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

CONTENTS

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 power project by AL – Wind Energy in Tamilnadu

Version number of the document : 01

Date of the document : 15.05.2008

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

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Project activity:

The project activity involves the implementation of 9.75 MW capacity wind power project by AL – Wind Energy (ALWE), a division of Ashok Leyland Project Services Ltd (ALPSL). The 9.75 MW comprises a total of 16 Wind Turbine Generators (WTGs) consisting of 6 WTGs each of 1250 kW capacity and 10 WTGS each of 225 kW capacity located at Uthumalai, Melamaruthappapuram and Panagudi villages respectively in Tirunelveli district in Tamilnadu.

The electricity generated from the 16 WTGs is wheeled through the grid and consumed by the group companies of Ashok Leyland for captive purposes. The consumers of this green power include Ashok Leyland Ltd (ALL) and Ennore Foundries Ltd (EFL). The State electric utility deducts 5% of the units as wheeling charges.

All the 16 WTGs in the project activity have been commissioned during the period February - March 2007. The project activity is expected to generate about 22.80 Million kWh annually, which would replace equivalent quantum of power at the Tamilnadu Electricity Board (TNEB) grid.

Table A-1 provides the location, make and capacity of wind turbine generators in the project activity.

Table A-1- Details of WTG installations

Location	Number of WTG	Make	Capacity. of each WTG (kW)	Installed capacity (kW)
Melamaruthappapuram village	2	Suzlon	1250	2500
Uthumalai village	4	Suzlon	1250	5000
Panagudi village	10	Southern Wind Farms Ltd (SWL)	225	2250
Total	**16**			**9750**

Project promoter background:

AL - Wind Energy (ALWE), a division of Ashok Leyland Project Services Ltd (ALPSL), was formed exclusively to establish, operate and maintain wind turbine generators installed by the group companies of Ashok Leyland. ALPSL is an associate company of Ashok Leyland Ltd., (ALL) which is involved in the manufacture of Medium and Heavy Duty Commercial Vehicles.

Realizing the impacts of fossil fuel generated electricity on environment in general and climate change in particular, these organizations had decided to harness renewable energy and consume the same for their operations.

ALWE is the coordinating agency and is responsible for establishing, operating and maintaining the wind turbine generators.

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 social well being is assessed by the contribution of the project activity to the improvement in the standard of living of the local community. The identified project activity has contributed to poverty alleviation as it has employed local manpower during erection and operation of the wind power plant. The project has also resulted in the development of basic amenities leading to an improvement in the infrastructure surrounding the region. The project also contributes to increased electricity availability to the otherwise deficit grid.

ii) Economic well being

The project's initial investment was about INR 475 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 fuels like coal for power generation.

The project activity has created direct and indirect job opportunities to the local community during installation and operation of the WTGs. The investment for the project activity has increased the economic activity of the local area. The above have contributed to the economic well being and social well being of the local community.

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 line losses;
- Reactive power control;
- Mitigation of transmission and distribution congestion and hence minimising transmission and distribution loss.

The above details the contribution of the project activity to sustainable development.

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)	AL-Wind Energy (ALWE), a division of M/s. Ashok Leyland Project Services Ltd (private entity- public limited company)	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 Uthumalai, Melamaruthappapuram and Panagudi villages of Tirunelveli 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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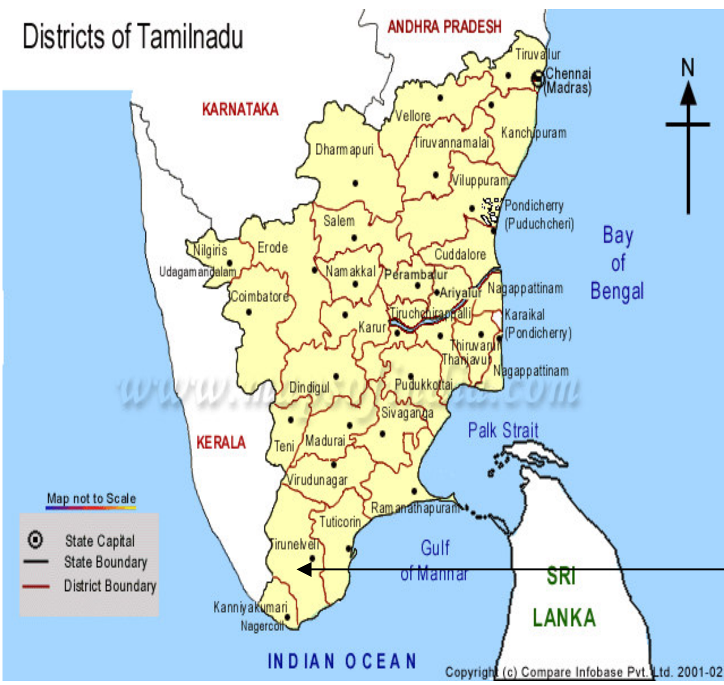
The project activity is located in Uthumalai, Melamaruthappapuram and Panagudi villages of Tirunelveli district. The detailed location of the WTGs with respect to latitude and longitude, survey numbers, and the date of commissioning of the respective WTGs are provided in Appendix-1. The location of the project activity is shown in Fig A-1

