CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

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Title: Enercon Wind Farms in Karnataka Bundled Project – 33 MW
Version: 1.0
Date of completion of PDD: 15 November 2006

A.2. Description of the project activity:

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Objective of the Project

The objective is development, design, engineering, procurement, finance, construction, operation and maintenance of Enercon Wind Farm (Karnataka) Ltd 21 MW and other wind power projects of 12 MW capacity ("Project") in the Indian state of Karnataka to provide reliable, renewable power to the Karnataka state electricity grid which is part of the Southern regional electricity grid. The Project will lead to reduced greenhouse gas emissions because it displaces electricity from fossil fuel based electricity generation plants.

Nature of Project

The Project harnesses renewable resources in the region, and thereby displacing non-renewable natural resources thereby ultimately leading to sustainable economic and environmental development. Enercon (India) Ltd ("Enercon") will be the equipment supplier and the operations and maintenance contractor for the Project. The generated electricity will be supplied to Karnataka Power Transmission Company Ltd ("KPTCL")/ Bangalore Electricity Supply Company Ltd ("BESCOM") under a long-term power purchase agreement (PPA). Enercon Wind Farm (Karnataka) Ltd is is owned by Enercon (India) Ltd and Enercon GmbH and the rest of the projects are owned by Enercon's customers. The details of the projects are as under:

1. CEPCO Industries: 1.20 MW
2. Siddaganga Oil Extractions Ltd.: 1.20 MW
3. Shreyalaxmi properties: 0.6 MW
4. Associated Autotex Ancillaries P Ltd: 1.2 MW
5. Good Luck Syndicate: 0.6 MW
6. Deffree Engineering P Ltd: 0.6 MW
7. VXL Systems: 0.6 MW
8. Reliance: 1.80 MW
9. Siddaganga Oil Extractions Ltd.: 1.20 MW
10. Panama Business Centre: 0.60 MW
11. Panama Credit and Capital Pvt. Ltd.: 0.60 MW
12. Shilpa Medicare Ltd.: 0.60 MW
13. Supreme Power company: 0.60 MW
14. Royal Energy Company: 0.60 MW
15. Enercon Wind Farm (Karnataka) Ltd: 21.00 MW

Contribution to sustainable development

The Project meets several sustainable development objectives including:

- contribution towards the policy objectives of Government of India and Government of Karnataka of incremental capacity from renewable sources;
- contribution towards meeting the electricity deficit in Karnataka;
- CO_2 abatement and reduction of greenhouse gas emissions through development of renewable technology;
- reducing the average emission intensity (SO_x, NO_x, PM, etc.), average effluent intensity and average solid waste intensity of power generation in the system;
- conserving natural resources including land, forests, minerals, water and ecosystems; and
- developing the local economy and create jobs and employment, particularly in rural areas, which is a priority concern for the Government of India;

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)
Government of India (Host)	Enercon (India) Ltd	No
Government of Japan	Japan Carbon Finance	No

The contact details of the entities are provided in Annex – 1. All the projects have authorized Enercon (India) Ltd to take them through the CDM process.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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The host party to the project activity is the Government of India.

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

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The Project is located in the State of Karnataka that forms part of the Southern regional electricity grid of India.

A.4.1.3. City/Town/Community etc:

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Sub-projects No. 1 to 7 are located in village Elladakere and sub-Projects 8 to 14 are located in Gundikere, Budipura , Gulihoshahalli , Kumminaghatta , Horakeredevarapura, Matthighatta and Thalya villages while sub-Project No. 15 , Enercon Wind Farm (Karnataka) Ltd is located in Doddapura, Yarehalli, Thekalavatti and Kolahalu villages. All the sub-projects are located in Chitradurga district falling under the Jogimatti wind Zone, of Karnataka state in India.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

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For sub-projects 1 to 7 , the project area extends between latitude 13^o 45' & 13^o 58' North and longitude 76^o 29' & 76^o 31' East. These sub-projects are connected to the Mathod 66/11 kV KPTCL sub-station.

For sub-projects 8 to 14, the project area extends between latitude 13^o 58' & 14^o 02' North and longitude 76^o 17' & 76^o 20' East. These sub-projects are connected to the Ramgiri 66/11 kV KPTCL sub-station.

For sub-project 15 , the project area extends between latitude 14^o 03' & 14^o 06' North and longitude 76^o 21' & 76^o 26' East. The sub-project is connected to the Pandrahalli 66/11 kV KPTCL sub-station.

The sites are located at a distance of 200 km from Bangalore by road. The nearest railway station is at Bangalore. A location map is attached at Appendix – 1.

A.4.2. Category(ies) of project activity:

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The project activity is considered under CDM category zero-emissions **'grid-connected electricity generation from renewable sources'** that generates electricity in excess of 15 MW (limit for small scale project). Therefore as per the scope of the project activity enlisted in the 'list of sectoral scopes and related approved baseline and monitoring methodologies (version 02 Mar 05/07:23)', the project activity may principally be categorized in Scope Number 1, Sectoral Scope - Energy industries (renewable/ non-renewable sources).

A.4.3. Technology to be employed by the project activity:

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The Project involves 55 wind energy converters (WECs) of Enercon make (600 kW E-40) with internal electrical lines connecting the Project with local evacuation facility. The WECs generates 3-phase power at 400V, which is stepped up to 33 KV. The Project can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The other salient features of the state-of-art-technology are:

- Gearless Construction - Rotor & Generator Mounted on same shaft eliminating the Gearbox.
- Variable speed function – has the speed range of 18 to 33 RPM thereby ensuring optimum efficiency at all times.
- Variable Pitch functions ensuring maximum energy capture.
- Near Unity Power Factor at all times.
- Minimum drawl (less than 1% of kWh generated) of Reactive Power from the grid.
- No voltage peaks at any time.
- Operating range of the WEC with voltage fluctuation of -20 to +20%.
- Less Wear & Tear since the system eliminates mechanical brake, which are not needed due to low speed generator which runs at maximum speed of 33 rpm and uses Air Brakes.

- Three Independent Braking System.
- Generator achieving rated output at only 33 rpm.
- Incorporates lightning protection system, which includes blades.
- Starts Generation of power at wind speed of 3 m/s.

