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:

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Fuel Free Electricity to Grid

Version 06

30/11/2007

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

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The project activity involves the effective utilization of the available wind energy to generate electricity by the installation of Wind Energy Generators (WEGs). The purpose of the project activity is to generate electricity using the fossil fuel free and emission free wind energy and contribute towards mitigation of greenhouse gas effects.

The project activity comprises of 22 WEGs of various capacities which are located in two districts of Tamil Nadu State, India. The total rated power generation capacity of the project activity is 14.96 MW. The WEGs are expected to generate around 32.53 Million kWhs of electricity per year and displace an equivalent quantity of electricity from the southern regional power grid of India. The WEGs are owned by different promoter entities of which Khivraj Motors Private Limited (KMPL) will act as the CDM project participant. The promoters have ventured into the wind power generation as a strategy of business diversification and contribution to sustainable development. Consideration of Clean Development Mechanism (CDM) incentives as a revenue source has helped the promoters to successfully implement the wind power project activity.

Thermal power plants are considered to be well suited to the Indian conditions since it proves to be economical and for years to come thermal power plants are expected to be the primary option to meet the ever growing energy demand. Therefore the grid is likely to remain an emission intensive source of electricity generation. In the absence of this CDM project activity the growing energy demand would have been met by adopting conventional thermal power plant which would have resulted in the emission of CO_2 from the combustion of fossil fuels.

View of project participants on the contribution of the project activity to sustainable development:

Socio-Economic:

The construction of any wind farm represents a significant investment often in relatively remote rural location.

- The project activity which has been commissioned has contributed to improving the condition of the existing roads and better connectivity to nearby villages.
- The local population residing in and around the project activity area has been benefited by the employment opportunities and the migration of the local population from villages to the urban areas has been brought down to a smaller extent as a result of this project activity.
- The economic well being of the area has been greatly influenced by direct and in-direct businesses opportunities created by this wind farms.
- The presence of wind farms in the area has directly benefited the local agricultural community by improving irrigation as a result of better power availability in the region.

Environmental:

- There is a low potential for damage to human health during the operational life time period of the WEGs.
- The wind turbines life cycle impacts are relatively low since there are no long term environmental effects, such as hazardous waste disposal or noxious emissions.
- The project activity displaces the GHG and other emissions which would otherwise have been produced by a power station burning fossil fuel and thereby reducing the adverse effects on environment.
- Above all wind is one of the cleanest sources of renewable energy available.

A.3. Project participants:

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Name of Party involved ((host indicates a host party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	Khivraj Motors Private Limited	No

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

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

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A.4.1.1. Host Party(ies):

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Country: India

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

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State: Tamil Nadu

A.4.1.3. City/Town/Community etc:

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Districts: Tirunelveli and Erode.

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

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The project activity WEG sites are located at Karunkulam, Panagudi and Thandiyarkulam villages of Tirunelveli district and Chinnaputhur village of Erode district. The detailed location details of each WEGs are provided in table A.1 below. The project activity is located at latitude 8.44' N and longitude 77.44' E in the Tirunelveli district and latitude 11.20' N and longitude 77.46' in Erode district. The nearest railway station for Karunkulam, Panagudi and Thandiarkulam is at Tirunelveli and nearest airport is at Trivandrum which is 100 kilometers away. The nearest railway station to Chinnaputhur is at Erode and nearest operational airport is at Coimbatore, which is 90 kilometres away from Erode.

Figure A.1 Location of the project activity

Table A.1

List of WEGs and location details[1]					
Sl No.	Capacity of WEG	No. of WEG's	Location	HT SC No	SF. No.
1	950 kW	1	Karunkulam	517	713/1
2	950 kW	1	Karunkulam	531	688/1 A
3	800 kW	1	Keelaveeranam	1737	1/1 & 1/2
4	600 kW	1	Panagudi	854	1261/2B
5	600 kW	1	Panagudi	860	1417/1
6	600 kW	1	Thandiyarkulam	728	289/1 & 2B
7	600 kW	1	Thandiyarkulam	737	427/3B
8	600 kW	1	Thandiyarkulam	779	437/2
9	600 kW	1	Thandiyarkulam	739	432/4 A1
10	600 kW	1	Panagudi	861	1431/1B2B,2
11	330 kW	1	Chinnaputhur (E[2])	1188	328/1 (P)
12	330 kW	1	Chinnaputhur (E)	1147	328/4 (P)
13	800 kW	1	Keelaveeranam	1757	535/2
14	800 kW	1	Chinnaputhur (E)	702	534
15	800 kW	1	Chinnaputhur (E)	1179	665
16	800 kW	1	Keelaveeranam	1736	70/2,3,6,7
17	800 kW	1	Chinnaputhur (E)	712	638/4 & 639/1
18	600 kW	1	Thandiyarkulam	735	439
19	600 kW	1	Thandiyarkulam	736	440
20	800 kW	1	Keelaveeranam	1756	533/1&2, 535/1&2
21	800 kW	1	Keelaveeranam	1758	482/3
22	600 kW	1	Thandiyarkulam	734	443/2

[1] Details of ownership, energy purchasing entity and Wind farm managing entity of each WEG are provided in Annex 5

[2] E- Refers to the WEGs installed in Erode District

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

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Project Type: I- Renewable Energy Projects

Category: I.D. Renewable Electricity Generation for a Grid.

Technology:

The project promoters have installed WEGs of different capacities of two different manufacturers. The technical description of each WEG is clearly listed below:

Manufacturers	Capacity of WEG's	No. of WEG's
NEG-Micon	950 kW	2
Enercon	800 kW	8
Enercon	600 kW	10
Enercon	330 kW	2

NEG-Micon

Nominal output	950 kW
Hub Height:	55 mts
Rotor Diameter:	54.5 mts
Power Regulation	Active stall
Controller Type	Microprocessor based computer control system
No. of Blades	3
Blade Material	With lighting protection and receptor in the blade tips
Generator Type	Asynchronous
Braking	Aerodynamic brake and Mechanical brake
Yaw System	Ball bearing slewing ring with gearing and yaw brakes

Enercon WTGs

Model:	**E-33**
Rated Power	330 KW
Hub Height:	50mts
Rotor Diameter:	33.4mts
Turbine type	Gearless horizontal axis wind turbine with variable rotor speed

Pitch Control	Three synchronized blade pitch system with battery back-up
Operating range rotational speed	16.0-31.5rpm
No. of Blades	3
Blade Material	Fiberglass (reinforced epoxy) with integral lightning protection
Generator Type	Synchronous Type
Braking	3 independent Aero Brakes
Yaw System	Active through adjustment gears, friction damping
Model:	**E-40**
Rated Power	600 KW
Hub Height:	46mts
Rotor Diameter:	44mts
Turbine type	Gearless horizontal axis wind turbine with variable rotor speed
Power Regulation	Independent electromechanical pitch system for each blade
Operating rotational speed range	18.0-33.0 rpm
No. of Blades	3
Blade Material	Glass fibre reinforced Epoxy
Generator Type	Synchronous generator
Braking	Aerodynamic
Yaw System	Active yawing with 4 electric yaw drives with brake motor & friction braking
Model:	**E-48**
Rated Power	800 KW
Hub Height:	56.85mts
Rotor Diameter:	48mts
Turbine type	Gearless horizontal axis wind turbine with variable rotor speed
Power Regulation	Independent electromechanical pitch system for each blade
Operating rotational speed range	16.0-31.5rpm
No. of Blades	3