Fig A-1 showing Tamilnadu state in Indian map

Tamilnadu state



Tirunelveli 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 Six (6) WTGs of 1250 kW capacity and Ten (10) WTGs of 225 kW capacity each, thereby having an aggregate capacity of 9.75 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 9.75 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	21,208
Year-2	21,208
Year-3	21,208
Year-4	21,208
Year-5	21,208
Year-6	21,208
Year-7	21,208
Year-8	21,208
Year-9	21,208

Year-10	21,208
Total estimated reductions (tonnes of CO_2e)	**212,082**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	21,208

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.

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. 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.

[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.

[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.

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."

There is only a large scale project activity by the same project proponent (ALWE), in the same project category and technology/ measure that has been registered within the previous 2 years (i.e. on 25th Sep 2006) titled '*56.25 MW bundled wind energy project in Tirunelveli and Coimbatore districts in Tamilnadu, India*', however the project boundary is not within 1 km of the project boundary of the proposed small scale activity at the closest point and therefore the identified 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 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 and as per this document the project activity falls under category I.D. - grid connected renewable electricity generation (Refer Table B-1).

Table B-1: 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 generates 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 9.75 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 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.

[4] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PHPV5WESACMBTJ2YY54GAJYSIEI3HD

From the above Table B-1, 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 up 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

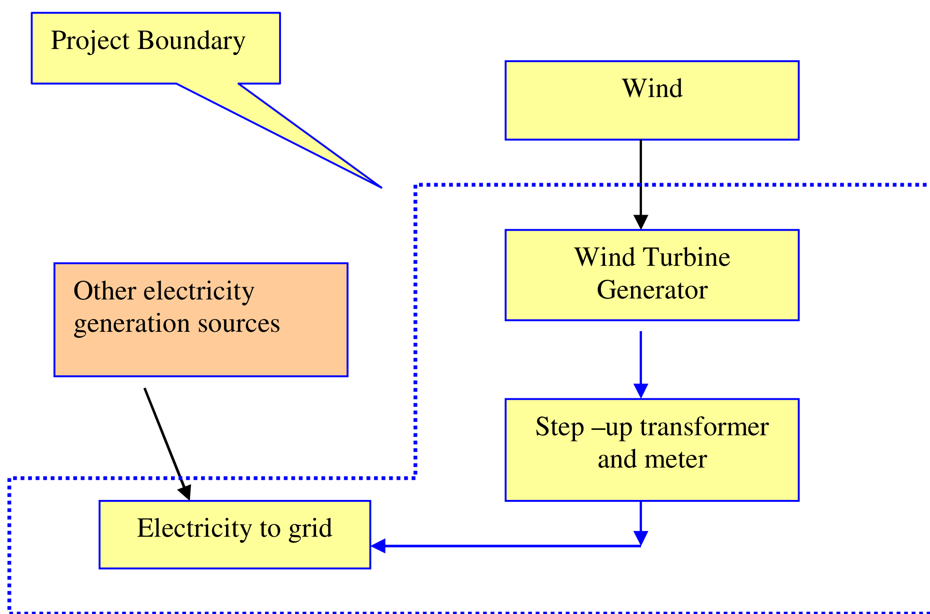

Fig B-1: Project boundary

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] published by the Central Electricity Authority (CEA), Ministry of Power, Govt. of India which has been computed according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system" version - 1. Considering the individual weightings of 0.75 and 0.25 assigned to the operating margin and the build margin emission factors respectively for wind power generation project activities, as prescribed in the 'Tool to calculate the emission factor for an electricity system (Version 1)' 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.

