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:

Title: **Grid connected Wind Power Generation Project by PSW.**

Version: 05
Date: 12/07/2012

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

The project activity involves commissioning and operation of five wind turbine generators (WTG) in the Coimbatore district of Tamil Nadu state by Premier Spg and Wvg Mills Pvt Ltd (PSW). The cumulative capacity of the WTGs is 8.25 MW with each WTG having an installed capacity of 1.65 MW. The electricity generated by the project activity would be wheeled for captive consumption in the industrial premises of Premier Spg and Wvg Mills Pvt Ltd, through the Southern grid.

Purpose of the Project Activity:

The objective of the project activity is to generate electricity from renewable wind energy without any associated greenhouse gas (GHG) emissions. In the absence of the project activity, the equivalent amount of electricity would have been generated from the connected power plants in the Southern grid which are predominantly based on fossil fuel. The generated power will be utilised for captive consumption in the mill.

The bundle consists of 5 WTGs. The details of the WTG locations are given below:

Name of the company	Number of WTGs and capacity (MW)	Total capacity (MW)	Location (Taluk and District)
Premier Spg and Wvg Mills Pvt Ltd[1]	5 x 1.65	8.25	Udumalpet, Coimbatore

Pre-project scenario:

The project activity is a Greenfield project where there was no renewable energy generation at the site.

The PP was using a Furnace Oil (FO) based power generation unit along with a diesel back-up before the implementation of the project activity. This was located at the site of the captive power consumption (textile mill) in the pre-project scenario. Due to the increasing trend in FO prices, the project proponent decided to discontinue the FO unit and made a quest for probable alternatives. Prior to the FO unit installation, the facility used to import electricity from grid till early 2002 and it would have been the most feasible option for them, similar to trend in the region. Instead of adhering to this financially attractive alternative (as there is no capital investment required), the project proponent decided to install

[1] Formerly known as *Premier Mills Pvt Ltd*

renewable energy generation unit to suffice their power requirement and contribute to sustainable development initiative.

Baseline Scenario:
In the absence of the project activity, the equivalent amount of electricity would have been generated by the operation of grid connected fossil fuel based power plants.

The Project activity will thus reduce the anthropogenic emissions of greenhouse gas (GHG), SOx, NOx and particulates into the atmosphere commonly associated with the equivalent amount of electricity generation from the fossil fuel dominated grid connected power plants.

Contribution of project activity to sustainable development

Ministry of Environment and Forests, Government of India has suggested social well being, economic well being, environmental well being and technological well being as the four indicators for sustainable development in the host country approval eligibility criteria for Clean Development Mechanism (CDM) projects[2].

The project activity contributes to sustainable development in the manner specified by Ministry of Environment and Forests, Government of India as follows:

i) Social well being

The project activity is generating electricity equivalent to 8.25 MW from clean and renewable energy source. This will aid the state electricity grid in meeting their electricity demand. The project activity has created employment opportunities during the commissioning and operation of the WTGs.

ii) Economic well being

The lands purchased for the wind farms are mostly non arable and sparsely inhabited areas. The local residents also recruited during development of the site and erection of the wind turbines. In addition, there will be rural and infrastructure development such as roads around the wind farms.

iii) Environmental well being

The project activity is generating clean energy without any GHG emissions commonly associated with the electricity generation from fossil fuel based power plant. The project related GHG emissions are nil for the project activity as it uses natural wind only as the energy source. The project activity will further reduce generation of SOx, NOx and particulates commonly associated with electricity generation in thermal power plants.

iv) Technological well being

The project activity is putting into use latest available WTGs from a leading manufacturer. This will further demonstrate the use of technology in harnessing the renewable energy and promote the further percolation of the technology. The clean renewable electricity generated will also displaces the state electricity grid to meet their demands.

[2] http://cdmindia.nic.in/host_approval_criteria.htm

Thus, from the above discussion it is evident that the project activity satisfies the Sustainable Development criteria of the host country.

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 wishes to be considered as a project participant (Yes/No)
India (host)	Premier Spg and Wvg Mills Pvt Ltd. - A Private entity	No

The contact information of the project participants is provided in the Annex 1 of this document.

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

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

A.4.1.1. Host Party(ies):

India

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

State: Tamil Nadu

A.4.1.3. City/Town/Community etc:

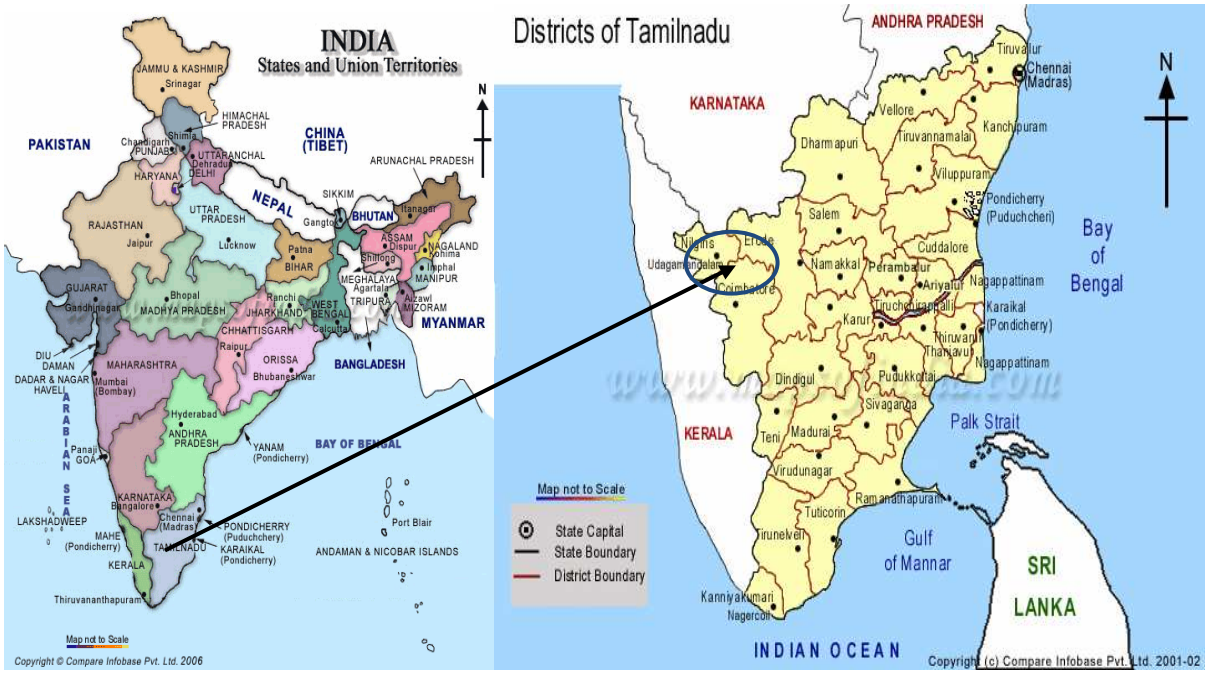
Udumalpet, District: Coimbatore

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

The project activity is located in Udumalpet, Coimbatore district in Tamil Nadu. The nearest railway station is Coimbatore, the nearest airport is Coimbatore and the nearest highway is NH – 47.

The maps below show the geographical location of the project sites. All these sites are identified as potential locations for the wind electricity generation by Ministry of New and Renewable Energy (MNRE), Govt. of India[3]. The details of the individual WTGs under the project activity, like location, unique high tension service connection (HTSC) number and date of commissioning are presented below:

[3] Press release of MNRE available on official web site. http://mnes.nic.in/press-releases/press-release-26112007-5.pdf



The geographical coordinates of the project activity are:

Sl. No.	HT SC No.	WEG Reference	Latitude				Longitude			
			Deg		Minutes	Seconds		Deg	Minutes	Seconds
1	1348	PSW – 1	North	10	38	18.1	East	77	12	55
2	1346	PSW – 2	North	10	38	31	East	77	12	52.4
3	1350	PSW – 3	North	10	38	50	East	77	12	15.1
4	1347	PSW – 4	North	10	39	20.1	East	77	12	42.8
5	1349	PSW – 5	North	10	39	4.7	East	77	12	57.2

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

The project activity is renewable energy generation using wind turbine generators.

As per 'Appendix B to the simplified modalities and procedures for small – scale CDM project activities' the project activity falls under following category

Type : I- Renewable energy projects
Category: I D- Grid connected renewable electricity generation
(Version 17.0, EB 61, Annex 17)

Tools referenced in this methodology:
Tool to calculate the emission factor for an electricity system
(Version 2.2.0, EB 61, Annex 12)

Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion
(Version 2.0, EB 41, Annex 11)

Technology/ Measure of the small scale project activity

The project activity involves installation of 5 nos. wind turbines to generate clean energy. The electric generators have an installed capacity of 1.65 MW each. The generated power will be used for captive consumption replacing power import from the state grid. The total installed capacity is 8.25 MW**.**

The project activity employs a clean technology for the generation of the electricity. This does not emit any kind of GHGs and other objectionable pollutants which are detrimental to the environment. Thus the applied technology is environmentally safe and sound for electricity generation.

The project activity under consideration is the bundling of 5 WTGs that are having a total capacity of 8.25 MW. The entire capacity consists of the Vestas WTGs of 1.65 MW capacity each. The technical specifications of the project activity equipment are as under.

Technical data of the major components of V 82 / 1650 Model of Vestas WTG

Operational data		**Rotor**	
Nominal Output Power regulation Rated wind speed Cut-in One speed Cut-out 20 m / sec.	1650 kW ACTIVE-STALL 13 m / sec. 3.5 m / sec.	Rotor Diameter Rotor swept area Blade pitch system Rotor speed One speed version Two speed version	82 m 5281 m^2 Hydraulic, fail safe 14.4 rpm 14.4 / 10.8 rpm
Generator		**Drive train**	
Type Nominal voltage Nominalfrequency Nominal power Cooling Closed circuit liquid	Asynchronous 690 V/50Hz 50Hz 1650 kW	Gear type Transmission Cooling Main shaft Main bearing Oil lubrication	Planetary/helical gears 1:70.2 – 50 Hz Closed circuit liquid cooling High quality forged shaft Self-aligning roller bearing Automatic microprocessor controlled

	cooling		
Brake System		**Yaw System**	
Mechanical brake Type: Position: No. of calipers:	Fail safe hydraulic Mounted on high speed shaft 1 pc	Type Yaw brakes Drive Mechanism	Ball bearing slewing ring with gearing and yaw brakes 6 hydraulic brakes 6 active electric yaw drives
Tower		**Controller**	
Type Hub height Height	Conical Tubular, steel, PU painted According to approvals 75.5 m	Type Grid cut-in Phase compensation Remote control	Microprocessor based computer control system Thyristorised soft starter Automatic intelligent phase compensation logic, multi-stage WindMan Professional remote communication software
Lightning protection			
According to Standard Blades Nacelle	IEC 1024 Receptor in the blade tips Arial		

The wind turbines have an average lifetime of 20 years as per the TNERC tariff guidance for Non conventional energy sources[4]. The WTGs constituting the project activity are newly commissioned. The date of the earliest commissioned WTG is December 2006 and the details of the date of commissioning are given below:

Sl.No	WM No.	Location	Survey No.	Invoice No. & Date	Installation Date	HT SC No.
1	PSW–1	Pukkulam Village, Udumalpet Taluk, Coimbatore	309/1A, 309/1B (P)	2174 / 26.12.06 2194 / 31.12.06	31.12.06	1348
2	PSW–2	Pukkulam Village, Udumalpet Taluk, Coimbatore	281/2(P), 282/3(P)	2173 / 26.12.06 2195 / 31.12.06	31.12.06	1346

[4] http://tnerc.tn.nic.in/orders/nces%20order%20-approved%20order%20host%20copy.pdf

3	PSW–3	Thottampatti Village, Udumalpet Taluk, Coimbatore	254/2D, 254/2E(P), 254/2F(P), 254/2G(P), 256/1(P), 256/2(P), 256/3(P)	2170 / 26.12.06 2197 / 31.12.06	31.12.06	1350
4	PSW–4	Thottampatti Village, Udumalpet Taluk, Coimbatore	33/2(P)	2171 / 26.12.06 2196 / 31.12.06	31.12.06	1347
5	PSW–5	Thottampatti Village, Udumalpet Taluk, Coimbatore	43/A (P), 45/B (P)	2172 / 26.12.06 2198 / 31.12.06	31.12.06	1349

The project activity does not involve technology transfer from the Annex 1 countries.

