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

CONTENTS

Annexes

Appendices:

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. • 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:

>>
Wind energy project by Velatal Spinning Mills Private Ltd in Coimbatore district, Tamilnadu, India.

Version number of the document : 01

Date of the document : 05.05.08

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

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Project activity:

The project activity involves the implementation of 8.75 MW capacity wind power project consisting of 7 Wind Turbine Generators (WTGs) of 1250 kW capacity each by Velatal Spinning Mills (P) Ltd (VSMPL) at Sellakarichal, Varapatti and Bogampatti villages in Coimbatore district in Tamilnadu. The power generated by all the seven WTGs would be exported to the grid.

The project activity would generate about 22.23 Million kWh annually, which would replace equivalent quantum of power at the Tamilnadu Electricity Board (TNEB) grid.

Project promoter background:

The Velatal Spinning Mills (P) Ltd (VSMPL) was established in 1981 and started its operation as a textile unit that produces and sells viscose spun yarn with a capacity of 3,520 spindles. The unit gradually expanded its operation and currently maintaining a capacity of 25040 Spindles. As a broad spectrum of activity VSMPL has a tradition of emphasising upon various issues towards contributing to sustainable development. In continuation to this VSMPL decided to establish WTGs for export of clean power to the state grid in order to mitigate climate change.

Contribution of the project activity towards achieving sustainable development objective of the host nation:

The project activity contributes to sustainable development of the region and satisfies the four pillars of sustainable development in the following ways

i) Social well being

The identified project activity has contributed towards poverty alleviation as it has employed local manpower during erection and operation of the wind power plant. The project has also resulted in an improvement in the infrastructure surrounding the region as well as the electricity availability to the otherwise deficit grid.

ii) Economic well being

The project's initial investment was about INR 409.5 Million and in addition to this there will be continuous inflow of funds to the project considering CDM revenues as well. The identified project being a renewable energy power generation activity, it will significantly contribute towards reducing the dependence on import of fossil fuel like coal for power generation.

iii) Environmental well being

The identified project will lead to the following environmental benefits due to the project activity:

- As the wind power replaces equivalent power generation from fossil fuel dominated southern regional grid, there would be a reduction in the GHG emissions due to the project activity.
- Project also eliminates emissions of other air pollutants viz. SOx, NOx, particulate matters etc which would otherwise be emitted by thermal power plants of the electricity grid for generating equivalent power
- Project enables conservation of fossil fuel resources for better applications

iv) Technological well being

The project activity has also led to the promotion of relatively high capacity WTGs of capacities 1250 kW. The identified project being a local distributed electricity generation activity provides the following benefits.

- Improved power quality;
- Reliable power supply
- Reduced lines losses;
- Reactive power control;
- Mitigation of transmission and distribution congestion and hence minimising transmission and distribution loss.

A.3. Project participants:

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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)
India (host Party)	Velatal Spinning Mills Private Ltd (VSMPL)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

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India

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

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Tamilnadu.

A.4.1.3. City/Town/Community etc:

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The project is located in Sellakarichal, Varapatti & Bogampatti village of Coimbatore district.

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

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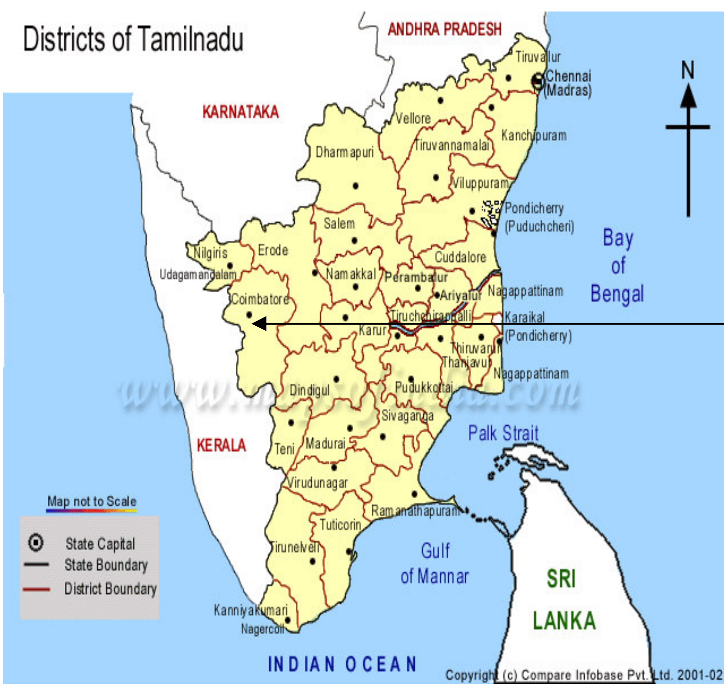
The project activity is located in the Sellakarichal, Varapatti & Bogampatti village of Coimbatore district. The detailed location of the WTGs with respect to latitude and longitude, survey numbers, and the date of commissioning of the respective WTGs are provided in Appendix 1.

The location of the project activity is shown in Fig A-1

Fig A-1 showing Tamilnadu state in Indian map

Tamilnadu state



Coimbatore district

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

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Type I : Renewable Energy Projects

Category-D : Grid Connected Renewable electricity generation

The identified project activity involves implementation of seven (7) WTGs with each having a capacity of 1250 kW and thus an aggregate capacity of 8.75 MW, which is less than the minimum threshold limit of 15 MW for renewable energy project activities to qualify under Type I project activities.

As per the provisions of Appendix B of Simplified Modalities and Procedures for Small Scale CDM Project Activities, Type ID (version 13, 14/12/2007) "comprises renewables, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and biomass, that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit".

The identified project activity is a wind power project with an aggregate installed capacity of 8.75 MW that displaces equivalent electricity in the TNEB grid which is a part of southern regional grid. Thus in light of the above discussion it can be concluded that Type I.D. is the most appropriate category for the project under discussion.

Wind power technology details

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

The technical specifications of the WTGs have been provided in Appendix 2. There is no transfer of technology involved in the project activity. The details of WTGs employed in the project activity and the corresponding interconnection with the grid are detailed in Appendix 3:

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

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Years	Annual estimation of emission reductions in tonnes of CO_2 eq
Year-1	20,672
Year-2	20,672
Year-3	20,672
Year-4	20,672
Year-5	20,672
Year-6	20,672
Year-7	20,672
Year-8	20,672
Year-9	20,672
Year-10	20,672
Total estimated reductions (tonnes of CO_2e)	**206,720**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**20,672**

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

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No public funding is involved in the identified project activity since the project is absolutely funded from internal accrual of capital only.

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

According to Appendix C[1] of the Simplified Modalities & Procedure for Small Scale CDM Project Activities –

“1. Debundling is defined as the fragmentation of a large project activity into smaller parts.

[1] This appendix has been developed in accordance with the simplified modalities and procedures for small-scale CDM project activities (contained in annex II to decision 21/CP.8, see document FCCC/CP/2002/7/Add.3) and it constitutes appendix B to that document.

A small-scale project activity[2] that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities[3]. The full project activity or any component of the full project activity shall follow the regular CDM modalities and procedures.

2. 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.

3. If a proposed small-scale project activity is deemed to be a debundled component in accordance with paragraph 2 above, but total size of such an activity combined with the previous registered small-scale CDM project activity does not exceed the limits for small-scale CDM project activities as set in paragraph 6 (c) of the decision 17/CP.7, the project activity can qualify to use simplified modalities and procedures for small-scale CDM project activities."