It is to be noted that the project proponent has considered the CDM revenue stream in determining the project cash flows 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.

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

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

(a.) ***Investment barrier***[6]

This project activity is a grid connected wind power project and in the absence of this project activity the power would have been generated by the fossil fuel based power plants. The capital investments for wind power project is high compared to other power projects like Coal, Natural gas and Diesel based Power plants. The capital investment for this wind power project activity with other thermal power plants are tabulated below:

Sr. No	Type of power plant	Capital Cost (INR/MW)
1	Coal Power Plant	40
2	Lignite Power Plant	42
3	Natural Gas Power Plant	27
4	Diesel Power Plant	35
5	Wind Power Plant	47.5[7]

Source: Report of the Expert committee on fuel for power generation-Page XI-CEA.

An investment analysis of the project activity was conducted considering equity IRR (Pre-tax) as the financial indicator. The equity IRR (Pre-tax) of the project activity was computed and then compared against the benchmark equity IRR (Pre-tax) of 16% as stipulated by the Tamilnadu Electricity Regulatory Commission (TNERC) in its order no 3. dated 15th May 2006[8] i.e. "power purchase and allied issues in respect of Non-Conventional Energy Sources based Generating Plants and Non-Conventional Energy Sources based Co-Generation Plants"

The equity IRR (Pre -tax) of the project activity was ascertained based on the following basic assumptions and information provided in Table B-2:

Table B-2: Assumptions and Information used in computing the equity IRR (pre-tax) for the project activity at ALWE

Sl. No	Parameter	Value
1	No.of WTGs	16 Nos
2	Capacity of each WTG	6 Nos of 1.25 MW (Suzlon make) 10 Nos of 0.225 MW (SWL make)
3	Capital Cost	49.7 Million INR per MW for 1.25 MW WTGs 45.3 Million INR per MW for 0.225 MW WTGs
4	Capacity Utilisation Factor (CUF)	26.7% (As per the TNERC order no. 03 dated 15th May 2006 for Group II projects)
5	Tariff (including Electricity Tax)	3.68 (INR/kWh) as the WTGs are used to satisfy captive power requirements. This is based on existing tariffs for the HT consumers as per TNEB.
6	Life of plant	20 years (As per TNERC order no. 03 dated 15th May 2006)

[6] Reference: Documents in support of the necessary assumptions and work sheets of the financials would be provided to the DOE during validation

[7] Reference: Purchase Orders of wind mills of ALWE

[8] Reference: http://www.tnerc.tn.nic.in/

Sl. No	Parameter	Value
7	Depreciation Rate (Schedule XIV rate)	5.28%
8	Operating Expenses (Maintenance + Employee + Administration)	For 1.25 MW WTGs (as per Supplier specifications) • First year – Nil • 2nd and 3rd year – 0.27% of capital cost • 4th year – 2.04% of capital cost • 5th to 11th year – 5 % annual escalation • 12th year onwards – 5% annual escalation For 0.225 MW WTGs (as per Supplier specifications) • First year – Nil • 2nd year - 0.20% of capital cost • 3rd year – 0.20 % of capital cost • 4th year – 1.96% of capital cost • 5th year onwards – 5% escalation
9	Debt	-
10	Equity	100%
11	Term of loan with interest	Not applicable
12	Insurance cost	0.16% of capital cost for 1.25 MW WTGs 0.7% of capital cost for 0.225 MW WTGs
13	Working capital	Nil
14	Interest on working capital	Nil

While determining the equity IRR (Pre - tax) for the project activity, the income from the project activity has been computed at INR 3.68 per kWh (including Electricity tax), which is the tariff offered by the TNEB for industrial high tension (HT) power consumers

The equity IRR (Pre - tax) for the project activity has been estimated over a period of twenty years, the results of which are detailed in Table B-3 below:

Table B-3: IRR with and without CDM funds

Details of WTG in the project activity	Equity IRR (Pre – tax) without CDM (%)	Equity IRR (Pre - tax) with CDM (%)
Suzlon (6 X 1.25 MW)	10.1%	13.3%
SWL (10 X 0.225 MW)	11.8%	15.2%
Project Activity	10.9%	14.2%

From the above Table B-3, it is apparent that the IRR without CDM funds is less than the benchmark equity IRR (Pre - tax) value of 16%. The details of the IRR workings would be provided to the Designated Operational Entity (DOE) during validation. The equity IRR (Pre- tax) will improve while the CDM revenues are accounted for within the project cash flow.

