Frequency variation | 50 Hz – 2.5 Hz to + 2 Hz |
| Gear Box | |
| Type model make | Type: On planetary stage / Two helical stages<br>Make: Winergy (Flender) |
| Gear ratio | 1: 95.09 |
| No. of steps | 3 stages |
| **Generator** | |
| Type of Generator | Asynchronous type single speed induction generator with slip rings, variable rotor resistance |
| Rated Power output | 1500 kW |
| Type | Single |
| Voltage | 3 phase 690 V AC +/- 15% |
| No. of poles / RPM | 4 / 1511 rpm (at rated power and short circuited rotor) |
| **Tower** | |
| Height | 76 m |
| Type | Tubular tower made of welded steel plates |
| **Yawing system** | |
| Yaw bearing type | Slide bearing with gear ring and automatic greasing system |
| Yaw motor & gear type | Active electric yaw drive having electric motor with brake, gearbox and pinion. |
| **Brake System** | |
| Aerodynamic | 3 independent systems with blade pitching mechanism |

| | |
|---|---|
| Mechanical | Hydraulic disc brake, activated by hydraulic pressure + mechanical rotor lock, activated by hydraulic pressure |
| **Rotor** | |
| No of Blades | 3 |
| Rotor diameter | 82 m |
| Swept Area | 5281 $m^2$ |
| **Transformer Details** | |
| Transformer Rating | 1750 kVA, 50 Hz |

**Technical Specification of Vestas V-82**

| | |
|---|---|
| **Wind Energy Generation Particulars** | |
| Rotor Diameter | 82 m |
| Hub height | 78 m |
| Power Regulation | Active Stall |
| Cut in wind speed | 3.5 m/s |
| Cut out wind speed | 20 m/s |
| Rated wind speed | 13 m/s |
| **Gear Box** | |
| Type model make | Planetary / Helical stages |
| **Generator** | |
| Type of Generator | Asynchronous water cooled |
| Rated Power output | 1650 kW |
| Type | Single |
| Operational data | 50/60 Hz 690/600 V |
| **Control** | |
| Type | Microprocessor-based monitoring of all turbine functions with the option of remote monitoring. Output regulation and optimisation via Active-Stall® |
| **Weight** | |
| Nacelle | 52 t |
| Rotor | 43 t |

| **Rotor** | |
|---|---|
| Diameter | 82 m |
| Area swept | 5281 $m^2$ |
| Nominal Revolutions | 14.4 rpm |
| No of Blades | 3 |
| Power regulation | Active stall |
| Air Brake | Full blade pitch by three separate hydraulic pitch cylinders. |

There is no technology transfer involved in the project activity. The project technology will not be substituted during the entire life of the project activity.

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

>>

The total emission reduction achieved during the 10-year crediting period aggregates to **3, 48, 860 tonnes of $CO_2e$.**

| **Years** | **Annual estimation of emission reductions in tonnes of CO2e** |
|---|---|
| 2009 | 34,886 |
| 2010 | 34,886 |
| 2011 | 34,886 |
| 2012 | 34,886 |
| 2013 | 34,886 |
| 2014 | 34,886 |
| 2015 | 34,886 |
| 2016 | 34,886 |
| 2017 | 34,886 |
| 2018 | 34,886 |
| **Total estimated reductions (tonnes of CO2e)** | **3,48,860** |
| **Total number of crediting years** | **10** |
| **Annual average over the crediting period of estimated reductions (tonnes of CO2e)** | **34,886** |

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

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There is no ODA financing involved in the Project.

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

>>

The project proponent hereby confirms that there are no other small scale project activities belonging to them that have been registered within the last two years in the same project category and technology

whose project boundary is within 1 km of the project boundary of this proposed small scale project activity. Therefore in accordance with the annex-7, appendix-C of the simplified modalities and procedures for the small-scale activity, the project activity is not a debundled component of a large 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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**Title:** Grid connected renewable electricity generation

**Reference:** Approved small scale methodology AMS I D
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

Version 13, EB 36

Sectoral Scope: 01

The methodology refers the "Tool to calculate the emission factor for an electricity system" Version 01.1

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

>>

The project activity utilizes wind energy for electricity generation, which falls into the category of renewable sources of energy. Since the installed capacity of the project is 13.95 MW, less than the threshold capacity of 15MW, the project activity can be regarded as a small-scale CDM project activity as per paragraph 6(c) of decision 17/CP.7., UNFCCC. Electricity generated by the project is supplied to the grid which comprises of a large number of power generating units, this satisfies the necessary criteria i.e. "electricity generation for a system" as per Appendix B of Simplified modalities and procedures for small-scale clean development mechanism project activities to be classified into category I.D.

The Project proponent hereby confirms that the capacity of the project activity will not exceed 15 MW i.e. the limit for small scale project activities, during the crediting period.

### B.3. Description of the project boundary:

>>

The project boundary, as stated in Appendix B of the simplified modalities and procedures for small-scale CDM project activities, encompasses the physical, geographical site of the renewable generation source.

Hence, the project boundary encompasses the 1.5 * 6 + 1.65 * 3 WTGs installed as part of the project activity. A flow chart for the project boundary is given in Annex 5.

The Indian electricity system is divided into five regional grids, viz. Northern, Eastern, Western, Southern, and North-Eastern. Each grid covers several states. As the regional grids are interconnected, there is inter-state and inter-regional exchange. A small power exchange also takes place with neighbouring countries like Bhutan and Nepal.

Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state in a regional grid meets its demand with its own generation facilities and also with allocation from power plants owned by the Central Sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the Central Sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus, represents the "project electricity system" for the Project. As the Project is connected to the Southern regional electricity grid, the Southern grid is the "project electricity system".

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

>>

As per the Indicative Simplified Baseline and Monitoring Methodologies for selected small scale CDM Project activity categories (AMS.I.D Version 13 Scope 1), the baseline for wind energy generating systems is the electricity (measured in kWh) produced by the generating unit multiplied by an emission coefficient (measured in tCO2e/MWh) calculated in a transparent and conservative manner as either of the following.

(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 tCO2e/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

We have used option (a) i.e. combined margin as per "Tool to calculate the emission factor for an electricity system" version 01.1, as the emission co-efficient for calculating the baseline emissions.

Since the Project does not modify or retrofit an existing generation facility, the baseline scenario is the emissions generated by the operation of grid-connected power plants and by the addition of new generation sources. This is estimated using calculation of Combined Margin multiplied by electricity delivered to the grid by the Project.

Accordingly the baseline emissions are given as:

***BEy = EGy * EFy ……..(1)***

Where:

- BEy Baseline emissions (tCO2e/year)
- EGy Electricity generation by the project activity (MWh/year)
- EFy Baseline emission coefficient determined in accordance with option (a) specified above

The key information and data used for calculation of baseline have been taken from following sources:

| S.No. | Key Information/data used for baseline | Source of data/information |
|---|---|---|
| 1. | Electricity generation | Month wise data collected and compiled from State electricity board credit reports |
| 2. | Grid electricity generation & fuel consumption | Website of Central Electricity Authority http://cea.nic.in |

| S.No. | Key Information/data used for baseline | Source of data/information |
|---|---|---|
| 3. | Emission factor based on combined margin of the Southern electricity grid | Website of Central Electricity Authority http://cea.nic.in |
| 4. | Plant Load factor | Assumption made during investment decision |

**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:**

>>

**Project Additionality:**

The investment Barrier analysis set out below demonstrates in a conservative and transparent manner that the project activity is financially unattractive.

