CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

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>.

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

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

7.25 MW wind energy project of Aruppukottai Sri Jayavilas Ltd, Tamilnadu, India.

Number of the version : 06

Date : 26/07/2007

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

Purpose of the project activity
The main purpose of the project activity is the implementation and operation of 7.25 MW wind farm in high wind speed areas of Tamilnadu state in India to generate electricity for consumption for captive use displacing grid electricity.

Project description
Aruppukottai Sri Jayavilas Limited, ("Jayavilas"), the project proponent, owns and operates textile mils manufacturing high quality yarn. Jayavilas operates two textile mills with an installed capacity of 90,240 spindles, manufacturing yarn out of cotton. These textile mills consume considerable quantity of electricity for their operations. This electricity was consumed from the fossil fuel dominated state owned electric utility. Realizing the impacts of electricity produced from fossil fuels, Jayavilas has decided to install wind farms to generate and consume "green and clean" electricity for its operations.

The project activity consists of 17 wind turbine generators (WTGs) in Tirunelveli district of Tamil Nadu state in India. The project activity has 5 WTGs of 850 kW and 12 WTGs of 250 kW. All the windmills have been commissioned and the generated electricity from WTGs is connected to state electric utility namely Tamil Nadu Electricity Board (TNEB) and transmitted through state grid for consumption for their textile mills. TNEB delivers the electricity at the consumption point after deducting 5 % of the kWh as Wheeling charges.

Contribution of the project activity to sustainable development in view of project participant
The project proponent believes that the project activity has contributed to sustainable development in following manners:
i) Social well being
ii) Economical well being
iii) Environmental well being
iv) Technological well being

i) Social well being
Social well being by providing job opportunities to the local population during erection and operation of the wind farms contributing in poverty alleviation of the local community and development of basic amenities to community.

ii) Economic well being
The wind farms need large area. The cost of land appreciated benefiting the landowners and local community directly. These lands were generally were unproductive. Most of the wind energy potential areas are in remote areas and are largely unfertile. These lands generally command low prices. But due to

land demand for wind farms, the land price increased leading to economic well being of the local community. The project activity also contributes in economic well being of the nation's economy by reducing import of coal and other fossil fuel for electricity generation in hard currency.

iii) Environmental well being
Environment friendly electricity generation project with no significant impact on the environment. Additionally, the project activity generates electricity from a renewable source of energy where the source gets replenished and is available for use.
Therefore, the following environmental benefits are derived from the project activity:

- Produces electricity without GHG emissions.
- Produces electricity from a renewable energy source.
- Rural development as the project activity location
- Nil impact on the environment due to the project activity.

iv) Technological well being
The project activity has higher capacity windmills of 850 kW which is technologically advanced to conventional smaller capacities.
Other technological well beings of the project :

- improved power quality in the vicinity
- reactive power control;
- mitigation of transmission and distribution congestion,

All the above are the contributions of the project activity for the sustainable development.

A.3. Project participants:

Name of Party involved (host indicates a host Party)	Private and/or public entity (ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host Party)	Aruppukottai Sri Jayavilas Limited (Private entity – public limited company)	No

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

India

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

South India/Tamil Nadu state/ Tirunelveli district

A.4.1.3. City/Town/Community etc:

Pazhavoor, Levenjipuram, Thanakkarkulam and Udayathur villages in Tirunelveli district.

The table A.4-1 gives the details of location of wind turbine generators of the project activity .

Table A. 4-1- Details of WTGs of the project activity

Village name	Number of WTG	Capacity of each WTG	Installed capacity
Pazhavoor	6 1	0.25 MW 0.85 MW	1.5 MW 0.85 MW
Levenjipuram	6 1	0.25 MW 0.85 MW	1.5 MW 0.85 MW
Thanakkarkulam	1	0.85 MW	0.85 MW
Udayathur	2	0.85 MW	1.7 MW
Total	**17**		**7.25 MW**

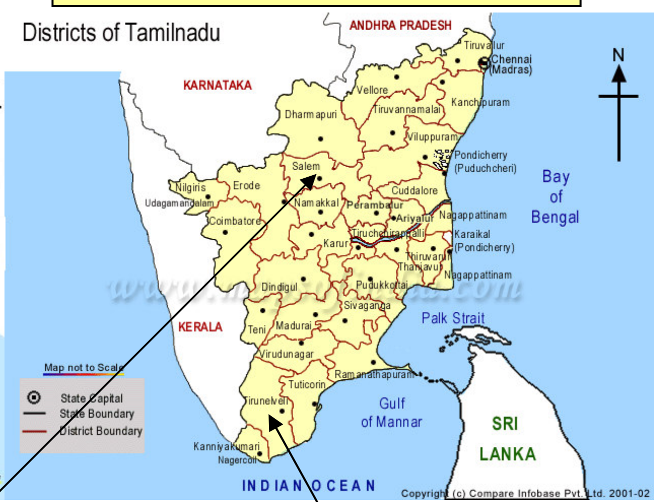
A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

The project activity is located in Tirunelveli district in Tamilnadu state in India. Tirunelveli district is located between 8º 8' and 9º 23' of the northern latitudes and 77º 09' and 77º54' of the eastern longitudes.

The project activity is about 15 –20 kilometres from Kanyakumari (Cape Comorin), the southern most point of India where three seas namely Bay of Bengal, Indian Ocean and Arabian sea confluence. The nearest big railway station is at Kanyakumari and nearest airport is at Trivandrum at 100 kilometres away. The geographical location of project activity is detailed in the maps below.

Fig A-1 showing Tamilnadu state in Indian map

Fig A-2 showing Tirunelveli district in Tamilnadu state



Tamil Nadu state

Tirunelveli district

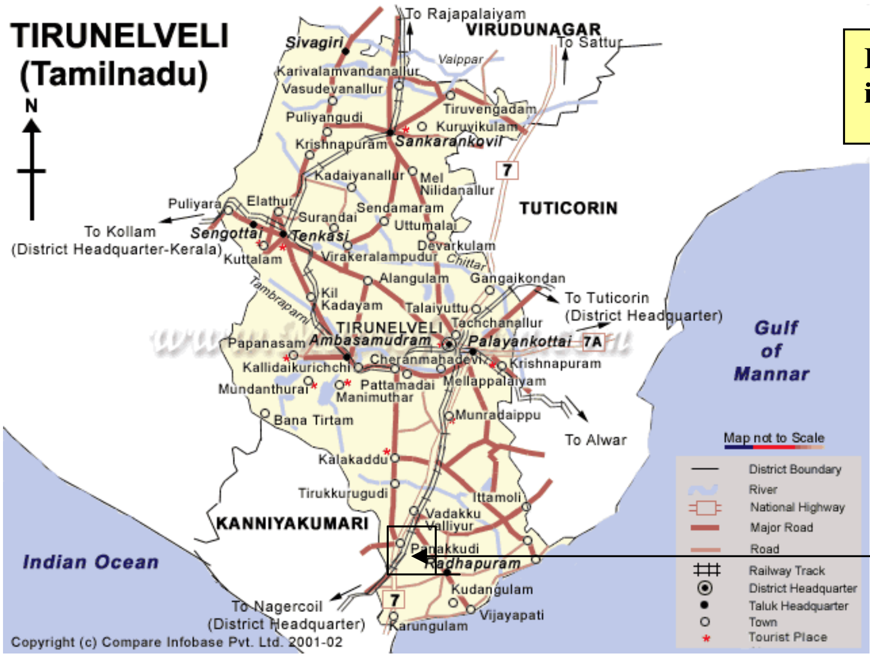


Fig A-3 showing project activity in Tirunelveli district

*The exact location of each WTG indicated as Survey Field No (S.F.No), High Tension Service Connection Number (HTSC .No.), make of each machine, capacity, location of the village and the date of commissioning are provided in attached Appendix 1.*The S. F. No and HTSC No. would give unique identification of the windmills of the small scale project activity. A schematic diagram showing the location of WTGs is attached as Appendix 2.

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

Scope Number	:	1
Sectoral Scope	:	Energy industries (renewable - / non-renewable sources)
Type	:	I. Renewable energy projects
Category	:	AMS I.D. Grid connected renewable electricity generation

The project activity is a wind energy project with an installed capacity of 7.25 MW which is lesser than 15 MW, qualifying for small scale CDM project activity. As per the provisions of Appendix B of Simplified Modalities and Procedures for Small Scale CDM Project Activities, approved small scale methodology AMS I.D /version 10 dated 23 December 2006, "this category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, ***wind,*** geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit". The project activity comprises ***wind energy*** supplying/ displacing electricity from the Tamilnadu state grid, which is part of southern regional grid, is being supplied by several fossil fuel generating units. With above considerations, the Type I.D. is the most appropriate for the project activity. The project activity does not comprise any electricity generation from non-renewable energy sources.