Sensitivity analysis:

The identified project being a grid connected wind power generation is susceptible to the annual generation which in turn is a dependent on the available wind in the region. Hence, in order to understand the financial viability of the project with a variation in the generation, a sensitivity analysis is carried out with a reduction and increase in generation by 10% and the results are presented in Tables B-4 and B-5 respectively.

1. **Reduction in annual generation** – Annual generation may reduce due to change in wind patterns, low capacity factors and any other unforeseen circumstances such as grid non-availability.

Table B-4: IRR with and without CDM funds (-10% generation)

Details of WTG in the project activity	Equity IRR (Pre – tax) without CDM (%)	Equity IRR (Pre - tax) with CDM (%)
Suzlon (6 X 1.25 MW)	7.6%	10.8%
SWL (10 X 0.225 MW)	9.2%	12.5%
Project Activity	8.4%	11.6%

The result of the above sensitivity analysis reveals the fact that the project's profitability level would reduce further if power generation by the proposed project activity is reduced which is a very realistic consideration as power generation from WTGs is 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 pattern or any other and related factors.

Table B-5 IRR with and without CDM funds (+10% generation)

Details of WTG in the project activity	Equity IRR (Pre – tax) without CDM (%)	Equity IRR (Pre - tax) with CDM (%)
Suzlon (6 X 1.25 MW)	12.4%	15.7%
SWFL (10 X 0.225 MW)	14.3%	17.8%
Project Activity	13.3%	16.7%

As apparent from the above sensitivity analysis, even with an increase in power generation by 10%, the equity IRR (Pre tax) without consideration of the CDM fund remains below the benchmark equity IRR (Pre - tax) of 16%.

Thus in light of the above discussions it can be concluded that the identified project activity would not be financially sustainable without the consideration of the CDM funds. As apparent from the above financial analysis, the CDM funds would reduce the financial risk to a certain extent and would enable the project activity, at least, to register an IRR close to the benchmark return.

(b.) Technological barrier

Barrier due to high pitch technology

The project activity has installed six high capacity WTGs of capacities 1250 kW each 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[9] 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 – B-6[10]. Wind power being a part of the RES has a much lower share in the installed capacity.

[9] 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)

[10] Source: Central Electricity Authority (CEA)

Table – B-6 - 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[11] on 31.12.2006 out of total installed capacity of 121,381.8 MW[12] 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 considered for evaluation. The aggregate installed capacity of wind power projects in Tamilnadu as of 31st December 2005 was 2526.7 MW[13]. The capacity amounting to 770.80 MW[14] which was already installed by 1999-2000 has been ruled out from CDM consideration. During the period 1st April, 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 B-7 below clearly specifies the capacity of the WTGs installed in Tamilnadu from the year 1992, till 31st December, 2005[15].

Table B-7: 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

11 www.mnes.nic.in

12 www.cea.nic.in

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

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

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

Year	Capacity addition (MW)	Cumulative Installed Capacity (MW)
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		

The CDM related status of different wind power projects commissioned in Tamilnadu during the period January 2000 to 31st December, 2005 was analysed[16] and the same is provided in the Table B-8 below.

Table B-8: 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 Table B-8:

- 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.

The above analyses clearly implies that most of the wind power projects in the State of TN have been implemented in view of inflow of CDM revenues considering low IRR, barriers such as low capacity factors, grid non-availability and other related aspects.

[16] cdm.unfccc.int

(d) Other barriers

(i) Grid non-availability:

It has been observed in the recent past that many of the wind power promoters in the State of Tamilnadu were asked by TNEB to shut down / back down their turbines during peak season due to evacuation problems, considering peak generation from thermal / hydel power stations. This has occurred especially during peak wind season wherein the power generation from wind would have been the highest. This situation of grid non-availability has resulted in reduced power generation from wind power projects in the State. As apparent, this would directly affect the profitability of the project considering lesser/ reduced generation. ALWE was aware of the grid non-availability aspects prior to the start of the project activity.