**Investment Barrier:**

The investment barrier has been substantiated below using the Investment Analysis as per the "Guidance on Assessment of Investment Analysis, EB 41 Annex 45" in accordance with Para 1(a) of "Non-binding best practice examples to demonstrate additionality for SSC project activities" EB 35, Annex 34. The financial indicator identified for carrying out the investment analysis is the IRR.

As per Guidance on assessment of investment analysis issued in EB 41 (paragraph 11) the weighted average cost of capital can be considered as appropriate benchmark for project IRR. It is also worthwhile to note that the captioned project is a Greenfield wind power generation project that generates and supplies electricity to the state grid, therefore the project has more than one possible project developer. The guidance under Para 13 also states that in cases where the project has more than one potential developer, the benchmark can not be based on internal cost of equity or WACC and shall be based on publicly available data sources which can be clearly validated by the DOE. According to the EB's guidance under the additionality tool, we have not used company or project specific parameters for the calculation of the benchmark (such as company WACC, project and company specific interest rates, etc.). Accordingly, the weighted average cost of capital has been calculated based on parameters that are standard in the market, considering the specific characteristics of the project type. The WACC has been derived based on the cost of capital of all listed power generating companies.

Weighted average cost of capital (WACC) is calculated as weighted average cost of equity and cost of debt as illustrated below

WACC = [D/ (D+E)]*[Cost of Debt] + [E/ (D+E)]*[Cost of Equity]

**Cost of Debt:**

Cost of debt is defined as the rate at which lenders agree to lend money to a project. The additionality tool and the guidance to investment analysis clarify that the benchmark for projects with more than one potential developer should not be based on project specific parameters but should represent the standard in the market. Prime Lending Rate is defined as the benchmark rate for all bank loans. Historically, the PLR is the rate at which banks lend to the best borrower—one who is the safest or the least likely to default on the loan. Accordingly, the bank prime lending prevailing at the time of project start date has been considered as the cost of debt. The prime lending rate at the time of investment was in the range of

12.75% - 13.25 % [Source: Reserve Bank of India (RBI), http://www.rbi.org.in/scripts/WSSView.aspx?Id=11936), the average PLR of 13.00% has been considered as the cost of debt.

**Cost of Equity:**

The cost of equity has been determined using the Capital Asset Pricing Model (CAPM) considering Beta values of all power generating companies in India that were listed at the time of this investment. Detailed calculations of cost of equity and WACC along with an elaboration of the approach are provided in Annex 6.

As can be seen, the WACC works out to **14.73%.**

*Key assumptions for financial analysis*

All the values taken for the various parameters in the analysis are assumptions made by SRF during the project evaluation at the time of investment decision.

| Parameter | Input value | Basis of assumption during investment decision |
|---|---|---|
| Project Commissioning Date | 31-March-08 | Quotation from WEG manufacturer |
| Project Cost per MW (Rs. In Millions) | 61.3 | Quotation from WEG manufacturer |
| | | |
| **Operations** | | |
| Plant Load Factor | 30.72% | Estimate of generation from WaSP analysis given by WEG manufacturer |
| Insurance Charges @ % of capital cost | 0.18% | Estimate based on standard insurance charges for wind projects |
| Operation & Maintenance Cost base year @ % of capital cost | 1.63% | Quotation from WEG manufacturer |
| % of escalation per annum on O & M Charges | 5.0% | Quotation from WEG manufacturer |
| Salary and overheads (Rs. Million/year) | 0.40 | One person's salary |
| | | |
| **HT Tariff** | | |
| Base year Tariff (2007-08) - Rs./kWh | 3.50 | HT Tariff[1] |
| Electricity Duty (Rs./kWh) | 0.18 | |
| Tariff applicable | | |

[1] In a captive wind project the revenue from electricity will be the HT tariff payable by the consumer that is avoided due to installation of the windmill. The tariff would include the HT tariff of Rs. 3.5 per kWh and the electricity duty of Rs. 0.18 per kWh. This has been sourced from Tamil Nadu Electricity Board. http://www.tneb.in/template_ 3.php?tempno=3&cid=0& subcid=54.

| | | |
|---|---|---|
| | 3.68 | |
| Annual Escalation (Rs./kWh per Year) | - | |
| Wheeling charge (% of Gross generation) | 5% | TNERC order |
| | | |
| **Means of Finance** | | |
| Own Source | 50% | SRF's assumption for evaluating capital projects |
| Term Loan | 50% | SRF's assumption for evaluating capital projects |
| Interest Rate | 10.00% | Prevailing market rate for bank loans. |
| | | |
| **Income Tax** | | |
| Income Tax rate | 33.99% | As per Indian Income Tax Act |
| Minimum Alternate Tax | 11.33% | As per Indian Income Tax Act |
| | | |
| **Income Tax Depreciation Rate (Written Down Value basis)** | | |
| on Wind Energy Generators | 80% | As per Indian Income Tax Act |
| | | |
| **Book Depreciation Rate (Straight Line Method basis)** | | |
| On all assets | 4.50% | **As per TNERC Order** |
| Book Depreciation up to (% of asset value) | 90% | **As per TNERC Order** |

The post tax project IRR is 10.48% which is lesser than the WACC of 14.73%.

Further the project IRR of 10.48% indicates that the project did not generate enough returns to even cover the prevailing bank prime lending rate at the time of investment. The average bank PLR at the time of investment decision of the project was 13% (Source: http://www.rbi.org.in/scripts/WSSView.aspx?Id=11936, Reserve Bank of India) much higher than the project IRR value of 10.48%.

**Sensitivity analysis**

*PLF*

At the time of investment decision there were two available sources for assumption of PLF; an independent study conducted by a well known third party organisation - C-Wet (Centre for Wind Energy Technology) on the estimated generation from the WEGs at the proposed sites and the WEG manufacturer's WaSP (Wind Atlas Analysis and Application Program) analysis. The base case PLF assumption was arrived at on the basis of the analysis conducted by the WEG manufacturer for estimating the electricity generation in the proposed specific site for the particular machine type chosen for the

project activity. This value was used for the initial financial evaluation of the project at the time of investment decision. The PLF as per the two sources are as follows:

- CWet Analysis – 25-27%
- WaSP analysis – 30.72%

The Project IRR at 25% PLF is 7.07% and at 27% PLF is 8.3% and at 30.72% PLF (base case) is 10.48%.

As can be seen the base case PLF assumed for the investment analysis is the highest of the PLF estimations, hence it would not be appropriate to carry out sensitivity analysis on the higher side.