The identified project activity does not comply with the conditions as mentioned in paragraph 2 above and hence should not be regarded as a debundled component of a large scale project activity.

[2] A project activity is a measure, operation or an action that aims at reducing GHG emissions. The Kyoto Protocol and the CDM modalities and procedures use the term "project activity" as opposed to "project". A project activity could therefore be a component/aspect of a project undertaken/planned.

[3] For the full text of the simplified modalities and procedures for small-scale CDM project activities see http://unfccc.int/cdm/ssc.htm.

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 methodology small scale – I D, version 13, dated 14th December, 07 [4]

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

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Appendix B of the simplified Modalities & Procedures for small-scale CDM project activities provides indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. As per this document the project activity falls under category I.D. - grid connected renewable electricity generation.

Justification of the category

Technology /Measure as per AMS I.D	Measure of project activity
This category comprises renewable energy generation units such as photovoltaics, hydro**,** tidal/wave, **wind**, geothermal and 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	The project activity will generate electricity from wind energy resources and displaces electricity from the TNEB electricity distribution system that is a part of southern regional grid which is dominated by fossil fuel based power generating sources. The project activity therefore meets this applicability requirement.
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, the capacity of the entire unit shall not exceed the limit of 15MW.	There is no non-renewable component attached to the project activity and the aggregate installed capacity of the project activity is 8.75 MW which is less than the eligibility limit of 15 MW for a small scale CDM project activity.
Combined heat and power (co-generation) systems are not eligible under this category.	The project involves power generation from wind power only and therefore this is not

[4] http://cdm.unfccc.int/methodologies/DB/GA1Z9QIWW2MFAX2GT0Y6IYNPGNH0S1/view.html

Technology /Measure as per AMS I.D	Measure of project activity
	relevant to the project activity.
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 from the existing units.	This is not relevant to the project activity as it does not involve any addition of renewable energy generation units at existing renewable energy power generation facility.
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 is not relevant to the project activity since the project activity does not involve any retrofitting or modification of an existing facility for renewable energy generation.

From the above table, it is evident that the project activity meets all the applicability conditions of the approved small scale methodology AMS I.D (version 13, dated 14/12/2007) - Grid connected renewable electricity generation as specified in *Appendix B of the simplified modalities and procedures for small scale CDM project activities*.

B.3. Description of the project boundary:

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As mentioned under paragraph 6 of Type I.D. (Version 13, 14/12/2007) of '*Appendix-B of the simplified modalities and procedures for small-scale CDM project activities'*, "project boundary encompasses the physical, geographical site of the renewable generation source." For the identified project activity the project boundary will encompass the individual WTGs to the grid interconnection point. It is to be noted in this regard that up to the grid interconnection point all the equipments belonging to the project proponent will be regarded to fall within the project boundary.

Thus the project boundary will physically cover the individual WTGs, step-up transformer and the point of grid interconnection. The diagram (Fig B-1) below delineates the project boundary

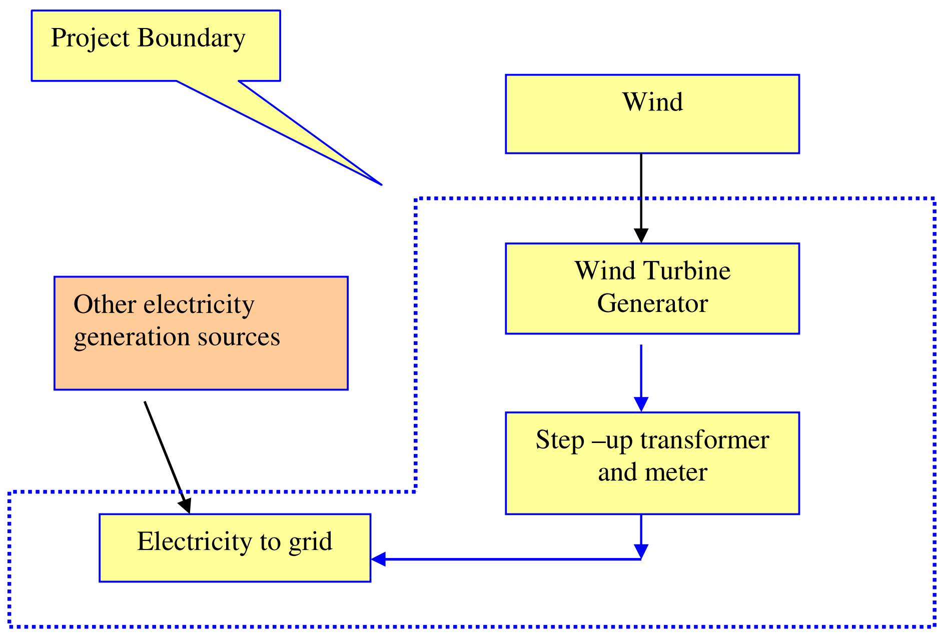

Fig B-1: Project boundary

B.4. Description of baseline and its development:

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As per AMS I D, (Version 13, 14/12/2007), paragraph 9 "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'.

OR

(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 approach proposed in the "Option (a)" i.e. "Combined Margin" has been used for ascertaining Baseline Emission Reductions. The operating margin and the build margin emission factor have been considered from the information (Baseline Carbon Dioxide Emission Database -Version 3.0)[5]

[5] Reference: http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

published by the Central Electricity Authority (CEA), Ministry of Power, Govt. of India which have been computed according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system" version -1. Considering the individual weighting assigned to the operating margin emission factor and the build margin emission factor for wind power generation project activities as prescribed in the 'Tool to calculate the emission factor for an electricity system'the combined margin emission factor for the Southern Grid has been estimated at 0.93 kg CO_2/kWh.

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:

The project activity satisfies the eligibility criteria to use simplified modalities and procedures for small-scale CDM project activities as laid out in paragraph 6 (c) of decision 17/CP.7.

As per the decision 17/cp.7 Para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

CDM revenue has been considered for determining the project cash flow while analysing the financial viability of the project activity during the project designing stage itself. The supporting document towards this would be made available to the DOE during validation. In this regard it is to be noted that the Project Proponent (PP) took a decision to structure the project activity including all the seven WTGs under consideration and hence the documentation towards realising the CDM revenue was initiated after implementation of all the WTGs.

Further referring to Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

a. Investment barrier
b. Technological barrier
c. Barrier due to prevailing practice
d. Other barriers

(a.) Investment barrier

The project is a grid connected wind power generation project activity. In absence of the present project activity the equivalent quantum of power would have been generated by the other fossil fuel based power generating stations connected to the southern regional grid. The capital cost involved in wind power projects is higher than the other fossil fuel based power generating stations. The capital cost comparison of the present wind power project activity with the other fossil fuel based power generating stations is tabulated below

Capital cost comparison of various power plants[6]

Sl. No.	Fuel Type	Capital cost of power plant (INR Million /MW)
1.	Domestic coal	40
2.	Imported coal	40
3.	Lignite	42
4.	LNG	27
5.	Naptha	27
6.	Gas	27
7.	Diesel	35
8.	Project Activity	46.8

Hence the statistics provided in the table above clearly demonstrate that the present project activity entails higher capital cost as against the other fossil fuel based alternatives of power generation.