Apart from the WTGs under consideration in the project activity, the project proponent has already implemented few other wind power projects in Tamilnadu which are a part of the UNFCCC registered project activity. For some of these installations, poor grid availability has been observed during the years 2005 and 2006 respectively[17].

Further to the above, the article[18] in The Hindu Business Line dated 12.08.2005 titled 'Poor transmission causing wastage, say Wind Energy Units' and the article[19] in The Hindu Business Line dated 31st May 2006 titled 'TN wind mills asked to back down turbines' indicate the grid non-availability situation in Tamilnadu even before the project activity was considered for implementation by the project proponent.

Moreover, ALWE has also faced the barriers pertaining to inadequate power evacuation facilities by the State Electricity Board (SEB) in the area. It is to be noted that more than 25% of the energy generation from wind mills during the period 2005-2006 could not be achieved due to the lack of evacuation facilities.

The peak wind season in Tamil Nadu is between June to September and the wind speed during this period ranges between 11 m/s to 20 m/s. However, due to the grid drop, the wind mills remain idle during this period. Tirunelveli region, where the project activity is located, has experienced grid drop of almost 19 hours a day for few days during this peak wind speed season.

Apart from the above, ALWE has also faced the barrier considering the capacity of substations. The substation load in the region is not adequate to cater to the power export from the wind mills and hence there are power cuts daily in order to balance the load of the substation..

It is apparent from the above discussions that the project proponent invested in the project activity being fully aware of the various grid related barriers in Tamilnadu and the rationale behind such an investment was consideration of CDM revenues which will make up for the losses on account of the barriers due to poor grid availability.

ALWE has experienced this barrier of grid non availability for the project activity as well. The details of the grid drop hours (grid non-availability) since the commissioning of the project is given in the Table B-9 below:

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[17] Reference: Documentary evidence would be provided to DOE

[18] Reference: Poor transmission causing wastage, say wind energy units – Article in The Hindu Businessline dated 12th August 2005

[19] Reference: Business Line dated 31 May 2006 with article 'TN wind mills asked to back down turbines'

Table B-9 Grid non availability in the project activity

Sr. No	Month	Grid Drop (GD) Hours	
		Suzlon WTGs (6 x 1250 kW)	***SWL WTGs (10 x 225 kW)***
1.	April 07	0	0
2.	May 07	943.6	16
3.	June 07	1245.5	615
4.	July 07	1393.8	155
5.	Aug 07	449.5	120
6.	Sep 07	320.7	40
7.	Oct 07	199.2	13
8.	Nov 07	53.5	280
9.	Dec 07	64.1	53
10.	**Total (Apr – Dec 07)**	**4669.9**	**1292**

During 2007 many of the wind power promoters were asked by TNEB to shut down / back down[20] their turbines during peak season (May to September) as also apparent from Table B-9 (for the project activity) due to evacuation problems, considering peak generation from thermal / hydel power stations. This has resulted in reduced power generation from the project activity and therefore affected the profitability of the project considering lesser/ reduced generation, which is a barrier to the project activity.

(ii) Low capacity factors:

Low capacity factors of wind mills have been observed by ALWE in their previous projects (not included in the project activity) which have been installed in the Tirunelveli region. It has been observed that for the 36 WTGs of 225 kW capacity located in the Tirunelveli region about 19% and 18% plant load factors/ capacity utilisation factors were observed during the years 2005 and 2006 respectively[21]. Despite having faced this situation in the past, ALWE still took the decision of investing in the wind power project considering the revenues/ fund flow from CDM.

[20] Reference: The Hindu dated 24 June 2007 with article ‘Windmills come to a grinding halt’

[21] Reference: Documentary evidence would be provided to the DOE

Summary of barrier analysis:

It is apparent from the above discussions that the project activity could not even ensure the minimum benchmark return without consideration of the CDM funds in its cash flow considering low capacity utilisation, grid non-availability and related factors. 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 tCO_2/ 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:	TCO_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) of the ‘‘Tool to calculate the emission factor for an electricity system’, 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 replaced by the project activity at the grid is estimated to be about 228,044.7 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 = 228,044.7 MWh * 0.93 tCO_2 eq/ MWh