Blade Material	Glass fibre reinforced Epoxy
Generator Type	Synchronous generator
Braking	Aerodynamic
Yaw System	Active yawing with 4 electric yaw drives with brake motor and friction bearing

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

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Year	Estimate of GHG abatement (in tCO_2e)
2007- 2008	30,251
2008- 2009	30,251
2009- 2010	30,251
2010- 2011	30,251
2011- 2012	30,251
2012- 2013	30,251
2013- 2014	30,251
2014- 2015	30,251
2015- 2016	30,251
2016- 2017	30,251
Total emission reductions (tCO_2e)	**302,510**
Total number of crediting periods	Ten years
Annual average over the crediting period of emission reductions (tCO_2e)	**30,251**

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

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Public funding is not being availed for the project activity from any Annex I parties.

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

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The project activity is not a debundled component of a large project activity. The promoters KMPL has not registered a small scale project activity or applied to register another project activity:

- With the same project participants

- In the same category and technology/measures
- Whose project boundary is within 1 km of project boundary of the small scale project activity
- Registered within 2 years

SECTION B. Application of a baseline and monitoring methodology

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

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Title: "AMS I.D. Grid connected renewable electricity generation", Version 11, EB 31

Reference: http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

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

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The project activity falls under the following CDM project category:

Type I (Renewable Energy Projects) Category D (Grid connected renewable electricity generation)

Classification	Justification
Type I – Renewable Energy projects	The project activity involves generation of electricity using the wind energy, which is a renewable source.
Category 'D' – Grid connected renewable electricity generation	The project activity supplies the generated electricity to the Tamil Nadu Electricity Board (TNEB) grid.

As per Appendix B of the simplified modalities and procedures for small-scale project activities, the project activity is eligible to use the baseline calculation provided in methodology AMS I.D. The applicability to the methodology is described below:

AMS I.D Applicability conditions	Project applicability
This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.	The project activity involves wind energy generating units that supply electricity to the southern regional electricity distribution system of India that is supplied by a number of fossil fuel fired units. Hence applicability condition is satisfied.

If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component.	The project has only renewable components with a capacity of 14.96 MW (is lower than 15MW eligibility limit). Hence applicability condition satisfied.
For project activities adding renewable energy capacity, to qualify as a small scale CDM project activity, the aggregate installed capacity after adding the new units should be lower than 15 MW.	The project activity is the installation of new renewable energy capacity where currently no power generation occurs. The aggregate capacity of these units is 14.96 MW which is lower than the threshold limit of 15 MW. Rated capacities of WEGs are specified in various project documents (like purchase order and commissioning certificate).
Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	Not Applicable

Eligibility as a small-scale CDM project activity:

The table below demonstrates, following the "Simplified modalities and procedures for small-scale project activities" and its recent revisions, the eligibility of the project activity as a small-scale project activity and confirms that it will remain under the small-scale limits over the crediting period.

Criteria	Eligibility
For Type I: Demonstrate that the capacity of the project activity will not exceed 15 MW.	The project activity involves 22 WEGs of various capacities. The sum of maximum rated capacity of all the WEGs is 14.96 MW (Within the 15 MW threshold). Rated capacities of WEGs are specified in various project documents (like purchase order and commissioning certificate).

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B.3. Description of the project boundary:

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The project boundary encompasses the physical, geographical site of the renewable generation equipments. It includes the WEGs, land on which it is located and electrical equipments like transformers. Following diagrams represents the project boundary for this project activity.