Technology

In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy. Wind has considerable amount of kinetic energy when blowing at high speeds. This kinetic energy when passes through the blades of the WTG is converted into mechanical energy and rotates the wind blades. When the wind blades rotate, the connected generator also rotates, thereby producing electricity.

The project activity has 5 WTGs each of 850 kW and 12 WTGs each of 250 kW.

Technology of 850 kW wind turbine generator

The 850 kW WTGs are of PAWT technology with Gamesa make turbines. These are an advanced version over conventional low capacity WTGs. The towers of these WTGs are 65 metres height. The higher height gives the advantage of capturing higher power at higher height. This height also avoids disturbance from windmills located nearby. These turbines have state of art technology of variable speed and variable pitch with a double fed generator. The 'aerofoil' design of the blade, especially 58 metres rotor, as against conventional 48-50 metres contributes to a larger swept area for energy capture. The design of the blade is suitable for low and medium wind conditions in plain and complex terrain, which suits the region where wind farms are located. The WTG reaches the rated capacity of 850 kW at 10.5 meters itself as against 12 metres as per power curve.

Technology of 250 kW wind turbine generator

The 250 kW WTGs installed in the project activity are of Wincon, Denmark technology and are manufactured by Pioneer Wincon in India. These WTGs are of well established technology with very little maintenance. These WTGs are robust in construction and has a few moving parts as a fixed blade configuration.

The important parts of windmill are:

i. Main Tower
ii. Blades
iii. Nacelle
iv. Hub
v. Main shaft
vi. Gearbox, bearing and housing
vii. Brake
viii. Generator

i. Main Tower

This is a very tall structure of 65 metres height for 850 kW turbines and of 45 meters high for 250 kW turbines with a door and inside ladder at the bottom. The door is used to enter into the tower for operation and maintenance.

ii. Blades

The WTGs are provided with three blades. The blades are self supporting in nature made up of Fiber Reinforced Polyester. The blades are mounted on the hub.

iii. Nacelle

The Nacelle is the one which contains all the major parts of a WTG. The nacelle is made up of thick rugged steel and mounted on a heavy slewing ring. Under normal operating conditions the nacelle would be facing the upstream wind direction.

iv.Hub

The Hub is an intermediate assembly between the wing and the main shaft of the wind mill. Inside the hub, a system to actuate the aerodynamic brake is fitted. The hub is covered with nose cone.

v. Main Shaft

The shaft is to connect the gear box and the hub. Solid high carbon steel bars or cylinders are used as main shaft. The shaft is supported by two bearings.

vi. Gear Box, Bearing and housing

The gearbox is used to increase the speed ratio so that the rotor speed is increased to the rated generator speed. Oil cooling is employed to control the heating of the gearbox. Gearboxes are mounted over dampers to minimise vibration. The main bearings are placed inside housing.

vii. Brake

Brake is employed in the WTGs to stop the windmill mainly for maintenance check. Brakes are also applied during over speed conditions of the windmill. The brakes are placed on the high speed shaft.

viii. Generator

The generator uses induction type of generator. The generators are provided with monitoring sensors in each phase winding to prevent damage to the generators.

Not to replace the technology

The technology is a clean technology since there are no GHG emissions associated with the electricity generation. The project proponent hereby assures and undertakes that the installed technology would not be replaced with any other or more efficient technology during the crediting period.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

The emission reductions of the project activity arise from electricity displaced in the grid. The project activity is a wind energy plant generating electricity from a renewable source of energy. The renewable energy source is a source of energy that gets replenished naturally and does not suffer permanent depletion due to use. The energy supplied by project activity to the state grid would reduce anthropogenic GHG emissions by displacing equivalent amount of grid electricity as per the combined margin carbon intensity of the grid, which is mainly dominated by fossil fuel based power plants. The project activity would supply about 15,089 MWh of electricity per year. During the crediting period of first 7 years, the project activity would deliver to the grid at least 105,623MWh generated from a renewable energy. In the absence of the project activity, the same amount of electricity would have been produced from other sources of energy. The electricity generated from the project activity is connected to Tamil Nadu grid, which is part of southern regional grid, which is mostly supplied by electricity produced from thermal sources.

The electricity generation for Southern regional grid and Tamilnadu state grid from various fuel sources for the years 2003-2004, 2004-2005 and 2005 –2006 in GWh are given in Table A –2 below;

Table A -2 – Power generation from various fuel sources in southern regional grid [1]

	Southern regional grid				Tamilnadu grid			
Fuel type	2003-04	2004-05	2005-06	average % mix	2003-04	2004-05	2005-06	average % mix
								All units in GWh
Thermal generation	116,072	113,122	108,217	**75.07%**	43,049	42,050	40,767	**83.61%**
Hydro generation	16,670	25,280	33,506	16.79%	2,044	4,413	6,110	8.35%
Nuclear generation	4,700	4,407	4,713	3.07%	1,577	1,480	1,853	3.26%
Low cost generation	5,880	7,625	9,293	5.07%	1,690	2,650	2,850	4.78%
Total	**143,322**	**150,434**	**155,729**	**100.00%**	**48,360**	**50,593**	**51,580**	**100.00%**

[1] Source : Central Electricity Authority www.cea.nic.in

From the table A-2, it may be seen that the average **thermal** power generation for the last three years is 75.07% in the southern regional grid and 83.61 % in the Tamilnadu grid which clearly evidences that the grid is predominantly based on thermal generation. Hence, in the absence of project activity, the same amount of electricity generated by the project activity would have been met from largely thermal generation with its associated GHG emissions.

The estimated total emission reductions be achieved by the project activity is **93,317 tonnes of CO_2** equivalent for the crediting period of 7 years. Detailed estimates are given in section E.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tonnes of CO_2 eq
01/08/2007 -31/07/2008*	13,331
01/08/2008-31/07/2009	13,331
01/08/2009-31/07/2010	13,331
01/08/2010-31/07/2011	13,331
01/08/2011-31/07/2012	13,331
01/08/2012-31/07/2013	13,331
01/08/2013-31/07/2014	13,331
Total estimated reductions (tons of CO_2e)	**93,317**
Total number of crediting years	7 years
Annual average over the crediting period of estimated reductions (tons of CO_2e)	**13,331**

** One year period is considered from 01/08/2007 to 31/07/2008 anticipating the date of registration to be 01/08/2007 as mentioned in section C.2.1.1. Any change in the date of registration will change this period also. That is, the one year period would start from the date of registration which would be the starting date of crediting period.*

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

There is no public funding for the project activity from parties included in Annex I of the convention.

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

The project activity is not a debundled component of a large project activity as there is **no** registered small scale project activity or application to register another project activity;

- with the same project participants
- in the same category and technology/measure; and
- whose project boundary is within 1 km of project boundary of the small scale project activity.

SECTION B. Application of a baseline methodology:

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

Title of approved baseline methodology : Grid connected renewable electricity generation

Reference : Approved small scale methodology AMS I. D.

Type I : Renewable energy project

Category I.D : Grid connected renewable electricity generation

B.2 Project category applicable to the small-scale project activity:

Appendix B of the simplified M&P for small-scale CDM project activities provides indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. As per the M&P, the project activity falls under the approved small scale methodologies :

AMS I.D. : Grid connected renewable electricity generation.

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 an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit	The project activity is a renewable energy generation based on **wind** source. The generated energy is connected to TNEB grid, part of southern regional grid, which is being supplied by several fossil fuel fired generating units.
If the unit added has both renewable and non renewable components, the eligibility limit of 15 MW for a small scale CDM project applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed 15 MW.	The project activity has only renewable component and the capacity of the project activity is 7.25 MW.
The sum of all forms of energy output shall not exceed 45 $MW_{thermal}$	There is no thermal energy and the total capacity of the project activity is 7.25MW.
For project activities adding renewable energy generation units at an existing renewable power	There is no capacity addition and total installed capacity is 7.25 MW.

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	
The total output of the modified, retrofitted unit shall not exceed the limit of 15 MW.	Not applicable, since this a new greenfield project and no retrofitting is involved.

From the above table, it is evident that the small scale project activity meets all the applicability conditions of the latest version of approved small scale methodology AMS I.D. – Grid connected renewable electricity generation version 10; 23 December 2006 as specified in *appendix B of the simplified modalities and procedures for small scale CDM project activities*.

Application of the methodology

The methodology is applied in the context of a project activity that comprises renewable energy generation based on wind energy that supplies to and displaces electricity to Tamil Nadu sate grid, which is part of southern regional grid. The Tamil Nadu grid and the southern regional grid are being supplied by several fossil fired generating stations.