= 212,082 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	21,208	0	21,208
Year 2	0	21,208	0	21,208
Year 3	0	21,208	0	21,208
Year 4	0	21,208	0	21,208
Year 5	0	21,208	0	21,208
Year 6	0	21,208	0	21,208
Year 7	0	21,208	0	21,208
Year 8	0	21,208	0	21,208
Year 9	0	21,208	0	21,208
Year 10	0	21,208	0	21,208
Total	**0**	**212,082**	**0**	**212,082**

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:	Grid electricity displaced 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	22,804,470
Description of measurement methods and procedures to be applied:	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 ALWE. Double check by billing of TNEB to the consumer company
QA/QC procedures to be applied:	TNEB proposes to calibrate the energy meters of ALWE as per approved testing 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 generated by the project activity

As the emission reductions from the project are determined by 'the number of units wheeled through the grid by the project activity for captive purposes' it is mandatory to have a monitoring system in place. The sole objective of having monitoring system is to monitor the emission reductions.

The energy delivered to the TNEB grid is metered by ALWE and TNEB at the high voltage side of the step up transformers installed for each high tension service connection (HTSC). The metering equipment is maintained in accordance with electricity standards. In accordance with electricity standards, electronic tri-vector meters capable of recording and storing the parameters have been installed. The total energy delivered to the grid and energy imported from the grid for start up etc., is metered once in thirty days by the authorized representative of TNEB in presence of the representative of ALWE.

The net energy delivered to the grid (wheeled through the grid for captive purposes) is calculated and issued by TNEB as a "Monthly statement" (as a difference between the total energy delivered to grid and the electricity imports if any for start ups etc). The monthly statement shall be the basis of emission reductions. The energy meter is jointly inspected and sealed on behalf of ALWE and TNEB, in the presence of its authorized representatives. TNEB holds the responsibility of carrying out calibration of all the metering instruments as per their standard testing procedures. As the instruments are calibrated and marked at regular intervals, the accuracy of measurement can be assured at all times.

Management structure:

The power generation data is recorded once in 24 hours by an operator (who is an electrical engineer) which is further checked by the Shift engineer. There are one shift engineer and five operators for each site during a shift (each shift consisting of 8 hours). The Shift engineer is an electrical engineer and is in-charge of all operation and maintenance activities of the windmills in the shift. Weekly reports are sent to the Head Office at Chennai and a Chief Executive Officer (CEO) at the Head Office reviews the generation and other operational activities of the plant.

Fortnightly reviews are conducted by the CEO at the wind mill sites and all operational activities, maintenance schedules etc., are also inspected by CEO. The management/ organisation structure is given below in Fig B-2:

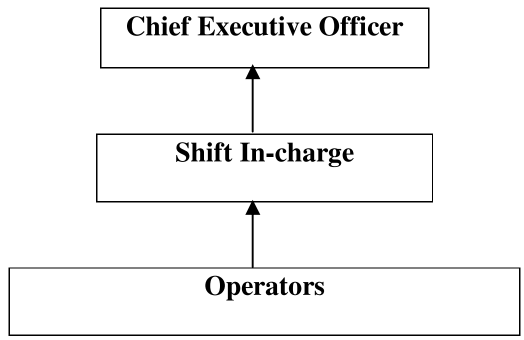

Fig B-2: Organisation structure for CDM project activity

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

Individual agencies having requisite experience in establishing wind power plants, such as Suzlon and SWL, have been appointed by ALWE 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 ALWE are responsible for operation and maintenance (O&M) of the installed WTGs. The related documentary evidences would be 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 CO_2e/kWh) calculated in a transparent and conservative manner". Hence, the baseline is the net electricity wheeled through the grid for captive purposes 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)

>>
12/03/2008

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

Mr. C.M. Sambasivam
Chief Executive Officer (CEO)
AL – Wind Energy (A Division of M/s.Ashok Leyland Project Services Ltd.)

Mr. C.M. Sambasivam represents the project proponent i.e. AL-Wind Energy 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:

>>
09/11/2006

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

>>
20 years, 0 months

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:

>>
15/07/2008 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 impacts 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 identified for the project activity:

- *Local community*
- *Local village administration*
- *Tamilnadu Electricity Board (TNEB)*

Stakeholders meetings were convened on 10th January 2008 and 11th January 2008 at the wind farm site offices of AL Wind Energy (ALWE) at Panagudi village and Uthumalai Village respectively in Tirunelveli district.