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

Years	Estimation of annual emission reductions in tonnes of CO_2 e
2012	17,566
2013	17,566
2014	17,566
2015	17,566
2016	17,566
2017	17,566
2018	17,566
2019	17,566
2020	17,566
2021	17,566
Total estimated reductions (tonnes of CO_2 e)	**1,75,660**
Total number of crediting years	**10**
Annual average of the estimated reductions over the crediting period (tCO_2 e)	**17,566**

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

The total project cost is met by the PP and in part by debt finance from banks/ lending institutions. Public funding from Annex I and diversion of official development assistance is not involved in this project.

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

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

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

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

The project participant does not have any other registered CDM project activity of application for registration of another project activity in the same category and technology which is within 1km of the project site. Therefore, the project participant confirms that the project activity is not a debundled component of any large scale 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:

The baseline and monitoring methodology applicable to the small scale project activity is:

Methodology : AMS-I.D
Title : Grid connected renewable electricity generation[5]
Sectoral Scope : 01
Version : 17
EB : 61

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

The concerned Project activity is the establishment of 8.25 MW of WTGs in the state of Tamil Nadu. By the virtue of its size the Project activity is less than 15 MW and confirms to the small scale project activity size for the Type I projects activities.

PP also submits that the project activity will remain under the limits of the small scale Project activity types during every year of the crediting period.

[5] http://cdm.unfccc.int/methodologies/SSCmethodologies/approved

The applicability conditions for the methodology AMS ID is satisfied by the project activity as discussed below.

<table>
<tr><th>S.N</th><th>Applicability condition of AMSID</th><th>Project activity condition</th></tr>
<tr><td>1.</td><td>This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass :

a) Supplying electricity to a national or a regional grid.or
b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.
c)</td><td>The project activity is wind based electricity generation which is a renewable energy generation.
The power generated is supplied to an identified consumer facility via national/regional grid through a wheeling arrangement[6].Therefore, the applicability condition is met.</td></tr>
<tr><td>2.</td><td>Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies is included in Table 2.

<table>
<tr><th></th><th>Project type</th><th>AMS-I.A</th><th>AMS-I.D</th><th>AMS-I.F</th></tr>
<tr><td>1</td><td>Project supplies electricity to a national/regional grid</td><td></td><td>√</td><td></td></tr>
<tr><td>2</td><td>Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)</td><td></td><td></td><td>√</td></tr>
<tr><td>3</td><td>Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)</td><td></td><td>√</td><td></td></tr>
<tr><td>4</td><td>Project supplies</td><td></td><td></td><td>√</td></tr>
</table>
</td><td>As the project activity matches with the S.No 1 and 3 of the table. Therefore, the applicability condition is met</td></tr>
</table>

[6] The wheeling agreement has been submitted to the DOE.

			electricity to a mini grid[7] system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			
		5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		
3.	This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).					The project activity installs a new renewable energy power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity i.e. "Greenfield Plant". It does not involve any capacity additions, retrofitted or replacement of existing plant. Hence the **applicability condition is met.**
4	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.					This project activity uses wind energy and is not a hydro power project. **Hence the applicability condition is not relevant**.
5.	If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity					Project activity consists of only renewable components i.e. wind turbine generators. Project activity does not have

[7] The sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW.

	applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	any non-renewable component or co-firing fossil fuel. Thus, the applicability condition is **not relevant**.
6.	Combined heat and power (co-generation) systems are not eligible under this category.	The project activity will generate only renewable electricity and does not involve cogeneration. Thus, applicability condition is **not relevant.**
7.	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 project activity is new and does not involve the addition of wind energy generating units to any existing power generation facility. Thus, applicability condition is **not relevant.**
8.	In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	This project activity is new and does not involve retrofit or replacement of units. Therefore, this applicability criterion is **not relevant**.

Thus, the project activity meets all the applicability conditions of baseline methodology AMS I.D, version 17 and is used further.

B.3. Description of the project boundary:

As per the baseline methodology AMS ID, (ver. 17, para 9), the project boundary includes The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to. Thus the project activity will include the (5 numbers of 1650 kW Vestas make) wind turbine generators and related electrical components as well as other power plants connected to the grid.

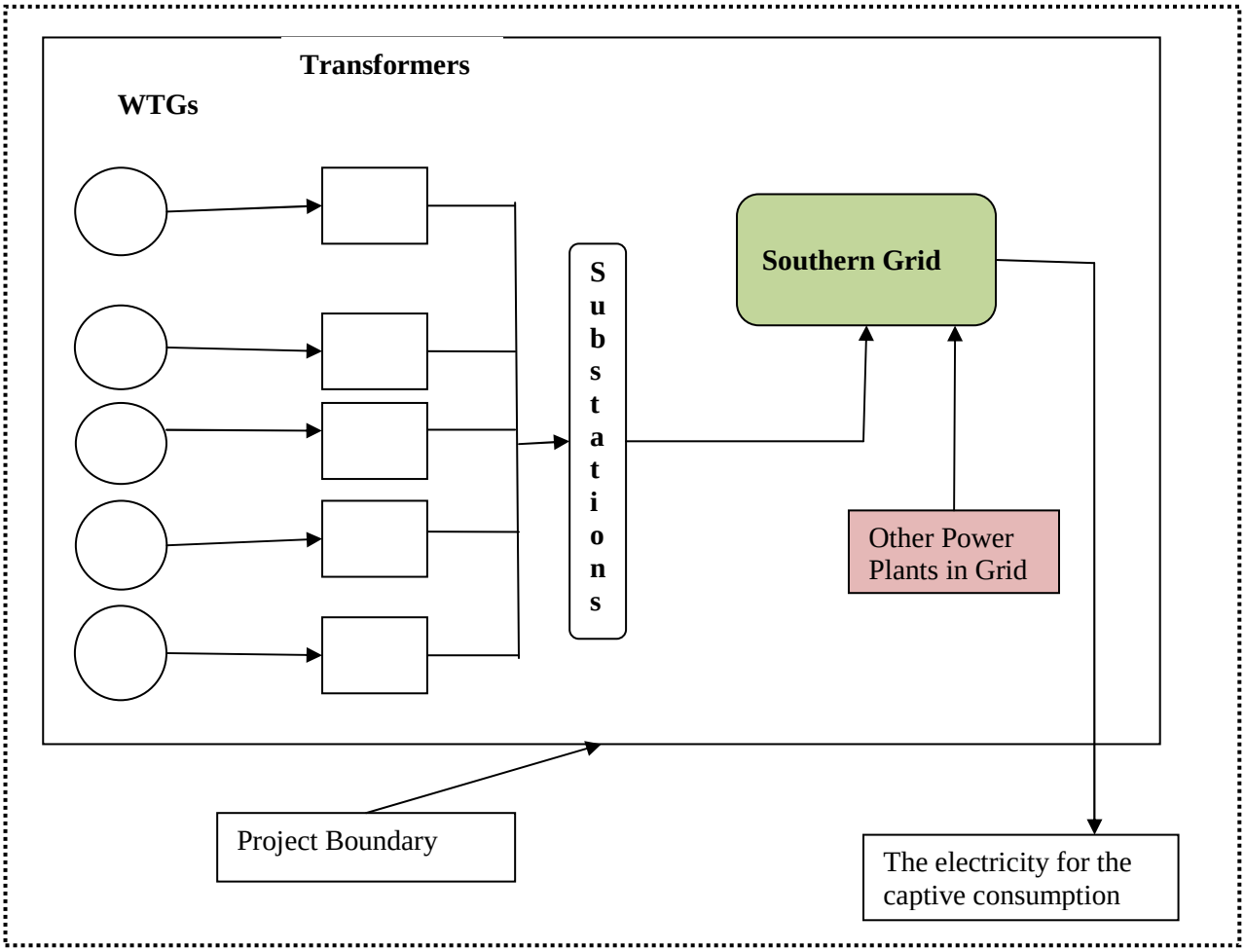


Figure 1: Project boundary

B.4. Description of baseline and its development:

The project activity is the commissioning and operations of 8.25 MW of wind electric generators. In the absence of the project activity, the power would have been generated by fossil fuel power plants in the grid using existing fuel mix. Thus, the applicable baseline is -

The project category applicable for the proposed CDM project activity is AMS ID. For establishing the baseline for this project activity § 10 of the methodology AMS ID will be appropriate since the project activity is based on wind energy generation, as *", The baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources".*

Based on Para 11 of methodology AMS ID the baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor as described below:

$BE_y = EG_{BL,y} * EF_{CO2, grid,y}$

Where,

BE_y = Baseline emissions in year y (tCO_2)

$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in the year y (MWh)

$EF_{CO2,grid, y}$ = CO_2 emission factor of the grid in year y (t CO_2/MWh)

According to the para 12 of the methodology AMS ID, "*The Emission Factor can be calculated in a transparent and conservative manner as follows:*

(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 t CO_2/MWh) of the current generation mix.
The data of the year in which project generation occurs must be used.

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

The project activity has chosen option (a) i.e. 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", version 2.2.0 as the emission co-efficient for calculating the baseline emissions.