Figure B.1: Overall project boundary

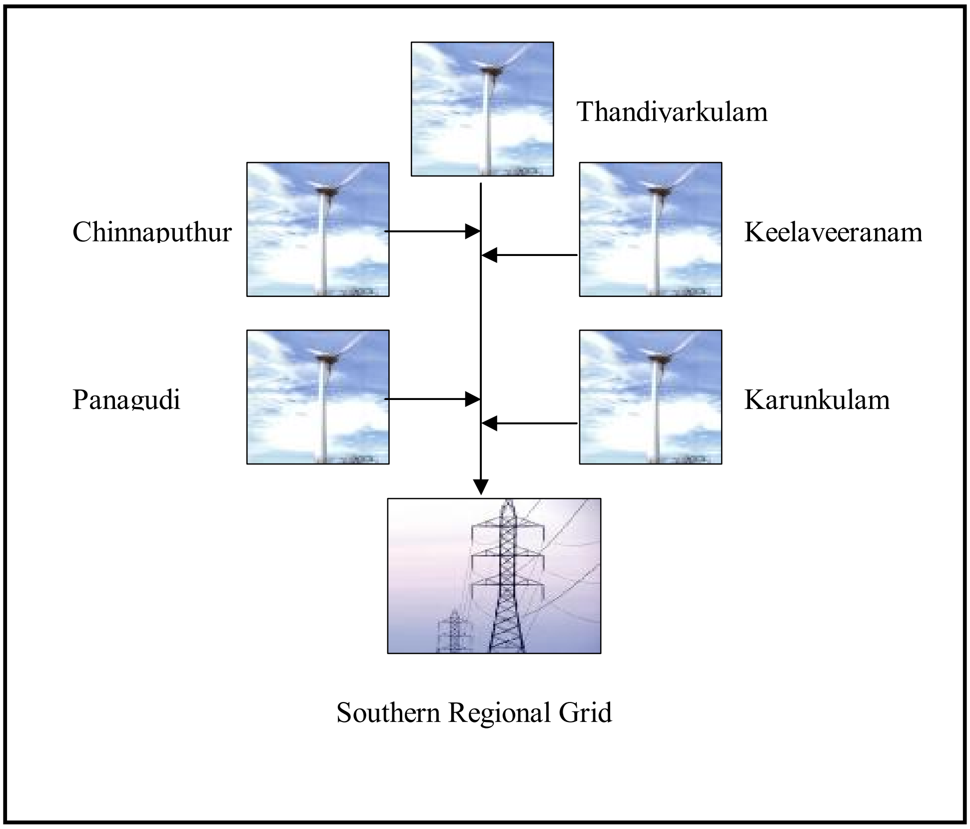
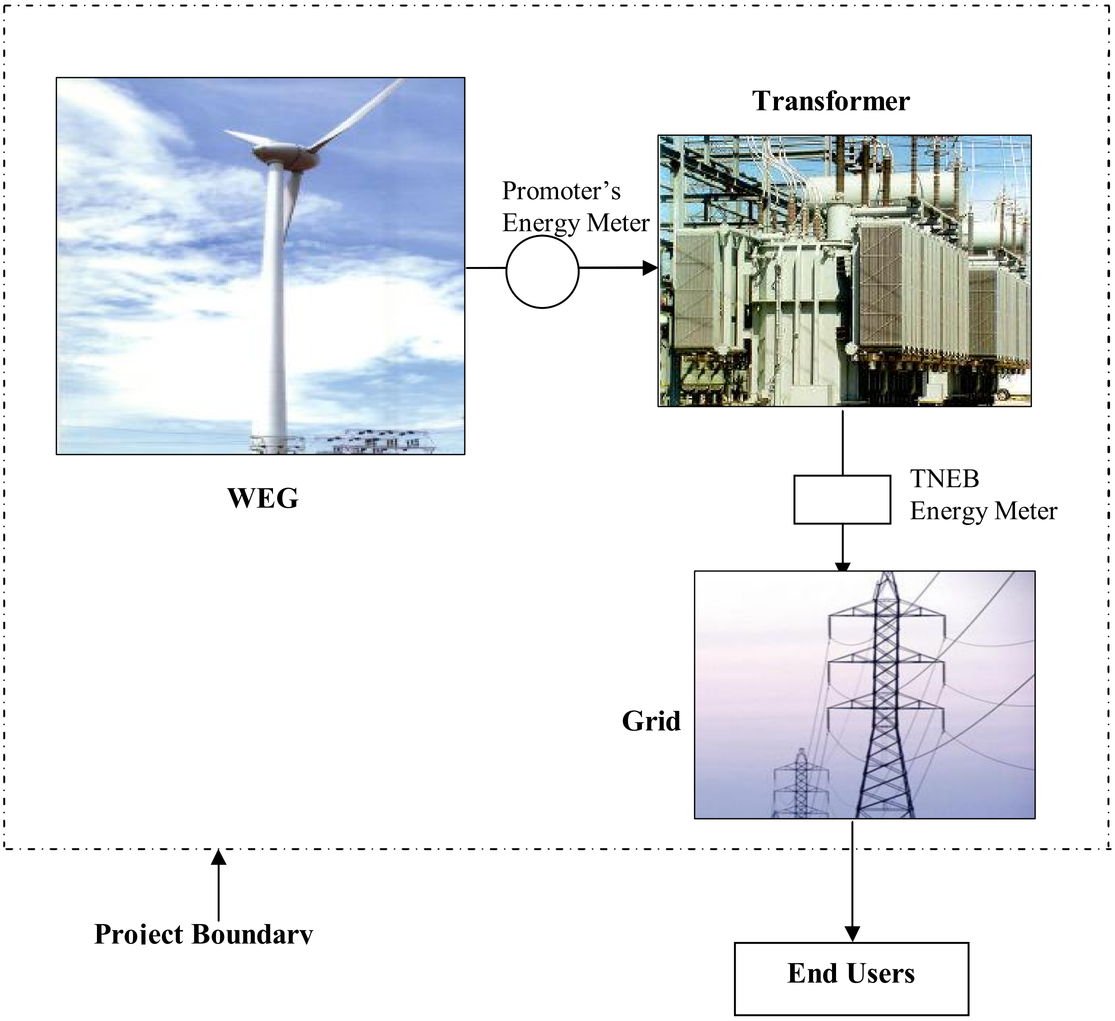


Figure B.2: Project boundary in detail



B.4. Description of baseline and its development:

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As per the methodology (AMS I.D) specified for this project category in Appendix B to simplified modalities and procedures, "The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient calculated in a transparent and conservative manner".

Whereas the kWh produced by the WEGs can be monitored directly through energy meters, the methodology AMS.I.D prescribes the calculation of emission factor as per ACM0002. The method "combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002" has been used in this document to calculate the emission factor. The operating margin and build margin values for calculation of combined margin are adopted from the latest Central Electricity Authority (CEA)'s CO_2 database. Refer section B.6.1 and Annex III for details.

The project activity displaces electricity from the TNEB grid which is part of the southern regional grid. In the absence of this CDM project activity, equivalent quantity of electricity would be generated from the southern regional grid. Hence for the calculation of baseline emission factor, all generating sources connected to the southern regional grid of India have been considered as per latest UNFCCC guidelines. Therefore the baseline for the project activity would be the product of kWh generated by the WEGs and the emission factor of the southern regional grid.

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:

In accordance with the simplified modalities and procedures for small-scale CDM project activities, it is required to demonstrate how the project activity (or the emission reduction) would not have occurred in the absence of the CDM project activity by showing that one or more barriers would have prevented its implementation. The barriers faced by the promoters in case of this wind power project activity have been described below:

Investment Barrier:

- **Economic Feasibility:**

  Economic feasibility is the major criteria for implementation of any project activity. The feasibility of setting up a wind farm at a particular location is primarily dependent on two factors that determine the financial returns from the project activity:

  a) The average annual energy generation expected at the site (The estimated annual generation at the project activity sites is 32.53 million kWhs per year)

  b) The revenue from the sale of power per kWh based on the prevailing power purchase policy

  The vital investment decision factor considered in normal business practice is that the expected rate of return from a project activity should meet the Required Rate of Return (RoR)[3]. Considering the above two parameters - 'annual expected electricity generation' and 'revenue from sale of power', financial analysis were carried out by the project promoters and Internal Rate of Return (IRR) was calculated. The expected IRR[4] (8.62% - average for all WEGs) was below the RoR (12.76 %) even at optimistic projections. This was a significant barrier to the project promoters and this meant that implementation of the project activity will result in losses to the project promoters. Under normal circumstances the project promoters would not have gone ahead with the project activity.

  However the financial attractiveness of the project activity improved when the CDM revenue from the sale of carbon credits was taken into consideration.

[3] Required Rate of Return is computed based as that rate of return required for the project activity to be economically feasible to the promoter. It is calculated as the weighted average of the cost of debt and the standard return on equity expected from wind power projects.

[4] Refer to IRR calculation sheets for detailed calculations

Post commissioning of the project activity, it was observed that over a period of wind mill's operation, the actual generation achieved was only 60-70% of the manufacturer estimated generation. The results have proven to be disappointing to the project promoter.

Every month the commitment towards the financial institutions has to be met on regular basis (monthly) by paying the interest and principal towards the acquired loan. Whether the wind mills generate the desired power or not, still the project promoter is obliged to pay the loan amount. The situation for the project promoter worsens during low wind seasons. If the same trend continues wind energy based power generation would prove to be a business risk and continuing with the operation of the project activity will not be a feasible option to the project promoter.

- **Past Experience of the promoter:**

The project promoter's experience in the field of wind power projects can be dated back to 1996 when they first installed Wind Energy Generators of 0.5 MW (2 x 0.25 MW). Project promoter experienced difficulties in the implementation of the wind power projects.

Project promoter had obtained loan sanction from a renewable energy Financing Institution (FI). However, after commencing work on the project, the project promoter was informed by the FI about hike in their interest rates. Increase in interest rates proved to be a big hurdle for project promoter and also affected the rate of returns from the project, which resulted in lower returns and this was not anticipated by the project promoter. In the usual business scenario any investment without good returns is certainly not an attractive option for any investor. The results from this venture proved to be a bitter experience to the project promoter and interest of project promoter slowly faded in wind energy sector due to above mentioned factors.