Enercon (India) Ltd has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH, has established a manufacturing plant at Daman in India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

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Crediting Period for the Project: fixed for 10 years

Years	Annual estimation of emission reductions in tonnes of CO2e
2008	79,473
2009	79,473
2010	79,473
2011	79,473
2012	79,473
2013	79,473
2014	79,473
2015	79,473
2016	79,473
2017	79,473
Total estimated reductions (tonnes of CO2e)	794,730
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	79,473

A.4.5. Public funding of the project activity:

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There is no ODA financing involved in the Project.

SECTION B. Application of a baseline and monitoring methodology

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

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The approved consolidated baseline and monitoring methodology **ACM0002 Version 6.0** (19 May 2006) has been used. The titles of these baseline and monitoring methodologies are "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" and "Consolidated monitoring methodology for grid-connected electricity generation from renewable sources.

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

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The Project is wind based renewable energy source, zero emission power project connected to the Karnataka state grid, which forms part of the Southern regional electricity grid. The Project will displace fossil fuel based electricity generation that would have otherwise been provided by the operation and expansion of the fossil fuel based power plants in Southern regional electricity grid.

The approved consolidated baseline and monitoring methodology ACM0002 Version 6 is the choice of the baseline and monitoring methodology and it is applicable because:

- the Project is grid connected renewable power generation project activity
- the Project represents electricity capacity additions from wind sources
- the Project does not involve switching from fossil fuel to renewable energy at the site of project activity since the Project is green-field electricity generation capacities from wind sources at sites where there was no electricity generation source prior to the Project, and
- the geographical and system boundaries of the Southern electricity grid can be clearly identified and information on the characteristics of the grid is available.

B.3. Description of the sources and gases included in the project boundary

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The project boundary encompasses the physical, geographical site of the Project sited at the Project Location. It would include the wind turbine installations and sub-station up to the Metering Point.

According to ACM0002, for the baseline emission factor, the spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The Indian electricity system is divided into five regional grids, viz. Northern, Eastern, Western, Southern, and North-Eastern. Each grid covers several states. As the regional grids are interconnected, there is inter-state and inter-regional exchange. A small power exchange also takes place with neighbouring countries like Bhutan and Nepal.

Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state in a regional grid meets its demand with its own generation facilities and also with allocation from power plants owned by the Central Sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the Central Sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus, represents the "project electricity system" for the

Project. As the Project is connected to the Southern regional electricity grid, the Southern grid is the "project electricity system".

Grid connected captive power plants have not been included because adequate detail of data (for example, fuel consumption) is not available. In addition, data on certain utility power plants was not available and these were excluded from the project electricity system. Even though data on individual renewable energy projects is not available, they have been included using appropriate assumptions.

	Source	Gas	Included?	Justification/ Explanation
Baseline	Electricity generation from power plants connected to the Southern Grid	CO_2	Included	Main emission source
		CH_4	Excluded	This source is not required to be estimated for wind energy projects under ACM0002
		N_2O	Excluded	This source is not required to be estimated for wind energy projects under ACM0002
Project Activity	Electricity generation from the Project	CO_2	Excluded	Wind energy generation does not have any direct GHG emissions.
		CH_4	Excluded	
		N_2O	Excluded	

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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According to ACM0002, for project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the following:

Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described below.

As the Project does not modify or retrofit an existing generation facility, the baseline scenario is the emissions generated by the operation of grid-connected power plants and by the addition of new generation sources. This is estimated using calculation of Combined Margin multiplied by electricity delivered to the grid by the Project.

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 CDM project activity (assessment and demonstration of additionality): >>

Step 0: Preliminary screening based on the starting date of the project activity

If project participants wish to have the crediting period starting prior to the registration of their project activity, they shall:

a) Provide evidence that the starting date of the CDM project activity falls between 1 January 2000 and the date of the registration of a first CDM project activity, bearing in mind that only CDM project

activities submitted for registration before 31 December 2005 may claim for a crediting period starting before the date of registration.

b) Provide evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity. This evidence shall be based on (preferably official, legal and/or other corporate) documentation that was available at, or prior to, the start of the project activity.

The Project start date is prior to the date of validation of the PDD. The Power Purchase Agreements of all the sub-projects contain clauses on sharing of CDM benefits between KPTCL and the sub-projects. This evidence will be shown to the validator.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

1. Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity. These alternatives are to include:

- The proposed project activity not undertaken as a CDM project activity;
- All other plausible and credible alternatives to the project activity that deliver outputs and on services (e.g. electricity, heat or cement) with comparable quality, properties and application areas;
- If applicable, continuation of the current situation (no project activity or other alternatives undertaken).

Alternative(s) available to the project participants or similar project developers include:

(a) The Project is not undertaken as a CDM project activity.

(b) Setting up of comparable utility scale fossil fuel fired or hydro power projects that supply to the Karnataka grid under a PPA.

(c) Continuation of the current situation where no project activity or any of the above Alternatives are undertaken would not be applicable as Karnataka had energy (MU) shortages of 0.7% and peak (MW) shortages of 9.8% in 2005-06 (Source: Southern Region Power Sector Profile, August 2006, Ministry of Power).

Sub-step 1b. Enforcement of applicable laws and regulations

2. The alternative(s) shall be in compliance with all applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. This sub-step does not consider national and local policies that do not have legally-binding status.

3. If an alternative does not comply with all applicable legislation and regulations, then show that, based on an examination of current practice in the country or region in which the law or regulation applies, those applicable legal or regulatory requirements are systematically not enforced and that non-compliance with those requirements is widespread in the country. If this cannot be shown, then eliminate the alternative from further consideration.

4. If the proposed project activity is the only alternative amongst the ones considered by the project participants that is in compliance with all regulations with which there is general compliance, then the proposed CDM project activity is not additional.

There are no legal and regulatory requirements that prevent Alternatives (a) and (b) from occurring.

Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis). (Project participants may also select to complete both steps 2 and 3.)

Step 2: Investment Analysis

Determine whether the proposed project activity is the economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, use the following sub-steps:

Sub-step 2a. - Determine appropriate analysis method

1. Determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis (sub-step 2b). If the CDM project activity generates no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III).

Sub-step 2b. – Option I. Apply simple cost analysis

2. Document the costs associated with the CDM project activity and demonstrate that the activity produces no economic benefits other than CDM related income.