Even though a 10% increase in generation is not a realistic or likely scenario, the following table shows that that IRR for the project still remains below the benchmark even with a 10% increase in generation.

| Variation in Generation | Project IRR |
|---|---|
| + 10% | 12.20% |
| + 5% | 11.35% |
| **Base** | **10.48%** |
| - 5% | 9.59% |
| - 10% | 8.69% |

*Project Cost*

In case of projects that have a long gestation period, the capital cost is subject to a multitude of factors like labour and construction issues, variations in cost of input materials, alterations in project design to account for site conditions etc., and therefore any variations in these parameters can lead to changes in the initial estimates of project cost. However unlike long gestation projects, wind mills are not affected by any such issues as the gestation period of a small scale wind project is usually 4-6 months. Contracts with WEG suppliers are typically fixed price contracts, therefore the only possible variation in the estimated cost could be on account of any negotiations that take place before the final orders are placed.

The estimated project cost was based on the final negotiated price with WEG manufacturer. Therefore sensitivity on project cost is not required.

The above discussions clearly substantiate that the project activity would not have been undertaken without CDM. Therefore it can be concluded that the project activity faces significant Investment Barriers[2]. In the absence of the project activity equivalent amount of electricity would have continued to be supplied by the power generation mix of the southern grid (which is fossil fuel dominated), this would have lead to higher emissions. Hence as per Attachment A - Appendix B, the project activity is additional.

**Prior Consideration of CDM**

As the start date is prior to the date of publication of the PDD for global stakeholder consultation evidence of awareness of CDM, seriousness of CDM consideration and the evidence that continual and real action was taken for acquiring CDM status of the project is presented below.

*Awareness of CDM*

[2] As per Attachment A - Appendix B, Simplified modalities and procedures for small scale CDM project activities

SRF has an already registered CDM project (UNFCCC ref no 115) and are well aware of the CDM modalities and procedures. They were aware that wind power projects that supply electricity to the grid are eligible under the CDM. They conducted an initial feasibility which showed that project would meet the requirements and additionality criteria of CDM. Hence the investment in the project was made assuming that CDM registration will occur and revenues will be generated.

*Seriousness of CDM consideration*

The project proponents, during their decision to invest in the project, had considered CDM as a source of additional revenue (in their board meeting dated 17 December 2007) for investing in the project. The board resolution clearly mentions the contribution of CDM revenues towards project's returns and that the project has been conceived and invested in only after considering it as a CDM initiative. The information about the PP undertaking the wind power project as a CDM initiative is also available in public domain through several newspaper reports and articles. The news of PP's investment in the CDM project was reported in leading newspapers in India immediately after undertaking the decision to invest in the project even before the start date of the project. [*Refer news articles in "The Hindu" dated 18th December 2007, "Dainik Bhaskar" dated 19th December 2007 and "The Financial Express" dated 21st December 2007 ("The Hindu" and "The Financial Express" are two of the leading national newspapers in India*)].
Apart from this SRF's annual report for the year 2007-08 also states that the wind project has been set up as a CDM initiative and the project's viability is linked to it being a CDM project.

*Continued real action for acquiring CDM status*

Chronology of events

| Event | Date / Time period | Evidence Document / web-link |
|---|---|---|
| Communication to Ms. Bharti Gupta Ramola, Head - PwC CDM services, regarding assistance for wind project | 29th May 2007 | E-mail from SRF to PwC |
| Clarification from PwC on the emission factor to be taken as part of the financial analysis of the project with CER revenue | 6th December 2007 | E-mail from SRF to PwC |
| Decision to Invest in the project activity considering it as a CDM initiative | 17th December 2007 | Board resolution |
| Notification to stock exchange of the investment in the wind project | 18th December 2007 | http://www.bseindia.com/qresann/newsh.asp?newsid={A6183B36-F6B3-4CEF-9B06-AD2411EACAFE}&param1=1 |
| Article in "The Hindu" about the wind CDM project | 18th December 2007 | http://www.hindu.com/2007/12/18/stories/2007121856011600.htm |
| Article in the newspaper "Dainik Bhaskar" about the wind CDM project | 19th December 2007 | Scanned copy of the article |
| Placement of first purchase Order for the project | **20th December 2007 (Project start date)** | Purchase Order to Suzlon |
| Article in "The Financial Express" about SRF's wind CDM project | 21st December 2007 | http://www.financialexpress.com/news/SRF-to-set-up-wind-energy-project-in-TN/253149/ |
| Article in the website yarnsandfibres.com | 25th December 2007 | https://www.yarnsandfibers.com/new |

| | | |
|---|---|---|
| regarding the CDM initiative by SRF | | s/index_fullstory.php3?id=14399&section=32&countrynews=&month=12&year=2007&mode=month&newsdated=200700 |
| Communications with PwC regarding CDM consultancy for the wind project | January 2008 | Telephonic discussions between SRF and PwC (this is referred in the email dated 20th February 2008) |
| Request for proposal for CDM consultancy from PwC | 20th February 2008 | e-mail from SRF to PwC |
| Placement of last purchase Order for the project | 21st February 2008 | Purchase Order to Vestas |
| Mail to Suzlon introducing PwC as CDM consultant and requesting Suzlon to nominate a single point of contact for CDM project | 5th March 2008 | e-mail to Suzlon |
| Communications with Vestas introducing PwC as CDM consultant and requesting Vestas to nominate a single point of contact for CDM project | 5th March and 10th March 2008 | e-mail to Vestas |
| Passing of the contact details of Vestas and Suzlon representatives to PwC for furthering the CDM project. | 10th March 2008 | e-mail from SRF to PwC |
| Proposal from PwC for CDM consultancy of the project | 20th March 2008 | e-mail from PwC to SRF |
| Signing of Power wheeling banking agreements | 27th March 2008 | Power Wheeling banking agreement |
| Clearances from TNEB for WEGs | March, April and May 2008 | All clearance documents |
| Commissioning of first WEG | 27th March 2008 | Commissioning Certificate |
| Discussions and Negotiations with PwC on the terms and conditions of the CDM consultancy contract including the price | April 2008 | Meetings and telephonic discussions between SRF and PwC |
| SRF Quarter 4 results publication highlighting the investment in wind project, the commissioning of the first few WEGs and that the project is being developed as a CDM project. | 25th April 2008 | http://www.srf.com/inv/Press200708_Q4.pdf |
| SRF Annual report 2007-08 mentioning that the wind power project is being developed as a CDM initiative and that the viability of the project is linked with its ability to generate CERs. | 25th April 2008 | http://www.srf.com/inv/Annual%20Report%202007-08.pdf |
| Request for a revised proposal from PwC after negotiations on price | 12th May 2008 | E-mail from SRF to PwC |
| Revised price offer from PwC | 25th May 2008 | E-mail from PwC to SRF |
| Discussions on other terms and conditions of the CDM consultancy contract such as time schedule | 25th May 2008 to 5th June 2008 | Telephonic Discussions |