In addition to the higher capital cost, the cost of generation of the present project activity is also higher than the other fossil fuel options such as coal or Fuel Oil (FO). A comparison of the unit cost of generation of the present project activity as against the coal and FO based power generation is tabulated below.

[6] Source: (Serial no 1-7) Report of the Expert committee on fuel for power generation-Page XI-CEA.

Unit generation cost comparison of various power plants[7]

Sl. No	Source	Unit generation cost (INR/kWh)
1	Coal	2.27
2	Fuel Oil	3.57
3	Project activity	3.67

The above table clearly demonstrates that the present project activity is not the most economical option when compared against the other fossil fuel based alternatives.

In order to evaluate the profitability of the present project activity a detailed investment analysis has been conducted considering equity IRRs (Post-tax & Pre-tax) as the most suitable financial indicators.

The equity IRR (Post -tax) of the project activity was computed and then compared against the benchmark equity IRR (Post-tax) of 16% for an electric utility industry as stipulated by the Central Electricity Regulatory Commission (CERC) in its order dated 26th March 2001[8].

In addition to the CERC benchmark, Tamilnadu Electricity Regulatory Commission (TNERC) has considered 16% pre – tax Return on Equity- (ROE) as per order no "3" dated 15th May 2006[9] while determining the tariff for wind power projects in Tamilnadu. Subsequent to this order, the tariff for the wind power projects whose purchase order of the WTGs were placed prior to 15th May, 2006 were established at INR 2.74/- per unit without any annual escalation.

[7] Source: (Serial no.1&2) Nagda hills Registered wind PDD (Annex 4)

(Serial no. 3) Unit cost of generation has been computed for the present project activity which will be provided to the DOE during validation.

(Serial no. 8) The purchase order of the respective WTGs included within the project activity

[8] http://cercind.gov.in/Tariiff/Notification.pdf

[9] (http://www.tnerc.tn.nic.in/); "power purchase and allied issues in respect of Non-Conventional Energy Sources based Generating Plants and Non-Conventional Energy Sources based Co-Generation Plants"

TNEB had determined the tariff for wind power projects vide its order dated 27th September 2001[10] at INR 2.70 /- per unit without any escalation. This tariff was determined as per the tariff guidelines laid down by Ministry of Non-conventional Energy Sources (MNES) which stipulates the base purchase price of electricity at INR 2.25 /- per unit with 1994-95 as the base year with an escalation at a minimum rate of 5% every year.

Hence it is quite evident from the above discussion that the tariff of INR 2.74/kWh set by TNERC as per order no "3" dated 15th May, 2006 is similar to the tariff of INR 2.70/kWh set by TNEB vide its order dated 27th September 2001.

The equity IRR (Pre-tax) of the project activity has also been computed and compared against the TNERC benchmark of 16% equity IRR (Pre-tax) which has explicitly focused upon the wind power projects in Tamilnadu. This benchmark though is post facto to the project activity, has been used for the comparative benchmark analysis due to the following reasons:

- The TNERC tariff being similar to the tariff established by TNEB during 2001; and
- Non availability of any investment benchmark specific to wind power project in Tamil Nadu prior to the starting date of the project activity.

The equity IRR (Post tax & pre -tax) of the project activity was ascertained based on the following basic assumption and information:

Sl. No	Parameter	Value
1	No.of WTGs	7 Nos
2	Capacity of each WTG	1.25 MW
3	Capital Cost	46.8 Million INR/MW
4	Capacity Utilisation Factor (CUF)	29%
5	Tariff	2.70 (Rs/kWh)
6	Life of plant	20 years
7	Depreciation Rate	4.50% under Straight Line Method up to 90%
8	Operating Expenses (Maintenance + Employee + Administration)	0.17%-1st year
		0.18%- 2nd year
		0.19%- 3rd year
		0.20%- 4th year
		0.21%- 5th year

[10] http://www.nepcindia.com/images/goverpolicy/policytneb.doc

		1.93%- 6th year
		5% escalation every year after 6th year
9	Debt	0%
10	Equity	100%
11	Term of loan with interest	-
12	Insurance cost	0.17%
13	Working capital	Nil
14	Interest on working capital	Nil

Justification of Capacity Utilisation Factor (CUF) as considered towards estimating equity IRR (Post-tax & Pre-tax) of the project activity

The CUF for wind power projects in Tamilnadu has been estimated for each year during the period 1999-00 to 2003-04 as per the annual installed capacity of wind power projects and the corresponding annual generation indicated in the MNES annual reports. The table below demonstrates the CUF for wind power projects in Tamilnadu for each year during the period 1999-00 to 2003-04.

Capacity Utilisation Factor (CUF) for wind power projects in Tamilnadu

Year	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004
Installed Capacity[11] (MW)	725.2	770.8	812.7	857.6	895.1
Annual Generation (MWh)	1155088.718	1095839.373	1245761.198	1305501.417	1653914.77
Capacity Utilisation Factor (CUF) (%)	**18.18**	**16.23**	**17.50**	**17.38**	**21.09**
Average Capacity Utilisation Factor (CUF) (%)	**18.08**				
Source : MNES Annual Report 2002-03 & 2004- 05					

As per the statistics provided in the table B-3 above, the average CUF for wind power projects, as per MNES, in Tamilnadu has been estimated at 18.08%. On the contrary as per the purchase order the suppliers of the WTGs have guaranteed 31% CUF. All the supporting documentary evidences would be made available to the DOE during validation. As these are the only information available

[11] Capacity addition during the year has been considered in installed capacity of the next year since power generation from the capacity additions contribute to the generation of the next year only.

on the CUF of wind power projects in Tamilnadu prior to the start of the project activity, these values have been further evaluated towards computing the equity IRR.

As a conservative estimate 31% CUF as guaranteed in the purchase order has been considered and 2% has been deducted from this guaranteed CUF (31%) on account of line loss. Hence a net CUF of 29% (31% - 2%) has been used towards determining the equity IRR (Post tax & pre tax) of the project activity.

The equity IRR (Post Tax & Pre-tax) with and without CDM for the project activity is provided in the table below:

Equity IRR (Post tax & pre-tax)

CERC Benchmark of 16%		TNERC Benchmark of 16%	
Equity IRR (Post – tax) without CDM (%)	Equity IRR (Post - tax) with CDM (%)	Equity IRR (Pre – tax) without CDM (%)	Equity IRR (Pre - tax) with CDM (%)
11.9%	15.0	13%	16.4%

Comparison against the CERC benchmark of 16% equity IRR – (Post -Tax)

The equity IRR (Post - tax) without CDM revenue for the project activity has been found to be below the benchmark equity IRR (Post-tax) value of 16%.

As apparent from the table above, the equity IRR (Post-tax) improves only after accounting for the CDM revenue in its cash flow but is observed to be still lower than the benchmark equity IRR (Post-tax) value of 16%.

Comparison against the TNERC benchmark of 16% equity IRR – (Pre -Tax)

The equity IRR (Pre - Tax) without CDM revenue for the project activity has been found to be below the benchmark equity IRR (Pre - tax) benchmark value of 16%.

The equity IRR (Pre-tax) improves only after accounting for the CDM revenue and it registers a value higher than the benchmark equity IRR (Pre-tax) value of 16%.