Sub-step 2b. – Option II. Apply investment comparison analysis

3. Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service (e.g., levelized cost of electricity production in $/kWh or levelized cost of delivered heat in $/GJ) most suitable for the project type and decision-making context.

Sub-step 2b. – Option III. Apply benchmark analysis

4. Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service (e.g., levelized cost of electricity production in $/kWh or levelized cost of delivered heat in $/GJ) most suitable for the project type and decision context.

Option I – Simple cost analysis is not applicable as the project activity sells electricity to the grid and obtains economic benefits in the form of electricity tariffs.

Enercon proposes to use **Option II – Investment comparison analysis** and the financial indicator that is identified is the post-tax return on equity or the equity IRR.

The post tax return on equity and equity IRR is used as the appropriate financial indicator because in the Indian power sector, a 14% post tax return on equity is an established benchmark for projects in public or private sector based on cost-plus regulations (Source: Central Electricity Regulatory Commission, Terms and Conditions of Tariff, Regulations 2004 dated 26 March 2004) for utility scale power plants (similar to Alternative (b)). Incentives, foreign exchange variations and efficiency in operations are in addition to this benchmark of 14%.

For determining the tariffs for wind power projects, the electricity regulatory commissions of the state of Rajasthan and Gujarat have considered the return on equity at 14% while the electricity regulatory commissions of the state of Madhya Pradesh, Maharashtra and Karnataka have considered the return on equity at 16%. (Source: RERC Order dated 29 September 2006).

There are some essential differences between the Project (whether implemented with or without CDM revenues) and the Alternatives identified in Sub-step 1(b) (utility scale fossil fuel and hydro projects). These should be taken into account while setting the appropriate level of equity IRR.

- The project activity tariff structure is a single-part tariff structure as compared to utility scale fossil fuel and hydro projects, which have two-part tariff structure. This implies that project activity carries a higher investment risk than the utility scale fossil fuel and hydro projects (Alternative (b)) where the investment recovery is decoupled from the level of actual generation achieved by the project due to variations in offtake.

  Thus, in case of the project activity, issues such as transmission unavailability, back-down of generation or part-load operations, which are beyond the control of the investors are likely to affect the project activity more severely and therefore the project activity investors would require higher rate of return to compensate them for these additional risks.

- In case of utility scale fossil fuel and hydro projects (Alternative (b)), these are by reference to cost-plus approach whereby the projects recover their full investment cost each year if they are able to reach specified level of plant availability. In case of the Project, it does not recover its full investment cost in the initial years as the tariffs are back-loaded. This increases the investment risks in the project activity compared to the alternatives.

Based on the above considerations, 16% post-tax equity IRR is considered to be the appropriate post-tax equity return. If the Project has a post-tax equity IRR of less than 16%, then it can be considered to be additional.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III):

5. Calculate the suitable financial indicator for the proposed CDM project activity and, in the case of Option II above, for the other alternatives. Include all relevant costs (including, for example, the investment cost, the operations and maintenance costs), and revenues (excluding CER revenues, but including subsidies/fiscal incentives where applicable), and, as appropriate, non-market cost and benefits in the case of public investors.

6. Present the investment analysis in a transparent manner and provide all the relevant assumptions in the CDM-PDD, so that a reader can reproduce the analysis and obtain the same results. Clearly present critical techno-economic parameters and assumptions (such as capital costs, fuel prices, lifetimes, and discount rate or cost of capital). Justify and/or cite assumptions in a manner that can be validated by the DOE. In calculating the financial indicator, the project's risks can be included through the cash flow pattern, subject to project-specific expectations and assumptions (e.g. insurance premiums can be used in the calculation to reflect specific risk equivalents).

7. Assumptions and input data for the investment analysis shall not differ across the project activity and its alternatives, unless differences can be well substantiated.

8. Present in the CDM-PDD submitted for validation a clear comparison of the financial indicator for the proposed CDM activity and:

   (a) The alternatives, if Option II (investment comparison analysis) is used. If one of the other alternatives has the best indicator (e.g. highest IRR), then the CDM project activity can not be considered as the most financially attractive;

(b) The financial benchmark, if Option III (benchmark analysis) is used. If the CDM project activity has a less favourable indicator (e.g. lower IRR) than the benchmark, then the CDM project activity cannot be considered as financially attractive.

The key assumptions used for calculating the benchmark (post-tax equity IRR) are set out below. This has been done for the 21 MW Enercon Wind Farm (Karnataka) Ltd which is executed through a Special Purpose Vehicle (SPV) and thus brings out transparently the equity IRR:

Capacity of Machines in kW	600
Number of Machines	35
Project Capacity in MW	21.00
Project Commissioning Date	1-Jul-03
Project Cost per MW (Rs. In Millions)	52.4

Operations	
Plant Load Factor	26.5%
Insurance Charges @ % of capital cost	0.18%
Operation & Maintanance Cost base year @ % of capital cost	1.25%
% of escalation per annum on O & M Charges	5.0%

Tariff	
Base year Tariff for 10 years - Rs./Kwh	3.25
Annual Escalation (Rs./kWh per Year)	0.06
Tariff applicable after 10 years (Rs/kWh)	Cost plus 16% return on equity

Project Cost	Rs Million
Land and Infrastructure, Generator & Electrical Equipments, Mechanical Equipments, Civil Works, Instrumentation & Control, Other Project Cost, Pre operative Expenses, etc.	
Total Project Cost	1,100

Means of Finance		Rs Million
Own Source	30%	330
Term Loan	70%	770
Total Source		1,100
Terms of Loan		
Interest Rate	8.50%	
Tenure	10	Years
Moratorium	6	Months

Income Tax Depreciation Rate (Written Down Value basis)	
on Wind Energy Generators	80%
On other Assets	10%
Book Depreciation Rate (Straight Line Method basis)	
On all assets	7.86%
Book Depreciation up to (% of asset value)	90%

Income Tax	
Income Tax rate	30%
Minimum Alternate Tax	10%
Surcharge	10%
Cess	2%

Working capital	
Receivables (no of days)	45
O & m expenses (no of days)	30
Working capital interest rate	12%

CER Revenues	
CER Price in US$	-
Exchange rate Rs./US$*	45.34

* RBI reference rate as of 15 November 2006

Crediting period starts	1-Apr-07
Length of Crediting period	10

Baseline Emission Factor for Southern Region (tCO2/GWh)	1037.43

The equity IRR for the Project without CDM revenues is 9.9%. The equity IRR is 11.9% after considering CDM revenues.