For the project activity, the baseline emissions and emission reductions are estimated based on the amount of electricity replaced by the project activity from the Southern grid multiplied by the emission factor of the southern grid calculated as the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors. The parameters used for the calculations are summarised below:

Parameters	**Source**
$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)	Windmill generation statement obtained from ELECTRICITY BOARD at the end of every month.
$EF_{grid,OM,y}$ = Operating Margin Emission Factor (tCO_2/MWh)	Calculated using CO_2 Baseline

$EF_{grid,BM,y}$ = Build margin Emission factor (tCO_2/MWh)	Database for the Indian Power sector, version 06[8]
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for the project electricity system in year y (tCO_2/MWh)	

The parameters used in the calculation of baseline emissions are as follows:

Description of the parameter	**Units**	**Source of value of the parameter**
Quantity of net electricity supplied to the grid as a result of implementation of the CDM project activity in year y	MWh	*Ex-ante*: Derived based on technical parameters of WTG *Ex-post*: Monitored data by export-import meters installed at power evacuation facility. This is reflected from the generation statement provided by ELECTRICITY BOARD at the end of every month.
CO_2 emission factor of the grid in year y	tCO_2/MWh	Calculated using CO_2 Baseline Database for the Indian Power sector, version 06

Though there was a fossil fuel (Furnace Oil) based power generation in the textile unit before implementation of the project activity, since there is a significant escalation of Furnace Oil (FO) price for last few years, the project proponent had decided to take a call for some other option. Before installation of the FO electricity generation in the plant, there was grid import and diesel back-up to meet the electricity requirement of the unit. Therefore, grid import would have been the best plausible alternative for baseline. The escalation of index price of FO is demonstrated in the following table:

[8] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Monthly Wholesale Price Index of Furnace Oil in India (April 1990 to April 2008)												
Year	Base Year : 1993-94 = 100											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1990*				121.7	121.7	121.7	121.7	121.7	121.7	135.8	150.0	150.0
1991*	150.0	150.0	150.0	150.0	150.0	150.0	153.6	164.5	164.5	164.5	164.5	164.5
1992*	166.6	166.6	166.6	166.8	166.9	166.9	166.9	166.9	186.9	206.8	206.8	206.8
1993*									208.0	208.0	208.0	208.0
1994	208*	206.8*	206.8*	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5
1995	99.5	99.5	99.5	99.5	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4
1996	99.4	99.4	99.4	99.4	99.4	99.4	127.3	127.3	127.3	127.3	127.3	127.3
1997	127.3	127.3	127.3	127.3	127.3	127.3	127.3	127.3	112.0	112.0	112.0	112.0
1998	112.0	111.6	111.5	109.7	109.6	109.6	109.6	109.6	109.6	109.6	109.6	109.6
1999	108.4	106.8	101.8	101.9	101.9	110.1	111.3	114.8	131.4	140.5	146.6	146.6
2000	147.9	148.2	173.5	183.2	183.2	202.8	209.4	209.4	208.1	211.6	213.0	213.0
2001	213.0	202.9	192.9	192.8	192.8	192.8	192.8	192.8	202.0	208.1	201.3	172.2
2002	166.5	166.5	168.8	170.2	170.2	170.2	170.2	170.2	170.2	170.2	170.2	170.2
2003	177.0	197.4	250.0	225.0	219.6	222.2	224.6	226.7	219.0	214.4	234.9	232.4
2004	232.4	240.5	234.8	243.2	248.6	266.2	262.3	272.6	278.6	271.7	281.6	261.1
2005	257.4	280.8	262.3	285.1	296.8	309.8	330.1	319.4	369.2	383.9	378.3	361.6
2006	348.4	381.3	404.5	414.7	431.7	424.7	417.1	435.4	408.4	398.8	376.7	339.1
2007	343.0	353.3	376.0	387.7	389.2	385.8	399.2	410.4	408.2	422.2	471.6	478.8
2008	503.3	491.1	517.3	526.4								

Note : * : Base Year 1981-82=100.
Source : Ministry of Commerce and Industry, Govt. of India.

Hence while perusing the option for replacing the furnace oil based generation with importing electricity from the grid, the management of the project proponent considered investing in the wind mills as explained in the section B.5.

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:

National policies and circumstances

Wind energy, today, has emerged as the most promising renewable energy technology for generating grid connected power amongst various renewable energy sources. Total capacity of 10925 MW has been established up to December, 2009 in the country. India is now the fifth largest wind power producer in the world, after USA, Germany, Spain and China[9]. The table below provides the wind power installation in various states of India as on 31.12.2009.

[9] http://www.mnre.gov.in/annualreport/2009-10EN/Chapter%206/chapter%206_1.htm

STATE	INSTALLED CAPACITY
Andhra Pradesh	122.5
Gujarat	1711.8
Karnataka	1390.6
Kerala	27.0
Madhya Pradesh	212.8
Maharashtra	2004.4
Rajasthan	855.4
Tamil Nadu	4596.2
West Bengal	1.1
Others	3.2
Total	**10925.0**

A package of incentives which includes fiscal concessions such as 80% accelerated depreciation, concessional custom duty for specific critical components, excise duty exemption, income tax exemption on profits for power generation, etc. are available for wind power projects. The State Electricity Regulatory Commissions (SERCs) in Andhra Pradesh, Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, and West Bengal have announced preferential tariff for purchase of power from wind power projects.

Demonstration of Additionality

According to the **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****: a financially more viable alternative to the project activity would have led to higher emissions*
(b) ***Technological barrier:*** *a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions*
(c) ***Barrier due to prevailing practice****: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions*
(d) ***Other barriers:*** *without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher."*

The investment barrier analysis has been chosen to demonstrate additionality of the project activity in a conservative and transparent manner.

Investment Barrier:

The proposed project activity involved savings from HT tariff of grid import, so IRR approach has been chosen. The financial indicator chosen is project IRR and justified in the following table. The analysis is done over a lifetime of 20 years. The investment analysis is done in line with the "Guidance on the assessment of Investment Analysis, Version 5.0"[10].

Referring to guidance provided by document, fulfillment of this guidance by the proposed project activity's investment analysis with justification of choice is shown below:

Guidance Number	Guidance text	Explanation related to fulfillment of guidance by the below presented Investment Analysis
General issues in presentation and calculation		
3	The period of assessment should not be limited to the proposed crediting period of the CDM project activity. Both project IRR and equity IRR calculations shall as a preference reflect the period of expected operation of the underlying project activity (technical lifetime), or - if a shorter period is chosen - include the fair value of the project activity assets at the end of the assessment period. In general a minimum period of 10 years and a maximum of 20 years will be appropriate. The IRR calculation may include the cost of major maintenance and/or rehabilitation if these are expected to be incurred during the period of assessment. Project participants are requested to justify and DOEs are requested to validate the appropriateness of the period of assessment in the context of the underlying project activity, without reference to the proposed CDM crediting period.	Applicable and fulfilled: The period of assessment is taken as 20 years (which is the useful lifetime of the project activity and is not limited to the 10 years crediting period). The project is using project IRR to demonstrate investment barrier. The same is reflected in the IRR spreadsheet.
4	The fair value of any project activity assets at the end of the assessment period should be included as a cash inflow in the final year. The fair value should be calculated in accordance with local accounting regulations where available, or international best practice. It is expected that such fair value calculations will include both the book value of the asset and the reasonable expectation of the potential profit or loss on the realization of the assets.	Applicable and fulfilled: The fair value of assets at the end of the 20 years assessment period is included as cash inflow in the final year. The same is reflected in the IRR spreadsheet.

[10] http://cdm.unfccc.int/UserManagement/FileStorage/OHNFC4T6RUZEQXDL20JVG7MWK35YI1

5	Depreciation, and other non-cash items related to the project activity, which have been deducted in estimating gross profits on which tax is calculated, should be added back to net profits for the purpose of calculating the financial indicator (e.g. IRR, NPV). Taxation should only be included as an expense in the IRR/NPV calculation in cases where the benchmark or other comparator is intended for post-tax comparisons.	Applicable and fulfilled: Depreciation, which is a non cash item was deducted to calculate tax, and was added back to calculate post tax cash flows. Taxation has been included as an expense because the IRR calculated is post tax IRR. The same is reflected in the IRR spreadsheet.
6	Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant. The DOE is therefore expected to validate the timing of the investment decision and the consistency and appropriateness of the input values with this timing. The DOE should also validate that the listed input values have been consistently applied in all calculations.	Applicable and fulfilled: Input values used in the financial assessment were valid and appropriate at the time of decision making. The same are based on the techno-commercial offers on the basis of which the investment decision for the project activity was taken. This is reflected in the IRR spreadsheet.
7	In the case of project activities for which implementation ceases after the commencement and where implementation is recommenced due to consideration of the CDM the investment analysis should reflect the economic decision making context at point of the decision to recommence the project. Therefore capital costs incurred prior to the revised project activity start date can be reflected as the recoverable value of the assets, which are limited to the potential reuse/resale of tangible assets.	Not Applicable: For the project activity CDM was considered from the decision making stage itself, and there was no cessation at any stage of the project implementation.
8	Project participants should supply spreadsheet versions of all investment analysis. All formulas used in this analysis be readable and all relevant cells be viewable and unprotected. The spreadsheet will be made available to the Executive Board, UNFCCC secretariat and others contracted to assess the request for registration on behalf of the Board including assigned members of the Registration and Issuance Team. In cases where the project participant does not wish to make such a spreadsheet available to the public an exact read-only or PDF copy shall be provided for general publication. In case the PP wishes to black-out certain elements of the publicly available version, a clear justification for this	Applicable and fulfilled: Spreadsheet versions of all investment analysis would be provided to the Executive Board, UNFCCC secretariat and others contracted to assess the request for registration on behalf of the Board including assigned members of the Registration and Issuance Team.

	shall be provided to the UNFCCC secretariat by the DOE when requesting registration.	
Specific Guidance on the calculation of project IRR and Equity IRR		
9	The cost of financing expenditures (i.e. loan repayments and interest) should not be included in the calculation of project IRR.	Applicable and fulfilled: The financing means for the project activity involves 70% debt and30% equity. Cash flows related to loan repayments and interests are not included in the calculation of the IRR. The same is reflected in the IRR spreadsheet.
10	In the calculation of equity IRR only the portion of investment costs which is financed by equity should be considered as the net cash outflow, the portion of the investment costs which is financed by debt should not be considered a cash outflow.	Not Applicable: The financial indicator used to demonstrate additionality for the project activity, as mentioned above, is post tax project IRR. The same is reflected in the IRR spreadsheet.
11	Due to the impact of loan interest on income tax calculations it is recommended that when a project IRR is calculated to demonstrate additionality a pre-tax benchmark be applied. In cases where a post-tax benchmark is applied the DOE shall ensure that actual interest payable is taken into account in the calculation of income tax.	Applicable and fulfilled: Post-tax project IRR has been calculated to demonstrate additionality and has been compared against the "Weighted Average Cost of capital".
Selection and validation of appropriate benchmark		
12	In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for equity IRR. Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate that they are applicable to the project activity and the type of IRR calculation presented.	Applicable and fulfilled: Project IRR is calculated to demonstrate additionality, and has been compared with weighted average cost of capital (WACC). The same is reflected in the IRR spreadsheet.
13	In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on publicly available data sources which can be clearly validated by the DOE. Such data sources may include local lending and borrowing rates, equity indices, or benchmarks determined by relevant national authorities. The DOE.s validation of such benchmarks	Applicable and fulfilled: The proposed project activity is power generation from wind energy and could be developed by an entity other than the project participants. The benchmark has been established based on publicly available data sources specific to the industry sector and the country applicable at the time of decision making. Thus the