| | | |
|---|---|---|
| Commissioning of last WEG | 3rd June 2008 | Commissioning Certificates |
| Stakeholder consultation Invitation for CDM project | 3rd June 2008 | Stakeholder Invitation |
| Email to PwC requesting final offer including revision in the clause of time schedule | 5th June 2008 | Email from SRF to PwC |
| Signing of the final contract with PwC for CDM consultancy | 5th June 2008 | Engagement Contract with PwC |
| Article in "The Hindu" stating that SRF's CDM project has been commissioned | 12th June 2008 | http://www.thehindubusinessline.com/2008/06/13/stories/2008061351200300.htm |
| Article in Economic Times, Chennai reiterating that the viability of the wind project is linked directly to it being a CDM initiative. | 12th June 2008 | Scanned copy of the article |
| Stakeholder consultation for CDM project | 17th and 18th June 2008 | Minutes of meeting of the stakeholder consultation |
| Draft PCN submitted by PwC to SRF | 18th June 2008 | E-mail from PwC to SRF |
| Submission of PCN to DOEs for validation quotation | 20th June 2008 | E-mail from SRF to DOE |
| Engagement Contract with DOE SGS | 30th June 2008 | Engagement Contract |
| Submission of PDD and PCN for HCA | 4th July 2008 | Letter to the DNA of India |
| Submission of PDD and PCN to DOE | 24th July 2008 | E-mail from SRF to DOE |
| Web-hosting of PDD and PCN for GSP | 26th July 2008 | UNFCCC web-site |

The above chronology of events clearly shows that real and continuing action to secure CDM status for the project was taken right at the time of project start. Also, there are several published newspaper reports about the project being implemented as a CDM activity, even prior to start of the project. As can be seen even before the start of the project the PP had undertaken measures towards CDM registration of the project, including seeking inputs from CDM consultants on issues such as relevant emission factors and CER prices so that the contributions of CDM towards project's viability can be assessed.

As evident from the timeline; besides taking measures to appoint CDM consultants, the PP themselves undertook efforts to secure CDM registration for the project. Within 2 weeks of placing the final purchase orders, even before the finalisation of the contract with the CDM consultants, the PP introduced the CDM consultant to WEG manufactures i.e. Suzlon and Vestas and instructed the CDM consultants to commence collecting necessary information on the projects to avoid any time delays in CDM. It is also important to note that the PP had already sent out the invitations for CDM stakeholder consultation, even before finalising the contract with CDM consultants, to avoid any time delays. However, the PP had to wait for all the clearances before proceeding further with the PDD and PCN preparation since these clearances are required for Host Country Approval. The clearances and necessary documents were available by end of May 2008 within one month of this the PDD and PCN was submitted to the DNA.

In summary, we would like to submit that there are several activities that are required to be completed in order to meet the requirements of CDM, including where required, appointment of consultants for CDM. As can be seen from the foregoing, even while the contract negotiations with CDM consultants were ongoing, the PP has taken real and continued measures to ensure that CDM registration happens in a timely manner. The process of engaging the CDM consultants i.e. PwC was initiated at an early stage; as can be seen from the email exchanges provided, the work on CDM development had already started even

though the final contract was signed later. This can also be corroborated from the fact that the PDD and PCN were submitted to DNA within one month of receiving the clearances and signing of the final contract for CDM services.

The time taken for finalising the contract with consultants is due to the fact that, there are multiple rounds of discussions and negotiations and several technical and legal formalities that are required to be addressed.

## B.6. Emission reductions:

### B.6.1. Explanation of methodological choices:

>>

According to the approved small scale methodology AMS I.D. version 13, the emission reductions ***ERy*** by the project activity during a given year "*y*[1]" is

***ERy = BEy – PEy – Ly……..(1)***

Where: *BEy* is the baseline emissions
*PEy* is project activity emissions and;
*Ly* is the amount of emissions leakage resulting from the project activity.

Baseline Emissions for the amount of electricity supplied by project activity, *BEy* is calculated as

***BEy = EGy * EFy ……..(2)***

Where, *EGy* is the electricity supplied to the grid, *EFy* is the $CO_2$ emission factor of the grid as calculated below.

***Calculation of Baseline Emission Factor***

According to AMS I.D, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg $CO_2e$/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'
(b) The weighted average emissions (in kg $CO_2e$/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

The project proponents have chosen the combined margin approach to calculate the emission coefficient for the grid. According to the tool the baseline emission coefficient will be determined using the following steps:

**STEP 1. Identifying the relevant electric power system**

The Indian electricity system is divided into five regional grids, viz. Northern, Eastern, Western, Southern, and North-Eastern. Each grid covers several states. As the regional grids are interconnected, there is inter-state and inter-regional exchange. A small power exchange also takes place with neighbouring countries like Bhutan and Nepal.

Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state in a regional grid meets its demand with its own generation facilities and also with allocation from power plants owned by the Central Sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the Central Sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus, represents the "project electricity system" for the Project. As the Project is connected to the Southern regional electricity grid, the Southern grid is the "project electricity system".

**STEP 2. Select an operating margin (OM) method**

According to the tool the calculation of the operating margin emission factor is based on one of the following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

Any of the four methods can be used, however, the simple OM method (option a) can only be used if low cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The Share of Low Cost / Must-Run (% of Net Generation) in the generation profile of the different grids in India in the last five years is as follows:

| | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 |
|---|---|---|---|---|---|---|---|
| North | 25.9% | 25.7% | 26.1% | 28.1% | 26.8% | 28.1% | 27.1% |
| East | 10.8% | 13.4% | 7.5% | 10.3% | 10.5% | 7.2% | 9.0% |
| **South** | **28.1%** | **25.5%** | **18.3%** | **16.2%** | **21.6%** | **27.0%** | **28.3%** |
| West | 8.2% | 8.5% | 8.2% | 9.1% | 8.8% | 12.0% | 13.9% |
| North-East | 42.2% | 41.7% | 45.8% | 41.9% | 55.5% | 52.7% | 44.1% |
| India | 19.2% | 18.9% | 16.3% | 17.1% | 18.0% | 20.1% | 20.9% |

*Source: $CO_2$ Baseline Database for the Indian Power Sector – Central Electricity Authority*

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) for the southern regional grid is less than 50 % of the total generation. Hence the Simple OM method can be used to calculate the Operating Margin Emission factor.

The project proponents choose an ex ante option for calculation of the OM with a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

**STEP 3. Calculate the operating margin emission factor according to the selected method**
The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or
- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C)

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO2 Baseline Database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India. The Combined Margin in the CEA database is calculated ex ante using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system". We have, therefore, used the Combined Margin data published in the CEA database, for calculating the Baseline Emission Factor.