Therefore the above analysis lead to the conclusion that the project activity could not ensure the benchmark return and inclusion of additional cash flow to the project in the form CDM revenue would muffle the financial risk to a certain extent. The related financial data and calculations towards estimating the equity IRRs (Post-tax & Pre-tax) of the project activity with and without CDM revenues would be provided to the Designated Operational Entity (DOE) during validation.

Sensitivity analysis:

The identified project being a grid connected renewable energy power generation activity, the energy generation is amongst one of the key parameters that determine the profitability of the project activity. Moreover the generation is a function of the available wind speed in the region. The quantum of energy that can be harnessed from the wind resources is directly proportional to the cube of the wind speed. Hence generation from the project activity is considered as the most suitable variable parameter to carry out the sensitivity analysis. The table below demonstrates how the profitability of the project activity will be impacted if the annual sale of power is reduced by another 10% or increased by 10%.

1. **Reduction in annual generation** – Annual generation may reduce due to change in wind patterns, low capacity factors etc.

Equity IRR (Post-tax & pre-tax) with and without CDM funds (-10% generation)

CERC Benchmark of 16%		TNERC Benchmark of 16%	
Equity IRR (Post – tax) without CDM (%)	Equity IRR (Post - tax) with CDM (%)	Equity IRR (Pre – tax) without CDM (%)	Equity IRR (Pre - tax) with CDM (%)
9.7	12.4	10.6	13.6

Comparison against the CERC benchmark of 16% equity IRR – (Post -Tax)

The result of the above sensitivity analysis reveals that the equity IRR – (Post -Tax) of the project activity, both with and without considering CDM revenue, will go down and hence will remain well below the benchmark equity IRR – (Post -Tax) value of 16% if the power generation by the project activity is further reduced. This is a very realistic consideration as power generation from WTGs are dependent upon wind availability in the region which is highly seasonal and uncertain.

Comparison against the TNERC benchmark of 16% equity IRR – (Pre -Tax)

The result of the above sensitivity analysis reveals that the equity IRR – (Pre -Tax) of the project activity, both with and without considering CDM revenue, will go down and hence will remain well below the benchmark equity IRR (Pre -Tax) value of 16% if the power generation by the project activity is further reduced. This is a very realistic consideration as power generation from WTGs are dependent upon wind availability in the region which is highly seasonal and uncertain.

2. **Increase in annual generation** – Annual generation may increase due to change in wind or any other and related factors.

Equity IRR (Post-tax & pre-tax) with and without CDM funds (+10% generation)

CERC Benchmark of 16%		TNERC Benchmark of 16%	
Equity IRR (Post – tax) without CDM (%)	Equity IRR (Post - tax) with CDM (%)	Equity IRR (Pre – tax) without CDM (%)	Equity IRR (Pre - tax) with CDM (%)
14.1	17.6	15.4	19.3

Comparison against the CERC benchmark of 16% equity IRR – (Post -Tax)

As apparent from the above sensitivity analysis, with increase in power generation, though the equity IRR (Post-tax) will improve but will still remain below the benchmark value of 16%.

Once the CDM revenue is accounted for in a most optimistic scenario of higher generation, the project activity will register equity IRR (Post-tax) higher than the benchmark value of 16%.

Comparison against the TNERC benchmark of 16% equity IRR – (Pre -Tax)

As apparent from the above sensitivity analysis, with increase in power generation, though the equity IRR (Pre-tax) will improve but will still remain below the benchmark value of 16%.

Once the CDM revenue is accounted for in a most optimistic scenario of higher generation, the project activity will register equity IRR (Pre-tax) higher than the benchmark value of 16%.

Thus in light of the above discussion it can be concluded that the identified project activity would not be financially sustainable without the consideration of the CDM funds. As apparent CDM funds would muffle the financial risk and will ensure the financial sustainability of the project activity to a certain extent.

(b.) Technological barrier

(i) Barrier due to high pitch technolohy

The project activity has installed high capacity WTGs of capacities 1250 kW which inculcate high pitch technology. This high pitch technology demands additional technical insight to ensure smooth operation of the WTGs which in turn has lead to additional investment when compared to lesser capacity WTGs. The project promoter has taken a step forward and invested in relatively better technology wind turbines.

(c) Barriers due to prevailing practices:

The proposed project activity is located in the State of Tamilnadu which forms a part of the southern regional grid. The total installed capacity of southern grid was 37,781.38 MW as on 30.04.07[12] with coal having the predominant share (42.81%) in the fuel mix. The installed capacity of thermal sources (coal, gas and diesel) was about 54.7% during the same period. The installed capacity of renewable energy sources (RES) constituted 13.15 % and the same is depicted in the table[13]. Wind power being a part of the RES has a much lower share in the installed capacity.

Total Southern Region -Installed Generation Capacity & Fuel Mix as on 30.04.07

Hydro	Thermal			Total Thermal	Nuclear	RES	Total
	Coal	Gas	Diesel				
11011.71	16172.50	3586.30	939.32	20698.12	1100.00	4971.55	37781.38

In India, wind farms are located only in following 8 states out of 29 states and 6 union territories *viz*: Gujarat, Karnataka, Kerala, Maharashtra, Tamil Nadu, Andhra Pradesh, Rajasthan and West Bengal, last two states being latest entries. The total installed capacity of country's wind energy was 6270.40 MW[14] on 31.12.2006 out of total installed capacity of 121,381.8 MW[15] for the same period. Thus the share of installed capacity of wind was just 5.16%. From the above explanation, it is evident that wind energy is not a regular prevailing practice to meet the electricity demand of the country.

Further to the above, an assessment of the wind power projects in the State of Tamilnadu has been conducted to analyse the prevailing practice scenario with respect to wind power generation. The WTGs installed in Tamilnadu during the period 1st April, 2000 to 31st December, 2005 have been

[12] Source: Central Electricity Authority (CEA) – 'All India Installed capacity (in MW) of power stations located in regions of main land and islands'. (http://www.cea.nic.in/power_sec_reports/executive_summary/2007_04/22-28.pdf)

[13] Source: Central Electricity Authority (CEA)

[14] www.mnes.nic.in

considered for evaluation. The aggregate installed capacity of wind power projects in Tamilnadu as of 31st December 2005 was 2526.7 MW[16]. The capacity amounting to 770.80 MW[17] which was already installed by 1999-2000 has been ruled out from CDM consideration. During the period 1stApril, 2000 – 31st December, 2005 the wind mill capacity addition in the state of Tamilnadu has been estimated at 1755.9 MW. The statistics provided in the table below clearly specifies the capacity of the WTGs installed in Tamilnadu from the year 1992, till 31st December, 2005[18].

Annual capacity addition of WTGs in Tamilnadu till 31st December, 2005

Year	Capacity addition (MW)	Cumulative Installed Capacity (MW)
Upto March 1992	22.3	-
1992-93	11.10	33.4
1993-94	50.5	83.9
1994-95	190.9	274.8
1995-96	281.7	556.5
1996-97	119.8	676.3
1997-98	31.1	707.4
1998-99	17.8	725.2
1999-00	45.6	770.8
2000-01	41.9	812.7
2001-02	44.9	857.6
2002-03	37.5	895.1
2003-04	371.2	1266.3
2004-05	315.9	1582.2
Up to 31st December, 2005	-	2526.7
WTGs installed during the period 1st April, 2000 to 31st December, 2005 -		**1755.9**
Source : MNES Annual Report 2002-03 & 2004-05		

15 www.cea.nic.in

16 http://www.mnes.nic.in/annualreport/2005_2006_English/CH8/2.html

17 http://www.mnes.nic.in/annualreport/2002_2003_English/ch5_pg4.htm

18 http://www.mnes.nic.in/annualreport/2002_2003_English/ch5_pg4.htm & http://www.mnes.nic.in/annualreport/2005_2006_English/CH8/2.html

The CDM related status of different wind power projects commissioned in Tamilnadu during the period January 2000 to 31st December, 2005 was analysed[19] and the same is provided in the table below.