The key steps involved in the application of the methodology are given below:

Step 1 - Determination of baseline

Baseline as per AMS I.D/version 10 dated 23 December 2006

As per AMS I. D/ version 10, the applicable baseline is as per paragraph 9 of the approved methodology AMS I. D/ version 10 – " the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2 eq/ kWh) calculated in a transparent and conservative manner as:

A combined margin (CM) consisting of the combination of operating margin (OM) and the build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the simple OM and the average OM calculations must be considered.

Step –2 Additionality of the project activity

Simplified modalities and procedures for small scale CDM project activities guides to establish additionality of the project activity as per Attachment A to Appendix B. The Attachment A to appendix B mentions various barriers and requires explanation to show that the project activity would not have occurred due to at least any one barrier.

Step 3 -Determining the baseline and project emissions, assessment of leakage and emission reductions.

The baseline emissions, project emissions, leakage from the project and the emission reductions due to project activity are elaborated in Section E as per approved small scale methodology AMS I.D /Version 10.

Step 4- Electricity baseline emissions

As per ACM 0002, "In large countries with layered dispatch systems, such as India, the regional grid definition should be used and that a state/ provincial grid definition may be too narrow".

The small scale project activity is in Tamil Nadu state in India which is part of southern regional grid. Hence, ***southern regional grid is considered*** for estimation of baseline emission factor.

The determination of electricity baseline emission factor has been discussed in section B.5

B.3. 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:

Justification for additionality of the project

Simplified modalities and procedures for small scale CDM project activities guides to establish additionality of the project activity as per Attachment A to Appendix B. The Attachment A to appendix B mentions various barriers and requires explanation to show that the project activity would not have occurred due to at least ***any one*** barrier.

Barrier analysis

Establishing the project activity is a voluntary step undertaken by the project proponents with no direct or indirect mandate by law. The main driving forces to this 'climate change initiative' have been:

- To reduce the impact of fossil fuel generated electricity consumed by the project proponents for their industrial operations.
- To generate and consume clean and green energy
- Rural development of the region by creating job opportunities for the local people.

However, the project proponent was aware of the various barriers associated to project implementation. But it was felt that the availability of carbon financing against a sale consideration of carbon credits generated due to project activity would help to overcome these barriers.

The barriers faced by the project activity are discussed in this section.

B.3.1. Investment barriers

3.1.i) Returns from the project activity – Investment analysis

An investment analysis of the project activity was carried out with the Internal Rate of Return (IRR) on equity as the financial indicator. Internal Rate of Return is one of the known financial indicators used by project developers, banks, and financial institutions for making investment decisions.

The IRR was estimated with the following basic data inputs:

Total project cost	:	INR 355 millions (US$7.977 Million)[2]
Operating expenses	:	INR 0.1 Million (US$2247) per 250 kW and 0.17 Million (US$3820) for 850 kW per year (including staff expenses, maintenance and administration expenses)
Insurance costs	:	INR 0.065 million (US$ 1461) per 250 kW and 0.1 Million (US$2247) for 850 kW
Generation tax	:	INR0.1 per kWh (US$2.247 per MWh)
Rate of interest	:	10.5 %
Price/kWh	:	INR 3.5 (US$0.078/kWh)

The income from the project activity is calculated by the income saved by project proponent due to reduction of consumption of grid electricity for its operations. The tariff paid by the project proponent for grid electricity, which is INR 3.5/kWh (US$0.078 /kWh), has been considered for estimation of IRR. This tariff is higher than the tariff of INR 2.75/kWh (0.06/kWh) that is paid by TNEB, the state electric utility for purchase of electricity. Therefore, the IRR calculations are conservative, as higher income is considered from the project activity.

The detailed calculations of the IRR workings are annexed with this PDD in a spread sheet and have *been forwarded to DOE.* ***It may be seen that pre tax IRR for the project is only 8.0 % and post tax IRR is 8.3 %.*** This IRR is not attractive for investment in a project in the country's investment scenario.

An IRR of 14 -16 % is the standard returns in the Indian market. Central Electricity Regulatory Commission (CERC), Government of India vide its order dated 16 January 2004 had specified the IRR for independent electricity generation projects to be post tax IRR of 16 % which is the most commonly used benchmark value. This value was fixed by CERC after an elaborate consultation process from all the stakeholders including public and private sector electricity utilities, private sector organisations, non governmental organisations etc.,. Tthis shows that 16 % is the standard returns in the Indian market.

[2] 1US$=INR44.5

The post tax IRR of the project activity, which is 8.3 %, is far lesser than the project proponent's expectations for investment and standard returns in the market. However project proponent went ahead with the implementation of the project activity to produce and consume "green electricity" for its operation *and with the expectations of realizing the revenue from the sale of CERs.*

The IRR of the project would improve to post tax IRR of 9.4 % with expected CDM incentives. This is still lesser than the standard returns. The IRR workings with and without CDM incentives are attached as Annex 1.

Apart from low returns from the project activity, the project also had several other barriers which are discussed below:

B.3.1.ii) Higher capital cost

The capital cost of wind energy is more than that of other renewable energy plants and thermal energy plants. The total cost of establishing 7.25 MW wind turbine generators is INR 355.0 Millions (US$7.977 Millions). Therefore, the capital cost per MW is INR 48.965 Millions per MW (US$ 1.100 Million). The cost of biomass based power projects and small hydro power projects ranges from INR 20- 25 Million (US$ 0.449 – 0.561 Million). The thermal sources based power projects costs around INR 25-35 Million (US$0.561-0.786 Million). Hence, capital cost of wind energy is high as compared to other renewable energy plants and conventional thermal source based power plants.

B.3.1. iii) High interest rate

When the project proponents first approached Indian Bank, South Indian Bank Ltd and State Bank of India for financial assistance of the project activity, the rate of interest was 8.5 %. Subsequently, the rate of interest was raised to 10-11 % and the debt portion of the small scale project activity was financed at higher rate of interest of 10.5 %. The extra interest burden on the project activity due to this was INR 7.85 Million /year (US$ 0.174Million/ year). This was a huge unexpected increase and would result in lower returns.

B.3.1. iv) Less capacity utilization factor:

Though the potential locations for wind mill installations were identified through detailed micrositing by reputed organizations in the country, the capacity factor of the wind mills in the country is low which is around 20-22 % for lower capacity WTGs and 25-30 % for higher capacity WTGs. Over the years, due to change in the wind pattern and increase in the population of WTGs, the capacity utilization factor has been continuously decreasing. Initially when the population of WTGs were very less, the capacity utilization factor was 32-35 %, which has gradually reduced to present days' plant utilization factor of 20 –25 %. The low capacity factors of the wind farms adversely affects the returns from the project activity.

B.3.2. Technological barrier

B.3.2.i). Higher capacity WTG

The project activity consists of 5 nos. 850 kW for a total installed capacity of 4.25 MW, which is more than 60 % of the capacity of the project activity. Generally WTGs installed in these areas are of 225 kW and 250 kW. Higher capacity of WTGs is able to produce higher electricity in lesser area. Due to increased height of higher capacity WTGs (65 meters as against 45 meters), and rotor diameter of 58 meters as against 48-50 meters of conventional WTGs enable to capture more energy due to larger swept area..

Less expertise is available in the country for operation and maintenance of these higher capacity WTGs. The higher capacity of WTGs is a technological barrier for the project activity.

B.3.2.ii). Spare parts availability

Spare parts are very critical for any machine. Sometimes spare parts may not be available for 3 – 4 months and the prime wind speed season may be lost affecting the generation of electricity from that machine. This would lead to reduced returns from the project activity.

B.3.2.iii). Not core business

The core business of the project proponents is textile and transport industry. The company was incorporated in the year 1951 and initially operated in transport industry and subsequently in textile industry. The company has been actively involved in manufacture of high quality yarn since 1978. Therefore, the installation and operation of wind farms is not a core business for the project proponents and the wind energy is totally a new field of industrial activity for the project proponents.

B.3.3.Barrier due to prevailing practice

Wind farms are located only in following 9 states of India out of 29 states and 6 union territories: Tamil Nadu, Maharashtra, Karnataka, Gujarat, Rajasthan, Andhra Pradesh, Madhya Pradesh, Kerala and West Bengal, last two states being latest entries. The installed capacity in Madhya Pradesh is 40.3 MW, in Kerala is 2.0 MW and in West Bengal is just 1.1 MW. Hence, the wind energy is active only in six states of India. The total installed capacity of wind energy in India is 5340.6 MW[3] as on 31 March 2006 out of total installed capacity of power generation is 124,827.17MW[4] for the entire country. The share of installed capacity of wind source is just 4.2 %.

[3] Source : www. windpowerindia.com
[4] Source : Ministry of Power, Government of India www.powermin.nic.in/generation/generation_state_wise.htm

Similarly, the installed capacity of wind energy in states covered in southern regional grid is 3600.1 MW[5] and total installed capacity of southern regional grid is 36,447.52 MW[6]. The share of installed capacity of wind energy in southern regional grid is 9.8 % only.