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

9. Include a sensitivity analysis that shows whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favor of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially attractive (as per step 2c para 8a) or is unlikely to be financially attractive (as per step 2c para 8b).

Sensitivity analysis of the Equity IRR to the Plant Load Factor (the most critical assumption) has been carried out considering a plant load factor of 23% and 28% (the range indicated in KERC Order dated 18

January 2005). Plant Load Factor is the key variable encompassing variation in wind profile, variation in off-take (including grid availability) including machine downtime. The post tax Equity IRRs at the stated PLFs are as follows:

	PLF at 23%	PLF at 28%
Post tax Equity IRR without CER revenues	5.8%	11.9%
Post tax Equity IRR with CER revenues	7.5%	13.9%

As can be seen from above, the Project is not the most financially attractive (as per step 2c para 8a) we proceed to Step 4 (Common practice analysis).

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

1. Provide an analysis of any other activities implemented previously or currently underway that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities are not to be included in this analysis. Provide quantitative information where relevant.

Sub-step 4b. Discuss any similar options that are occurring:

2. If similar activities are widely observed and commonly carried out, it calls into question the claim that the proposed project activity is financially unattractive (as contended in Step 2) or faces barriers (as contended in Step 3). Therefore, if similar activities are identified above, then it is necessary to demonstrate why the existence of these activities does not contradict the claim that the proposed project activity is financially unattractive or subject to barriers. This can be done by comparing the proposed project activity to the other similar activities, and pointing out and explaining essential distinctions between them that explain why the similar activities enjoyed certain benefits that rendered it financially attractive (e.g., subsidies or other financial flows) or did not face the barriers to which the proposed project activity is subject.
3. Essential distinctions may include a serious change in circumstances under which the proposed CDM project activity will be implemented when compared to circumstances under which similar projects where carried out. For example, new barriers may have arisen, or promotional policies may have ended, leading to a situation in which the proposed CDM project activity would not be implemented without the incentive provided by the CDM. The change must be fundamental and verifiable.

We analyze the extent to which wind energy projects have diffused in the electricity sector in Karnataka. In 2004 – 05, wind electricity generation was 485.57 GWh and the total electricity availability at bus-bar in the state of Karnataka was 33523.92 GWh (Source: CEA General Review 2006). This works out to 1.45%, showing that wind energy power generation is insignificant as compared to other power project generation sources in Karnataka.

Installed capacity of wind energy generation sources stood at 276 MW as of 31 March 2005 (Source: CEA General Review 2006). There are approximately 201 MW wind energy projects that are currently in the CDM pipeline (UNFCCC website) and more are expected to follow.

Clearly, wind power project development in Karnataka is insignificant when compared to the power sector of Karnataka. Further, wind power project development is substantially dependent on CDM mechanism and thus is not common practice.

Sub-steps 4a and 4b are satisfied.

Step 5. Impact of CDM registration

Explain how the approval and registration of the project activity as a CDM activity, and the attendant benefits and incentives derived from the project activity, will alleviate the economic and financial hurdles (Step 2) or other identified barriers (Step 3) and thus enable the project activity to be undertaken.

Registering the project activity as a CDM activity provides a significant amount of revenue, improving the project's cash flow and improving the equity IRR by 2%. The revenues from sale of the Certified Emission Reductions would enhance the viability of the project and would partially offset the risks associated with the possible changes in policy, wind regime, project implementation risks (time and cost overruns), etc. Further, CER revenues will be high quality cash flows coming from creditworthy parties and denominated in foreign currency. The CDM revenues will attract new players to wind investments in Karnataka, as they provide compensation for the regulatory and project risks implicit in the wind power projects.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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According to the approved baseline methodology ACM0002, the emission reductions ***ERy*** by the project activity during a given year "*y*[1]" is

ERy = BEy – PEy – Ly……..(1)

where *EGy* is the electricity supplied to the grid, *EFy* is the CO_2 emission factor of the grid and Ly is the amount of emissions leakage resulting from the project activity.

Baseline Emissions for the amount of electricity supplied by project activity, *BEy* is calculated as

BEy = EGy * EFy ……..(2)

where *EGy* is the electricity supplied to the grid, *EFy* is the CO_2 emission factor of the grid as calculated below.

[1] Throughout the document, the suffix *y* denotes that such parameter is a function of the year y, thus to be monitored at least annually.

The emission factor *EFy* of the grid is represented as a combination of the Operating Margin (OM) and the Build Margin (BM). Considering the emission factors for these two margins as $EF_{OM,y}$ and $EF_{BM,y}$, then the *EFy* is given by:

$$EFy = w_{OM} * EF_{OM,y} + w_{BM} * EF_{BM,y} \quad \text{.....(2)}$$

with respective weight factors w_{OM} and w_{BM} (where $w_{OM} + w_{BM} = 1$).

The Operating Margin emission factor

As per ACM0002, dispatch data analysis should be the first methodological choice. However, this option is not selected because the information required to calculate OM based on dispatch data is not available in the public domain for the Southern electricity regional grid.

The Simple Operating Margin approach has been used to calculate the Operating Margin emission factor applicable in this case. As per ACM 0002 the Simple OM method can only be used where low cost must run resources constitute less than 50% of grid generation based on average of the five most recent years. The generation profile of the Southern grid in the last five years is as follows:

Generation in GWh	**2004-05**	**2003-04**	**2002-03**	**2001-02**	**2000-01**
Low cost/must run sources					
Hydro	24,951	16,943	18,288	26,260	29,902
Wind & Renewables	3,256	1,865	1,607	1,456	1,262
Nuclear	4,408	4,700	4,390	5,244	4,331
Other sources					
Coal	99,010	98,435	92,053	84,032	83,292
Diesel	2,434	3,295	4,379	4,155	2,868
Gas	12,428	14,214	13,950	10,331	7,132
Total Generation	**146,487**	**139,451**	**134,667**	**131,478**	**128,787**
Low cost/must run sources	32,615	23,508	24,285	32,960	35,496
Low cost/must run sources	22%	17%	18%	25%	28%

Source: Table 3.4 of CEA General Review 2004-05, 2003-04, 2002-03, 2001-02, 2000-01

From the available information it is clear that low cost/must run sources account for less than 50% of the total generation in the Southern grid in the last five years. Hence the Simple OM method has been used to calculate the Operating Margin Emission factor applicable.