CDM status (As on 5th March, 2008) of the wind power projects commissioned in Tamilnadu during the period January 2000 to 31st December, 2005	
Aggregate capacity of projects registered (MW)	691.37
Aggregate capacity of projects under validation (MW)	329.41
Aggregate capacity of the project applied for availing CDM revenue (MW)	1020.78

The following can be concluded from the statistics provided in the above table:

- 58.13% of the WTGs installed in Tamilnadu during the period January 2000 to 31st December, 2005 have applied for availing CDM revenue, of which:
  - ✓ 39.37% of the WTGs installed in Tamilnadu during the period January 2000 to 31st December, 2005 have been registered as a CDM project activity at UNFCCC.
  - ✓ 18.76% of the WTGs installed in Tamilnadu during the period January 2000 to 31st December, 2005 are in the process of completing CDM registration.

This clearly implies that most of the wind power projects in the state of TN have been implemented with due consideration of CDM revenues in its cash flow.

(d) Other barriers

(i) Regulatory barrier

Tamilnadu has emerged as the pioneer with regard to the grid connected wind power generation in India with maximum installed capacity[20] amongst all the states. On the contrary the regulatory policies as laid out by the different nodal agencies of the state are not quite encouraging for direct sale of wind power to the grid.

TNEB was earlier (prior to 2002) paying a tariff of INR 2.25/ kWh for wind energy for the year 1995-96 with 5% annual increase for a period of 5 years based on the guidelines issued by the

[19] cdm.unfccc.int

[20] http://www.indianwindpower.com/potential.html#top

Ministry of Non-conventional Energy Sources (MNES)[21] which was more favourable. However TNEB revised the policy and in the Order dated 27 September 2001, the tariffs were fixed at the rate of INR 2.70 /kWh for a period of 5 years without escalation. The above seems to be one of the most important barriers for wind power projects in Tamilnadu. This has been envisaged as a barrier for wind power projects in Tamilnadu since the existing tariff rate of INR 2.70/-per kWh is the lowest when compared to other states like Andhra Pradesh, Maharashtra, Rajasthan, Karnataka and Madhya Pradesh.

In addition to this, the Tamilnadu electricity regulatory commission (TNERC) does not allow the investors to sell the generated electricity to other HT customers, which is permitted in many other states in the country. In many other states the project promoter/ investor has the option of switching over to third party sale of electricity, whereas in Tamilnadu this option is not possible. This limits the project promoter from making the project economically more viable.

In order to demonstrate that the prevailing policy framework for wind power project in the state of Tamilnadu is not quite encouraging when compared to the other states in India a tabular comparison of various macro level policies for wind power project in different states in the country is given in the table below.

Policy frame work for wind power project in different states in India[22]

State	Buy back	Banking charges	Wheeling charges	Third party sale
Tamilnadu	INR 2.70/kwh (No escalation)	5 % for 12 months	5 %	Not allowed
Karnataka	INR 3.40/kwh	2 % every month for 12 months	5 %	Allowed to HT Consumers
Andhra Pradesh	INR 2.25/kwh (Escalation 95-96) Presently Rs 3.37	12 months	2 %	Not allowed
Kerala	To be agreed mutually	6 months	2 %	-
Maharashtra	INR 3.50/kwh	2 % for 12 months	2 %	Allowed
Gujarat	INR 3.32/kwh	6 months	4 %	Not allowed
Rajasthan	INR 3.32/kwh.	2 % for 12 months	2 %	Allowed
Madhya Pradesh	INR 3.90/kwh	2 %for 12 months	2 %	Allowed

[21] http://www.tneb.in/tarwhewind.php

[22] http://cdm.unfccc.int/UserManagement/FileStorage/SERN7QJ63WUHSBSGCYLR2KYV2P1QD1

Uttar Pradesh	INR 2.25/kwh (5 % Escalation from 95- 96)	12 months	2 %	Allowed
West Bengal	To be decided case to case basis	6 months	2 %	Not allowed

Summary of barrier analysis

It is apparent from the above discussion on barriers as envisaged for the project activity that the project activity could not even ensure the minimum benchmark return without consideration of the CDM fund in its cash flow. Moreover the project activity inculcates a relatively superior technology which also contributes towards increase in the total capital cost. Besides this the various macro level regulatory policies as existent in the state of Tamilnadu is not quite encouraging for direct sale of power to the grid by WTGs. Hence it can be concluded that registering the project activity as a CDM project activity would provide an additional revenue stream which would certainly improve the financial viability of the project activity enabling the investors in realizing returns commensurate to the risks in project development.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>
As per AMS I D, (Version 13, 14/12/2007), paragraph 9 "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'.

OR

(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.
Calculations must be based on data from an official source (where available) and made publicly available."

The approach proposed in the "Option (a)" i.e. "Combined Margin" has been used for ascertaining Baseline Emission Reductions. The combined margin emission factor consists of two components i.e. the operating margin and the build margin. The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the simple operating margin and build margin emission factor for the southern regional grid and the synopsis of which has been given in Annex – 3. For the purpose of estimation of emission reductions from the project activity, the combined margin emission factor has been estimated at 0.93 tCO2/ MWh. The combined margin emission factor has been derived from the simple operating margin and build margin emission factors after considering/ factoring the weights of 0.75 and 0.25 for operating margin (OM) and build margin (BM) emission factors respectively relevant to the wind power generation project activities as per the 'Tool to calculate the emission factor for an electricity system (Version 01)'.

The steps involved in the computation of the combined margin emission factor have been detailed in the section B.6.3 of this document.

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

(Copy this table for each data and parameter)

Data / Parameter:	EF
Data unit:	T CO_2/MWh
Description:	Combined Margin CO_2 emission factor of the regional grid
Source of data used:	CO_2 baseline database for the Indian Power Sector –Central Electricity Authority (CEA), Ministry of Power, Version 3.0, dated 15 December 2007
Value applied:	0.93
Justification of the choice of data or description of measurement methods and procedures actually applied :	CEA has estimated the simple operating margin and build margin emission factors for the southern regional grid. For calculating the CO2 emission factor as per combined margin method for the wind power generation project activities the weights of 0.75 for operating margin and 0.25 for build margin are considered as per 'Tool to calculate the emission factor for an electricity system (Version 01)
Any comment:	Details given in Annex-3

B.6.3 Ex-ante calculation of emission reductions:

>>

As per AMS ID (version 13, dated 14/12/2007), baseline emissions (BE_y in tCO_2) is the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity to the grid (EG_y in MWh).

$$BE_y = EG_y * EF_y$$

EGy = Net quantum of electricity supplied by the project activity to the grid in year "y"

EF_y = $EF_{southern\ grid,\ CM,\ y}$ = Baseline Emission Factor for the Southern regional grid (Combined Margin Approach)

Calculation of electricity baseline emission factor (Combined Margin Approach)

The baseline emission factor has been calculated as a combined margin (CM), following the Baseline Methodology Procedure of the 'Tool to calculate the emission factor for an electricity system'. The steps as defined under the Baseline Methodology Procedure and the application to the project activity are detailed below:

Step 1: Identify the relevant electric power system

A regional grid definition is used and for the project activity, the simple operating and build margin emission factors estimated by Central Electricity Authority (CEA) for the Southern Regional grid have been used to derive the combined margin emission factor for the wind power generation project activity.