The generation of electricity from wind energy in southern regional grid and overall country as against the total generation in the respective regions are given in the Table B.3.1 and B.3.2 below:

Table B.3.1 – Share of generation from wind energy vis a vis total generation of country

Year	**Region**	**Generation from wind[7]**	**Total Generation[8]** *(excluding renewable energy)*	**% of wind energy generation**
2002-2003	India –entire country	2,446.8 GWh	531,607 GWh	0.46 %
2003-2004	India – entire country	2811.1 GWh	558,338 GWh	0.5 %
April 2004 -Dec’ 2004	India – entire country	1996.5 GWh	411,365 GWh	0. 47 %

Table B.3.1 – Share of generation from wind energy vis a vis total generation of southern region

Year	**Region**	**Generation from wind[9]**	**Total Generation in southern region** *(excluding renewable energy)*	**% of wind energy generation**
2002-2003	Southern region	1577.3 GWh	135,161 GWh	1.1 %
2003-2004	Southern region	1993.03 GWh	137,442 GWh	1.4 %
April 2004 -Dec’ 2004	Southern region	497 GWh	100,696 GWh	0.49 %

From the above tables, it can be seen that the generation of electricity from wind is less than ***half percent*** for the entire country and is about 1 % in the southern regional grid. From this it can be evidenced that wind energy is not a common prevailing practice in India.

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5 www.windpowerindia.com

6 Central Electricity Authority

7 www.windpowerindia.com

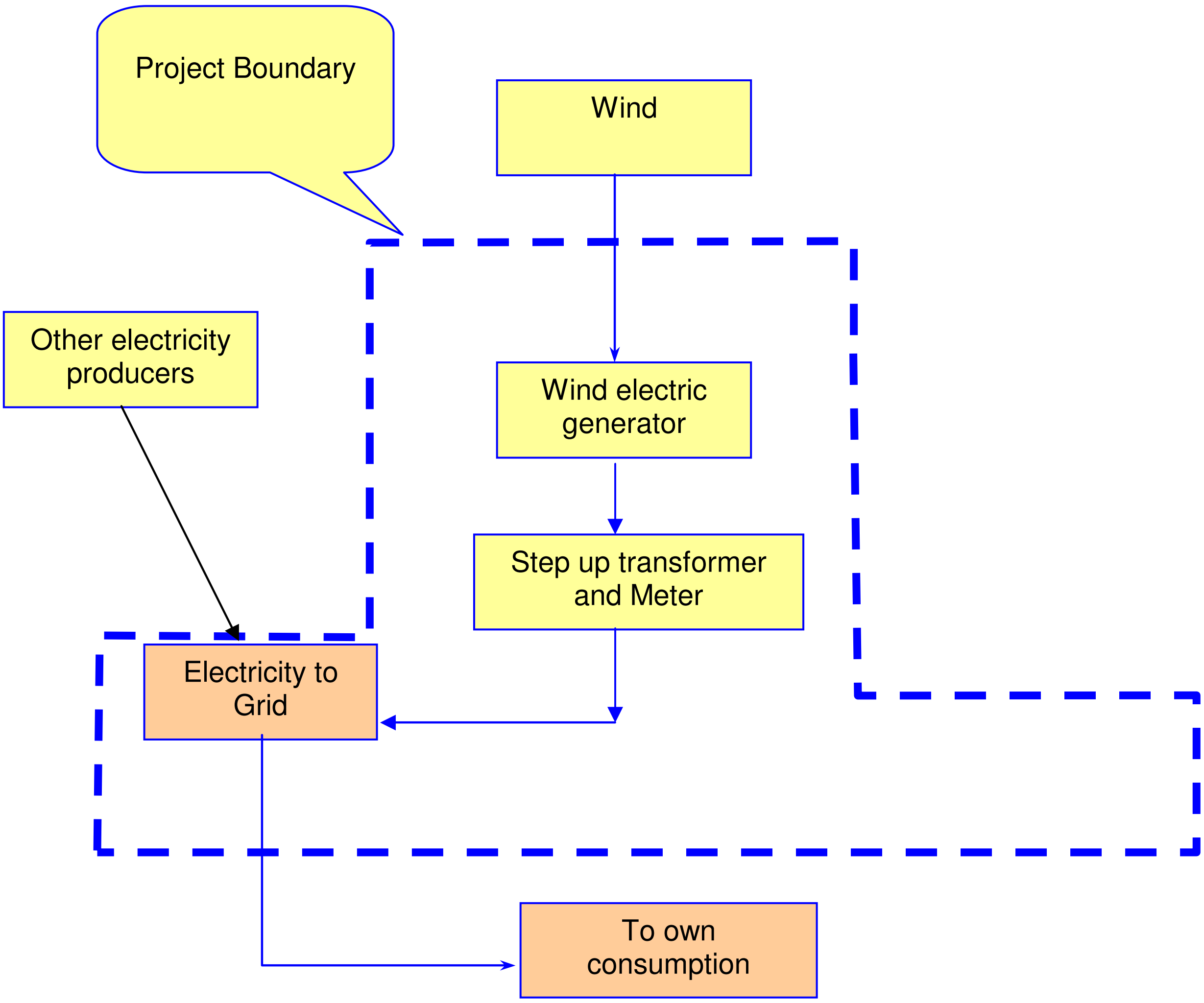
8 Central Electricity Authority

9 Source : www. windpowerindia.com

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

As mentioned under paragraph 6 of AMS I.D. version 10 dated 23 December 2006, the project boundary encompasses the physical, geographical site of the renewable generation source. For the project activity the project boundary is WTG, to the point of electricity supply to the grid interconnection point where the project proponent has full control.

Thus, the project boundary covers wind turbine generator, step up transformer, grid interconnection point. Flow chart and project boundary is illustrated in the following diagram:



B.5. Details of the baseline and its development:

The project activity is a renewable electricity generation activity that displaces fossil fuel dominated electricity generation. The baseline for the project activity is given by paragraph 9 in the methodology AMS I.D / version 10 which is, “the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2 / kWh) calculated in a transparent and conservative manner as :

(a) A combined margin (CM) consisting of the combination of operating margin (OM) and the build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the simple OM and the average OM calculations must be considered.

OR

(b) The weighted average emissions (in kg CO_2 e/ kWh) of the current generation mix. The data of the year in which the project generation occurs.

Hence, electricity baseline emission factor of the applicable grid has to be determined for estimating the emission reductions due to the grid electricity generation that is displaced by the project activity.

Electricity Emission factor from CEA Data

Central Electricity Authority, (CEA) (www.cea.nic.in) is the statutory organisation and its main objective is to advise the Government of India (Host Party) on the matters relating to the national electricity policy, formulate short-term and perspective plans for development of the electricity system and coordinate the activities of the planning agencies for the optimal utilization of resources to sub serve the interests of the national economy and to provide reliable and affordable electricity to all consumers. CEA has made an elaborate study and has determined electricity baseline emission factor for all grids in India for both the options of weighted average emissions and on combined margin approach which is as per AMS I.D. The latest emission factor of the southern regional grid has been considered for estimation of emission reductions of the project activity. The latest data available for the years, 2001-2002, 2002-2003 and 2004-05 updated as of 21 December 2006 is adopted.

The estimation of baseline emission factor of the southern regional grid is given in Annex -3. The same can be verified with CEA data which is publicly available and can be accessed at http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

B.5.2 Date of completing the final draft of this baseline section *(DD/MM/YYYY)*:

31/01/2007

B.5.3 Name of person/entity determining the baseline:

Ecoinvest Carbon S.A.
13, Rte de Florissant,
CH-1211, Geneva
Switzerland.

The entity determining baseline is not a project participant.

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

>>

C.1.1. Starting date of the small-scale project activity:

27/10/2005

C.1.2. Expected operational lifetime of the small-scale project activity:

25y –0m

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

The project activity will use renewable crediting period

C.2.1. Renewable crediting period:

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

At date of registration (tentatively selected 01/08/2007)

C.2.1.2. Length of the first crediting period:

7 y-0m

C.2.2. Fixed crediting period:

Not Applicable

C.2.2.1. Starting date:

Not Applicable

C.2.2.2. Length:

Not Applicable

SECTION D. Application of a monitoring methodology and plan:

>>

D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

Title of the approved monitoring methodology : Grid connected renewable electricity generation

Reference of the approved monitoring methodology : Paragraph 13 of the approved small scale methodology AMS I. D./Version 10 dated 23 December 2006.

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

As discussed elsewhere in the document and established in Section A.4.2, the project activity is in accordance with approved small scale methodology AMS I.D, and therefore, can use the monitoring methodology for I.D of 'Appendix B of the simplified M&P for small-scale CDM project activities-Version 10: 23 December 2006' – grid connected renewable electricity generation.