Simple OM Method: *The Simple OM emission factor* $EF_{OM,y}$ is calculated as the generation-weighted average emissions per electricity unit generated (tCO_2/MWh) for all sources serving the Southern regional grid, excluding zero- or low-operating cost power plants (hydro, wind and nuclear), using the following equation:

$$EF_{OM,y} = [\sum_{i,j} Fi,j,y * COEFi,j] / [\sum_j GENj,y] \quad \text{.....(3)}$$

where *Fi,j,y* and *COEFi,j* are the fuel consumption and associated carbon coefficient of the fossil fuel *i* consumed by power plant *j* in the grid in year(s) *y*. *GENj,y* is the electricity generation by power plant *j* connected to the grid excluding zero- or low-operating cost sources in year(s) *y*.

As per ACM0002, the OM emission factor can be calculated using *ex ante* generation-weighted average of the most recent 3 years for which data is available or using *ex post* generation data in the year in which the project generation occurs. The OM emission factor is calculated using *ex ante* generation-weighted average of the most recent 3 years and hence does not require yearly monitoring of the OM emission factor.

For the purpose of determining the emission factor(s) for net electricity imports from a connected electricity system within India, the following option has been used "(c) the average emission rate of the exporting grid, if and only if net imports do not exceed 20% of total generation in the project electricity system". This has been done because the net imports to the Southern Grid from the connected electricity system (Northern, Western and Eastern regional electricity grids) do not exceed 20% and it is not appropriate to use emissions of specific plants as it is not possible to identify specific plants from which these imports take place.

The CO_2 emission coefficient $COEF_{i,j}$ is obtained as:

$$\mathbf{COEF_{i,j}} = NCV_{i,j} * EFCO_{2,i} * OXID_i \quad \text{.....(4)}$$

where:

$NCV_{i,j}$ is the net calorific value (energy content) per mass or volume unit of a fuel *i*,

$OXID_i$ is the oxidation factor of the fuel,

$EFCO_{2,i}$ is the CO2 emission factor per unit of energy of the fuel i.

Build Margin Emission Factor

The Build Margin emission factor *EF_BMy* (tCO_2/GWh) is given as the generation-weighted average emission factor of the selected representative set of recent power plants represented by the 5 most recent plants or the most recent 20% of the generating units built (summation is over such plants specified by k):

$$EF_{BM,y} = [\sum_i F_{i,m,y} * COEFi] / [\sum_k GEN_{k,m,y}] \quad \text{.....(5)}$$

The summation over *i* and *k* is for the fuels and electricity generation of the plants in sample *m* mentioned above.

The choice of method for the sample plant is the most recent 20% of the generating units built as this represents a significantly larger set of plants for a large regional electricity grid have a large number of power plants connected to it and is therefore appropriate. The calculation of the net generation for 5 most recent built and for the most recent 20% of the generation units built is shown in the calculation of Build Margin in Annex – 3.

The Build Margin is calculated on *ex ante* based on the most recent information available on power plants already built for sample group *m* at the time of the PDD preparation.

Combined Margin Emission Factor

As already mentioned, baseline emission factor (EFy) of the grid is calculated as a combined margin (CM), calculated as the weighted average of the operating margin (OM) and build margin (BM) factor. In case of wind power projects default weights of 0.75 for EF_{OM} and 0.25 for EF_{BM} are applicable as per ACM0002. No alternate weights are proposed.

Using the above mentioned formulas for calculation of operating margin and build margin emission factors and their respective weights for calculation of combined margin emission factor, the baseline carbon emission factor (CM) is 1,037.43 tCO2e/GWh or 1.03743 tCO2e/MWh.

Project Emissions:

The project activity uses wind power to generate electricity and hence the emissions from the project activity are taken as nil.

PEy = 0

Leakage:

Emissions Leakage on account of the project activity is ignored in accordance with ACM0002.

Ly = 0

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

>>

Data / Parameter:	**Net Calorific Value of Coal, Furnace Oil, HSD, Light Oil, LSHS, Lignite**
Data unit:	Terra Joules per 10^3 tons
Description:	The Net Calorific Value has been used for calculating the emission coefficients of fuels.
Source of data used:	Data published in Table 1.3 of Central Electricity Authority (CEA) General Review of Power Sector for 2004-05, 2003-04 and 2002-03 has been used for all fuels except for HSD. Calorific value of HSD is taken from data published by CEA on petroleum fuels used by GT and Diesel power plants in India in 2003-04.
Value applied:	

	2002-03	2003-04	2004-05
Coal	17.46	15.99	15.72
Furnace oil	44.91	43.40	43.68
Light oil	40.86	42.65	43.00
LSHS/HHS/HSD	44.06	43.13	43.64
Lignite	11.25	11.46	11.40
HSD	42.71	42.71	42.71

Justification of the choice of data or description of measurement methods and procedures actually applied :	As per ACM0002, wherever available, country specific Net Calorific Values should be used for calculation. Accordingly the Net Calorific Value data published by the Central Electricity Authority, Ministry of Power, Govt. of India has been used. HSD Calorific values are not published in the CEA General Review, hence the value as per CEA data on petroleum fuels used by GT and Diesel power plants in India in 2003-04 was used. This publication is only available for 2003-04 hence the 2003-04 Calorific value has been used for all three years i.e. 2002-03, 2003-04 and 2004-05.
Any comment:	

Data / Parameter:	**Net Calorific Value of Naphtha, Natural Gas**
Data unit:	Terra Joules per M.cum
Description:	The Net Calorific Value has been used for calculating the emission coefficients of Naphtha and Natural Gas.
Source of data used:	Data published by CEA on petroleum fuels used by GT and Diesel power plants in India in 2003-04.
Value applied:	

	2002-03	2003-04	2004-05
Natural Gas	34.12	34.12	34.12
Naphtha	46.89	46.89	46.89

Justification of the choice of data or description of measurement methods and procedures actually applied :	HSD Calorific values are not published in the CEA General Review, hence the value as per CEA data on petroleum fuels used by GT and Diesel power plants in India in 2003-04 was used. This publication is only available for 2003-04 hence the 2003-04 Calorific value has been used for all three years i.e. 2002-03, 2003-04 and 2004-05.
Any comment:	