	shall also include its opinion of the suitability of the benchmark applied in the context of the underlying project activity.	data used for benchmark determination is not specific to project promoter but has been taken from several publicly traded companies in power generation business.
14	Internal company benchmarks/expected returns (including those used as the expected return on equity in the calculation of a weighted average cost of capital - WACC), should only be applied in cases where there is only one possible project developer and should be demonstrated to have been used for similar projects with similar risks, developed by the same company or, if the company is brand new, would have been used for similar projects in the same sector in the country/region. This shall require as a minimum clear evidence of the resolution by the company's Board and/or shareholders and will require the validating DOE to undertake a thorough assessment of the financial statements of the project developer - including the proposed WACC - to assess the past financial behavior of the entity during at least the last 3 years in relation to similar projects.	Not Applicable: As mentioned above, the proposed project activity could be developed by an entity other than the project participants. However there had been no previous investments by the PP in similar project and hence there is no historic data related to the same. Hence, as per the guidance, the benchmark has been established based on publicly available data sources specific to the industry sector and the country applicable at the time of decision making. The benchmark calculated to determine additionality of project has therefore not been calculated from company specific data of project promoter.
15	If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors. The values in the table inAppendix A may also be used, as a simple default option, if a company internal benchmark is used.	Applicable and fulfilled: As mentioned earlier, WACC has been considered as the benchmark in the investment analysis for the project activity. For the project activity, the risk premium has been accordingly calculated by application of the relevant risk measure (i.e. beta of power sector companies in the country). Thus the risk premium considered for the project activity is relevant to the nature and type of risks the project might face. The calculated cost of equity uses best financial practices, based on data sources which can be clearly validated by the DOE.
16	If a company.s internal benchmark is used for the expected return on equity, the cost of debt should be based on the weighted average cost of debt financing of the legal entity owning the CDM project activity. For loans, use the weighted average cost of outstanding long-term debt. For bonds, use the	Not Applicable: As mentioned above the benchmark employed in the project is not an internal benchmark but as per the standard market conditions.

	weighted average yield of the bonds during the last three months prior to the submission of the CDM-PDD for……	
17	If a company's internal benchmark is used for the expected return on equity, then the percentage of debt financing and equity financing should reflect the long-term debt/equity finance structure of the legal entity owning the assets of the project activity. The percentage should be determined based on the latest balance sheet provided under local fiscal/accounting standards and rules if: (a) the legal entity owning the assets of the project activity has balance sheets audited by a third party within two years prior to the submission of the CDM-PDD for validation; and (b) the accounting books of the legal entity reflect at least the total value of all the assets needed for the project activity. If the debt/equity finance structure is not yet available, 50% debt and 50% equity financing may be assumed as a default.	Not Applicable: As mentioned above the benchmark employed in the project is not an internal benchmark but as per the standard market conditions.
18	If the benchmark is based on parameters that are standard in the market, then the typical debt/equity finance structure observed in the sector of the country should be used. If such information is not readily available, 50% debt and 50% equity financing may be assumed as a default.	Applicable and fulfilled The benchmark uses a debt equity ratio of 70:30 which is standard for the sector as suggested by TNERC order 2006.
Investment Comparison Analysis and Benchmark Analysis		
19	If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate.	Applicable and fulfilled: The baseline scenario to the project activity does not creates a situation where the project proponent is left with no other choice but to make an investment in a wind energy based power plant. Further, the alternative to the project activity, as demonstrated earlier, is the continuation of generation of electricity from the grid and hence requires no additional investment. Hence, benchmark approach is considered appropriate.
Sensitivity Analysis		
20	Only variables, including the initial investment	Applicable and fulfilled:

	cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets.. Where a DOE considers that a variable which constitute less than 20% have a material impact on the analysis they shall raise a corrective action request to include this variable in the sensitivity analysis	Only parameters which would contribute to more than 20% of total project cost or total project revenues have been varied in a range of +10% to -10%, and sensitivity has been conducted. The same is reflected in the IRR spreadsheet. The parameters include the following ➢ The Project cost ➢ Plant load factor ➢ Tariff details ➢ O&M cost[11]
21	The DOE should assess in detail whether the range of variations is reasonable in the project context. Past trends may be a guide to determine the reasonable range. As a general point of departure variations in the sensitivity analysis should at least cover a range of +10% and 10%, unless this is not deemed appropriate in the context of the specific project circumstances. In cases where a scenario will result in the project activity passing the benchmark or becoming the most financially attractive alternative the DOE shall provide an assessment of the probability of the occurrence of this scenario in comparison to the likelihood of the assumptions in the presented investment analysis, taking into consideration correlations between the variables as well as the specific socio-economic and policy context of the project activity.	Applicable and fulfilled: Parameters which would contribute to more than 20% of total project cost or total project revenues have been varied in a range of +10% to -10%, and sensitivity has been conducted. The project IRR does not pass the benchmark in any of the above scenarios. The same is reflected in the IRR spreadsheet.

Calculation of Benchmark

As per guidance on Assessment of Investment analysis, version 05, annex 5 of EB 62, it states that "*In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate that they are applicable to the project activity and the type of IRR calculation presented.*"

"When applying benchmark analysis, the financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to

[11] Although O&M costs does not form 20% of the costs or the revenues, it is considered in the sensitivity analysis as it is one of the major cost component during the entire lifetime of the project activity.

the subjective profitability expectation or risk profile of a particular project developer. Only in the particular case where the project activity can be implemented by the project participant, the specific financial/economic situation of the company undertaking the project activity can be considered."

Project IRR, which is the return earned by the project, has to be compared with a benchmark or cut-off rate to determine the adequacy of the return. Weighted Average Costs of Capital WACC has been chosen as the benchmark. WACC alone represents the weighted average of the costs of various sources of financing in the financial structure of the project. In other words, WACC represents the minimum rate of return which the project should earn to merit consideration, as failure to earn the minimum rate of return is indicative of the erosion in the value of investment. Therefore, this appears to be the most appropriate benchmark for cases where project IRR is used to demonstrate the Additionality.

The WACC has been calculated as demonstrated below[12]:

WACC = CoE * {E/(E+D)} + CoD * {D/(E+D)}

Where:

CoE – Cost of equity
CoD – Cost of Debt
E - Equity
D - Debt

CoE – Cost of Equity:
The cost of equity is the minimum rate of return that a business or organization must offer investors or owners to offset their wait for a return on investment and for assuming some level of risk. The Capital Asset Pricing Model (CAPM) approach is a generally accepted methodology for determining the Cost of Equity. CAPM is based on the portfolio theory of finance in which risks are classified into:

- Systematic risk - risk applicable to the market as a whole, such as inflation, tax rises, interest rates, etc.
- Specific risk - residual risk unique to an individual firm or a small group of companies that form a subset of the market.

The theory stipulates that specific risks can be eliminated through diversification and hence, only systematic risks determine the return expectation of investors. The basis of CAPM is the relationship between risk and return. Whilst there has been considerable debate on the strength of the risk/return relationship, evidence indicates that there is a strong linear and positive relationship over the long term, which can be expressed by the following formula[13]

$E(r_e) = r_f + Equity\ Beta\ (\beta) * [E(r_m) - r_f]$

Where:

[12] Report on Cost of Capital for Central Sector Utilities by Crisil Advisory services.

[13] Cost of Capital for Central Sector Utilities by Crisil Advisory Services

$E(r_e)$ - the expected rate of return on equity (cost of equity)
r_f - the risk-free rate of return (e.g. return on government bonds)
$E(r_m)$ - the expected rate of return on a market portfolio
Equity Beta (β) - coefficient reflecting the volatility (risk) of the stock relative to the market, which measures the systematic risk of the stock

The ***Risk free rate (r_f)*** has been taken from the long term government bond rates at the time of the investment decision of the project activity in July 2006. The weighted average interest rate on Central Government date Securities i.e. bond rate published during June 2006 is 7.80%[14].

The ***Market Risk Premium ($E(r_m) - r_f$)***, as measured and applied in practice, is the premium above the risk-free rate of return that investors expect to earn on a well-diversified portfolio of equities.

The ***expected rate of return on a market portfolio ($E(r_m)$)*** has been calculated as the compounded annual growth rate of the market portfolio. In calculating market risk premium, it is usual to use an established stock market index as a proxy for the market portfolio. In India, the possible choices of indices are – BSE 30, BSE 100, S&P CNX 500, Nifty, BSE 500 etc.

BSE 100 reflects the longest available time period from date of investment decision (22 years) and contains sufficient number of power sector industries and is therefore considered more appropriate than BSE 30 (which offers longer vintage but less number of companies listed in power sector) or BSE 500 (which contains more number of power companies but insufficient vintage).Hence market returns have been estimated based on BSE- 100 which works out to 18.77% for the period starting from 1983 till June 2006.

Beta
As the project activity involves the wind power generation, so the beta has to be taken from the listed companies involved in the wind power generation. But as there is no listed companies whose core business is wind power generation apart from BF utilities, so the beta value has been considered for the listed companies who are involved in the similar business i.e. power generation.There were in all six listed and traded (in the stock exchange) engaged in power generation, viz., Reliance Infrastructure Ltd., Tata Power Company Ltd., CESC Ltd., Gujarat Industrial Power Corporation Ltd., BF Utilities Ltd. and Neyveli Lignite Corporation Ltd[15].

The following are the raw beta of the companies

Companies	**Raw beta**
Tata power	1.277
BF utilities	2.088
Neyveli lignite corporation	1.104
GIPCL	1.298
RIL infra	0.775
CESC	1.427

http://rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=7624

[15] The details of the Beta calculations are submitted to the DOE.

Among the companies mentioned above, the beta of BF utilities is on an extreme side. Hence the same is removed from the population to arrive at an average of 1.18. The re-levered beta obtained from this data set is 2.09.Thus the beta of ***1.18*** is finalized on the conservative basis.

The ***Cost of Debt*** has been considered as *Prime Lending Rate (PLR)* at the time of investment decision of the project activity. The PLR during available at the time of investment decision is prevailing between 10.75%- 11.25%. The average of 11.00% is taken for the investments decision.

The ***Debt Equity ratio*** as per the Wind Power policy norms has been considered as 70:30.