The monitoring methodology specified in paragraph 13 of the methodology requires that the project-monitoring plan to consist of metering the electricity generated by the renewable technology. Emission reductions of the project activity are due to the electricity displaced in the grid. The electricity displaced in the grid multiplied by the baseline emission factor would give the emission reductions. Hence, the data to be monitored to estimate emission reductions of the project activity is the electricity generated by the project activity. Hence, the chosen methodology suits the project activity.

In order to monitor the mitigation of GHG due to the project activity, the total electricity exported by the project activity needs to be measured. The electricity displaced in the grid by the project activity in MWh multiplied by baseline emission factor for southern regional grid in t CO_2/MWh, would form the baseline for the project activity.

D.3 Data to be monitored:

ID Number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	For how long is archived data to be kept?	Comment
D.3.1	Electricity (TP $_{gross}$)	Gross electricity generated by the project activity	MWh	m	continuous	100 %	Electronic	2 years after the crediting period	Measured in the interconnection point by TNEB and mentioned as "Total Export" in the Monthly Statement
D.3.2	Electricity (TP$_{imp}$)	Electricity imported by the project activity	MWh	m	continuous	100 %	Electronic	2 years after the crediting period	Measured in the interconnection point by TNEB and mentioned as "Total Import" in the Monthly Statement
D.3.2	Electricity (TP$_{exp}$)	Net electricity displaced by the project activity	MWh	c	monthly	100 %	Electronic	2 years after the crediting period	Calculated after deducting 5 % wheeling charges and electricity imported by the project activity. This is shown as

									“Net Generation” in the monthly bill

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

Data	Uncertainty level of data (High/Medium/Low)	Are QA/QC procedures planned for these data?	Outline explanation why QA/QC procedures are or are not being planned.
D.3.1	Low	Yes	Meter will be checked and calibrated as per specification and operating procedures of Tamil Nadu Electricity Board (TNEB)
D.3.2	Low	Yes	Meter will be checked and calibrated as per specification and operating procedures of Tamil Nadu Electricity Board (TNEB)
D.3.3	Low	Yes	This data will be used for calculation of emission reductions by project activity. Meter will be checked and calibrated as per specification and operating procedures of Tamil Nadu Electricity Board (TNEB)

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

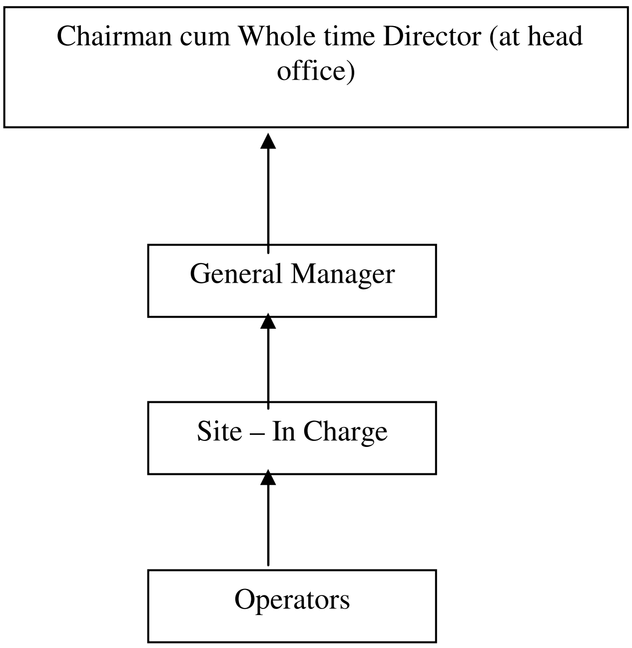
Training in operation and Maintenance

The WTG suppliers have trained the staff of project proponents in operation, preventive maintenance, trouble shooting, safety etc. At present the WTGs are under operation contract of the WTG suppliers. During this period, the staff of project proponent are further trained in effective operation and maintenance of the WTGs.

Operational and management structure

The Site In-charge would be responsible for operation and maintenance of wind turbine generators. The Site In-charge is a qualified electrical engineer with considerable experience in O & M of windmills. He would be assisted by operators in day today operations of wind farms. The management structure is given below:

The Management Structure for monitoring emission reductions is as follows:



The Operators would record the generation on a daily basis for each service connection. The operators would also maintain the records for training, maintenance, break down and calibration of meters.

The readings recorded by the operators would be verified by the Site –In charge. The Site In charge would report the cumulative generation to the head office on a weekly basis. The site in charge would be responsible for maintaining the Generation & Maintenance log books, along with the history card for each and every WTG.

<u>Internal Audits</u>

General Manager at head office at Melakandamangalam would be the overall in charge of the operation of the wind farms. The General Manager would carry out internal audits once in six months and any corrective action to be taken would be recorded and carried out.

<u>Monitoring</u>

As emission reductions from the project are determined by the number of units connected 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 project activity is designed and capable of synchronising within a frequency range of 47.5 to 51.5 Hz and a power factor between 0.85 lagging and 0.95 leading at the generator terminals.

The delivered electricity would be metered by TNEB at the high voltage side of the step up transformers. Metering is done either for two /three / more wind mills depending on the location of wind mills and service connection number. Metering equipment is electronic trivector meters of accuracy 0.2%. The metering equipment is maintained in accordance with electricity standards and have the capability of recording hourly and monthly readings. The monthly meter readings are taken at the interconnection point by TNEB between fifteenth to twentieth day of the each month. Records of joint meter reading are maintained at site and a copy is maintained at the head office.

The meter (export and import) installed at the project activity would be of 0.2% accuracy class. The meter would be jointly inspected and sealed on behalf of Jayavilas and TNEB, in the presence of its authorised representatives. The calibration of the meter would take place once in two years.

The generation data would be recorded daily from the panel board of the WTG too. This reading would be compared with the Export meter. If discrepancy is observed, the meter would be calibrated. This would ensure the accuracy of the measurements.

For the purpose of emission reduction estimates, the electricity exported to the grid has to be reduced by 5 % to account for wheeling charges. Therefore, only 95 % of the electricity exported would be considered for calculation of emission reductions. In the Monthly statement of TNEB, the net generation is given after deducting the 5 % wheeling charges and the electricity imported by the project activity. Therefore, the Net electricity displaced by the project activity would be the “Net Generation” mentioned in the Monthlystatement. This figure would be multiplied by the baseline emission factor obtained from the latest publicly available data from Central Electricity Authority, to give the emission reductions of the project activity. The calculation of emission reductions due to the project activity would be calculated as illustrated below :

Let the gross electricity generated by the project activity = TP_{gross} MWh

Wheeling charges at 5 % of gross electricity, P_w = (5 % * TP_{gross}) MWh

Let the electricity imported by the project activity = TP_{imp} in MWh

Net electricity displaced by the project activity, TP_{exp} (MWh) = TP_{exp} (MWh) - P_w (MWh) - TP_{imp} (MWh)

Emission reductions of the project activity ER (t CO_{2e}) = TP_{exp} (MWh) * EF (ton CO2e/ MWh)

where EF is the baseline emission factor of the southern regional grid.

As the instruments are calibrated and marked at regular intervals, the accuracy of measurement can be assured at all times. Necessary records of calibration are maintained by Jayavilas.

The Site In-charge is responsible for the upkeep of the safety and fire fighting and for maintaining necessary records.

D.6. Name of person/entity determining the monitoring methodology:

Ecoinvest Carbon S.A. has determined the monitoring methodology in consultation with the project proponents. The contact information of Ecoinvest Carbon S.A is given below:

Ecoinvest Carbon S.A.
13, Rte de Florissant,
CH-1211,
Geneva,
Switzerland

Ecoinvest Carbon S.A is not a project participant.

SECTION E.: Estimation of GHG emissions by sources:

E.1.1 Selected formulae as provided in appendix B:

Approved small scale methodology AMS I.D does not indicate a specific formula to calculate the GHG emission reduction by sources.

E.1.2 Description of formulae when not provided in appendix B:

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

The anthropogenic emissions by sources of GHGs due to the project activity could only be due to the small quantities of electricity imported from the grid. This electricity is deducted from the electricity exported to the grid and reported as "Net Generation" after deducting wheeling charges. Since the import electricity is already accounted, this is not calculated separately.

There are no other anthropogenic emissions by sources of greenhouse gases within the project boundary. Therefore no formula is described to estimate GHG emissions from sources.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

As per AMS I.D, Version 10dated 23 December 2006, leakage is to be considered only if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity. Since this does not apply for the project activity, there are no leakage issues associated with the project activity and hence no formula is used to estimate leakage due to the project activity.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

The sum of E.1.2.1 and E.1.2.2 will give the sum of GHG emissions due to the project activity and leakage, which would be the net project emissions due to the project activity. Since there are no anthropogenic emissions and no leakage due to the project activity, the sum of E.1.2.1 and E.1.2.2 will be zero.