Representatives from local villages, local village administration and Tamil Nadu Electricity Board (TNEB) were invited for the meetings. The stakeholders were invited through an Invitation Letter and the documentary evidence towards the same will be submitted to the DOE during validation.

The meeting was chaired by the CEO of AL-Wind Energy and presided by the respective panchayat representatives. A discussion on the merits and demerits of the wind mills installations were discussed and the comments were invited from the participants on the project activity. In the inaugural speech, the CEO of ALWE briefed the stakeholders about the project activity, its associated impacts upon the environment and the livelihood. Subsequent to the inaugural speech, comments were received from the stakeholders.

All the necessary documentary evidences related to the list of participants and the comments received from the stakeholders will be provided to the DOE during validation.

E.2. Summary of the comments received:

>>

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

- Employment opportunities have increased;
- Standard of living has improved;
- Uninterrupted power supply;
- Businesses are flourishing;
- Generation of revenues for the panchayats in the form of professional and industrial tax;
- Eco-friendly power generation; and
- Migration to cities for jobs has reduced as employment opportunities are available in the villages.

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

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

>>

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

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	AL-Wind Energy, A division of M/s. Ashok Leyland Project Services Ltd
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URL:	-
Represented by:	
Title:	Chief Executive Officer
Salutation:	Mr.
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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.

Electricity generated by the project activity

As the emission reductions from the project are determined by ‘the number of units wheeled through the grid by the project activity for captive purposes’ it is mandatory to have a monitoring system in place.

The energy delivered to the TNEB grid is metered by ALWE and TNEB at the high voltage side of the step up transformers installed for each high tension service connection (HTSC). The metering equipment is maintained in accordance with electricity standards. In accordance with electricity standards, electronic tri-vector meters capable of recording and storing the parameters have been installed. The total energy delivered to the grid and energy imported from the grid for start up etc., is metered once in thirty days by the authorized representative of TNEB in presence of the representative of ALWE.

The net energy delivered to the grid (wheeled through the grid for captive purposes) is calculated and issued by TNEB as a “Monthly statement” (as a difference between the total energy delivered to grid and the electricity imports if any for start ups etc). The monthly statement shall be the basis of emission reductions. The energy meter shall be jointly inspected and sealed on behalf of ALWE and TNEB, in the presence of its authorized representatives. TNEB holds the responsibility of carrying out calibration of all the metering instruments as per their standard testing procedures. As the instruments are calibrated and marked at regular intervals, the accuracy of measurement can be assured at all times.

Project Parameters affecting Emission Reduction

Monitoring Approach

The general monitoring principles are based on:

- Frequency
- Reliability
- Registration and reporting

The emission reduction units from the project are determined by the net energy generated by the project activity, that displaces the grid power and then multiplying with appropriate emission factors. Hence, it becomes important for the project to monitor the net delivery of power to the grid on real time basis.

Frequency of monitoring

The measurement of power generated is recorded and monitored on a continuous basis by both TNEB and ALWE.

Reliability

The amount of emission reduction units is proportional to the net energy delivered by the project activity or that wheeled through the grid for captive consumption. 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 ALWE, TNEB also monitors the power wheeled through the grid for captive purposes and certifies 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	Latitude/ Longitude	Village	Date of Commissioning	Wind Mill SC No
SUZLON	1 X1250 KW	671/2/PART	K414	8^0 58.496' N/ 077^0 33.105' E	Uthumalai	03.03.2007	2174
SUZLON	1 X1250 KW	493 (Part)	K458	9^0 00.008' N/ 077^0 33.109' E	Uthumalai	13.03.2007	2187
SUZLON	1 X1250 KW	434/2(Part), 3A(Part), 3B(Part), 3C(Part)	K450	$8^0$59.826' N/ 077^0 32.224' E	Uthumalai	13.03.2007	2186
SUZLON	1 X1250 KW	401/2B(Part), 3 (Part), 544/3 (Part), 545/1 (Part)	K434	8^0 59.296' N/ 077^0 32.395' E	Uthumalai	16.03.2007	2195
SUZLON	1 X1250 KW	451/1 (Part)	K462	9^0 00.363' N/ 077^0 32.703' E	Melamarutha ppapuram	21.02.2007	2161
SUZLON	1 X1250 KW	420/6B (Part) 426/2 (Part), 3 (Part)	K500	$9^0$00.216' N/ 077^0 32.025' E	Melamarutha ppapuram	27.03.2007	2237
Southern Wind Farms Ltd (SWL)	3X225 KW	219/1B (P) 212/1(P) 212/2(P)	1,2,3	WTG 1: $8^0$19.635' N/ 077^0 32.415' E WTG2: $8^0$19.571' N/ 077^0 32.355' E WTG3: $8^0$19.534' N/ 077^0 32.238' E	Panagudi	20.03.2007	2200
Southern Wind Farms Ltd (SWL)	2X225 KW	206(P) & 207/1A(P)	4,5	WTG4: $8^0$58.486' N/ 077^0 33.090' E WTG5: $8^0$58.456' N/ 077^0 32.890' E	Panagudi	20.03.2007	2199