Step 2: Select an operating margin (OM) method:

As per Step 2, the calculation of OM emission factor (EFgrid, OM,y) 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

Out of four methods mentioned in the Step 2, the Simple OM approach has been chosen for calculations since in the regional grid mix the low-cost/must run resources constitute less than 50% of total grid generation.

Further as per Step 2, the emission factor can be calculated using either of the two data vintages:

- ***Ex-ante option***: 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

- ***Ex post option***: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

For the project activity, the Ex-ante option is chosen for emission factor estimation.

The Simple OM factor is calculated as under in Step 3

STEP 3: Calculate the Operating Margin emission factor (*EFgrid, OM,y*) according to the selected method:

The simple OM emissions 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.

Of the three options provided under Step 3 (a), Option A has been used for calculating the Simple OM

As per Option A, the simple OM emission factor is calculated as below:

$$EF_{Grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \, x \, NCV_{i,y} \, x \, EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

where,

$EF_{grid,OMsimple,y}$ - Simple operating margin CO2 emission factor in year y (tCO2/ MWh)

$FC_{i,m,y}$ - Amount of fossil fuel type *i* consumed by the power plant/ 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)

$EF_{CO2,i,y}$ - CO2 emission factor of fossil fuel type i in year y (tCO2/ GJ)

$EG_{m,y}$ - Net electricity generated and delivered to the grid in year y by power plant/ unit m in year y (MWh)

M - All power plants/ units serving the grid in year y except low-cost / must run power plants/ units

i - All fossil fuel types combusted in power plant/ 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. For the project activity, the ex ante option is chosen.

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

The set of power units that comprise larger annual generation would be used.

In terms of vintage of data, the Option 1 is chosen. As per Option 1: *For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation.*

STEP 5. Calculate the Build Margin emission factor

The build margin emission factor ($EF_{grid,BM,y}$) is the generation-weighted average emission factor ($tCO2/MWh$) of a sample of power units during the most recent year y for which power generation data is available calculated as follows:

$$EF_{Grid,BM,y} = \frac{\sum_m EG_{m,y} \, x \, EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

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

$EG_{m,y}$ - Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ - CO2 emission factor of power unit m in year y (tCO2/ 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 guidance in step 3 (a) for simple OM using option 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. As per

Option B1, if for the power units 'm', data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) is determine as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \; x \; NCV_{i,y} \; x \; EF_{CO2,i,y}}{EG_{m,y}}$$

Where,

$EF_{EL,m,y}$	- CO2 emission factor of power unit m in year y (tCO2/ 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 in year y (GJ/ mass or volume unit)
$EF_{CO2, i,y}$	- CO2 emission factor of fossil fuel type i in year y (tCO2/ GJ)
$EF_{m,y,}$	- Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
i	- All fossil fuel types combusted in power unit m in year y
y	- Either 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 6: Calculation of Combined Margin Emission Factor:

The baseline emission factor of the Southern regional grid ($EF_{southern\ grid,\ CM,\ y}$ in tCO_2/ MWh)) is calculated as the weighted average of the Operating Margin emission factor ($EF_{Grid,\ OM,\ y}$) and the Build Margin emission factor ($EF_{Grid,\ BM,\ y}$)

$$EF_{southern\ grid,\ CM,\ y} = EF_{Grid,OM,\ y}\ x\ W_{OM} + EF_{Grid,\ BM,\ y}\ x\ W_{BM}$$

$EF_{grid,\ OM,,\ y}$	- Simple operating margin CO2 emission factor in year y (tCO2/ MWh)
$EF_{grid,\ BM,\ y}$	- Build margin CO2 emission factor in year y (tCO2/MWh)
W_{OM}	- Weighting of operating margin emission factor (%)
W_{BM}	- Weighting of build margin emission factor (%)

For wind power generation project activities, the default weighting value of 75% and 25% have been assigned to operating margin emission factor (W_{OM}) and build margin emission factor (W_{BM}) respectively.

As per the published data of the Central Electricity Authority (CEA), Ministry of Power, Government of India (CO2 baseline database, version 03, dated 15 December 2007):

$EF_{grid, OM,, y}$ i.e. the Simple Operating Margin emission factor of the Southern Grid is 1.00 tCO2/ MWh

$EF_{grid, BM, y}$ i.e. the Build margin CO2 emission factor of the Southern grid is 0.71 tCO2/MWh

The $EF_{Southern\ grid,\ CM,\ y}$ i.e. the combined margin baseline emission factor of Southern grid works out to 0.93 tCO2/ MWh for the wind power generation project activities. The Emission Factor details are provided in Annex-3.

The total power exported to the grid by the project activity is estimated to be about 193,847 MWh during the 10 years of crediting period. The baseline emissions for the crediting period, is estimated to be as follows:

BE_y = EG_y * $EF_{Southern\ grid,\ CM,\ y}$

BE = 222,285 MWh * 0.93 tCO_2 eq/ MWh

= 206,720 tCO_2 eq during 10 years of crediting period.

Leakage

As per AMS 1.D (version 13, dated 14/12/2007), 'if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered'. In the context of the project activity, there is no transfer of energy generating equipment and therefore the leakage from the project activity is considered as zero.

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

>>

Year	Estimation of project activity emissions (tons)	Estimation of baseline emissions (tons)	Estimation of leakage (tons)	Estimation of overall emission reductions (tons)
Year 1	0	20,672	0	20,672
Year 2	0	20,672	0	20,672
Year 3	0	20,672	0	20,672
Year 4	0	20,672	0	20,672
Year 5	0	20,672	0	20,672
Year 6	0	20,672	0	20,672
Year 7	0	20,672	0	20,672
Year 8	0	20,672	0	20,672
Year 9	0	20,672	0	20,672

Year 10	0	20,672	0	20,672
Total	**0**	206,720	**0**	206,720

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**Electricity Quantity**
Data unit:	kWh/year
Description:	Electricity supplied to the grid by the project activity during each year
Source of data to be used:	Log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	22,228,500
Description of measurement methods and procedures to be applied:	Electricity supplied by the project activity to the grid. The metering equipment is located at each WTGs location and the energy is metered by the TNEB at the high voltage side of the step up transformers installed at each high tension service connection (HTSC) point. Monthly meter reading is recorded by the authorised representatives of TNEB in presence of the representative of VSMPL.
QA/QC procedures to be applied:	TNEB proposes to calibrate the energy meters of VSMPL as per their standard procedures.
Any comment:	This data will be measured

B.7.2 Description of the monitoring plan:

>>

As per paragraph 13 of the AMS I D, version 13 (dated 14/12/2007) monitoring of the identified project activity requires "metering the electricity generated by the renewable technology."

Electricity generation

As emission reductions from the project are determined by the number of units exported to the grid it is mandatory to have a monitoring system in place and ensure that the project activity produces and exports the rated power at the stipulated norms. The sole objective of having monitoring system is to have a constant watch on the emission reductions.