The project emission of the project activity is zero.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

As per paragraph 9 of AMS I.D, the baseline is the kWh (=MWh) produced by the renewable generating unit multiplied by an emission coefficient measured in kg CO_2 equ/ kWh (=ton CO_2 eq /MWh). Southern regional grid is considered for baseline analysis and calculation of anthropogenic emissions by fossil fuels during power generation.

Emission Reduction by project activity

$$ERy = (TP\exp, y * EFy) - PEy - ELy$$

Where,

ER_y - Emission reductions of the year, "y" by project activity (ton CO_2 eq/year)

$TP_{exp,\,y}$ - Total electricity displaced by the project activity in the year "y" in MWh.

EF_y . Baseline emission factor (ton CO_2/MWh)

PE_y - Project emissions in the year "y" [= 0]

EL_y - Emissions due to leakage in the year "y" (ton CO_2 eq/year) [= 0]

Hence, ER_y = $TP_{exp,\,y}$ X EF_y

The baseline emission factor EF_y as per combined margin approach of ACM0002 (as estimated by the Host Party) is **0.93 ton CO_2/MWh (=0.93 kg CO_2/kWh)**

Estimate for electricity exported to the grid in a year

The ex-ante estimates of grid electricity displaced by the project activity are estimated based on the minimum guaranteed figures of the equipment suppliers and the average generation figures in the region. A 250 kW WTG would operate at 22 % utilisation factor and a 850 kW WTG would operate at 25 % utilisation factor. On this basis the ex-ante estimates of grid electricity displaced by the project activity are estimated and given in the table E.1 below.

Table E.1 - Ex ante estimates of electricity displaced by the project activity per year

Capacity of each WTG (kW)	Plant load factor	Electricity exported per WTG (MWh/WTG/ year)	Number of WTGs	Electricity exported by all WTGs (MWh / year	Wheelin g charges	Net of wheeling charges for all WTGs (MWh/year)
850	25%	1861.500	5	9307.500	5%	8842.125
250	22%	481.800	12	5781.600	5%	5492.520
Total		**2343.300**	**17**	**15,089.100**		**14334.645 (Rounded off to 14335)**

The net power that would be exported to the grid in each year during the crediting period, would be 15,089 MWh per year. The state electric utility deducts 5 % of the kWh of the electricity supplied by the project activity as 'wheeling charges' for transmitting the electricity to the project proponent's consumption point. The amount of electricity after deducting wheeling charges is considered for estimation of baseline emissions for conservatism. Therefore, the net electricity considered for estimation of baseline emissions is 14,335 MWh/year. Accordingly, the baseline emissions are estimated and are presented in the table E.2 below:

Table E-2 – Baseline emissions of the project activity

S. No.	Year*	Electricity displaced by the project activity $TP_{exp, y}$ *(MWh/year)*	Baseline emission factor EF_b *(tCO$_2$e / MWh)*	Baseline emissions BE *(ton CO$_2$eq/year)*
1	01/08/2007 -31/07/2008*	14,335	0.93	13,331
2	01/08/2008-31/07/2009	14,335	0.93	13,331
3	01/08/2009-31/07/2010	14,335	0.93	13,331
4	01/08/2010-31/07/2011	14,335	0.93	13,331
5	01/08/2011-31/07/2012	14,335	0.93	13,331
6	01/08/2012-31/07/2013	14,335	0.93	13,331
7	01/08/2013-31/07/2014	14,335	0.93	13,331
TOTAL		**100,345**		**93, 317**

* One year period is considered from 01/08/2007 to 31/07/2008 anticipating the date of registration to be 01/08/2007 as mentioned in section C.2.1.1. Any change in the date of registration will change this period also. That is, the one year period would start form the date of registration which is the start date of crediting period.

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

Following formula is used to determine emission reductions:

Emission reductions due to project activity	=	Baseline emissions	–	Project emissions

The emission reductions due to the project activity during the crediting period are given in table E.3

Table E.3– Emission reductions

S. No.	Year	Baseline emissions (ton CO_2)	Project emissions (tonCO_2)	Emission reductions (ton CO_2)
1	01/08/2007 -31/07/2008	13,331	0	13,331
2	01/08/2008-31/07/2009	13,331	0	13,331
3	01/08/2009-31/07/2010	13,331	0	13,331
4	01/08/2010-31/07/2011	13,331	0	13,331
5	01/08/2011-31/07/2012	13,331	0	13,331
6	01/08/2012-31/07/2013	13,331	0	13,331
7	01/08/2013-31/07/2014	13,331	0	13,331
Total		**93, 317**		**93, 317**

E.2 Table providing values obtained when applying formulae above:

The values obtained when applying above formula is reproduced below for the crediting period ;

S.No.	Year	Emission reductions (ton CO_2 eq)
1	01/08/2007 -31/07/2008	13,331
2	01/08/2008-31/07/2009	13,331
3	01/08/2009-31/07/2010	13,331
4	01/08/2010-31/07/2011	13,331
5	01/08/2011-31/07/2012	13,331
6	01/08/2012-31/07/2013	13,331
7	01/08/2013-31/07/2014	13,331
Total		**93, 317**

SECTION F.: Environmental impacts:

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

Wind energy projects are exempted from environmental clearance vide Notification dated 27 th January, 1994. However, a brief review of the environmental impacts project activity is discussed below ;

During construction phase

The construction phase involved erection of a WTG in particular location. Although movement of materials for erection produced some dust pollution, the impacts were negligible and do not have any significant impact on the environment.

During operation phase

Impact on Air

There are absolutely no negative impacts on air due to the project activity.

Impact on water

No water is consumed for the project activity and no effluent is discharged from the project activity and hence, there is no impact on water due to the project activity.

Impact due to odour

There is absolutely no odour issues due to the project activity.

Impact due to noise

There are no significant impacts on the environment due to noise.

Impact on ecology

There are no known endangered species in the vicinity of the project activity and hence no significant impact is effected on the ecology.

Social and economy issues

Land was purchased from the landowners. These lands are barren and largely unfertile. The farming operations were not very encouraging and land owners were in most cases more than willing to part off the land. They got a good price. The installation of the project activity has given job opportunities to the local community during construction and operation of the project activity. The project activity has contributed for improving the standard of living of the local community

SECTION G. Stakeholders' comments:

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

The following are the local stakeholders of the project activity :

(i.) Local community in villages where WTGs are located
(ii.) Tamil Nadu Electricity Board (TNEB)

The population (local community) in the villages of Pazhavoor, Levenjipuram Udayathur and Thankkarkulam villages are the most important local stakeholders of the project activity. The "Village Panchayat", which is a body elected by villagers, is the local government authority for the village. This Village Panchayat is the representative of the local community. Questionnaires were sent to the village panchayats of the villages of the project activity and to few other prominent members of these villages. They were informed about the project activity and comments were invited from them regarding the effects of the project activity. Written comments were received from them in vernacular language (Tamil Language) which are compiled and the summary of the comments translated in English is given in G.2.
TNEB which is the state electric utility is another important local stakeholder of the project activity. TNEB has approved the project activity and signed an agreement to transmit (wheel) the electricity / bank the electricity generated in case of non utilisation of electricity by the project proponents.

G.2. Summary of the comments received:

Summary of questions sent to various village panchayats are tabulated below:

Question	Reply from Mr. M. Subbiah,President, Pazahvoor Panchayat	Reply from Mr. M. Sivakumar, MSK Traders, South Karungulam	Reply from Mr. C.Ravi, Thanakarkulam, Valliyoor Union	Reply from Mrs. Janet Daisy, Headmistress, Thilakar Primary School, Peddarangapuram, Thanakkarkulam.
Effect of wind mills on environment	No impact on environment	Very good	Very good	Good
Has your normal life been affected in any way by wind mills	Not at all	No	No	No
Effect of wind	Improved	Very much	Good	Very much

farm on your living standard		improved	improvement	improved
Effect on local employment due to wind farm	Improved	Very good improvement	Good improvement	Very good improvement
Any effect due to noise created by wind mills	Nothing	Not at all	Nothing	Not at all
Effect on water due to wind farm	No effect on water	No	No effect on water	No
Any vibrations due to windmills	No vibrations felt	No	No vibrations felt	No
Did you have any problem during construction of wind farm	Nothing	Not at all	Nothing	Nothing
Effects on birds due to windmills	No effect on birds	No.	No effect on birds	No effect on birds
Is there any problem for animals grazing ?	No	No	Nothing	Nothing
Has receiving signals in the televisions in the village has been affected due to wind farms	No	No	Not at all	Not at all
What are the benefits of wind mills for you?	Positive benefits	Very good benefits	Good benefits	Good benefits
Any other comments	There has been improvement in employment and economic activity due to windmills.	Uninterrupted power supply	There has been improvement in employment and economic activity due to windmills.	There has been improvement in employment and economic activity due to windmills.