The CEA database uses the option B i.e. data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, to calculate the OM of the different regional grids.
The simple OM emission factor is calculated based on the electricity generation of each power unit and an emission factor for each power unit, as follows:

$$\mathbf{EF_{grid,OMsimple,y} = \Sigma\ (EG_{m,y}\ x\ EF_{EL,m,y})\ /\ \Sigma EG_{m,y}}$$

Where:
$EF_{grid,OMsimple,y}$ Simple operating margin $CO_2$ emission factor in year y ($tCO_2$/MWh)
$EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ $CO_2$ emission factor of power unit m in year y ($tCO_2$/MWh)
m All power units serving the grid in year y except low-cost / must-run power units
y Either the three most recent years for which data is available at the time of submission of the CDM PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

The emission factor of each power unit m has been determined using Option B1

$$\mathbf{EF_{EL,m,y} = (\Sigma\ FC_{i,m,y}\ x\ NCV_{i,y}\ x\ EF_{CO2,I,y})\ /\ EG_{m,y}}$$

Where:
$EF_{EL,m,y}$ $CO_2$ emission factor of power unit m in year y ($tCO_2$/MWh)
$FC_{i,m,y}$ Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$ Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,I,y}$ $CO_2$ emission factor of fossil fuel type i in year y ($tCO_2$/GJ)

$EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m All power units serving the grid in year y except low-cost / must-run power units
i All fossil fuel types combusted in power unit m in year y
y Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

**STEP 4. Identify the cohort of power units to be included in the build margin**
The sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use the set of power units that comprises the larger annual generation.
Accordingly, the CEA database calculates the build margin as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation.
The build margin emission factor has been calculated ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. This option does not require monitoring the emission factor during the crediting period.

**STEP 5. Calculate the build margin emission factor**
The build margin emissions factor is the generation-weighted average emission factor of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$\mathbf{EF_{grid,BM,y} = (\Sigma\, EG_{m,y} \times EF_{EL,m,}) / \Sigma\, EG_{m,y}}$$

Where:
$EF_{grid,BM,y}$ Build margin $CO_2$ emission factor in year y ($tCO_2$/MWh)
$EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ $CO_2$ emission factor of power unit m in year y ($tCO_2$/MWh)
m Power units included in the build margin
y Most recent historical year for which power generation data is available

The CO2 emission factor of each power unit m ($EF_{EL,m,y}$) is determined as per the procedures given in step 3 (a) for the simple OM, using options B1 using for *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

**STEP 6. Calculate the combined margin emissions factor**
The emission factor *EFy* of the grid is represented as a combination of the Operating Margin (OM) and the Build Margin (BM). Considering the emission factors for these two margins as $EF_{OM,y}$ and $EF_{BM,y}$, then the *EFy* is given by:

$$\mathbf{EF}_y = w_{OM} * \mathbf{EF_{grid,OM,}}_y + w_{BM} * \mathbf{EF_{grid,BM,}}_y$$

Where:
$EF_{grid,BM,y}$ Build margin $CO_2$ emission factor in year y ($tCO_2$/MWh)
$EF_{grid,OM,y}$ Operating margin $CO_2$ emission factor in year y ($tCO_2$/MWh)
$w_{OM}$ Weighting of operating margin emissions factor (%)

$w_{BM}$ Weighting of build margin emissions factor (%) (where $w_{OM} + w_{BM} = 1$).

As per the tool, for wind projects $w_{OM}$ is 0.75 and $w_{BM}$ is 0.25.
Using the values for operating and build margin emission factor provided in the CEA database and their respective weights for calculation of combined margin emission factor, the baseline carbon emission factor (CM) is 929.31 tCO2e/GWh or 0.92931 tCO2e/MWh.

**Details of Baseline data:**

Data of Operating for the three financial years from 2004-05 to 2006-07 and Build Margin for 2006-07 has been obtained from -

**The CO2 Baseline Database for the Indian Power Sector**
Ministry of Power: Central Electricity Authority (CEA)
Version 3
Dated: 15th December 2007 (Latest data available at the time of commencement of validation i.e. 26th July 2008)
Key baseline information is reproduced in annexure 3.
The detailed excel sheet is available at:
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

**Project Emissions:**

The project activity uses wind power to generate electricity and hence the emissions from the project activity are taken as nil.

*PEy = 0*

**Leakage:**

As per the applicable approved methodology AMS I.D. (version 13), leakage is to be considered if the energy generating equipment is transferred from another activity. The project activity is a green field power wind power generation facility and the energy generating equipment used in the project activity has not been transferred from any other activity. Hence, leakage is not considered.

*Ly = 0*

**B.6.2. Data and parameters that are available at validation:**

| **Data / Parameter:** | $EF_{OM,y}$ |
|---|---|
| Data unit: | tCO2e/MWh |
| Description: | Operating Margin Emission Factor of Southern Regional Electricity Grid |
| Source of data used: | "CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India.<br><br>The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in |
| Value applied: | **2004-05** 1.00088<br>**2005-06** 1.00789 |

| | | |
|---|---|---|
| | **2006-07** | 1.00302 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with "Tool to calculate the emission factor for an electricity system" | |

| **Data / Parameter:** | $EF_{BM,y}$ |
|---|---|
| Data unit: | tCO2e/MWh |
| Description: | Build Margin Emission Factor of Southern Regional Electricity Grid |
| Source of data used: | "CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India.<br><br>The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in |
| Value applied: | 0.70545 for the year 2006-07 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with "Tool to calculate the emission factor for an electricity system". |

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

>>

Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage are nil.

Baseline emission factor (combined margin)
= 929.31 tCO2e/GWh

Annual electricity supplied to the grid by the Project
= 13.95 MW (Capacity) x 30.72% (PLF) x 8760 (hours) / 1000 GWh
= 37.54GWh

Annual baseline emissions
= 929.31tCO2e/GWh x 37.54 GWh
= 34,886 tCO2

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

| Years | Estimation of project activity emissions (tCO2e) | Estimation of baseline Emissions (tCO2e) | Estimation of Leakage (tCO2e) | Estimation of overall emission reductions (tCO2e) |
|---|---|---|---|---|
| 2009 | 0 | 34,886 | 0 | 34,886 |
| 2010 | 0 | 34,886 | 0 | 34,886 |
| 2011 | 0 | 34,886 | 0 | 34,886 |
| 2012 | 0 | 34,886 | 0 | 34,886 |

| | | | | |
|---|---|---|---|---|
| 2013 | 0 | 34,886 | 0 | 34,886 |
| 2014 | 0 | 34,886 | 0 | 34,886 |
| 2015 | 0 | 34,886 | 0 | 34,886 |
| 2016 | 0 | 34,886 | 0 | 34,886 |
| 2017 | 0 | 34,886 | 0 | 34,886 |
| 2018 | 0 | 34,886 | 0 | 34,886 |
| **Total (tonnes of CO2e)** | **0** | **3,48,860** | **0** | **3,48,860** |

## B.7 Application of a monitoring methodology and description of the monitoring plan:

### B.7.1 Data and parameters monitored:

| **Data / Parameter:** | **EGy** |
|---|---|
| Data unit: | MWh (Mega-watt hour) |
| Description: | Net electricity supplied to the grid by the Project |
| Source of data to be used: | Electricity supplied to the grid as per the joint meter readings |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | Annual electricity supplied to the grid by the Project<br>= 13.95 MW (Capacity) x 30.72% (PLF) x 8760 (hours) / 1000 GWh<br>= 37.54 GWh |
| Description of measurement methods and procedures to be applied: | Net electricity supplied to grid will be measured through meter readings of the energy meters installed by TNEB, which have facilities to record export and import of energy. The procedures for metering the energy will be as per the provisions of the power wheeling banking agreement |
| QA/QC procedures to be applied: | QA/QC procedures including meter testing, calibration, etc. will be as implemented by TNEB pursuant to the provisions of the wheeling and banking agreement. The QA/QC procedures have been detailed in Annex 4. |
| Any comment: | Data will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. |