The delivered energy is metered by the project proponent and TNEB at the high voltage side of the step up transformers installed at each HTSC connection. The metering equipment is located for individual WTGs depending upon the location of WTGs.

In accordance with electricity standards electronic tri-vector meters capable of recording and storing the parameters has been installed. The main meters are maintained and owned by TNEB whereas the panel meters are maintained and owned by the equipment supplier. The readings are recorded once in thirty days by the authorised representative of TNEB in presence of the representative of VSMPL. The net energy exported to the grid is calculated (The quantum of power imported during off season for machine start up or any other requirement is deducted from the gross power exported to the grid) and issued by TNEB as a "Monthly statement". The monthly statement is the basis of emission reductions. The main meters and the meter boxes are kept sealed by the TNEB and a joint inspection is carried out on behalf of VSMPL and TNEB, in the presence of its authorised representatives. TNEB holds the responsibility of carrying out calibration of all the metering instruments.

Organisation structure:

The respective equipment supplier (Suzlon) is responsible for operation and maintenance (O&M) of wind turbine generators in association with the Site In-charge. There are two Site In-charges for the project activity. The Site In-charge is a qualified electrical engineer with more than 5 years experience in O & M of windmills. The Site In-charges are responsible for collecting the required information from the operators at the ground level and also to record the generation on a daily basis for each service connection and report the cumulative generation to the Managing Director. They (site in-charges) are also responsible for maintaining the Generation & Maintenance log books, along with the history card for each and every WTGs. The management/ organisation structure is given below in Fig B-2:

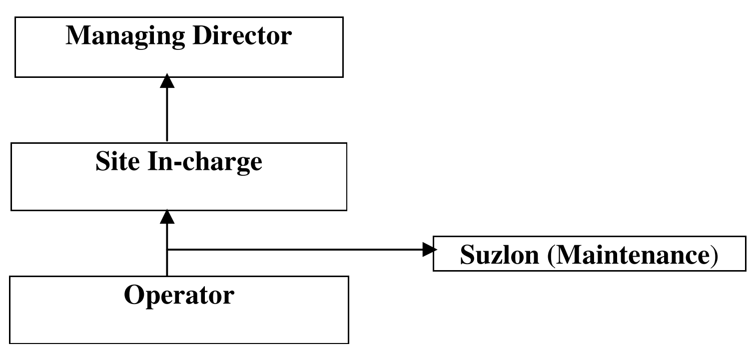

Fig B-2: Organisation structure for CDM project activity

CDM internal audit

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

Training and operation and maintenance arrangement

Since the project promoter does not have experience in the area of wind energy, individual agencies having requisite experience in establishing wind power plants have been appointed by VSMPL so as to implement the identified project activity. Thus no training is required prior to the start of the project activity. All the agencies as appointed by VSMPL are responsible for operation and maintenance (O&M) of the installed WTGs. The related documentary evidences have already been provided to the DOE.

Procedures for maintenance of monitoring equipment

In the context of the identified project activity, energy meter is the only equipment which is required to track the monitoring parameters as mentioned in section B.7.1 of this document. As per the power purchase agreement (PPA) with TNEB, the energy meters and the meter boxes shall be kept sealed by the TNEB and hence shall be maintained by the TNEB.

Baseline emission factor

According to AMS - ID, version -13 (14/12/2007) "the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO2e/kWh) calculated in a transparent and conservative manner". Hence, the baseline is the net electricity exported to the grid multiplied by baseline emission factor (combined margin) of the southern regional grid. The combined margin baseline emission factor has been determined as per 'Tool to calculate the emission factor for an electricity system (Version 01).

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

>>
05/05/2008

Name of responsible person (s) / entity (ies)

Mr. P.Selvaraj,

Managing Director - Finance

Velatal Spinning Mills Private Limited.

Mr. P.Selvaraj represents the project proponent i.e. VSMPL and is a project participant.

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:

>>
01/10/2003

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

>>
20 years, 0 month

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

Fixed crediting period is chosen

C.2.1. Renewable crediting period

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

>>
Not applicable

C.2.1.2. Length of the first crediting period:

>>
Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/08/2008 or subsequent to registration of the project, whichever is later.

C.2.2.2. Length:

>>
10 years, 0 months

SECTION D. Environmental impacts

>>

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

>>

The project activity does not fall under the purview of Environmental Impact Assessment notification of the Ministry of Environment and Forests (MoEF), Government of India (GOI) and the project activity is exempted from environmental clearances. The project activity has no significant impact on the environment. However, certain foreseen impacts due to the project activity are discussed below:

During construction

Impact on air

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

Impact on water

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

Impact on Land use

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

Impact due to noise

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

Taking into consideration the project life cycle, the magnitude of the impacts during the construction phase is found to be negligible and would exist for a temporary period of time till the end of construction phase. Therefore, it would not effect the environment considerably. The impacts on the environment due to construction activities of wind turbines are negligible

Operation and Maintenance Phase

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

Impact on air

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

Impact on water

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

Impact on ecology

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

Impact due to noise

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

Socio-Economic Impacts

There is no inconvenience to the local community due to the transmission lines. The project activity helps the up-liftment of skilled and unskilled manpower in the region. The project will be providing employment opportunities not only during the construction phase, but also during its operational lifetime. The project activity improves employment rate and livelihood of 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.

Conclusion

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

D.2. 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 project activity does not fall under the purview of Environmental Impact Assessment notification of the Ministry of Environment and Forests (MoEF), Government of India (GOI) and the project activity is exempted from environmental clearances.

The details of environmental impacts during construction and operational stages are already provided in section D.1 which indicates that the impacts are insignificant.

SECTION E. Stakeholders' comments

>>

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

>>

The followings are the local stakeholders for the project activity:

- *Local village administration*
- *Employee of the local school*
- *Representative of the Agricultures Association*
- *Representative of the local political party*

All the stakeholders have been invited through public notice. Subsequent to that the stakeholders meeting took place on 18th February, 2008 at S.F. No. 10 Vadavalli village, Coimbatore site office. Mr. Selvaraj of VSMPL chaired the meeting and requested the participants to express their views about the project.

In addition to this an advertisement was also published in the local news paper (Thandi) inviting comments from the stakeholders involved.

All the related documentary evidence towards the same will be submitted to the DOE during validation

E.2. Summary of the comments received:

>>

Mr. Appusamy, the president of the Boogampatti Village Panchayat commented in favour of the project and has accepted that the local panchayat collects house tax and profession tax which is a source of revenue for the local self government enabling them to provide drinking water, road, and sanitary facility to the local people.

Mr. R. Balachandar acknowledged the fact that due to the wind power generation facility employment opportunity has increased. They also requested the VSMPL management to permit grazing cattle in the vacant land.

Mr.M. Kuppusamy appreciated the fact that due to the wind power generation facility the land value has escalated and thereby has brought about economic upbringing of the local population.

Mr. Ramkumar, the site in charge of VSMPL, thanked the stakeholders for their participation and commenting about the project activity.

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

>>

Mr. Selvaraj has accepted the request of permitting grazing of cattle in the vacant land.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Velatal Spinning Mills Private Limited
Street/P.O.Box:	115 Tiruchengode Road
Building:	-
City:	Pallipalayam, Erode
State/Region:	Tamilnadu.
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Telephone:	+914288 - 240685, 242120
FAX:	+914288 – 240352
E-Mail:	velatal@sancharnet.in
URL:	-
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Selvaraj
Middle Name:	-
First Name:	P
Department:	-
Mobile:	+919842740685
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Direct tel:	+914288 - 240685, 242120
Personal E-Mail:	-

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding for this project activity was received from Annex 1 Parties.