.**Question**	**Reply from Mr. Masanam, Panchayat President, Udayathur**	**Reply from A.Abiraham, Resident of Udayathur**
Effect of wind mills on environment	No impact on environment	Very good
Has your normal life been affected in any way by wind mills	Not at all	No
Effect of wind farm on your living standard	Very much improved	Very much improved

Effect on local employment due to wind farm	Improved	Very good improvement
Any effect due to noise created by wind mills	Nothing	Not at all
Effect on water due to wind farm	No effect on water	No
Any vibrations due to windmills	No vibrations felt	No
Did you have any problem during construction of wind farm	Nothing	Not at all
Effects on birds due to windmills	No effect on birds	No.
Is there any problem for animals grazing ?	No	No
Has receiving signals in the televisions in the village has been affected due to wind farms	No	No
What are the benefits of wind mills for you?	Positive benefits	Very good benefits
Any other comments	Requesting for more employment from skilled people from our village	The village has benefited by additional employment benefits and improvement in economic activity.

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

Since there was no comment which required any specific action from the project proponent, no action is taken.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE SMALL SCALE PROJECT ACTIVITY

Organization:	Aruppukottai Sri Jayavilas Limited
Street/P.O.Box:	Tamilpadi Post
Building:	
City:	Melakandamangalam, Aruppukottai
State/Region:	Tamil Nadu
Postfix/ZIP:	626129
Country:	India
Telephone:	+91 4566 282376
FAX:	+91 4566 282334
E-Mail:	srijayavilas@vsnl.net
URL:	-
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Dinakaran
Middle Name:	
First Name:	Gopal
Department:	
Mobile:	+91 98429 13690
Direct FAX:	
Direct tel:	+91 4566 282378
Personal E-Mail:	srijayavilas@gmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding as part of project financing from the Parties included in Annex I of the convention is involved in the project activity.

Annex 3

Baseline information

The project activity is a renewable electricity generation activity that displaces fossil fuel dominated electricity generation. The baseline for the project activity is given by paragraph 9 in the methodology AMS I.D / version 10 which is, “the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2 / kWh) calculated in a transparent and conservative manner as :

(a) A combined margin (CM) consisting of the combination of operating margin (OM) and the build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the simple OM and the average OM calculations must be considered.

OR

(b) The weighted average emissions (in kg CO_2 e/ kWh) of the current generation mix. The data of the year in which the project generation occurs.

Hence, electricity baseline emission factor of the applicable grid has to be determined for estimating the emission reductions due to the grid electricity generation that is displaced by the project activity.

Electricity Emission factor from CEA Data

Central Electricity Authority, (CEA) (www.cea.nic.in) is the statutory organisation and its main objective is to advise the Government of India (Host Party) on the matters relating to the national electricity policy, formulate short-term and perspective plans for development of the electricity system and coordinate the activities of the planning agencies for the optimal utilization of resources to sub serve the interests of the national economy and to provide reliable and affordable electricity to all consumers. CEA has made an elaborate study and has determined electricity baseline emission factor for all grids in India for both the options of weighted average emissions and on combined margin approach which is as per AMS I.D. The latest emission factor of the southern regional grid has been considered for estimation of emission reductions of the project activity. The latest data available for the years, 2001-2002, 2002-2003 and 2004-05 updated as of 21 December 2006 is adopted.

Estimation of Baseline emission factor of Southern regional grid (Source : Central Electricity Authority, India)

The data for the years 2002-03, 2003-04 and 2004-05 as updated are given in Table A.3-1.

Table A.3-1 - Estimation of Baseline emission factor

Description	**2002-03**	**2003-04**	**2004-05**
Gross Generation Total (GWh)	136,916	138,299	144,086
Net Generation Total (GWh)	127,780	128,165	134,691
20% of Net Generation (GWh)	25,556	25,633	26,938
Share of Must-Run (Hydro/Nuclear) (% of Net Generation	18.3%	16.2%	21.6%
Net Generation in Operating Margin (GWh)	104,441	107,396	105,584
Net Generation in Build Margin (GWh)			27,195
20% of Gross Generation (GWh)	27,383	27,660	28,817
Gross Generation in Build Margin (GWh)			29,052
Absolute Emissions Total (tCO2)	104,180,940	108,406,007	105,960,087
Absolute Emissions OM (tCO2)	104,180,940	108,406,007	105,960,087
Absolute Emissions BM (tCO2)			19,525,581
Net Imports (GWh) - Net exporting grids are set to zero	518	0	0
Share of Net Imports (% of Net Generation)	0.4%	0.0%	0.0%

The values for operating margin and build margin estimated from the above values in conservative and transparent manner are given in the table A.3-2 below :

Table A.3-2- Baseline emission factor of southern regional grid for various approaches

Year	**Approach**	**Value**
2004-2005	Simple Operating margin **excluding** imports from other grids	1.00 t CO_2/ MWh
2004-2005	Build Margin **excluding** imports from other grids	0.72 t CO_2/ MWh
2004-2005	Simple Operating margin **including** imports from other grids	1.00 t CO_2/ MWh
2004-2005	Build Margin **including** imports from other grids	0.72 t CO_2/ MWh

Since in both the approaches of including and excluding imports from other grids, the values are same, a Simple operating margin value of 1.00 t CO_2 / MWh and a Build margin value of 0.72 t CO_2/MWh have been considered and emission factor as per combined margin method is calculated as follows:

$$EF_y = W_{OM} * EF_{y,\ OM} + W_{BM} * EF_{y,\ BM}$$

where

EF_y is the baseline emission factor of the grid in the year, “y”, in t CO_2/MWh

$EF_{y,\ OM}$ is the Simple operating margin emission factor in the year, “y” in t CO_2/MWh

$EF_{y,\ BM}$ is the Build margin emission factor in the year, “y” in t CO_2/MWh

W_{OM} is the weight for operating margin.

W_{BM} is the weight for build margin

As per ACM 0002, for wind energy project, the default weights W_{OM} = 0.75 and W_{BM}= 0.25 (owing to their intermittent and non dispatchable nature).

Adopting the values in the formula for determination of baseline emission factor,

Emission factor EF (t CO_2/MWh)	=	0.75 * 1.00 (t CO_2/MWh)	+	0.25 * 0.72 (t CO_2/MWh)
	=	**0.93 t CO_2 /MWh**		

Appendix 1 – Details of each wind turbine generator

Table A-1-1 – Wind turbine generators in Pazhavoor village

S.No.	S.F.No	HTSC No	Make	Capacity kW	Date of Commissioning
1	754/1(P), 755(P), 756(P)	1611	Pioneer Wincon	250	18/03/2006
2		1611	Pioneer Wincon	250	18/03/2006
3		1611	Pioneer Wincon	250	18/03/2006
4	756(P), 760(P)	1655	Pioneer Wincon	250	23/03/2006
5	757(P)	1799	Pioneer Wincon	250	31/03/2006
6	745/2C2	1718	Pioneer Wincon	250	29/03/2006
7.	898	1719	Gamesha	850 kW	29/03/2006
Total				2.35 MW	