Data / Parameter:	**Carbon Emission Factor**
Data unit:	Tonnes Carbon per Terra Joule
Description:	Carbon Emission Factor has been used for calculating the emission coefficients of different fuel types
Source of data used:	In case of Coal and Lignite, Carbon Emission Factor as per India's first National Communication to the UNFCCC has been used. For all other fuels, default values as per table 1-4 of Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook has been used.
Value applied:	

Coal	26.13
Furnace oil	21.10
Light oil	20.00
LSHS/HHS/HSD	20.20
Lignite	28.95
Natural Gas	15.30
Naphtha	20.00
HSD	20.20

Justification of the choice of data or description of measurement methods	As per ACM0002, wherever available, country specific values of Carbon Emission Factors should be used for calculation. Accordingly the Emission Factors data as per

and procedures actually applied :	India's first National Communication to UNFCCC has been used in case of Coal and Lignite. Country specific Emission Factors for other fuel types are not available. Hence default values as per the IPCC Guidelines have been used.
Any comment:	

Data / Parameter:	**Oxidation Factor**
Data unit:	Fraction of Carbon oxidised
Description:	Oxidation Factor has been used for calculating the emission coefficients of different fuel types
Source of data used:	Default values obtained from Table 1-6 of Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook
Value applied:	Coal: 0.98 Furnace oil: 0.99 Light oil: 0.99 LSHS/HHS: 0.99 Lignite: 0.98 Natural Gas: 1.00 Naphtha: 0.99 HSD: 0.99
Justification of the choice of data or description of measurement methods and procedures actually applied :	Only IPCC default values are available.
Any comment:	

Data / Parameter:	**Fuel Density**
Data unit:	Kgs per Ltr or Kgs per Cu.m
Description:	Fuel density of various fuels has been used for calculating the emission coefficients of the respective fuel types
Source of data used:	
Value applied:	**Fuel** / **Density (kg/Lt)** Coal: 1.00 Furnace oil: 0.93 Light oil: 0.83 LSHS: 0.83 Lignite: 1.00 Natural Gas: 1.00 HSD: 0.83 Naphtha: 0.76
Justification of the choice of data or description of measurement methods and procedures actually	Only IPCC default values are available

applied :	
Any comment:	

Data / Parameter:	**Fuel consumption by Southern grid generating sources in 2004-05, 2003-04 and 2002-03**
Data unit:	'000'MT, KL, M Cu M
Description:	Fuel consumption by generating sources have been used to calculate the total emissions from electricity generation in the Southern grid during 2004-05, 2003-04 and 2002-03
Source of data used:	Table 6.1 CEA General Review of Power Sector 2004-05, 2003-04 and 2002-03
Value applied:	

Fuel	**Units**	**2002-03**	**2003-04**	**2004-05**
Steam stations				
Coal	'000' MT	65,997	52,985	53,144
Furnace oil	KL	115,914	56,498	45,848
Light oil	KL	8,407	33,031	24,330
LSHS/HHS	KL	6,093	5,310	2,612
Lignite	'000' MT	17,738	20,755	22,121
Gas Stations				
Natural Gas	M Cu M	3,130	2,010	2,203
HSD	KL	275,122	226,981	81,254
Naphtha	KL	485,496	719,694	289,451
Diesel Stations				
LSHS	KL	-	647,451	465,220
Diesel	KL	865,938	14,903	63,039

Justification of the choice of data or description of measurement methods and procedures actually applied :	The data source, i.e. Central Electricity Authority is a Government of India organisation, which is mandated to publish such information under section 73 (i) and 73(j) of the Indian Electricity Act 2003.
Any comment:	

Data / Parameter:	**Net electricity generation by fossil fuel fired power plants in the Southern grid in 2002-03, 2003-04 and 2004-05**
Data unit:	GWh
Description:	Net electricity generation by fossil fuel fired power plants in the Southern grid has been used to calculate the average emission intensity of electricity generated in the Southern grid. This data is used as an input in the Operating margin emission factor calculation.
Source of data used:	Table 3.4 of CEA General Review of Power Sector for 2002-03, 2003-04 and 2004-05
Value applied:	

Net generation in GWh	**Steam**	**Gas**	**Diesel**
2004-05	90,726	12,007	2,363
2003-04	90,104	13,811	3,205
2002-03	84,255	13,637	4,283

Justification of the choice of data or description of measurement methods	The data source, i.e. Central Electricity Authority is a Government of India organisation, which is mandated to publish such information under section 73 (i) and

and procedures actually applied :	73(j) of the Indian Electricity Act 2003.
Any comment:	

Data / Parameter:	**Imports from other regional grids into the Southern grid in 2002-03, 2003-04 and 2004-05**
Data unit:	GWh
Description:	Electricity imports from other regional grids are used as an input into the calculation of operating margin.
Source of data used:	Table 5.8 of CEA General Review of Power Sector for 2002-03, 2003-04 and 2004-05
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data source, i.e. Central Electricity Authority is a Government of India organisation, which is mandated to publish such information under section 73 (i) and 73(j) of the Indian Electricity Act 2003.
Any comment:	

Net generation in GWh	2004-05	2003-04	2002-03
Western Region	2		116
Eastern Region	292		77
Northern Region		13	
North-eastern Region			

Data / Parameter:	**Sample group of power plants added to the Southern grid in recent times**
Data unit:	MW, GWh
Description:	The sample group of new additions to the Southern grid comprising 20% of the grid's net generation during 2004-05 have been used for calculating the build margin emission factor
Source of data used:	Table 2.8 of CEA General Review of Power Sector for 2004-05, 2003-04,2002-03,2001-02,2000-01,1999-00,1998-99,1997-98,1996-97 and 1995-96
Value applied:	Please refer Annex – 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data source, i.e. Central Electricity Authority is a Government of India organisation, which is mandated to publish such information under section 73 (i) and 73(j) of the Indian Electricity Act 2003.
Any comment:	

Data / Parameter:	**Gross electricity generation during 2004-05 by power plants considered for Build margin calculations.**
Data unit:	GWh
Description:	Net generation by the sample group of power plants has been used to arrive at the net electricity supply by these power plants to the Southern grid.