Calculation of WACC:

WACC = CoE * {E/(E+D)} + CoD * {D/(E+D)}*(1-Tax rate)
= $\{r_f$ + *Equity Beta (β)* [E(r_m) – r_f]}* {E/(E+D)} + CoD * {D/(E+D)} *(1-Tax rate)
= {7.80%+1.18*(18.77%% - 7.80%)}*{30% /100%} + 11.00% *{70%/100%}*(1-33.66%)
= 11.32%

Thus WACC as a benchmark has been calculated as ***11.32%***

Key variables used in assessing the IRR for the project and their sources for conducting the investment analysis are given in the flowing table:

Parameter	Unit	Value	Remarks
Technical parameters			
Number of WEGs to be installed	Number	5	The total number of wind mills installed in the project activity.
Capacity of each WTG	MW	1.65	Techno-commercial offer from NEG Micon dated 05/07/2006
Capacity of power plant	MW	8.25	Calculated
Plant load factor (PLF)	%	26.50	Based on the third party engineering company certificate as per EB 48, Annex 11.
De-ration in generation after 10 years	%	1	TNERC tariff order dated 15/05/2006
Wheeling charges	%	5	TNERC tariff order dated 15/05/2006
Banking charges (For 40% of the generation)	%	5	TNERC tariff order dated 15/05/2006
Transmission losses	%	2	Based on the third party engineering company certificate as per EB 48, Annex 11.
Financial parameters			
Project cost	INR Mil	565.72	Offer Letter from NEG Micon dated 05/07/2006
Annual O&M cost (from second year onwards, free for first year)	INR Mil/yr	7.07	Offer Letter from NEG Micon dated 05/07/2006 (1.25% of the project cost; From 3rd yr onwards @ 5% escalation every year and in 7th yr one time increase i.e., 20%, and 5% escalation every year thereafter)
Annual escalation in O&M cost	%	5	

Power selling tariff to the state grid	INR/kWh	3.67	Tariff Rates as per TNERC Order[16] dt. 15.03.03;
Generation tax	INR/kWh	0.10	Tamil Nadu Tax on Consumption or Sale of Electricity Act, 2003 (Act 12 of 2003)
Debt-Equity ratio		70:30	As per the TNERC order 2006.
Loan interest rate	%	9	Based on the loans taken by PSW in the financial years 2003-04 and 2004-05 and 2005-06.

The post tax project IRR comes to 8.20% without considering revenues from CDM whereas with CDM revenue it becomes 10.60%.

The applied benchmark for the project IRR is post tax **WACC** (Weighted Average Cost of Capital). In the case of the project activity this is the 11.32%.

Sensitivity analysis:

As per the Guidance on the assessment of Investment Analysis, Version 5.0, the following are the factors that constitute more than 20% of either total project costs or total project revenues (Except O&M cost which constitutes less than 20% but included in the analysis).

- Plant load factor
- Project cost
- Operation & Maintenance costs
- Electricity Tariff

PLF:

Since PLF varies according to the wind conditions and hence sensitivity analysis has been carried out at higher PLF to check the robustness of the financial model. The financial model has been developed on the basis of 26.50% PLF.

Sensitivity Analysis	
PLF	**Project IRR**
	Without CDM
Base case (26.50% PLF)	**8.20%**
Increase in PLF by 10 %	**9.95%**
Decrease in PLF by 10%	**6.51%**

In the above analysis the project IRR does not cross the benchmark even with increase in10% from the base PLF.

[16] http://www.tneb.in/template_3..php?tempno=3&cid=0&subcid=54

The project IRR reaches the benchmark with 18% increase in the total generation which converts to a PLF of 31.27%. This is highly unrealistic based on the average PLF provided by the TNERC vide its 2006 order. The order provides a PLF of 27.54% for the kind of WTGs installed in this project activity. Thus the analysis is robust for any possible increase in the PLF.

O&M cost:

Sensitivity Analysis	
O&M cost	**Project IRR**
	Without CDM
Base case (7.07 **Million)**	**8.20%**
Cost increased by 10%	**7.93%**
Cost decreased by 10 %	**8.46%**
Cost Increased by 15%	**7.80%**

From the above sensitivity analysis on the O&M cost, it is clear that the Project IRR does not cross the benchmark even after the decrease of 10% in the base case of the O&M. The actual cost incurred for O&M is 11% higher than the cost considered for the investment analysis hence the sensitivity is done for +15%. From the above, the financial analysis is prudent for the variations in the cost incurred for the operations and maintenance.

Power cost:

Sensitivity Analysis	
Power cost	**Project IRR**
	Without CDM
Base case(INR 3.67/kWh)	**8.20%**
Cost decreased by 10%	**6.45%**
Cost increased by 10 %	**10.02%**

The energy rate for captive consumption at the time of decision making is 3.67 INR/ kWh. This is based on the TNERC 2003 tariff order, which includes a base rate of INR 3.50 /kWh and a tax of 5%. The tariff has remained almost constant from the year 2001 onwards as per the HT tariff details submitted to the DOE. To consider any potential increase in the tariff over the lifetime of the project activity, a sensitivity analysis has been conducted for 10% increase in the tariff. The IRR values as presented in the above table shows that the project IRR is within the limits of the benchmark.

A fixed tariff has been considered for the period of 20 years. The scenario of escalation in tariff is unrealistic owing to the following reasons.

- The tariff rate has been almost same (INR 3.50/kWh) from 2001 till 2010 (Excluding a decrease to 3.30 INR/kWh during 2002).
- The Indian Electricity Act stipulates the tariff to be based on cost to serve principles, however in India the HT tariff for industrial consumers is set at a higher rate than the cost of supply because of loading of the cross subsidy surcharge. This cross subsidy surcharge is then used to subsidize the tariff for agricultural and domestic consumers. The Electricity Act has mandated a progressive removal of cross subsidy surcharge and tariff setting based purely on cost to supply. The section 61(g) of the Indian Electricity Act states "the tariff should be set such that it progressively reflects the cost of supply of electricity and also, reduces and eliminates cross-subsidies". This clearly means that the cross subsidy on HT tariff is likely to be phased out in coming years resulting in a decrease in HT tariff.
  Thus the IRR analysis is robust for any increase in tariff over the lifetime of the project activity.

Project cost:

Sensitivity Analysis	
Project cost	**Project IRR**
	Without CDM
Base case (INR 565.72 Million)	**8.20%**
Cost increased by 10%	**6.07%**
Cost decreased by 10 %	**10.83%**

From the above sensitivity analysis on the Project cost, it is clear that the Project IRR does not cross the benchmark even after the decrease of 10% in the base case of the Project cost. Hence the financial analysis is prudent for the variations in the cost incurred. The actual cost of the project as per the purchase order is INR 519 Million which is within the sensitivity limits. Hence the analysis provided is robust.

The following table provides the value of the parameters considered at the time of the investment decision and the actual. This also contains a column on the variation between the actual and the considered parameters.

Parameters	**Value at Investment decision**	**Actual values**	**% variation**
Plant load factor	26.50%	28.64% (Year 2010)	08.25%
Project cost	565.72 Millions	519.00 Millions	-08.25%
O&M costs	7.07 Millions	7.85 Millions	11.00%
Power cost	3.68 INR/kWh	3.68 INR/kWh	00.00%

From the above table it is clear that the actual values are within ±10% of the parameters considered at the investment decision. In case of O&M costs the variation is 11% which is covered in the sensitivity analysis for this parameter where it is considered up to +15%.

Conclusion of this step is:

Hence the sensitivity analysis holds good for all the possible combinations of the parameters discussed. From this it can be concluded that the financial analysis presented is robust for all the possible variations. Hence the investment analysis proves beyond doubt that the project activity is additional.

Serious CDM consideration

The establishment of WTGs for the electricity generation by the project proponent for its subsequent use in their constituent units for captive consumption, required considerable investment and associated risk. Hence the project proponent has seriously considered the CDM revenues during the planning of the project activity. Necessary evidences of the following nature are available with the project proponent and will be made available to the DOE for validation.

The Premier Group consists of four constituent concerns[17] along with the Premier Spg and Wvg Mills Pvt Ltd. The guidance for the investments for the individual concerns was decided by the combined meeting of the members from all concerns. A meeting of the members was convened on 19/01/2004 to decide on the investments in the windmills. The minutes of the meeting will be made available to the validator during the time of the validation. As a result of the meeting, it was concluded that although the returns from the windmills are not viable even based on the latest technology but as these projects are renewable energy initiatives they are eligible for getting CDM assistance as per the information given by the consultants. After analysing the propositions and the associated financial analyses it was instructed to the firms to proceed with the project activity and engaging the concerned persons for obtaining the CDM revenues.

Thus the constituting concerns while approving the investments for the windmills decided to go for the establishment of the windmills based on the decision taken by the Premier group and pursue for acquiring the CDM registration.

The following are the important milestones in the process of the implementation of the project activity by Premier Spg and Wvg Mills Pvt Ltd for acquiring the CDM registration of the project activity.

As per Guidelines on the demonstration and assessment of prior consideration of the CDM (Version 04), the project activity has a start date prior to 02/08/2008. Thus as per the § 6 of the above stated guidance, the project proponent has taken continuous and timely action to secure registration of the project activity with UNFCCC EB. The following table provides a chronological list of activities:

Sl.No	Date	Project activity milestones	Milestones in acquiring CDM registration	Evidences

[17] The details of the other companies will be provided at the time of validation to the DOE

1	07/12/2004	-	Proposal for Appointment of ERM as consultant for CDM projects of the Group companies.- **Prior knowledge of CDM to the Project Participants**	Letter accepting the proposal.
2	05/07/2006	Offer letter from M/s NEG Micon	-	Copy of the offer letter
3	19/07/2006	**Investment decision** by Board of PSW	Board considered CDM revenue for the project viability	Minutes of the meeting
4	03/08/2006	First purchase order of WTG	***CDM Starting date***	Purchase Order
5	31/12/2006	Commissioning of the first windmill of PSW	-	Commissioning certificate
6	27/10/2006	-	Work order to M/s care sustainability for carrying out the CDM services of the project activity	Copy of work order dated 27/10/2006
7	14/06/2007	-	Termination of work order with M/s Care sustainability	Copy of termination letter dated 14/06/2007
8	25/07/2007	-	Memorandum of understanding with M/s cantorCO2e for the CDM services.	Copy of the MoU dated 25/07/2007.
9	11/02/2008	-	Agreement appointing CantorCO_2e India Pvt Ltd covering 29 windmills (47.85 MW). The windmills of this project activity were a part of this bundle.	Accepted on 18/02/2008
10	28/06/2008	-	Stakeholders' Meeting – II for 29 windmills (47.85 MW). The windmills of this project activity were a part of this bundle.	Minutes of the meeting
11	18/11/2008	-	Appointment of Bureau Veritas Certification as validator for 29 windmills (47.85 MW).	Letter of appointment
12	12/06/2009 to 11/07/2009		Webhosting of the PDD of capacity 47.85 MW in the CDM website. The windmills of this project	http://cdm.unfccc.int /Projects/Validation/ DB/J0J2B6K3O92EEU AFD3OGYLE03TNZ7I

			activity were a part of this bundle.	/view.html
13	20/02/ 2010	-	Termination of CDM advisory contract with CIL	Letter of termination
14	10/04/ 2010	-	Emission Reduction Purchase Agreement with buyer	ERPA dated 10/04/2010
15	13/11/2010	-	Extension of scope of Validation services for the project activity with DOE - BVCI	Copy of extension agreement
16	07/03/2011		Webhosting of the PDD of the project activity in the CDM website.	http://cdm.unfccc.int Projects/Validation /DB/4QBCUVMF56B0I 5IHYMAAK4M35X7CDW /view.html
17	17/01/2012		Meeting with National CDM Authority	Invitation mail from NCDMA for HCA meeting

From the chronology and the immediate steps taken by the project proponent, it is clear that the project proponents are serious regarding the criticality of the CDM revenues for the project activity. The above table also demonstrates a continuous effort of project proponent to achieve CDM status. Hence based on EB49, Annex 22, clause No. 6-b it is evident from the chronology that the project proponent (being a part of the Premier Group) has contacted the CDM consultants. The first action specific to the project activity under consideration is taken by the project proponent by the appointment of the first CDM consultants in October 2006.Due to the lack of serious progress in the project, the consultant was terminated and the memorandum was signed with M/s CantorCO_2e in July 2007.