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

>>

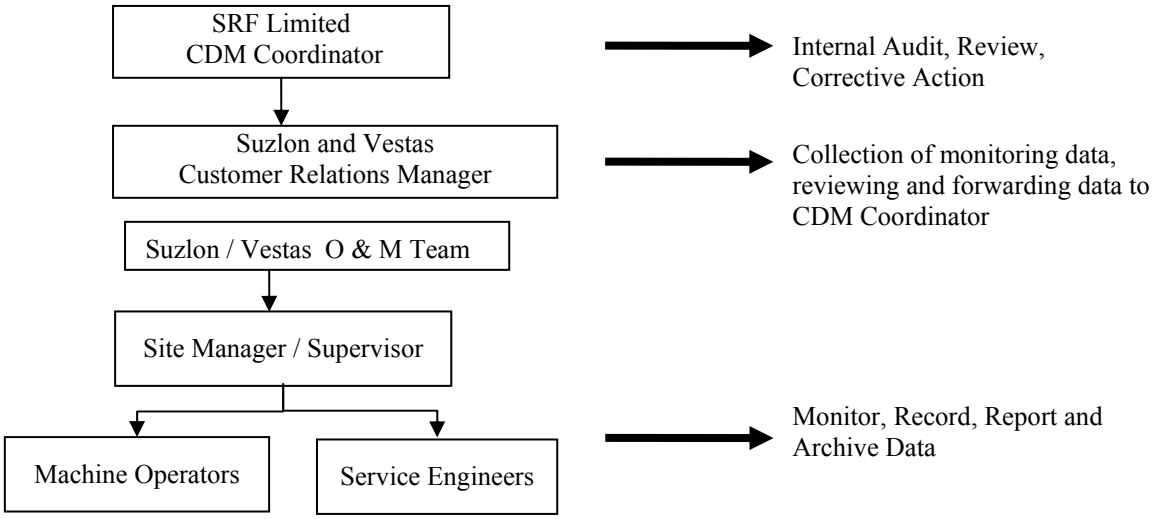
The project activity falls in the technology measure as described in the paragraph 1 of the Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. The applicable simplified baseline and monitoring methodology for selected small scale CDM project activities AMS I.D. version 13 requires monitoring of the following.

- Metering the electricity generated by the renewable technology

Further, wind based electricity generation is not associated with any kind of leakages. Hence, the sole parameter for monitoring is the net electricity supplied to the grid. The Project is operated and managed by the respective EPC contractors. Being ISO certified organizations, they follow the documentation practices to ensure the reliability and availability of the data for all the activities as required from the construction, commissioning and operation of the wind power project.

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure as set in the power wheeling agreement with the state electricity board. The project will adhere to all the mandatory regulatory and statutory requirements at the state as well as national level.

The operational and management structure implemented by SRF along with Suzlon and Vestas is as follows:




The monitored data will be maintained as hard copies in the form of Joint Meter Readings (JMR) as well as in the soft copy for a minimum period of 10+2 years. A copy of this data will be available at the site with the TNEB officials as well as with SRF at their plant site.

The authority and responsibility of project registration and overall project management would be with the CDM coordinator from SRF Limited.

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

>>

Date of completion: 27 / 03 / 2009

Name of responsible person/entity: SRF limited and consultants appointed by them

## 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:

>> 20/12/2007 (As per CDM glossary of terms and for this project is the first date of real action which is the date of placement of first purchase order)

As the starting date is earlier than the date of publication of PDD for global stakeholder comments, section B5 contains a discussion on seriousness of CDM consideration as well as a chronology of events proving that continual real action towards acquiring CDM status for the project activity.

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

>> 20 years 0 months

**C.2 Choice of the crediting period and related information:**

>> The project activity will use fixed crediting period.

**C.2.1. Renewable crediting period**

Not opted for

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

>> N/A

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

>> N/A

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

**C.2.2.1. Starting date:**

>> 01/03/2009 or date of registration whichever is later

**C.2.2.2. Length:**

>>10 years and 0 years

## SECTION D. Environmental impacts

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

>>

As per the Schedule 1 of the EIA notification 2006, given by the Ministry of Environment and Forests under the Environment (Protection) Act 1986, the proposed project doesn't fall under the list of activities requiring EIA[3]. The project will not involve any negative environmental impacts, as the WEGs are installed for generation of power using wind which is a clean source of energy, thus no EIA study was conducted.

**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:**

>>

Not Applicable, please refer D1 above.

[3] 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:

>>

A meeting for the local stakeholders of the windmill project was organized on 17th June 2008 in Tiruvambalapuram and on 18th June 2008 in Surandai (the respective project sites), Tirunelveli District to understand the concerns of the stakeholders with regard to the project activity. Invitation for the meeting was sent out to all pertinent stakeholders 15 days prior to the event. The stakeholders included the original landowners of the windmill farm, member of the local governing body, residents of village, representatives of the local school, TNEB Engineers, members of the Operation and Maintenance team of the EPC contractor, etc.

These invitations were delivered in person to all the stakeholders and they were informed about the consultation.

The stakeholders were presented, in vernacular (Tamil), with an overview of the project activity as well as the technological, economic, environmental and social issues associated with it. After the presentation, the stakeholders were invited to come forward with their comments, suggestions and concerns regarding the project activity. A questionnaire was circulated to all the stakeholders.

### E.2. Summary of the comments received:

>> The stakeholders gave their opinion on the project through the filled questionnaires. Overall a positive response was received from the stakeholders. Copies of the filled questionnaires from the attendees of the meeting are available for verification.

### E.3. Report on how due account was taken of any comments received:

>> There were no negative comments received from the stakeholders.

## Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| | |
|---|---|
| Organization: | SRF Limited, |
| Street/P.O.Box: | Block - C, |
| Building: | Sector – 45 |
| City: | Gurgaon |
| State/Region: | Haryana, |
| Postfix/ZIP: | 122003 |
| Country: | India |
| Telephone: | +91-124-4354400 |
| FAX: | +91-124-4354500 |
| E-Mail: | salotra@srf.com |
| URL: | www.srf.com |
| Represented by: | Roop Salotra |
| Title: | Chief Executive Officer |
| Salutation: | Mr. |
| Last Name: | Salotra |
| Middle Name: | - |
| First Name: | Roop |
| Department: | CEO |
| Mobile: | +91-9810180907 |
| Direct FAX: | +91-124-4354500 |
| Direct tel: | +91-124-4354466 |
| Personal E-Mail: | salotra@vsnl.com |

## Annex 2

## INFORMATION REGARDING PUBLIC FUNDING

There is no Official Development Assistance diverted into the Project.