Source of data used:	– Hydro Generation data obtained from CEA Performance Review of Hydro Power Stations 2004-05 – Steam Generation data obtained from Section 2, CEA Thermal Performance Review 2004-05 – Diesel Generation data obtained from SREB Annual Report 2004-05 – In case of Gas power plants, two data sources have been used. Section 10, CEA Thermal Performance Review 2004-05 and Annexure 6 of SREB Annual Report 2004-05. Data from SREB Annual Report has been taken for plants that are not covered under the CEA Thermal Performance Review. In particular generation data for the following plants has been taken from SREB Annual Report 2004-05 – Neyvelli TPS (Zero unit) – Peddapuram CCGT – Pillaiperumalnallur GTPP – Lanco Kondapalli – Generation data for Nuclear Power plants taken from website of Nuclear Power Corporation of India, http://www.npcil.nic.in/kaigaaps.asp – Wind generation data is obtained from Table 3.4, CEA General Review 2004-05
Value applied:	Please refer Annex – 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data source, i.e. Central Electricity Authority is a Government of India organisation, which is mandated to publish such information under section 73 (i) and 73(j) of the Indian Electricity Act 2003. The Southern Regional Electricity Board is a Government of India undertaking, responsible for administration of Southern grid operations. Data from SREB Annual Report 2004-05 has been considered in respect of plants whose generation data is not available in the CEA Thermal Performance Review. Many power generating stations in India house multiple generating units (both in case of Hydro and Thermal) and in many cases unit wise generation data is not published. Therefore some times it is not possible to determine the actual amount of electricity generated by a new unit that was added in recent times. In such cases pro-rata generation depending on capacity has been used. Plant wise generation for Nuclear power units is not available in the CEA publication or SREB Annual Report. Generation data reported for the Kaiga Atomic Power station for 2004-05 on the website of Nuclear Power Corporation of India Limited, http://www.npcil.nic.in/kaigaaps.asp, has been used. Unit or project–wise generation data for wind installations is not available in the public domain. For the build margin sample for Southern region, the earliest plant was commissioned on 2 July 1999. The wind generation in the build margin for the Southern region is therefore based on the following assumptions: ▪ Additions to installed capacity of wind energy generators has been considered from 1 April 1999 to 31 March 2005. This is arrived at by subtracting the wind energy generation capacity as on 31 March 1999 (808.51 MW) from wind energy generation capacity as on 31 March 2005 (2056.7 MW). ▪ A capacity utilisation factor of 20% has been assumed. ▪ The effect of capacity additions throughout the year has been ignored. This is conservative in the scenario where there is rapid wind energy capacity addition in the last year. This gives wind energy generation of 2,187 GWh for the year 2004-05. From CEA data, the wind energy generation in Southern region is 3,079 GWh. Based on the above assumptions, this suggests that the capacity as on 31 March 1999 (808.51 MW)

	generated 892 GWh (3079 GWh – 2187 GWh) during 2004 – 05, which works out to a capacity utilisation factor of 12.6% which is conservative.
Any comment:	

Data / Parameter:	**Auxiliary consumption during 2004-05 by power plants considered for Build margin calculations.**
Data unit:	GWh
Description:	Auxiliary consumption by the sample group of power plants has been used to arrive at the net electricity supply by these power plants to the Southern grid.
Source of data used:	– Auxiliary consumption for Hydro units is considered at 0.5% as per CERC norms applicable to Surface hydro electric power generating stations with static excitation system. – Auxiliary consumption for Steam units taken from Section 11, CEA Thermal Performance Review 2004-05 – State level average auxiliary consumption of Gas and Diesel Power plants as per Table 5.5 CEA General Review 2004-05 has been used in the absence of plant specific auxiliary consumption data. – Auxiliary Consumption for Nuclear Power Plants taken as the: State average for the respective generation type from Table 5.5 CEA General Review 2004-05
Value applied:	Please refer Annex – 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data source, i.e. Central Electricity Authority is a Government of India organisation, which is mandated to publish such information under section 73 (i) and 73(j) of the Indian Electricity Act 2003. The Southern Regional Electricity Board is a Government of India undertaking, responsible for administration of Southern grid operations. Actual auxiliary consumption of Hydro power units is not available in the CEA publications. Hence the auxiliary consumption norm of 0.5% set by Central Electricity Regulatory Commission for determination of tariff for Hydro units has been used. Nuclear power in India is generated by the Government owned Nuclear Power Corporation of India Limited. Therefore the entire nuclear power generation pertains to NPCL alone. Hence the state average auxiliary consumption for Nuclear power actually refers to the auxiliary consumption rate achieved by the NPCL plant. In case of Gas and Diesel plants, plant wise data is not available. Hence the state averages (for the respective fuel type) of auxiliary consumption have been applied. Auxiliary consumption of wind considered as "Nil" as wind power generation does not involve any auxiliary consumption. This is conservative.
Any comment:	

Data / Parameter:	**Average Emission Factor for Gas plants**
Data unit:	tCO2/GWh
Description:	The Average emission factor for Gas plants is used as in input for calculation of build margin emission factor
Source of data used:	CERC's tariff Regulations dated 24 March 2004
Value applied:	

	Gas Combined Cycle (Advanced class machines)	
	Gross Heat Rate (Kcal/KWh)	1,850
	Auxiliary Consumption	3.0%
	Net Heat Rate	1,907
	Net Calorific value of fuel (Kcal/SCM)	8,150
	Net Calorific value of fuel (TJ/'000' Tons)	34.12
	Specific Fuel Consumption (SCM/KWh)	0.23
	Carbon emission factor	15.30
	Oxidation factor	0.995
	tCO2/'000' tons	1,905
	Emission Coefficient (tCO2e/GWh)	**445.73**
Justification of the choice of data or description of measurement methods and procedures actually applied :	In the absence of any plant specific gas consumption information, the operating norms set by CERC, for tariff determination of Gas power plants, has been considered for arriving at the applicable emission rates for gas plants included in the build margin calculations.	
Any comment:		

Data / Parameter:	**Average Emission Factor for Diesel plants**
Data unit:	tCO2/GWh
Description:	The Average emission factor for Diesel plants is used as in input for calculation of build margin emission factor
Source of data used:	CEA norms for Diesel power plants
Value applied:	**CEA norms for Diesel Generating units**