Annex 3

BASELINE INFORMATION
(Source: Central Electricity Authority)
(Source: Central Electricity Authority, CO2 baseline database, Ver 3.0, 15 December 2007)

Weighted Average Emission Rate (tCO2/MWh) (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.72	0.73	0.74	0.71	0.72	0.73	0.74
East	1.06	1.03	1.09	1.08	1.05	1.05	1.00
South	0.74	0.75	0.82	0.84	0.79	0.74	0.72
West	0.90	0.92	0.90	0.90	0.92	0.89	0.86
North-East	0.42	0.41	0.40	0.43	0.52	0.33	0.40
India	0.82	0.83	0.85	0.85	0.84	0.81	0.80

Simple Operating Margin (tCO2/MWh) (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.98	0.98	1.00	0.99	0.98	1.00	1.00
East	1.22	1.19	1.17	1.20	1.17	1.13	1.09
South	1.02	1.00	1.01	1.00	1.00	1.01	**1.00**
West	0.98	1.01	0.99	0.99	1.01	1.00	0.99
North-East	0.74	0.71	0.74	0.74	0.90	0.70	0.70
India	1.01	1.02	1.02	1.02	1.02	1.02	1.01

Build Margin (tCO2/MWh) (not adjusted for imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					0.53	0.60	0.63
East					0.90	0.97	0.93
South					0.70	0.71	**0.71**
West					0.77	0.63	0.59
North-East					0.15	0.15	0.23
India					0.69	0.68	0.68

Annex 4

MONITORING INFORMATION

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

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

As emission reductions from the project are determined by the number of units exported to the grid, it is mandatory to have a monitoring system in place and ensure that the project activity generates and exports the rated power at the stipulated norms. The sole objective of having monitoring system is to have a constant watch on the emission reductions.

The delivered energy is metered by the project proponent and TNEB at the high voltage side of the step up transformers installed at each HTSC connection. The metering equipment is located for individual WTGs depending upon the location of WTGs.

In accordance with electricity standards electronic tri-vector meters capable of recording and storing the parameters has been installed. The main meters are maintained and owned by TNEB whereas the panel meters are maintained and owned by the equipment supplier. The readings are recorded from the main meter once in thirty days by the authorised representative of TNEB in presence of the representative of VSMPL. The net energy exported to the grid is calculated (The quantum of power imported during off season for machine start up or any other requirement is deducted from the gross power exported to the grid) and issued by TNEB as a "Monthly statement". The monthly statement is the basis of emission reductions. The main meters and the meter boxes are kept sealed by the TNEB and a joint inspection is carried out on behalf of VSMPL and TNEB, in the presence of its authorised representatives. TNEB is the responsible authority for ensuring accuracy level of all the meters through proper calibration.

Project Parameters affecting Emission Reduction

Monitoring Approach

The general monitoring principles are based on:

- Frequency
- Reliability
- Registration and reporting

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

Frequency of monitoring

The measurement will be recorded and monitored on a continuous basis by both TNEB and VSMPL.

Reliability

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

Registration and reporting

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

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Appendix 1:

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

Machine Make	Capacity	S.F.Nos.	Location with latitude and longitude	Date of Commissioning
SUZLON	1250 KW	399/1	Sellakarichal (Village), Coimbatore (Dist), $10^0$56 '08.6"(N) ; 77 ^{0}07' 46.3"(E)	31.03.2004
SUZLON	1250 KW	392	Sellakarichal (Village), Coimbatore (Dist) $10^0$56'36.3"(N) ; $77^0$07'54.9"(E)	07.03.2005
SUZLON	1250 KW	400/2	Sellakarichal (Village), Coimbatore (Dist) $10^0$55'59.8"(N) ; $77^0$07'54.6"(E)	15.09.2005
SUZLON	1250 KW	128/6	Sellakarichal (Village), Coimbatore (Dist) $10^0$56'12.0"(N) ; $77^0$10'05.7"(E)	28.09.2006
SUZLON	1250 KW	59	Varapatti (Village), Coimbatore (Dist) $10^0$55'10.5"(N); $77^0$09'52.0"(E)	27.02.2007
SUZLON	1250 KW	39	Varapatti (Village), Coimbatore (Dist) $10^0$55'29.1"(N); $77^0$10'71.7"(E)	To be commissioned
SUZLON	1250 KW	417	Bogampatti (Village) Coimbatore (Dist) $10^0$54'77.7"(N); $77^0$08'49.9"(E)	To be commissioned

Appendix 2:

Technical Specifications of SUZLON (1250 kW) WTG

ROTOR

Diameter	: 66 m
No of Rotor Blade	: 3
Swept area	: 3421 sq. mtrs
Orientation	: Upwind/ Horizontal axis
Rotational speed	: 13.8/20.7 rpm.
Rotational direction	: Clockwise
Rotor blade material	: GRP
Hub height	: 74 m

OPERATIONAL DATA

Cut in wind speed	: 3 m/s
Rated wind speed	: 14 m/s
Cut off wind speed	: 22m/s

GEAR BOX

Type	: Integrated 3 stage; 1 planetary & 2 helical
Gear ratio	: 1:74.917
Nominal load	: 1390 kW
Type of cooling	: Oil cooling system, Forced lubrication

GENERATOR

Type	: Asynchronous 4/6 pole
Rotational speed	: 1006/1606 rpm
Rated output	: 250/1250 kW
Rated voltage	: 690 V
Frequency	: 50 Hz.
Insulation	: Class “H”
Enclosure Class	: IP 56
Cooling system	: Air cooled

OPERATING BREAKES

Aerodynamic	: 3 independent systems with blade pitching
Mechanical	: Spring powered disc brakes, hydraulically released, fail safe

YAW DRIVE

Method of operation	: 4 active electrical yaw motors
Bearing type	: Polyamide side bearing

Appendix – 3

Power evacuation details of the WTGs

No. of WEGs & Capacity in 'KW'	MAKE	GENERATION DETAILS VOLTAGE FREQUENCY		STEP UP TRANSFORMER	SUB-STATION TRANSFORMER CAPACITY LOCATION	
1 X 1250	SUZLON	690 V	50 Hz	1500 KVA, 33 KV/690V	16 MVA ,110/33KV	Sellakarichal Coimbatore
1 X 1250	SUZLON	690 V	50 Hz	1500 KVA, 33 KV/690V	16 MVA ,110/33KV	Sellakarichal Coimbatore
1 X 1250	SUZLON	690 V	50 Hz	1500 KVA, 33 KV/690V	16 MVA ,110/33KV	Sellakarichal Coimbatore
1 X 1250	SUZLON	690 V	50 Hz	1500KVA 22KV/690V & 22KV/400V	2X16,1X25 MVA, 110/22 KV	Sellakarichal Coimbatore
1 X 1250	SUZLON	690 V	50 Hz	1500KVA & 500 KVA 22KV/690V & 22KV/400V	4X25 MVA,110/ 22 KV	Sellakarichal Coimbatore
1 X 1250	SUZLON	-	-	-	-	-
1 X 1250	SUZLON	-	-	-	-	-