Machine Make	Capacity	S.F.Nos.	Location	Latitude/ Longitude	Village	Date of Commissioning	Wind Mill SC No
Southern Wind Farms Ltd (SWL)	2X225 KW	1224/1A, 1B,2 & 1231/1A, 1230, 1227/1B 1225, 1229 (P)	6,7	WTG6: $8^0$20.316' N/ 077^0 35.113' E WTG7: $8^0$19.047' N/ 077^0 35.154' E	Panagudi	24.03.2007	2222
Southern Wind Farms Ltd (SWL)	3X225 KW	826/1C(P), 2(P) 902/2, 880/2(P) 881(P), 905/1,2 & 906/2	8,9,10	WTG8: $8^0$20.393' N/ 077^0 34.913' E WTG9: $8^0$20.389' N/ 077^0 34.921' E WTG 10: $8^0$20.259' N/ 077^0 34.799' E	Panagudi	29.03.2007	2272

APPENDIX 2:
Technical Specifications of SUZLON (1250 kW) WTG

ROTOR

Diameter	: 66 m
No of Rotor Blade	: 3
Orientation	: Upwind/ Horizontal axis
Rotational speed	: 13.8/20.7 rpm.
Rotational direction	: Clockwise
Rotor blade material	: GRP
Swept area	: 3421 m^2
Hub height	: 74 m
Regulation	: Pitch regulated

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
Manufacturer	: Winergy
Nominal load	: 1390 kW
Type of cooling	: Oil cooling system, Forced lubrication

GENERATOR

Type	: Asynchronous 4/6 pole
Manufacturer	: Siemens
Rotational speed	: 1006/1506 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 BRAKES

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

Technical Specifications of 225 kW WTG (Southern Wind Farms Ltd)

Wind Turbine Generator of 225/40 kW of 50 m Tabular Tower:

(a) Tower	Tabular Tower of hub height 50 m
(b) Blades	Fiberglass reinforced polyesters, designers as per NACA specification. Blade equipped with tip brakes, mounted on hub along with extendors 1 set = 3 blades
(c) Gear Box	Helical type, 2 steps with ratio 1:40 KPCL make
(d) Brake system	Fail safe heavy duty disc brake and calliper brake with accumulator provided on high speed shaft. Make – Sime
(e) Yaw system	With provision for active clockwise and anticlockwise movement through slewing system
(f) Generator	3 phase, Asynchronous, 400 volts, 50 HZ, 225/40 kW (Dual) capacity by Jyoti-make
(g) Local control system	Designed for automatic, unattended operation with provision for display of various operating parameters including restart condition
(h) Power panel	Mounted inside the tower with MCCB protection for transformer and generator with earth fault relay and thyrister based soft start facility
(i) Capacitor panel	Mounted inside the tower with capacitors with automatic power correction, contactors in steps, backup protection and fuse

Appendix – 3

Power evacuation details of the WTGs

Wind Mill SC No.	No. of WEGs & Capacity in 'KW'	MAKE	GENERATION DETAILS		STEP UP TRANSFORMER	SUB-STATION	
			VOLTAGE	FREQUENCY		CAPACITY	LOCATION
2174	1x1250KW	SUZLON	690V	50Hz	6X1500kva	110/33KV	Uthumalai SS
2195	1x1250KW						
2186	1x1250KW						
2187	1x1250KW						
2161	1x1250KW						
2237	1x1250KW						
2200	3x225KW	SWL	415V	50Hz	10X350kva	110/11KV	Panagudi SS
2199	2X225KW						
2222	2X225KW						
2272	3x225KW						