The DOE was appointed in November 2008.The project activity was taken up for validation along with the other wind Mills belonging to the other companies of the same group (Different legal entities). Then owing to procedural constraints, the project is taken up separately for validation. Thus as per the guidelines stated above the project proponent has taken all the necessary and real actions to achieve the CDM revenues for the viable operations of the project activity.

Thus, the project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The project category applicable for the proposed CDM project activity is AMS ID. According to para 21 of the methodology, the emission reduction is calculated as follows:

$ER_y = BE_y – PE_y – LE_y$

Where,

ER_y = Emission reduction in year y (tCO_2/year)

BE_y = Baseline Emissions in year y (t CO_2/year)

PE_y = Project emissions in year y (t CO_2/year)

LE_y = Leakage emissions in year *y* (t CO_2/year)

Baseline Emission:

The project category applicable for the proposed CDM project activity is AMS ID. For establishing the baseline for this project activity para 11 of the methodology AMS ID will be appropriate since the project activity is based on wind energy generation, which is associated with the regional grid for wheeling of power to the facility, the applicable baseline for this project activity will be, the product of amount of electricity supplied to the electricity produced by the renewable generating unit and an emission factor as described below :

$BE_y = EG_{BL,y} * EG_{CO2,grid,y}$ 1

Calculation of Baseline Emission Factor

As per AMS ID, Version 17, the baseline emission factor for a grid system can be calculated as either of the following options in a transparent and conservative manner:

As per paragraph 12 of the methodology AMS ID,

"The Emission Factor can be calculated in a transparent and conservative manner as follows:

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 t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

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

Since the proposed project activity is likely to affect both present and future carbon intensity of the grid mix, Option (a) Combined Margin consisting of operating margin (OM) and build margin (BM), calculated according to the procedures described in the 'Tool to calculate emission factor of an electricity system' by Central Electricity Authority of India and made publicly available through their website, is used to calculate the baseline emissions for the project activity The combined margin emission factor of the Southern Regional grid published in the CEA CO_2 Baseline Database for the Indian Power Sector, version 6.0 has been used to estimate baseline emissions for the project activity.

The combined margin approach is chosen as the preferred approach. As the "Tool to calculate emission factor for an electricity system" (Version no.02.2.1):

The tool provides procedures to determine the following parameters:

SI unit	Description
tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y
tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y
tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y

BASELINE METHODOLOGY PROCEDURE:

For determination the emission factor of the relevant electricity grid the following six steps needs to be applied:
STEP 1: Identify the relevant electricity systems.

STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)

STEP 3: Select a method to determine the operating margin (OM)

STEP 4: Calculate the operating margin emission factor according to the selected method.

STEP 5: Calculate the build margin emission factor.

STEP 6: Calculate the combined margin (CM) emissions factor.

Step 1: Identify the relevant electricity systems

The project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used.

As per CEA CO_2 Baseline Database for the Indian Power Sector (Version 6)[18], Indian electricity grid is divided into two parts:

- North East West North East (NEWNE) grid system and
- Southern grid system.

The project activity plant is connected to Tamil Nadu state electricity grid, which in turn is a part of Southern Grid of India. The carbon dioxide emission factor of the Southern Grid is calculated in line with the "Tool to calculate emission factor for an electricity system (Version No. 02.2.1)"

For the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system, except where recent or likely future additions to transmission capacity enable

[18] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

significant increases in imported electricity. In such cases, the transmission capacity may be considered a build margin source.

For the purpose of determining the operating margin emission factor, use one of the following options to determine the CO_2 emission factor(s) for net electricity imports from a connected electricity system within the same host country(ies): 0 tCO_2/MWh, or

a) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in step 4 (d) below; or

b) The simple operating margin emission rate of the exporting grid, determined as described in step 4 (a), if the conditions for this method, as described in step 3 below, apply to the exporting grid; or

c) The simple adjusted operating margin emission rate of the exporting grid, determined as described in step 4 (b) below.

The method used for calculating the Operating Margin is explained below

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional):

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

As per CEA CO_2 Baseline Database for the Indian Power Sector, Version No. 6:

"The following power stations are currently not accounted for in the database:
- *Stations or units installed in Andaman and Nicobar Islands and Lakshadweep.*
- *Captive power stations:*

As on 31 March 2009, the installed capacity from captive stations was 26673.68 MW. The generation of these stations in 2008-09 was 99721.16 GWh, The data of captive plants could not be added in this database in absence of the data availability
• Non-conventional renewable energy stations:
These include power generation from wind, biomass, solar photovoltaic, and hydro below 3 MW capacity. The installed, grid-connected capacity of these sources was15521.11 MW as on 31. 03. 2010.6 The generation from renewable energy sources in the year 2009-10 have been 34,442 GWh (tentative figures)
• Small decentralised generation sets.

The above points prove that only grid connected power plants are chosen in calculation of grid emission factor by CEA. Thus option I holds true.

Step 3. Select a method to determine the operating margin (OM)

The calculation of operating margin emission factor ($EF_{grid,OM,y}$) 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.

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

The latest available CO_2 Baseline Database for the Indian Power Sector, Version 6, published by CEA, has used Simple OM. The percentage share of low cost/must run power plants in NEWNE & Southern grid is given below:

	Share of Low cost/Must run Sources (% of Generation)				
	2005-06	**2006-07**	**2007-08**	**2008-09**	**2009-10**
South	27.0%	28.3%	27.1%	22.8%	20.6%
India	20.1%	20.9%	21.0%	18.7%	17.1%

From the above table it is evident that the percentage contribution of low cost/must run is lower than 50% in each of the five most recent years. Thus, use of simple OM is justified.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following 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, or*
- *Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.*

The proposed project activity would use the *ex-ante* option for calculating Simple OM.

Step 4: Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- *Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or*
- *Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.*

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Option B can only be used if:

a) The necessary data for Option A is not available; and
b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity replaced from the grid by these sources is known; and
c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2)

As per the CEA CO_2 Baseline Database for the Indian Power Sector, Version No. 6 (Page 10), "*net generation data is generally not measured at unit level"* making use of option A out of scope for CEA. Thus option B has been used. Compliance with conditions mandatory for use of option B has been demonstrated below:

Condition to use option B as per the Tool	Compliance of the conditions for Southern Regional grid in India
The necessary data for Option A is not available	Applicable and fulfilled: As per Option A given above, net electricity generation for each unit is required. As per CEA CO_2 Baseline Database for the Indian Power Sector, Version No. 6, net generation data is not measured at unit level.
Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known	Applicable and fulfilled: As per CEA CO_2 Baseline Database for the Indian Power Sector, Version No. 6, *"in India, hydro and nuclear stations qualify as low-cost / must-run sources"*. The quantity of electricity supplied to the grid by these sources is known as depicted by their percentage share in Figure 1 Database.
Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2	Applicable & fulfilled: Off grid power plants are not included in the calculation as option I has been chosen in step 2 above.

The latest available at the time of PDD preparation- CEA CO_2 Baseline Database for the Indian Power Sector, Version 6, , has used data the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system for calculating Simple OM. The equation used is:

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} * NCV_{i,y} * EF_{CO2,i,y}}{\sum_{m} EG_{m,y}} \quad \text{_____ 2}$$

Where:

$EF_{grid,OM,y}$	tCO_2/MWh	Simple operating margin CO_2 emission factor of the regional grid in year *y*
$FC_{i,m,y}$	Mass or volume unit	Amount of fossil fuel type *i* consumed by power plant / unit *m* in year *y*
$NCV_{i,y}$	GJ/mass or volume unit	Net calorific value (energy content) of fossil fuel type *i* in year *y*
$EF_{CO2,i,y}$	tCO_2/GJ	CO_2 emission factor of fossil fuel type *i* in year *y*
$EG_{m,y}$	MWh	Net electricity generated and replaced from the grid by power plant / unit *m* in year *y*
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).

Based on the above equation, simple OM for the Southern grid provided by CO_2 Baseline Database for the Indian Power Sector, Version 6 is as follows:

Operating margin Emission Factor for Southern grid in tCO_2/MWh

2009-10	0.9415
2008-09	0.9729
Average	**0.9684**

Step 5: Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power unit m during the most recent year y for which power generation data is available,

The applicable equation is:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \text{3}$$

Where:

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

As per the latest available CO_2 Baseline Database for the Indian Power Sector, Version 6, published by CEA, CO_2 emission factor of thermal stations is calculated using the following equation:

$$SpecCO_2(station)_y = \frac{\sum_{i=1}^{2} FuelCons_{i,y} * GCV_{i,y} * EF_i * Oxid_i}{NetGen(station)_y} \quad \text{4}$$

Where:

$Oxid_i$	%	Oxidation factor of fuel type i

Most recent historical year for which data is available is 2009 – 20010. The latest available CO_2 Baseline Database for the Indian Power Sector, Version 6, published by CEA, has provided the following value for BM:

Emission Factor for Build Margin (BM) in tCO_2/MWh	
2009-10	**0.7634**

Step 6. Calculate the combined margin emissions factor

The combined margin emission factor is calculated as follows:

$$EF_{CO2,grid,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM} \quad \text{Equation 5}$$

Where:

$EF_{CO2,grid,y}$	tCO_2/MWh	CO_2 emission factor of the grid in year y
$EF_{grid,OM,y}$	tCO_2/MWh	Operating margin CO_2 emission factor for regional grid in year y
$EF_{grid,BM,y}$	tCO_2/MWh	Build margin CO_2 emission factor for regional grid in year y
w_{OM}	%	Weighing of operating margin emissions factor
W_{BM}	%	Weighing of build margin emissions factor

Further the Tool to calculate emission factor of an electricity system, version 02.2.0, as well as CEA CO_2 Baseline Database for the Indian Power Sector, Version 6 user guide provides default values of OM & BM for projects with intermittent sources of power like wind and solar energy based power plants. Thus, w_{OM} =0.75 and w_{BM} =0.25. for the first crediting period. The project activity would claim emission reductions for a fixed crediting period of 10 years, and thus for the project's crediting period, the weighing of OM and BM are fixed at 75% and 25% respectively.

Weighted Average Emission Factor for Southern grid	0.9172	Calculated

Project emissions: PE_y
According to Para 19 of AMS ID, no project emissions are applicable for this small scale project activity.

The project activity uses wind energy to generate electricity and hence there is no project emission due to the above sources.

$PE_y = 0$ Equation 6

Leakage: LE_y

According to para 20 of AMS ID, no leakage is applicable as there is no transfer of energy equipment involved from another activity.