India signing Kyoto protocol in August 2002 brought in healthy changes, especially to the potential CDM projects in the renewable energy sector. The project promoter realised positive potentials of CDM, taking into consideration the positive aspects and impacts of CDM. The project promoter slowly started concentrating on improving their interest towards wind power segment once again and decided to implement more number of WEG's anticipating the returns through CDM revenue would boost the rate of return from the project activity. It also can be stated that this project activity has helped the project promoter in realising their corporate responsibility towards the society.

- **Availability of Funds:**

  The continuous growth in wind power projects in Tamil Nadu has been greatly influenced by availability of technology and also support from the government in the form of loans/subsidies. Loans and subsidies from the concerned government bodies such as IREDA, Tamil Nadu Energy Development Agency (TEDA) and interest subsidies provided by the government under the Technological Up gradation Fund Scheme (TUFS) to help the textile and jute industry for modernising infrastructure facilities. A significant factor in the increase in number of WEGs installation can be attributed to TUFS and other subsidies given by these financial institutions. However, the project promoters were not eligible for funding under TUFS and had to resort to normal debt funding with higher interest rates which has increased the WACC.

Other Barriers:

- **Grid Availability and Load Shedding:**

  The wind electricity generated cannot be stored and therefore can be utilized only if continuous power evacuation facilities are provided. The internal transmission lines, transformers, high voltage lines, and other infrastructure necessary to connect to the transmission grid are constructed by the project promoter. However, since electricity has to be wheeled through the state electricity grid, it is necessary that the grid transmission infrastructure is of sufficient capacity to evacuate the wind power generated. "A critical factor in the Wind Energy Sector in India is the availability of sub-station close-by, both to supply the power needed to start up the machines as well as to evacuate the power generated" *(Source: Renewingindia.org).*

  Though Tamil Nadu Electricity Board (TNEB) made efforts to create the necessary infrastructure, most wind farm areas were still inadequate in grid evacuation facilities. The evacuation facilities are sufficient in the non-windy months. However, during the peak windy months (May – October), when power generation is maximum, the evacuation facilities prove inadequate with the wind farms having to shut down for a few hours daily. The wind power plants are characterized with low (20-30%) plant load factors (PLF) due to the seasonal wind regimes. The limited grid availability in the peak seasons further leads to a significant drop in the inherently low PLF and results in significant financial loss. The project promoters were cognizant of such infrastructure problems that may have adverse impact on its wind farm project and was skeptical of its profitable operation. The Indian

Wind Power Association has been making several futile representations[5] to the state and central government for the improvement of infrastructure facilities. The consideration of CDM revenue has assisted the promoters in overcoming this barrier and implementing the wind power project.

Summary:

It may be noted from the above that the promoters faced prohibitive and real[6] risks that acted as barriers to investing in wind energy projects. In spite of the above barriers, the project promoters have gone ahead and taken the risk of investing in wind energy projects which is not their core area of business. The project promoters hope that in the long run the revenue through sale of carbon credits would help the wind power business to run in a sustainable manner.

In the absence of the CDM project activity, there would not be any GHG emission reduction as the grid would have continued to remain an emission intensive source of electricity. Though the Ministry of Non-conventional Energy Sources (MNES)-India has plans under which 10% of the total power generated would be from renewable sources by 2012, there is no enforced law for realizing this objective.

[5] *Sources: The Financial Express, September 1, 2005, The Hindu, Thursday, Jul 14, 2005*

[6] It may be noted that the risk of lower generation has become a reality as the actual generation is only 60 – 70% of the manufacturer guaranteed generation. The risk of "lower grid availability" is also a reality with grid non-availability running into a few hours daily during the peak wind season.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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The methodology AMS I.D states "the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient measured in (kg CO_2e/kWh) calculated in a transparent and conservative manner".

Calculation of baseline emissions (BE_y):

$BE_y = (EG_y \times BEF_y)$

Where,

BE_y	Baseline emissions in year represented in tCO_2e
EG_y	Baseline energy generation, which is equal to the electricity generated by all the WEGs constituting the project activity represented in MWh[7] per year. This parameter is monitored continuously.
BEF_y	Emission co-efficient calculated as per AMS I.D and represented in tCO_2e/MWh

Calculation of emission co-efficient (EF_y):

As described in Section B.2, the southern regional grid is considered as the baseline reference grid for the project activity and the method *"combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002."* as prescribed by AMS I.D has been adopted to calculate the baseline emission factor.

As prescribed by ACM0002, combined margin emission factor of the grid is calculated as follows:

$BEF_y = w_{OM}.EF_{OM,\, y} + w_{BM}.EF_{BM\,,\, y}$

Where,

w_{OM}	Weight of the operating margin emission factor (0.75 for wind power projects as per ACM0002, Ref: Version 06, 19th May, 2006 Pg No. 10)
$EF_{OM,\, y}$	Operating margin emission factor calculated as per ACM0002
w_{BM}	Weight of the build margin emission factor (0.25 for wind power projects as per ACM0002, Ref: Version 06, 19th May, 2006 Pg No. 10)

[7] Though the methodology prescribes representation in kWh, for ease of calculations, MWh has been used

$EF_{BM,y}$	Build margin emission factor calculated as per ACM0002
BEF_y	Combined margin baseline emission factor of the grid

Operating margin (OM):

ACM0002 provides four options for calculating OM. Option (a) "Simple OM" has been adopted here and the formula for calculating same is described below:

$$EF_{OM,y} = \sum_{i,j} F_{i,j,y} \, x \, COEF_{i,j} / \sum_{j} GEN_{j,y}$$

where,

$F_{i,j,y}$	Is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*
j	Refers to the power sources delivering electricity to the grid, excluding low-operating cost and must-run power plants, and including imports from the grid
$COEF_{i,j\,y}$	Is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and
$GEN_{j,y}$	Is the electricity (MWh) delivered to the grid by source *j*

The CO_2 emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_{i,} \, x \, EF_{CO2} xOXIDi$$

For calculations, local values of NCV_i and $EFCO_{2i}$ have been used. The *ex-ante* data vintage of 3-year average, based on the most recent statistics available at the time of PDD submission has been used for the calculation.

Build Margin:

The build margin is calculated as the weighted average emissions of recent capacity additions to the reference grid, based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The PDD has adopted *ex-ante* option for build margin calculation.

$$EF_{BM,y} = \sum_{i,m} F_{i,m,y} \, x \, COEF_{i,m} / \sum_{j} GEN_{m,y}$$

where,

$F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ - Are analogous to the variables described for the OM method above for plants *m*.

The sample group *m* consists of,

- The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Further, power plant capacity additions registered as CDM project activities have been excluded from the sample group *m* of South India Regional grid mix.