## Annex 3

## BASELINE INFORMATION

The Operating Margin data for the most recent three years and the Build Margin data for the Southern Region Electricity Grid as published in the CEA database are as follows:

**Simple Operating Margin**

| | **$tCO_2 e$ / GWh** |
|---|---|
| Simple Operating Margin – 2004-05 | 1,000.88 |
| Simple Operating Margin – 2005-06 | 1,007.89 |
| Simple Operating Margin – 2006-07 | 1,003.02 |
| Average Operating Margin of last three years | 1,003.93 |

**Build Margin**

| | **tCO2e/GWh** |
|---|---|
| Build Margin for the year 2006-07 | 705.45 |

**Combined Margin calculations**

| | **Weights** | **tCO2e/GWh** |
|---|---|---|
| Operating Margin | 0.75 | 1003.93 |
| Build Margin | 0.25 | 705.45 |
| **Combined Margin** | | **929.31** |

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at www.cea.nic.in.

## Annex 4

## MONITORING INFORMATION

**Metering arrangements of TNEB (Extracts from the Wheeling Banking Agreement)**

1) The Wind Energy Generator will provide with energy meters with facilities to record export and import of energy.

2) The distribution licensee may provide check meters of the same specification of as the main meter.

3) The main and the check meters shall be tested for accuracy once in six months and shall be calibrated once a year.

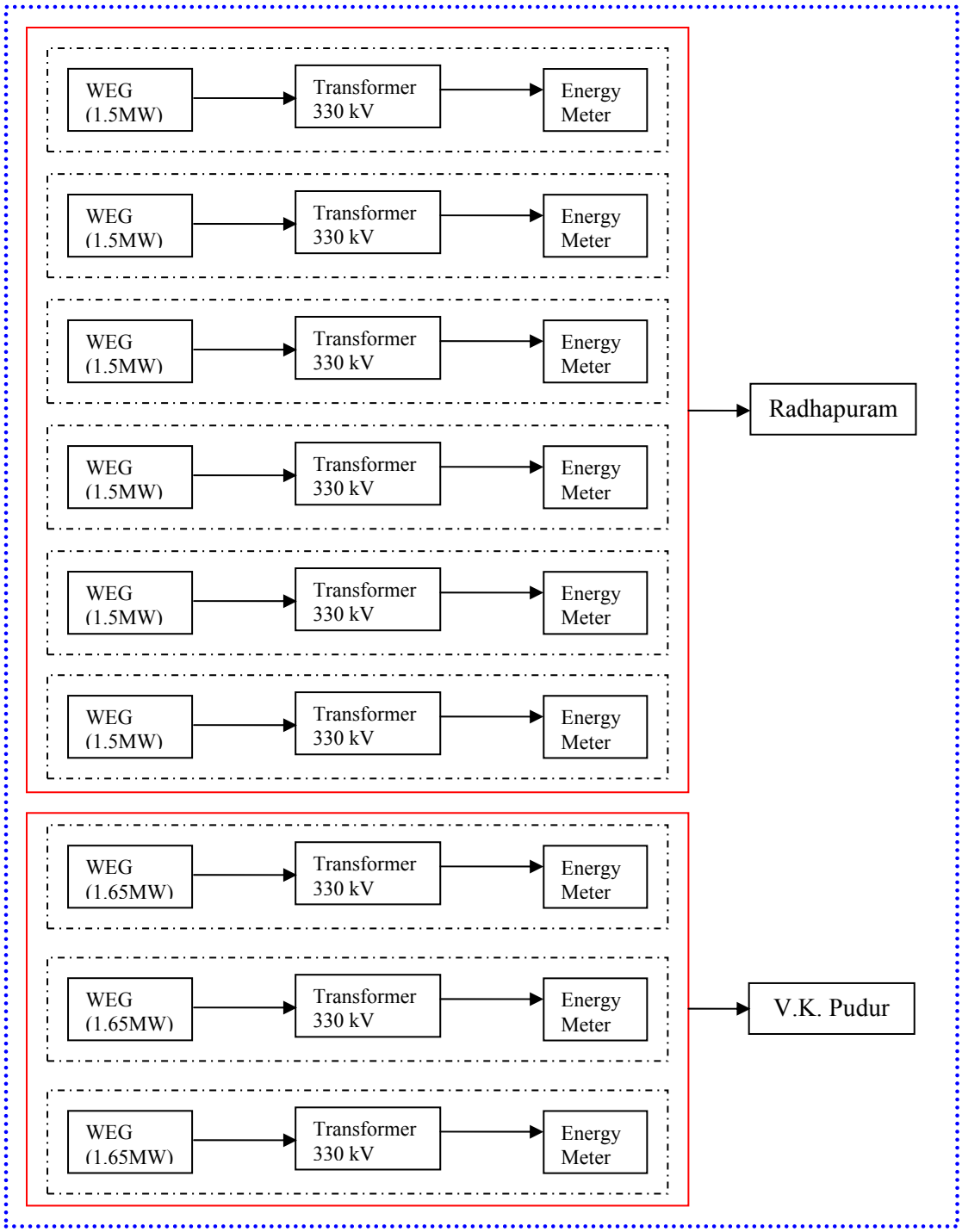
4) The meters may be tested using NABL accredited mobile laboratory or any accredited laboratory in the presence of the parties involved. Both parties shall seal main and check meters. Defective meter shall be replaced.

5) Reading of the meters shall be taken periodically by an authorized officer of the distribution licensee / STU and the generator or his representative, if present.

6) Check meter readings shall be considered when the main meters are found to be defective or have stopped.

**Annex 5**

**Flow Diagram of the project boundary**




Represents project activity 1.5 * 6 and 1.65 * 3 WEGs and project boundary

Represents 1 WEG

**Annex 6**

**Selection of Appropriate Benchmark:**

In choosing an appropriate benchmark we have based our approach on the principles of financing and investment decision making that are well found in theory and practice of corporate financing world wide. We have derived from text book on "Corporate Finance Theory and Practice" by Dr. Aswath Damodaran of Stern School of Business, New York University. Dr. Damodaran is one of the foremost authorities in the world in the field of Investment Analysis.

Principles of Corporate Finance state: Projects raise money from both equity investors and lenders, both groups of investors make their investments expecting to make a return. The expected return for equity investors includes a premium for the equity risk in the investment and is known as Cost of Equity. Similarly; lenders expected return includes a premium for undertaking the risk that the project could default in repayments, and is referred as the Cost of Debt [Page 186, 187]. In fact, "the first principle of Corporate Finance" states that investment should be made only in projects that yield a return greater than the minimum acceptable hurdle rate; the hurdle rate should be higher for riskier projects and should reflect the financing mix" [Page 185]. Therefore the costs of equity and cost of debt, collectively represent what the project needs to make on its investment in order for it to be considered as investment worthy.

The guidance to investment analysis issued in EB 41 (paragraph 11) states that in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for equity IRR.

It is also worthwhile to note that the captioned project is a Greenfield wind power generation project that generates and supplies electricity to the state grid, therefore the project can not have only one possible project developer. The tool for demonstration and assessment of additionality [para-5, sub step 2(b)] states that in such cases (where the project has more than one potential developer) the benchmark can not be based on internal cost of equity or WACC and shall be based on publicly available data sources which can be clearly validated by the DOE. Accordingly, the weighted average cost of capital has been calculated based on parameters that are standard in the market, considering the specific characteristics of the project type shall be based on parameters that are standard in the market, considering the specific characteristics of the project type. Hence, we have not used company or project specific parameters for the calculation of the benchmark (such as company WACC, project and company specific interest rates, etc.).