$LE_y = 0$ Equation 7

Emission Reductions:

As per paragraph 21 of AMS I D Ver 17, *"Emission reductions are calculated as follows"*

$$ER_y = BE_y - PE_y - LE_y$$ Equation 8

Where:

ER_y	tCO_2	Emission reductions in year y
BE_y	tCO_2	Baseline emissions in year y
PE_y	tCO_2	Project emissions in year y
LE_y	tCO_2	Leakage emissions in year y

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

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2/MWh
Description:	Operating margin CO_2 emission factor for Southern grid in year y
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. Version 06. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.9684
Justification of the choice of data or description of measurement methods and procedures actually applied :	Operating Margin Emission Factor has been calculated by taking data from the Central Electricity Authority using the simple OM approach as per Tool to calculate emission factor for an electricity system in accordance with ACM0002, Version 12.2.0. The data has been calculated based on net electricity generation and simple operating margins of the Southern Grid for the years 2007 – 2008, 2008 – 2009 and 2009-10
Any comment:	The parameter has been calculated *ex-ante* and will remain fixed throughout the crediting period of the project activity

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2e/MWh
Description:	Build margin CO_2 emission factor for Southern grid in year y
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" published by the Central

	Electricity Authority, Ministry of Power, Government of India. Version 06. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.7634
Justification of the choice of data or description of measurement methods and procedures actually applied :	Build Margin Emission Factor has been calculated by taking data from the Central Electricity Authority using the BM approach as per Tool to calculate emission factor for an electricity system in accordance with ACM0002, Version 12.2.0. The data reflects Build margin emission factor of the Southern Grid for the year 2009 – 2010
Any comment:	The parameter has been calculated *ex-ante* and will remain fixed throughout the crediting period of the project activity

Data / Parameter:	$EF_{CO2,grid,y}$
Data unit:	tCO_2e/MWh
Description:	Combined margin CO2 emission factor for Southern grid in year y
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. Version 06. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.9172
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data reflects Combined margin emission factor of the Southern Grid for the year 2009-10
Any comment:	The parameter has been calculated *ex-ante* and will remain fixed throughout the crediting period of the project activity

B.6.3 Ex-ante calculation of emission reductions:

Baseline emissions:

Baseline emissions from the project activity are estimated *ex-ante* using equation number 1 under section B.6.1 of the PDD:

Table 1:

Notation	Unit	Description	Value	Remarks
Using equation no.1 under section B.6.1 of the PDD: $BE_y = EG_{BL,y} * EF_{CO2,grid,y}$				
BE_y	tCO_2	Baseline emissions in year y	17,566	Calculated using equation no. 1 of the PDD
$EG_{BL,y}$	MWh	Quantity of net electricity supplied to the grid as a result of implementation of the CDM project activity in year y	19,152	Calculated
$EF_{CO2,grid,y}$	tCO_2/MWh	CO_2 emission factor of the grid in year y	0.9172	Refer Table 2 below.

$EG_{BL,y}$ = Installed capacity (MW) * annual operating hours (h) * Plant load factor (%)

Annual operating hours = 24 * 365

There fore $\boldsymbol{EG_{facility,y}}$ = 8.25 (MW) * 24* 365* 26.5% = 19,152 MWh/year

$\boldsymbol{BE_y}$ = 19,152 (MWh/year) * 0.9172 (tCO_2e/MWh) = 17,566 tCO_2e/ year

Calculation of baseline emission factor:

Table 2:

Notation	Unit	Description	Value	Remarks
Using equation no.5 under section B.6.1 of the PDD: $EF_{CO2,grid,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$				
$EF_{CO2,grid,y}$	tCO_2/MWh	CO_2 emission factor of the grid in year y	0.9172	Calculated using equation no. 5 of the PDD
$EF_{grid,OM,y}$	tCO_2/MWh	Operating margin CO_2 emission factor for regional grid in year y	0.9684	Table A under section B.6.1 of the PDD
$EF_{grid,BM,y}$	tCO_2/MWh	Build margin CO_2 emission factor for regional grid in year y	0.7634	CEA database Version 6. BM taken for year 2008 – 2009.
w_{OM}	%	Weighing of operating margin emissions factor	75	Tool to calculate emission factor for an electricity system, Version no. 02.2.0
W_{BM}	%	Weighing of build margin emissions factor	25	Tool to calculate emission factor for an electricity system, Version no. 02.2.0

Emission Reduction:

Emission reduction for the project activity has been estimated *ex-ante* using equation no. 8 under section B.6.1 of the PDD:

Notation	Unit	Description	Value	Remarks
Using equation no.8 under section B.6.1 of the PDD: $ER_y = BE_y - PE_y - LE_y$				
ER_y	tCO_2	Emission reductions in year y	17,566	Using equation no. 8 under section B.6.1 of the PDD
BE_y	tCO_2	Baseline emissions in year y	17,566	Table no. 1 of the PDD
PE_y	tCO_2	Project emissions in year y	0	Equation 6 under section B.6.1 of the PDD
LE_y	tCO_2	Leakage emissions in year y	0	Equation 7 under section B.6.1 of the PDD

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

Year	Estimation of project activity emissions (tCO_2 e)	Estimation of baseline emissions (tCO_2 e)	Estimation of leakage (tCO_2 e)	Estimation of overall emission reductions (tCO_2 e)
2012	0	17,566	0	17,566
2013	0	17,566	0	17,566
2014	0	17,566	0	17,566
2015	0	17,566	0	17,566
2016	0	17,566	0	17,566
2017	0	17,566	0	17,566
2018	0	17,566	0	17,566
2019	0	17,566	0	17,566
2020	0	17,566	0	17,566
2021	0	17,566	0	17,566
Total (tonnes of CO_2 e)	**0**	**1,75,660**	**0**	**1,75,660**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$EG_{BL,y}$**
Data unit:	MWh

Description:	Quantity of net electricity supplied to the grid as a result of implementation of the CDM project activity in year y. This value is the summation of generation from the 5 WTGs of the project activity.
Source of data to be used:	Net electricity supplied by the windmills to grid as mentioned in the generation statement provided by ELECTRICITY BOARD every month.
Value of data	**19,152**
Description of measurement methods and procedures to be applied:	Export-Import electricity meters installed at WTG site where the electricity is fed into the regional grid. Monitoring frequency: Continuous Recording: Monthly from the meter readings Archiving Policy: Paper & Electronic Calibration – Calibration will be done annually by TNEB. Responsible Entity: - The measurements will be jointly taken by the officials from TNEB and the personnel appointed by the project proponent for this purpose (PSW).
QA/QC procedures to be applied:	The meter is of 0.5 accuracy class. The meter will be calibrated as per the conditions provided in the Wheeling agreement. The monthly reading of main meters (TNEB Meters) will be taken by skilled technician to check the consistency of the meters, if during any reading difference of more than standard variation is found the faulty meter will be replaced with information to concerned authority. For the faulty meters electricity board assigns reading based on performance of nearby similar capacity machines. The same is conservative and will be used for the CDM monitoring as well. The value of the generation statement can be verified with the HT bills of the PSW manufacturing unit. The details pertaining to the cross verification are provided in the section B.7.2.
Any comment:	The data will be kept in the plant for the crediting period + 2 years after it. The data will be maintained in both soft copy and hard copy format.

B.7.2 Description of the monitoring plan:

Metering:

The electricity supplied to the grid will be metered from main meter (recording both import and export) which is connected to each WTGs of the project activity. The electricity export and import for the project activity will be taken from the summation of the export and import values from joint meter readings connecting each WTG of the project activity.

Meter reading mechanism:
The readings of the Export/Import meter installed by TNEB are taken once in a month by TNEB officials along with the representatives from the PP[19]. The readings of the meter will be provided to the PP in the

[19] The O&M personnel appointed by the PP is responsible for regular metering.

form of a monthly generation statement. This is the source of the record for electricity generation. There is also a daily recording of the data by the O&M personnel. This is to verify the proper working of the WTGs. But this is not used for the purpose of emission reduction calculations.

The individual meter is calibrated and sealed by the supplying company and is not interfered by project proponent without the presence of manufacturing company or its accredited representatives. The import and export meter is owned by the state electricity board and will be calibrated annually. The export vouchers are raised based on the difference of import and the export meter readings, so this can also be considered as the third party certified electricity generation.

Data Uncertainty and Emergency preparedness:

In case of any error observed in the meter readings of the import export meter, the operators will inform the project proponent and which will be subsequently informed to the TNEB persons. Representatives from TNEB will check the meters for correctness and will replace the faulty meters and a written report will be sent to the project proponent by the O&M personnel in this regard. In case of the faulty meters electricity board assigns reading based on performance of nearby similar capacity machines to be considered in the generation statement. The lower of the readings is taken for consideration and the same is conservative and will be used for the CDM monitoring as well.

Calibration:

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

Designation	**Responsibilities**	**Persons responsible for monitoring**
Project Head (Incharge person from Project proponent)	Registration Data storage and electronic archiving	Representative of the project proponent
Project Executor and Controller (WTG owner or appointed person on behalf)	• Recording • Verification • Storage of Data	Representative of the project proponent
Site main Controller	• Operation, Monitoring and Verification of Data • Data Recording • Storage of data	Area Service Manager (Appointed by the equipment supplier based on O&M contract)
Operation and Maintenance Contractor	• Operation and Maintenance • Data Recording • Storage of data	Vestas Wind Technology India Pvt Ltd

Data Verification

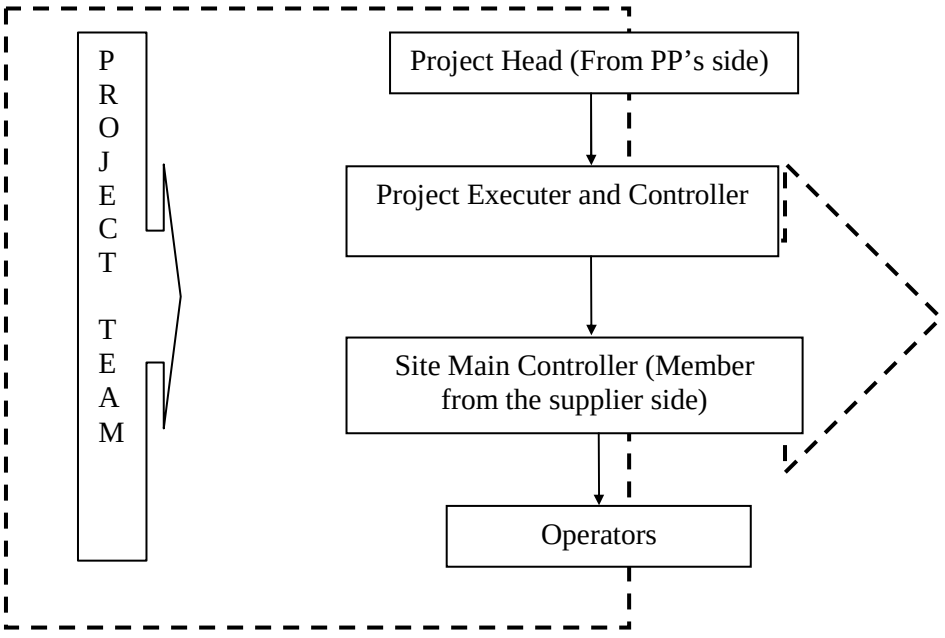
The electricity generation for this project activity mentioned in themonthly generation statement of the ELECTRICITY BOARD can be verified from the HT bills of the identified customer (PSW factory) where the generated electricity is wheeled.