Emission Reductions (ER_y):

The emission reductions from the project activity are equal to the baseline emissions minus project emissions and Leakage. Since the project activity generates electricity from wind, which is a zero emission source, there are no associated project emissions. As per AMS I.D, leakage need not be considered since there is no transfer of energy generating equipment from another activity or transfer of existing equipment to another activity.

Therefore, emission reductions from the project activity directly equal the baseline emissions.

$$ER_y = BE_y$$

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

Data / Parameter:	$EF_{OM,y}$
Data unit:	$kgCO_2equ/kWh$
Description:	Simple Operating Margin Emission Factor for Southern Regional Grid
Source of data used:	CEA (Dated: 21/12/06)
Value applied:	1.00
Justification of the choice of data or description of measurement methods and procedures actually applied :	The values are deduced from the CEA's CO_2 Baseline Database, which are best suited to the current scenario.
Any comment:	

Data / Parameter:	$EF_{BM,y}$
Data unit:	$kgCO_2equ/kWh$
Description:	Build Margin Emission Factor for Southern Regional Grid
Source of data used:	CEA Data (Dated: 21/12/06)
Value applied:	0.72

Justification of the choice of data or description of measurement methods and procedures actually applied :	The values are deduced from the CEA's CO_2 Baseline Database, which are best suited to the current scenario.
Any comment:	

Data / Parameter:	BEF_y
Data unit:	$kgCO_2$equ/kWh
Description:	Baseline Emission Factor for Southern Regional Grid
Source of data used:	CEA Data (Dated: 21/12/06) and ACM0002
Value applied:	0.93
Justification of the choice of data or description of measurement methods and procedures actually applied :	The values are calculated using ACM0002 formula based on operating margin and build margin data from the CEA's CO_2 Baseline Database.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

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Ex-ante calculation of emission reductions (ER_y):

As per formula described in Section B.6.1, following

$ER_y = BE_y = (EG_y \times EF_y)$

$ER_y = (EG_y \times EF_y)$

$ER_y = 32528 \times 0.93 = 30251$ tCO_2e/yr

Ex-ante Estimation of Energy Generation (EGy):

Energy generation per year has been considered as 80%[8] of the estimated generation data for each WEG provided by the equipment suppliers.

Sum of estimated generation for all WEGs = 40660 MWh/yr

$EG_y = 40660 \times 80\% = 32528$ MWh/yr

Ex-ante determination of baseline emission factor (BEFy):

As per formula described in section B.6.1 above,

BEF_y = Combined margin emission factor = $w_{OM}.EF_{OM,\ y} + w_{BM}.EF_{BM\ ,\ y}$

BEFy = 0.75*1.003 + 0.25*0.72 = 0.93 tCO_2e/yr

Simple Operating Margin (OM) values for three years and Build Margin (BM) values have been directly taken from CEA database. Refer Annex 3 for details.

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[8] Arrived by applying grid availability factor, array efficiency, machine availability and internal losses on the estimated generation. Reference - TNERC Discussion Paper on Tariff Related Issues of NCES - Page 2 of Annexure I - http://tnerc.tn.nic.in/regulation/draftncestariff.pdf

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

>>

Year	Baseline emissions tCO_2e	Estimation of Project Emissions tCO_2e	Estimation of Leakage tCO_2e	Emission reductions tCO_2e
2007-08	30,251	0	0	30,251
2008-09	30,251	0	0	30,251
2009-10	30,251	0	0	30,251
2010-11	30,251	0	0	30,251
2011-12	30,251	0	0	30,251
2012-13	30,251	0	0	30,251
2013-14	30,251	0	0	30,251
2014-15	30,251	0	0	30,251
2015-16	30,251	0	0	30,251
2016-17	30,251	0	0	30,251
Total	**302,510**	**0**	**0**	**302,510**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**EG_y**
Data unit:	**MWh**
Description:	Net quantity of electricity generated by the project activity and supplied to the grid during the year y
Source of data to be used:	Monitored energy data from TNEB Energy meter will be used. Monitored data from Project Promoter (PP)'s meter would be used to cross-check TNEB data. Refer Annex 4 for details.
Value of data	32,528
Description of measurement methods and procedures to be applied:	Instrument Used : Measured continuously by TNEB energy meters and PP's energy meters Recording Frequency: Recorded monthly from TNEB energy meters. Recorded daily from PP's energy meters. Refer Annex 4 for details. Proportion of data to be monitored: 100%
QA/QC procedures to be applied:	The consistency of TNEB meter's data will be cross-checked with the PP's energy meter data. The PP's energy meters will be calibrated periodically. Refer Annex 4 for detailed procedures.
Any comment:	Net electricity generation will be calculated after deducting energy imports from the grid if any. Transmission and distribution losses from the WEG to the TNEB meter would be excluded by the energy meter and therefore transmission and distribution losses need not be separately deducted.

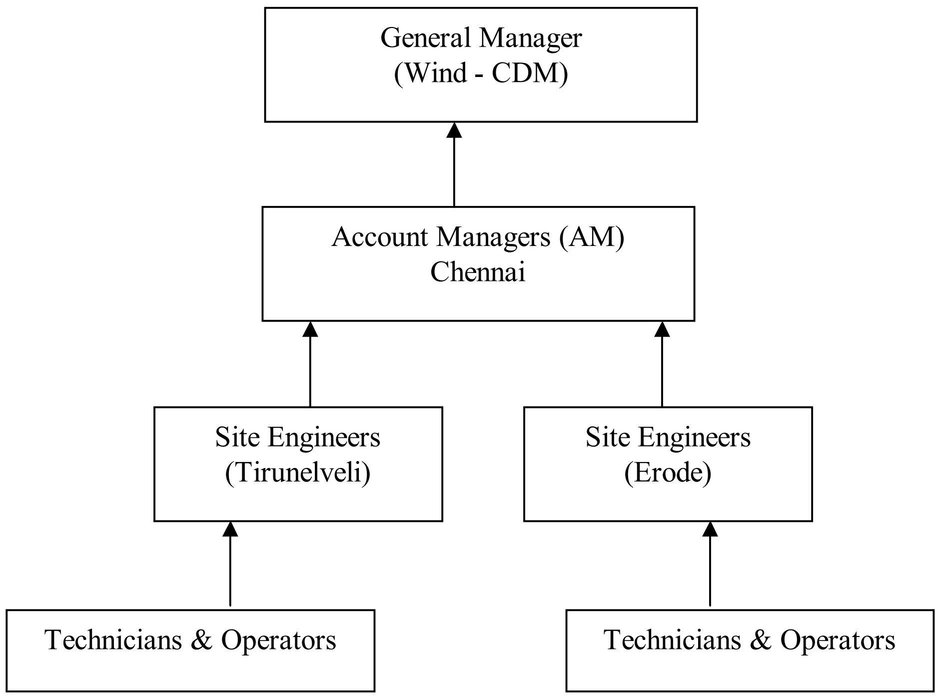
B.7.2 Description of the monitoring plan:

>>

A special CDM team has been formed to take care of the monitoring of energy generation and other aspects of the project activity. The team includes the technicians reporting to wind farm site engineers/managers at each location. The wind farm managers in turn report to the respective Account Managers (AMs) at the

administration office at Chennai. The AMs report to the Head (General Manager) – Wind Power Project. A periodic report of the generation status and Operation and Maintenance (O&M) status of the wind farm is prepared and sent to the Head for review, compilation and storage. Periodic meetings of the CDM team are held to review the performance of the project activity and plan for its sustainable operation. Refer Annex 4 for more details.