Weighted average cost of capital (WACC) is calculated as weighted average cost of equity and cost of debt as illustrated below

WACC = [D/ (D+E)]*[Cost of Debt] + [E/ (D+E)]*[Cost of Equity]

**Cost of Debt:**

Cost of debt is defined as the rate at which lenders agree to lend money to a project. The additionality tool and the guidance to investment analysis clarify that for projects that benchmark for project with more than one potential developer should not be based on project specific parameters but should represent the standard in the market. Prime Lending Rate is defined as the benchmark rate for all bank loans. Historically, the PLR has been the rate at which banks lend to the best borrower—one who is the safest or

the least likely to default on the loan. Accordingly, the bank prime lending prevailing at the time of project start date has been considered as the cost of debt. The prime lending rate at the time of investment was in the range of 12.75% - 13.25% [Source: Reserve Bank of India, http://www.rbi.org.in/scripts/WSSView.aspx?Id=11936], the average PLR of 13.00% has been considered.

Interest costs are tax deductible, therefore in order to arrive at the post tax cost of debt, the cost of debt is multiplied with marginal tax rate. The loan tenure of a typical power project is 10 years, it may be noted that for the first 10 years, all power projects in India are required to pay tax @ 11.33% (considering section 80 IA of Income Tax Act). Accordingly the marginal tax rate has been considered as 11.33%

The post tax cost of debt therefore works out to: 13.00% * (1-11.33%) = 11.53%

**Cost of Equity:**

The expected return on equity has been determined using the Capital Asset Pricing Model (CAPM)[4]. The CAPM economic model is used worldwide to determine the required/expected return on equity based on potential risk of an investment. The CAPM framework is the Nobel award winning work of financial economist Dr. William Sharpe.

Ke = Rf + B x (Rm - Rf)

where:

Ke = Rate of return on equity capital;

Rf = Risk-free rate of return;

B = Beta;

Rm – Rf = Market risk premium;

**Risk free rate:**

The risk free rate is understood as the rate of return on an asset that is theoretically free of any risks, therefore the rate of interest on government bonds are considered as risk free rates Page 188 of text book on "Corporate Finance Theory and Practice" by Dr. Aswath Damodaran, Stern School of Business, New York University[5], describes that the long term government bond rates are suitable indicators of risk free rates when the time horizon for the investment is long term.

Accordingly the risk free rate has been taken from long dated Indian government bond rates available at the project start date (December 2007). This has been considered as it was in the year of investment (i.e in that year, the company had the alternative of this long term risk free investment). The data on government bond rates is published by Reserve Bank of India. (Web-link: http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/80303.pdf)

[4] The Capital Asset Pricing Model (CAPM) was published in 1964 by William Sharpe, for his work on CAPM Sharpe received the Nobel Prize in 1990. http://www.investopedia.com/articles/06/CAPM.asp

[5] Dr. Damodaran, one of the foremost authorities in the world in the field of Investment Analysis

The applicable risk free rate is 7.89%.

**Risk Premium:**

The most common approach for estimating the risk premium is to base it on historical data, in the CAPM, the premium is estimated by looking at the difference between average return on stocks and average return on government securities over an extended period of history [page 190, Corporate Finance Theory and Practice, Dr. Aswath Damodaran]. It is preferred to use long term premimums, i.e over a period of 25 years, since considering shorter time periods can lead to large standard errors because volatility in stock returns [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran]. It is also preferred to calculate the risk premium based on geometric mean of the returns since arithmetic mean overstates the risk premium. Geometric mean is defined as the compounded annual return over the same period [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran.].

Therefore the risk premium has been calculated as the difference in compounded annual return between the BSE-Sensex and the Government bond rates since the year of inception of BSE Sensex, i.e. 1979 – 80. The detailed calculations are presented in the attached excel sheet.

The applicable risk premium is 9.95%.

**Beta:**

Beta (B) indicates the sensitivity of the company to market risk factors. Beta represents the market risk for an asset and is calculated as the statistical measure of volatility of a specific asset/investment relative to the movement of a market group. The conventional approach for estimating beta of an investment is a regression of returns on investment against returns on a market index. For companies that are not publicly listed, the beta is determined by referring beta values of publicly listed companies that are engaged in similar types of business. The project activity type is wind power generation; the approach therefore should be to base the beta for the project on the beta values of listed wind power generation companies in India. However, since there are no exclusive wind energy companies listed on any stock exchange in India (both BSE- Bombay Stock Exchange and NSE-National Stock Exchange) in year 2007, in the absence of adequate data on companies which are exclusively into the same type of business (i.e wind power projects), the next best option for assessing the risk of these projects is to consider the data available on companies which are involved in similar businesses.

Therefore, we have considered beta values of all electricity generating companies in India. The group of companies considered includes renewable as well as conventional power generating companies. It is understood that risky businesses are likely to have higher cost of equity than safer businesses; projects in riskier businesses will have to cover these higher costs. Hence, investors demand a higher return from renewable energy projects than from conventional energy ones, given the higher risks in renewable, including risks of technology, risks from significantly varying and unpredictable resource availability (e.g. wind), and a lower established support base for such projects relative to that for conventional power (e.g. grid connections, bank finance, suppliers, etc.). The use of this Beta value is therefore considered conservative, as it does not add for the higher risk of non conventional energy.

The applicable Beta value has been determined on the basis of the Beta values of all power generating companies in India which were listed on the stock exchange at the time of this investment. Beta values of individual companies have been sourced from Bloomberg values of which are available at http://pages.stern.nyu.edu/~adamodar/.

The table below summarises the beta values:

| Company Name | Beta |
|---|---|
| BF UTILITIES LTD | 2.03 |
| NTPC LIMITED | 1.04 |
| CESC | 1.47 |
| ENERGY DEV CO | 1.36 |
| GUJARAT INDS | 0.93 |
| JAIPRAKASH HYDRO | 1.48 |
| NEYVELI LIGNITE | 1.33 |
| RELIANCE ENERGY | 1.9 |
| TATA POWER CO | 1.41 |
| **Average Beta** | **1.44** |

**Source: Bloomberg**

**Calculation of Benchmark WACC:**

The WACC is the weighted average of the cost of equity and cost of debt used for financing. As per the additionality tool, standard parameters (and not project specific ones) are required to be used for arriving at the benchmark rate. In India, a debt to equity ratio of 70:30 is considered as the norm for financing wind power projects[6]. Accordingly the WACC has been calculated based on a standard 70:30 debt to equity ratio.

WACC = [D/ (D+E)]*[Cost of Debt] + [E/ (D+E)]*[Cost of Equity]

WACC = 70%* Cost of debt + 30%*[Rf + B x (Rm - Rf)]

Therefore, WACC = 70% * 13% * (1-11.33%) + 30% * (7.89% +1.44* 9.95%) = **14.73%**

[6] Several regulations and orders refer this as the normative debt equity ratio for wind power projects.