PSW also owns and operates other WTGs apart from the project activity WTGs. The total electricity generation of all the WTGs owned by PSW (including the project activity WTGs) are mentioned separately in the HT Bill and are adjusted against the electricity consumption by the manufacturing unit. The electricity generation of the project activity can be obtained by the following algorithm.

Electricity generation from the project activity (kWh) Mentioned as a separate item in the HT bill	= Tot electricity generation from al the WTGs- Elelctricity generation of the Non - Project WTGs (kWh) from their respective generation statements

Data archiving:

As data archival is an important component of the monitoring process in the CDM, the project proponent will take a special care for this process. The entire data that is monitored will be maintained in the electronic format and also in the Log books for a period of crediting period + 2 years as required by CDM process.



Data Apportioning:

During the crediting period, there will be instances when, the dates of the crediting period may not match with that of the dates of the generation statements from Electricity board, For

example, if the crediting period begins from 15th of the October and generation statement is provided for the period is from 1st of October to 31st of October, the partial days generation as per the crediting period needs to be determined.

In these instances PP undertakes that the crediting period will be considered in accordance with the dates of the generation statement. The excess period generation which is not covered in the generation statement will be foregone and will not be considered for the CER calculations. In the example stated above the period from 15th of October to 31st of October will not be considered and the generation for the CER calculations will be taken from 1st November onwards.

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

30/12/2010

Name of person/entity determining the baseline: General Carbon Pte. Ltd.

General Carbon Pte. Ltd. is not a project participant in this activity..

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:

03/08/2006

The date of the release of first purchase order of wind turbine generator for the proposed CDM project has been considered as the start date of the project:

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

20 years 00 Months

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

Fixed crediting period has been selected for this project activity

C.2.1. Renewable crediting period

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

N.A (Not applicable)

C.2.1.2. Length of the first crediting period:

N.A

C.2.2. Fixed crediting period:

The project activity has chosen a fixed crediting period.

C.2.2.1. Starting date:

01/05/2012 or the date[20] of registration whichever is later

C.2.2.2. Length:

10 Years 00 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:

As per the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated 27/01/1994, a list of activities that are required to undertake environmental impact assessment studies has been provided. EIA is not a regulatory requirement in India for wind energy projects and the project proponent does not expect any adverse impacts of the proposed CDM project activity on the environment.

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 Environment Impact Assessment of the project activity concluded that the project will not present any significant negative impact on the natural environment and will contribute to the socioeconomic development of the region and the reductions of the GHG emissions. Also, there are not any trans-boundary impacts of the project activity.

The project activity is not envisaged to have any trans-boundary impacts.

SECTION E. Stakeholders' comments

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

The stakeholders' consultation process was taken up by the project proponent in a systematic manner. The Stakeholders' Meeting - II was conducted by the project proponent on 28/06/2008. The local stakeholders were invited by the project proponent, after giving the prior notice which was circulated[21] through the local village representatives, to the Premier Mills Recreation Hall, and the mechanism of

[20] Or the effective date 'submission of complete request for registration by DOE' as per EB 59 Annex 12 para 25

[21] The notices will be made available to the DOE during validation.

CDM was explained to them. The stakeholders were invited by letters issued by the project participant on 23/05/2008.

Members of the public belonging to Anthiyur, Venasapatti and Gomangalam (locally known as Gomangalampudur) villages attended the meeting. Officials from Premier Group represented by Mr. T. S. Jayachandran, Mr. G. Kumar, Mr. V. K. Dhamodarasamy, Mr. A. R. Vishwanathan and Mr. C. Venkatesan also attended the meeting.

Mr. T. S. Jayachandran of Premier Group welcomed all the participants of the Local Stakeholders Meeting. He introduced the dignitaries present at the meeting specially the Local Government Officials of the surrounding villages. He explained the Agenda of the meeting.

Mr. T. S. Jayachandran of Premier Group explained the activities of Premier Group including environmental protection and safety measures adopted by the Management at the mills belonging to the Premier Group. He referred to the negative climatic changes and global warming brought about by the emission of greenhouse gases by the ever increasing industrial activities, the burning of fossil fuels by the burgeoning number of vehicles and the demands of the population for better infrastructure. He stated that generation of power using wind energy is harmless to the environment, whereas generation of thermal power involves burning of non-renewable natural resources like coal, lignite etc which in turn leads to emission of greenhouse gases and global warming.

Mr. G. Kumar of Premier Group welcomed the members of the villages and the Government officials. He made a brief and informative introduction about Kyoto Protocol and about the concept and background of Clean Development Mechanism Process to the stakeholders. He gave a brief introduction on the captive wind power projects of the Premier Group, the importance of holding local stakeholders meeting and the activities involved in a CDM Process.

The Stakeholders' meeting is convened to achieve twin objectives of creating awareness about the benefits of wind power and addressing the concerns of the stakeholders. The CDM project being implemented by the Premier Group fulfils the objective of 'sustainable development' as envisaged by the Kyoto Protocol. Technical aspects, viability and various initiatives taken in the field of CDM Project were discussed in detail.

Mr. Thomas William, Village Administrative Officer, Gomangalam Village, educated the members about the beneficial aspects of windmills. He stated that the opinion held by some people that the rotating blades of the windmill dries up the humidity in the air and that the windmills prevents rain from falling on to the ground are myths which cannot stand scientific tests.

Mr. S. Muthuramalingam, Chairman, explained the beneficial aspects of the windmill projects at Udumalpet district. He commended the promoters for taking the initiative of convening the Stakeholders' meeting as it has provided a right forum for creating awareness about wind power amongst the general public. He stated that the implementation of the windmill projects in the Udumalpet region has resulted in an increase in prosperity in general.

After completion of the presentation, the Chairman opened the session for the stakeholders to put forward their queries, comments and suggestions. The stakeholders were also provided a time of 15 days for the submission of the comments. The participants were interested in getting clarifications on Kyoto Protocol,

Clean Development Mechanism (CDM) and other associated issues. The entire meeting was conducted in local vernacular which was immediately translated in English for everyone's convenience.

E.2. Summary of the comments received:

The following are certain comments received from the stakeholders and the answers given by the officials for the corresponding questions.

Q.1	Mr. Ramanujam, President of Gomangalam Village, asked to explain about the Kyoto Protocol
Ans.	It was explained that the Kyoto Protocol is an international agreement which provided a link to the United Nations Framework Convention on Climate Change. The major feature of the Kyoto Protocol is that it set targets for the Annexure-1 developed countries for reducing the Greenhouse Gas emissions to bring it down by an average of 5 percent against 1990 levels over a period of 5 years period 2008-2012.
Q.2	Mr. V. S. Soundararajan asked about the impact of CDM Project activities on the local community
Ans.	It was explained that the project will make a significant contribution to the socio-economic development of the region. The predominant occupation of the area is agriculture. Being an area dominated by agriculture, and because of consistent deficiency in rainfall year to year, the area for number of years, the people were left with very less options for livelihood. With the advent of windmills, the region has witnessed lot of activities and developments. The landowners received higher value for lands from the promoters, which in the absence of windmill projects would have been not possible. Now the farmers are getting easy access for movement of people, farm animals, materials and vehicles to their respective lands, because of the broad roads laid down by the promoters for the purpose of maintenance of windmills. Many commercial establishments like restaurants, general stores have been established in and around the villages to cater to the various needs of the people visiting the areas for the project works, and the Maintenance Staff employed at each of the windmill project. Unemployed people and equipment / vehicle suppliers gain employment in activities associated with the excavation of soil, digging of trenches, transportation of materials, removing of unwanted soil, and maintenance of the turbines. In general, after the setting up of windmills in the area, the town and the villages are ensured with more and good quality electricity power.
Q.3	Mr. M. Venugopal asked whether the CDM activities of the Premier Group are approved by the Government of India and any further statutory compliance are required to be met.
Ans.	Mr. Jayachandran explained that a comprehensive Project Description Document (PDD) alongwith the Minutes of the present stakeholders' meeting will be submitted to the Ministry of Environment and Forests for approval. To design, construct and operate a wind power project like the present CDM project, there are no specific public consultation requirements. Of course the normal formal procedures need to be followed to obtain the required land and operational licenses and permits. The electricity sector set up in the state of Tamil Nadu is unitary, meaning that generation, transmission and distribution is merged into a body called a board, hence it is manned by TNEB (Tamil Nadu Electricity Board). TNEB is therefore the state organisation responsible for all matters related to the wind farm and they confirmed their approval with the project. Thereafter but before commencement of construction and operation of the wind farm the following formalities are required to be complied with - (a) No Objection Certificate from TNEB prior to installation of wind mill (b) Inspection from TNEB before the start of generation of power. The same has been followed by the windmill suppliers. The lands constituting the site/s at

	which the windmills are installed and operated are dry agricultural lands. These lands are solely dependent on rainwater for cultivation of crops. Owing to continuous prevalence of drought like situation, the lands are barren and uncultivated and not dependable for livelihood. As such, the State Government of Tamilnadu has identified these lands as suitable areas for harnessing of wind power.
Q.4	Mr. A. Krishnaswamy asked about the activities undertaken by the Premier Group and future plans to reduce GHG emissions.
Ans.	Mr. Jayachandran explained that the Premier Group is a responsible business group committed to the implementation of environmental friendly projects as a part of the overall business activities of the Group. Towards this direction, the Group has already implemented the present 24.75MW wind power project. Further, it is constantly involved in various innovative measures and process rationalization aimed at reducing the consumption of power and energy. It has already switched over from fossil fuel to biomass for meeting steam requirement at its processing units.
Q.5	Mr. T. Subramaniam asked in what time frame the CDM Project activities will be completed and for how long it will work?
Ans.	It was explained the CDM project activities have already been completed by December 2006. The project will remain effective throughout the 20 years of the windmill life period. However, the CER business will remain attractive for a 10 year period.
Q.6	Mr. T. Kuppuswamy asked whether the CDM Project will have any negative impact on the environment or will lead to air / noise / water pollution or have adverse impact on the wildlife or birds
Ans.	It was explained that the CDM project activity will not create any adverse impact on the Bio physical environment citing examples.

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

From the section E.2 presented above, the comments received for this project activity were only informatory in nature, which were duly clarified by the concerned officials to the satisfaction of the commentators. No comments that require a follow up action from the project proponent were received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Premier Spg and Wvg Mills Pvt Ltd
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FAX:	91-422-3060188
E-Mail:	mail@premill.in
URL:	www.premiermills.com
Represented by:	D. Rajendran
Title:	Managing Director
Salutation:	Mr.
Last name:	-
Middle name:	-
First name:	Rajendran
Department:	-
Mobile:	-
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Personal e-mail:	mail@premill.in

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Public funding from Annex I countries under Kyoto protocol and diversion of official development assistance is not involved in this project. The project cost is met by the project participants by own sources and in part by the debt finance from banks and financial institutions.

Annex 3

BASELINE INFORMATION

Baseline information is demonstrated in detail in the section B.3, B.6

Annex 4

MONITORING INFORMATION

Demonstrated in the section B.7.1 and B.7.2 of this PDD.