Table A-1-2- Wind turbine generators in Levenjipuram village

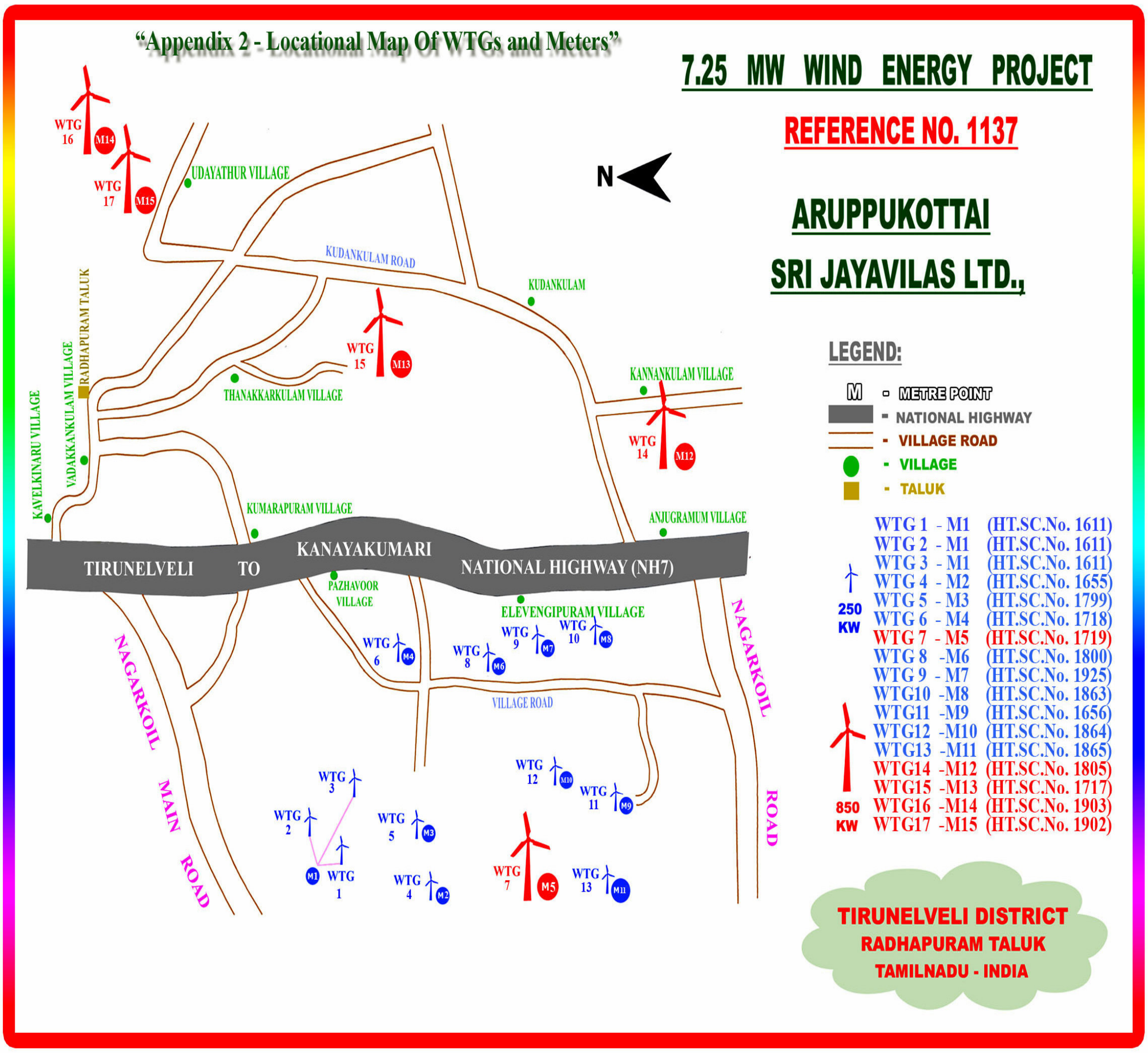
S.No.	S.F.No	HTSC No	Make	Capacity kW	Date of Commissioning
8	1240/1B1 & 1B2	1800	Pioneer Wincon	250	31/03/2006
9	1239/1A3 (P)	1925	Pioneer Wincon	250	12/06/2006
10	1238/3A&4	1863	Pioneer Wincon	250	31/03/2006
11	1051/1(P)	1656	Pioneer Wincon	250	23/03/2006
12	1301(P)	1864	Pioneer Wincon	250	31/03/2006
13	1278 (P)	1865	Pioneer Wincon	250	31/03/2006
14	670/2 (P),3 (P),4 & 7	1805	Gamesha	850	31/03/2006
Total				2.35 MW	

Table A-1-3- Wind turbine generator in Thanakkarkulam village

S.No.	S.F.No	HTSC No	Make	Capacity kW	Date of commissioning
15	688/1A, 1B, 1C, 2A, 2B, 2C, 2D, 2E, 2F, & 2G	1717	Gamesha	850	29/03/2006
Total				0.85 MW	

Table A-1-4- Wind turbine generator in Udayathur village

S.No.	S.F.No	HTSC No	Make	Capacity kW	Date of commissioning
16	440/2, 444/2B2	1903	Gamesha	850	18/04/2006
17	849	1902	Gamesha	850	18/04/2006
Total				1.7 MW	


"Appendix 2 - Locational Map Of WTGs and Meters"
7.25 MW WIND ENERGY PROJECT
REFERENCE NO. 1137
ARUPPUKOTTAI
SRI JAYAVILAS LTD.,
N
LEGEND:
M - METRE POINT
- NATIONAL HIGHWAY
- VILLAGE ROAD
- VILLAGE
- TALUK
250 KW
850 KW
WTG 1 - M1 (HT.SC.No. 1611)
WTG 2 - M1 (HT.SC.No. 1611)
WTG 3 - M1 (HT.SC.No. 1611)
WTG 4 - M2 (HT.SC.No. 1655)
WTG 5 - M3 (HT.SC.No. 1799)
WTG 6 - M4 (HT.SC.No. 1718)
WTG 7 - M5 (HT.SC.No. 1719)
WTG 8 -M6 (HT.SC.No. 1800)
WTG 9 - M7 (HT.SC.No. 1925)
WTG10 -M8 (HT.SC.No. 1863)
WTG11 -M9 (HT.SC.No. 1656)
WTG12 -M10 (HT.SC.No. 1864)
WTG13 -M11 (HT.SC.No. 1865)
WTG14 -M12 (HT.SC.No. 1805)
WTG15 -M13 (HT.SC.No. 1717)
WTG16 -M14 (HT.SC.No. 1903)
WTG17 -M15 (HT.SC.No. 1902)
TIRUNELVELI DISTRICT
RADHAPURAM TALUK
TAMILNADU - INDIA
UDAYATHUR VILLAGE
KUDANKULAM ROAD
KUDANKULAM
KANNANKULAM VILLAGE
THANAKKARKULAM VILLAGE
RADHAPURAM TALUK
VADAKKANKULAM VILLAGE
KAVELKINARU VILLAGE
KUMARAPURAM VILLAGE
ANJUGRAMUM VILLAGE
TIRUNELVELI TO KANAYAKUMARI NATIONAL HIGHWAY (NH7)
PAZHAVOOR VILLAGE
ELEVENGIPURAM VILLAGE
VILLAGE ROAD
NAGARKOIL MAIN ROAD
NAGARKOIL ROAD
WTG 16 M14
WTG 17 M15
WTG 15 M13
WTG 14 M12
WTG 6 M4
WTG 8 M6
WTG 9 M7
WTG 10 M8
WTG 3
WTG 2
WTG 1 M1
WTG 5 M3
WTG 4 M2
WTG 7 M5
WTG 12 M10
WTG 11 M9
WTG 13 M11

Appendix 3 –Abbreviations

AMS	Approved small scale methodology
BM	Built Margin
CM	Combined Margin
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CO_2e or CO_2eq	Carbon di Oxide equivalent
FO	Fuel oil
GHG	Green house gases
GWh	Giga watt hour
HTSC	High Tension Service Connection
INR	Indian Rupees – the official currency of India, IUS$= INR45
IPCC	Inter Governmental Panel on Climate Change
IRR	Internal rate of return
kgCO_2 eq/kWh	Kilogram carbon di oxide equivalent per kilowatt hour
KV	Kilo Volt
kW	Kilo watt
kWh	Kilo watt hour
m /s	meter per second
M&P	Modalities and Procedures
MNES	Ministry of Non conventional Energy Sources, Government of India
MoEF	Ministry of Environment &Forests, Government of India
MU	Million kilowatt hour
MW	Megawatt
MWh	Mega watt hour
NPC	Nuclear Power Corporation Limited
NTPC	National Thermal Power Corporation Limited
OM	Operating margin
INR	Indian Rupees, the official currency of India. (1 US $ = 44.5 Indian Rupees) – Although there are minor variations in the exchange rate, the indicated exchange rate is considered in this document
t CO_2/MWh	tonnes carbon di oxide per mega watt hour

tCO_2e or tCO_2eq	tonnes carbon di oxide equivalent
TNEB	Tamil Nadu Electricity Board
UNFCCC	United Nations Framework Convention on Climate Change
US$	United States Dollars
WTG	Wind turbine generator

Appendix 4- List of References

Sl. No.	Particulars of the references
1.	United Nations Framework Convention on Climate Change (UNFCCC), http://unfccc.int
2.	UNFCCC document: Clean Development Mechanism, Simplified Project Design Document for Small Scale Project Activities (SSC-PDD), Version 02
3.	UNFCCC document: Simplified modalities and procedures for small–scale clean development mechanism project activities
4.	UNFCCC document: Appendix B of the simplified modalities and procedures for small–scale CDM project activities - Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories - Type I.D Grid connected renewable electricity generation Version 10:23 December , 2006
5.	Ministry of Power (MoP), Govt. of India, www.powermin.nic.in
6.	Ministry of Non conventional Energy Sources www.mnes.nic.in
7.	Tamil Nadu Electricity Board www.tneb.org
8.	Karnataka Power Transmission Corporation Ltd www.kptcl.com
9.	Kerala State Electricity Board www.kseboard.com
10.	Andhra Pradesh Power Generation Corporation Ltd. www.apgenco.com
11.	Central Electricity Authority (CEA), Govt. of India, www.cea.nic.in
12.	Ministry of Environment and Forest, http://envfor.nic.in