A schematic representation of the project management structure and CDM team are provided below:



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

>>

Date of completion of the baseline and monitoring methodology:

13/08/2007

Entity determining the baseline:

M/s. Khivraj Motors Private Limited

617, Anna Salai, Chennai- 600006

Tamil Nadu, India

The entity is also a project participant listed in Annex I to this document.

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:

>>
16/12/2002

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

>>
20 years 0 months

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

>>
The project promoter has opted for a fixed crediting period of ten years

C.2.1. Renewable crediting period

>>
Not applicable

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

>>
Not applicable

C.2.1.2. Length of the first crediting period:

>>
Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/10/2007 or upon registration with UNFCCC whichever is later

C.2.2.2. Length:

>>
10 years 0 months

SECTION D. Environmental impacts

>>

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

>>

The project activity does not fall under the purview of Environmental Impact Assessment notification of the Ministry of Environment and Forests (MoEF) -Government of India (Reference: Environment Impact Assessment Notification dated 27/01/1994 and its subsequent amendments).

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

Not Applicable.

SECTION E. Stakeholders' comments

>>

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

>>

The local population in the vicinity of the project activity comprises mainly of farmers and rural population, who are the major stakeholders in the project activity. The other stakeholders are the party off-taking power from the project activity as well as other parties involved in the construction, operation of the project activity. The project promoter had transmitted the information to the relevant stakeholders to obtain the necessary clearances. The stakeholders identified for the project are listed below:

- Elected body of representatives administering the local area (Village Panchayat)
- Local Residents
- Tamil Nadu Electricity Board
- Consultants
- Equipment suppliers

All the stakeholders were invited for a discussion on the project activity and the date and venue were informed to them through formal invitations. The stakeholder consultation meetings were conducted on 4/11/2006 at Sultanpet village, Coimbatore district, on 5/11/2006 at Panagudi village, Tirunelveli district and on 27/03/2007 at Chinnaputhur village, Erode district. The meetings were attended by all the stakeholders. The equipments and technology used in the project activity, prospective benefits of GHG reduction and contribution to sustainable development were appraised by the project promoter to the stakeholders through a presentation in English and in the regional language (Tamil). Detailed reports on the stakeholder consultation process including the written feedback is available and have been made available to the Designated Operational Entity (DOE) at the time of Validation.

E.2. Summary of the comments received:

>>

The consultation process was taken up in a good note by the stakeholders, which was very clearly visible during the interaction session. The queries by the stakeholders were pertaining to the environmental and social well being, which were attended and appropriate clarifications were given. The stakeholders appreciated project promoters for being instrumental in implementing the project activity and no negative comments were put forth by the stake holders. Further they have encouraged the project promoters for similar future projects.

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

>>

Since the project activity received no negative comments from the concerned stakeholders, no mitigative action was to be taken. As per UNFCCC requirement, the Project Design Document has been published at the validator's web site for public comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Khivraj Motors Private Limited
Street/P.O.Box:	617, Anna Salai,
Building:	
City:	Chennai
State/Region:	Tamil Nadu
Postfix/ZIP:	600006
Country:	India
Telephone:	+91-44-39119643
FAX:	+91-44-28293279
E-Mail:	wind@khivrajmotors.com
URL:	www.khivrajmotors.co.in
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	V
Middle Name:	
First Name:	Rajamanickam
Department:	
Mobile:	+91-9381003393
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Not Applicable since there is no public funding availed in this project activity.

Annex 3

BASELINE INFORMATION

The Central Electricity Authority (CEA) has published the baseline emission factors database for the various electricity grids in India. The emission factors have been calculated based on UNFCCC guidelines (ACM0002). For further details on the calculation methods and data used, please refer the following weblink:
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
In the CEA database, the simple operating margin, build margin and combined margin emission factors of the regional electricity grids have been provided separately for two cases; Including electricity imports and Excluding electricity imports from other regional grids. Since, emission factors excluding imports are lower, the same has been considered as a conservative approach. The below data extract from the CEA database (Table AN.3) shows the simple operating margin data for the most recent three year data vintage (shown highlighted) and the build margin data (shown highlighted).

Table AN.3: Extract from CEA CO_2 database

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE					
VERSION			**1.1**		
DATE			**21 Dec 2006**		
BASELINE METHODOLOGY			**ACM0002 / Ver 06**		
EMISSION FACTORS					
Simple Operating Margin (tCO2/MWh) (excl. Imports)					
	2000-01	2001-02	2002-03	2003-04	2004-05
North	0.98	0.98	1.00	0.99	0.97
East	1.22	1.22	1.20	1.23	1.20
South	1.02	1.00	1.00	1.01	1.00
West	0.98	1.01	0.98	0.99	1.01
North-East	0.67	0.66	0.68	0.62	0.66
India	1.02	1.02	1.02	1.03	1.03
Build Margin (tCO2/MWh) (excl. Imports)					
	2000-01	2001-02	2002-03	2003-04	2004-05
North					0.53

East					0.90
South					0.72
West					0.78
North-East					0.10
India					0.70
Combined Margin (tCO2/MWh) (excl. Imports)					
	2000-01	2001-02	2002-03	2003-04	2004-05
North	0.76	0.76	0.77	0.76	0.75
East	1.06	1.06	1.05	1.07	1.05
South	0.87	0.86	0.86	0.86	0.86
West	0.88	0.89	0.88	0.88	0.90
North-East	0.39	0.38	0.39	0.36	0.38
India	0.86	0.86	0.86	0.86	0.86

The relevant three year simple OM data for the project would be as below:

2002-03: 1.00 tCO2e/MWh

2003-04: 1.01 tCO_2e/MWh

2004-05: 1.00 tCO_2e/MWh

Average of above three years: 1.003 tCO_2e/MWh

Simple OM = 1.003 tCO_2e/MWh

Build Margin = 0.72 tCO_2e/MWh (Directly taken from above table for year 2004-05)

Combined Margin (CM):

The combined margin baseline emission factor provided in the above table for year 2004-05 is 0.86 (shown highlighted). This CM has been calculated by CEA using a weight of 0.5 for both the Operating Margin (OM) and Build Margin (BM). Though this is correct for other project activities, for wind projects, the weights are 0.75 for OM and 0.25 for BM (as per ACM0002). Therefore, the combined margin has been re-calculated for this project activity based on CEA's OM and BM data. Calculation is shown below:

Combined Margin Baseline Emission Factor:

$CM = w_{OM}.EF_{OM,\ y} + w_{BM.}EF_{BM\ ,\ y}$

Applying values in the formula,

CM = 0.75 * 1.003 + 0.25 * 0.72

CM = 0.93 tCO_2e/MWh

BEF_y = 0.93 tCO_2e/MWh

Annex 4

Monitoring Information

Parameters to be monitored and detailed monitoring procedures:

Net energy generation and export to the grid (MWh)	
Monitoring methods and procedures	This data will be measured continuously in the Project Promoter (PP)'s energy meters located at individual WEGs and also in the TNEB energy meters located at individual WEGs. The Technicians of the CDM team will record the generation data from the PP's meters on a daily basis in log books. The data from the PP's energy meter would also be directly recorded in computers through SCADA[9] network. The reading from the TNEB meter will be recorded every month by TNEB personnel in the presence of the site Engineer. TNEB will provide this monthly recorded data as a report to the project promoter. The reading in the TNEB meter would always be lower than the PP meter since the TNEB meter in located down stream of the transformer. All power transmission infrastructures downstream of the TNEB meter are part of the TNEB grid and therefore for the calculation of emission reductions, TNEB's monthly meter readings shall be considered.
QA/QC procedures	The PP's energy meter would be calibrated on a yearly basis. The monthly TNEB meter reading would be cross-checked with the PP's meter data by the Site Engineer. In case the deviation in TNEB's recorded data is beyond the allowable limits for the energy meters used, the PP would request TNEB to calibrate/rectify the meter at the earliest. For the period of error, data would be adjusted as described under "Data uncertainties and adjustments". Responsibility of calibration will be with the Site Engineer.
Reporting	The Site Engineers (SE) will review the PP's energy meter log books on a daily basis and record the data in computer. On a daily basis, a

[9] Supervisory Control and Data Acquisition system

	compilation of the energy data from each WEG would be uploaded in the O&M Contractor's website. This website data would be accessible by the CDM Accounts Manager (AM) at the respective project promoter's administration office. The AMs would take a print of the daily report from the website and file it. The AMs would prepare a monthly consolidated report of the energy meter data. The monthly consolidated report would include reading provided by TNEB's monthly report for cross-checking purposes. The AMs would forward the monthly reports in paper and electronic format to the General Manager (GM) - CDM for review and approval.
Data archiving	Once the monthly reports are approved by the GM, it would be archived in paper at the respective administrative office by the AMs. Electronic copy of monthly reports from the various AMs would be archived by the GM. Log books at the site would be archived by the Site Engineer.
Data uncertainties and adjustments	For this parameter, data uncertainties are likely during the following scenarios: • During error in meter • When meter is dismantled for O&M or calibration • When data is not recorded or records are lost Error in the meter will be usually identified during cross-checking the monthly energy reports. If an error is found in the TNEB meter, the data recorded by the PP's meter minus average transformer losses would be calculated and used for emission reduction determination for the error period. When the PP's meter is dismantled for O&M or Calibration, the reading recorded by the TNEB meter for that period would be noted and adjusted with the PP meter reading. When data or records are lost, the emission reductions would be calculated based on TNEB's monthly generation report.

Procedures for project performance reviews before data is submitted for internal audit or external verification:

The GM - CDM assisted by the Account Managers would do the project performance review every month based on the monthly consolidated CDM reports prepared by the AMs based on data provided by the O&M contractor. A comparison of the daily generation data from the PP's meter and TNEB data will be done using MS-Excel. Any discrepancy or deviations would be inspected and traced back to original records and corrective action as per the CDM protocol (above) would be done.

Procedures for internal audit and Management review:

An internal audit of the project activity would be done on a half yearly basis by a special audit team. The audit team would comprise competitive persons who would be appointed by the General Manager. The team would audit the project for the below aspects among other things:

- Are the monitoring of CDM parameters done in line with the CDM PDD and CDM Manual
- Is the documentation of monitored CDM parameters done properly
- Are equipments calibrated and maintained as scheduled
- Is the quantity of CERs generated inline with that projected in the CDM PDD? If not, what are the reasons for deviation?
- Are necessary corrective actions being taken to address deviations?
- Check the authenticity of data monitored and recorded by random cross-checking with other sources.

The audit team would submit their observations to the GM for his review and necessary action. The GM would instruct the CDM Team head to take the required corrective action if any suggested by the audit team.

Procedures for corrective actions for better future monitoring and reporting:

Errors or anomalies in the monitoring and reporting would be identified by the GM while reviewing the monthly CDM. Errors or deviations will also be identified during the half yearly internal audits. The CDM team Head (i.e., GM) would take up these matters during the half yearly CDM Team meetings (that normally would happen a few days after internal audit reports are prepared and submitted). The root cause

of these errors would be discussed and appropriate action would be taken for better future monitoring and reporting. The corrective actions may include:

- Training of monitoring personnel where required
- Replacement or repair of equipment

Procedures for training of monitoring personnel:

- An initial training would be provided by the CDM consultant to all the monitoring personnel identified. Detailed monitoring procedures for each of the CDM parameters would be elaborated.
- Subsequent to the training program, the consultant would witness the actual monitoring on site and help with any difficulties faced by the personnel.
- The CDM – Head would closely inspect the monitoring activities till the mechanism works smoothly.
- Any new person joining the team would be trained on the job by the person being replaced.

Procedures for maintenance of monitoring equipments:

- The Site Engineer would conduct a physical inspection of all the energy meters once a month
- Any maintenance requirements would be immediately attended
- The energy meters will undergo a preventive maintenance one a year
- The responsibility of maintenance will be with the Site Engineer
- Maintenance history card would be maintained for all energy meters

CDM Team meeting:

The team meets every 6 months to review the CDM performance of the plant. Any particular concerns are discussed and appropriate action is taken.

Annex 5
Details of WEGs ownership and entities using the energy generated

S.No	Capacity (kW)	Location	HTSC No	S.F. No	Owner	Lessee[10]	Energy user[11]	Baseline grid
1	950	Karunkulam	517	713/1	Khivraj Motors Pvt. Ltd	KA Infrastructure Pvt. Ltd (KAIPL)	TNEB	Southern regional grid
2	950	Karunkulam	531	688/1 A	Khivraj Motors Pvt. Ltd	KAIPL	TNEB	Southern regional grid
3	800	Keelaveeranam	1737	1/1 & 1/2	Khivraj & Co	Not leased	TNEB	Southern regional grid
4	600	Panagudi	854	1261/2B	Khivraj Motors Pvt. Ltd	KAIPL	Rane Group	Southern regional grid
5	600	Panagudi	860	1417/1	Khivraj Motors Pvt. Ltd	KAIPL	Rane Group	Southern regional grid
6	600	Thandiyarkulam	728	289/1 & 2B	Navratanmull Chordia	KAIPL	Rane Group	Southern regional grid
7	600	Thandiyarkulam	737	427/3B	Khivraj Holdings Pvt. Ltd	KAIPL	Rane Group	Southern regional grid
8	600	Thandiyarkulam	779	437/2	Khivraj Holdings Pvt. Ltd	KAIPL	Rane Group	Southern regional grid
9	600	Thandiyarkulam	739	432/4 A1	Khivraj Automobiles Pvt. Ltd	KAIPL	Rane Group	Southern regional grid
10	600	Panagudi	861	1431/1B 2B,2	Khivraj Automobiles Pvt. Ltd	KAIPL	Rane Group	Southern regional grid

[10] The Khivraj Group management created KA Infrastructure Pvt. Ltd (KAIPL) for the purpose of managing the WEGs owned by its group companies under a single entity. The WEGs owned by other Khivraj group companies have been brought under KAIPL through a lease agreement between the companies under which KAIPL is responsible for the operation, maintenance and management of the WEGs.

[11] Energy generated from some of the WEGs are directly sold to the TamilNadu State Electricity Board (TNEB) whereas generation from some of the machines are used by the Rane Group of Companies by wheeling it through the TNEB grid. For this purpose, the respective WEG owners have entered into a license agreement with the Rane Group. For enabling the wheeling and captive use of power from these machines, the Power Purchase Agreements of these machines are signed between the Rane Group and TNEB. It may be noted that Rane Group using the power generated are also located within Tamil Nadu and therefore the baseline grid is the same for all the WEGs.

11	330	Chinnaputhur (E[12])	1188	328/1	Khivraj Motor and Co.	Not Leased	Rane Group	Southern regional grid
12	330	Chinnaputhur (E)	1147	328/4	Khivraj & Co	Not Leased	Rane Group	Southern regional grid
13	800	Keelaveeranam	1757	535/2	Khivraj Motors	Not Leased	TNEB	Southern regional grid
14	800	Chinnaputhur (E)	702	534	Khivraj Motors	Not Leased	TNEB	Southern regional grid
15	800	Chinnaputhur (E)	1179	665	Texonic Instruments	Not Leased	Rane Group	Southern regional grid
16	800	Keelaveeranam	1736	70/2,3,6, 7	Texonic Instruments	Not Leased	TNEB	Southern regional grid
17	800	Chinnaputhur (E)	712	638/4	Texonic Instruments	Not Leased	Rane Group	Southern regional grid
18	600	Thandiyarkula m	735	439/2&3	Texonic Instruments	Not Leased	Rane Group	Southern regional grid
19	600	Thandiyarkula m	736	440/3B	Texonic Instruments	Not Leased	Rane Group	Southern regional grid
20	800	Keelaveeranam	1756	533/1 & 2 535/1& 2	Ramana Shetty	Not Leased	TNEB	Southern regional grid
21	800	Keelaveeranam	1758	482/3	Ramana Shetty	Not Leased	TNEB	Southern regional grid
22	600	Thandiyarkula m	734	443/2	Sidharath & Co	Not Leased	TNEB	Southern regional grid

[12] E- Refers to the WEGs installed in Erode District. The rest are located in Coimbatore district. All the WEGs are located in Tamil Nadu and are connected to the same regional electricity grid

Annex 6
IRR Summary without and with CDM revenue

Summary of IRR Calculations													
Promoter	**Khivraj Motors**	**Khivraj Motors**	**Sidharath & Co.**	**Ramana Shetty**	**Texonic**	**Texonic**	**Texonic**	**Texonic**	**KMPL**	**Khivraj Motor Co +Khivraj and Company**	**Khivraj & Co**	**Khivraj Group / Navarantmull Chordia**	**Khivraj Group**
WEG Capacity	**0.8**	**0.8**	**0.6**	**0.8**	**0.8**	**0.8**	**0.8**	**0.6**	**0.95**	**0.33**	**0.8**	**0.6**	**0.6**
Nos	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**1**	**6**
Total Capacity	**0.8**	**0.8**	**0.6**	**1.6**	**0.8**	**0.8**	**0.8**	**1.2**	**1.9**	**0.66**	**0.8**	**0.6**	**4.2**
Location	Chinnaputhur	Keelaveeranam	Thandiarkulam	Keelaveeranam	Chinnaputhur	Keelaveeranam / Nettur	Chinnaputhur	Thandiarkulam	Karunkulam	Chinnaputhur	Keelaveeranam	Panagudi, Thandiarkulam	Panagudi, Thandiarkulam
HTSC Nos	702	1757	734	1758, 1756	1179	1736	712	735, 736	517, 531	1188, 1147	1737	728	854, 860, 728, 737, 739, 779, 861
IRR Without CDM	8.09	6.61	9.31	7.51	10.06	6.57	8.9	10.32	7.65	8.33	7.22	10.18	9.68
IRR With CDM	11.49	9.71	12.86	9.76	13.11	9.68	12.11	13.78	10.82	11.2	10.48	13.52	12.76
Rate of Return	16	16	11.5	11.82	11.58	11.58	10.9	10.38	16	14.5	14.44	11.5	11.5

Appendix-1

ABBREVIATIONS

AMS	Approved Methodology for Small Scale
BEF	Baseline emission factor
BM	Build Margin
CO_2	Carbon dioxide
CER	Carbon Emission Reductions
CEA	Central Electricity Authority
CDM	Clean development mechanism
CM	Combined Margin
DOE	Designated Operational Entity
EIA	Environmental Impact Assessment
FI	Financial Institution
GHG	Green House Gas
GoI	Government of India
HT SC	High Tension Service Connection
IREDA	Indian Renewable Energy Development Agency
INR	Indian Rupees
IPCC	Inter Governmental Panel on Climate Change
IRR	Internal rate of return
kg	Kilogram
KMPL	Khivraj Motors Private Limited
kW	Kilowatt
kWh	Kilowatt Hour
MoEF	Ministry of Environment & Forest
MW	Mega watt
MWh	Megawatt hour
MT	Metric tonnes

Mts	Metres
MU	Million Units
MNES	Ministry of non-conventional energy sources
OM	Operating Margin
O & M	Operation & Maintenance
PF	Power Factor
PLF	Plant Load Factor
PPA	Power Purchase Agreement
PDD	Project design document
RPM	Revolution Per Minute
SCADA	Supervisory Control and Data Acquisition system
tCO_{2e}	Tonnes of carbon dioxide equivalent
T & D	Transmission & Distribution
TEDA	TamilNadu Energy Development Agency
TNEB	Tamil Nadu Electricity Board
TUFS	Technological Up gradation Fund Scheme
UNFCCC	United Nations Framework Convention on Climate Change
WACC	Weighted Average Cost of Capital
WEGs	Wind Electric Generators
WPP	Wind Power Project

Appendix-2

List of References

- Kyoto Protocol to the United Nations Framework Convention on Climate Change
- Website of United Nations Framework Convention on Climate Change (UNFCCC), http://unfccc.int
- UNFCCC document: Clean Development Mechanism, Simplified Project Design Document for Small Scale Project Activities (SSC-PDD), Version 02
- UNFCCC document: Simplified Modalities and Procedures for small-scale Clean Development Mechanism project activities
- Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual
- Central Electricity Authority: CO2 Baseline Database
- http://cea.nic.in
- http://envfor.nic.in
- http://mnes.nic.in