	Low speed, 4 stroke engine
Gross Heat Rate (Kcal/KWh)	1,900
Auxiliary Consumption	3.0%
Net Heat Rate	1,959
Net Calorific value of fuel (Kcal/Kg)	10,270
Net Calorific value of fuel (TJ/'000' Tons)	43.00
Specific Fuel Consumption (SCM/KWh)	0.19
Carbon emission factor	20.20
Oxidation factor	0.99
tCO2/'000' tons	3,153
Emission Coefficient (tCO2e/GWh)	**601.34**

Justification of the choice of data or description of measurement methods and procedures actually applied :	In the absence of any plant specific gas consumption information, the operating norms set by CEA for Diesel power plants has been considered for arriving at the applicable emission rates for Diesel plants included in build margin calculations.
Any comment:	

Data / Parameter:	**Average Emission Factor for Coal plants**
Data unit:	tCO2/GWh
Description:	The Average emission factor for Coal plants is used as in input for calculation of build margin emission factor.
Source of data used:	CEA Thermal Performance Review 2004-05 * CEA data for lignite consumption for Tamil Nadu has been considered. **: GCV of lignite as per CERC Order dated 26 September 2006 for determination of tariff for NLC-I (600 MW). **: Station heat rate assumed to be same as that for NLC-II (1470 MW) as per CERC Order dated 26 March 2004 for determining tariff.
Value applied:	

Coal/lignite fired stations	Coal consumption	Installed Capacity	Gross generation	Auxiliary consumption	Net Generation	Emission Coefficient (tCO2/ 1000 tonnes of fuel)	Specific emissions (tCO2e/MWh)
	Million Tonnes	MW	GWh	%	GWh		
Southern Region							
Ramagundam S.T.P.S.	10,490	2,600	16,952	6.59%	15,835	1,476	978
Raichur	6,923	1,470	10,737	8.82%	9,790	1,476	1,044
Simhadri	5,556	1,000	8,123	5.65%	7,664	1,476	1,070
Neyveli TPS (Zero unit) *	1,370	250			1248	1,186	1,303
Neyveli FST (Ext) **	3,371	420	3,238	9.0%	2,947	1,186	1,357

Justification of the choice of data or description of measurement methods and procedures actually applied :	The data source, i.e. Central Electricity Authority is a Government of India organisation, which is mandated to publish such information under section 73 (i) and 73(j) of the Indian Electricity Act 2003. In case of Neyveli TPS (Zero unit), it is the only lignite based non-Central sector power plant in Tamil Nadu. Accordingly, CEA data for lignite consumption for Tamil Nadu has been considered. As per CERC order dated dated 26 March 2004 for determining tariff the station heat rate of Neyveli FST (Ext) is considered equivalent to the station heat rate for NLC-II (1470 MW), accordingly the SHR of NLC II has been applied in case of Neyveli FST (Ext).
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>
Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage are nil.

Baseline emission factor (combined margin)
= 1037.43 tCO2e/GWh

Annual electricity supplied to the grid by the Project
= 33 MW (Capacity) x 26.5% (PLF) x 8760 (hours) / 1000 GWh
= 76.606 GWh

Annual baseline emissions
= 1037.43 tCO2e/GWh x 76.606 GWh
= 79473 tCO2e

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

>>

Year	Estimation of project activity emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of overall emission reductions (tonnes of CO2e)
2008	0	79,473	0	79,473
2009	0	79,473	0	79,473
2010	0	79,473	0	79,473
2011	0	79,473	0	79,473
2012	0	79,473	0	79,473
2013	0	79,473	0	79,473
2014	0	79,473	0	79,473
2015	0	79,473	0	79,473
2016	0	79,473	0	79,473
2017	0	79,473	0	79,473
Total (tonnes of CO2e)	0	79,4730	0	79,4730

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**EGy**
Data unit:	MWh (Mega-watt hour)

Description:	Net electricity supplied to the grid by the Project
Source of data to be used:	Electricity supplied to the grid as per the tariff invoices raised on KPTCL/HESCOM.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Annual electricity supplied to the grid by the Project = 33 MW (Capacity) x 26.5% (PLF) x 8760 (hours) MWh = 76,606 MWh
Description of measurement methods and procedures to be applied:	Net electricity supplied to grid will be measured by main meters (export and import). The procedures for metering and meter reading will be as per the provisions of the power purchase agreement. Refer Annex – 4 for an illustration of the provisions for measurement methods.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by KPTCL/BESCOM pursuant to the provisions of the power purchase agreement. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

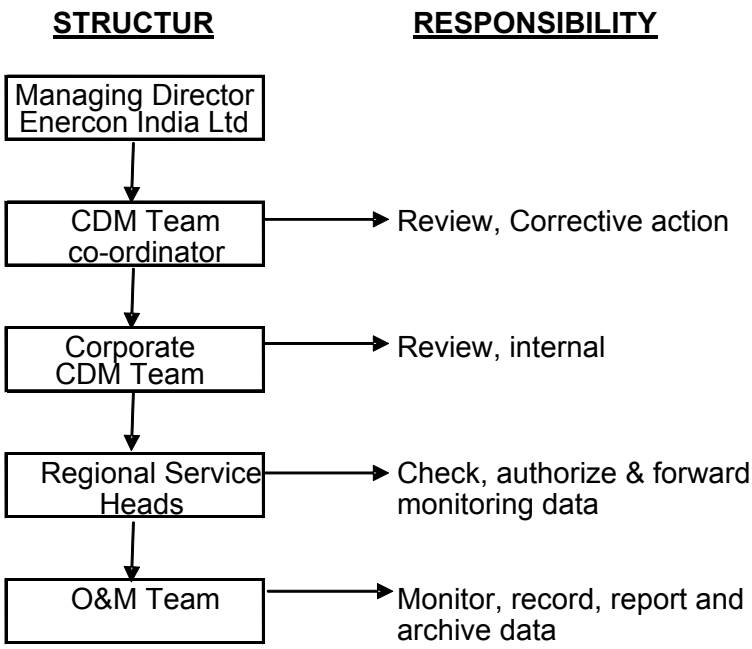
Approved monitoring methodology ACM0002 / Version 06 Sectoral Scope: 1, "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

This approved monitoring methodology requires monitoring of the following:

- Electricity generation from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where *ex post* determination of grid emission factor has been chosen

Since the baseline methodology is based on ex ante determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required.

The sole parameter for monitoring is the electricity supplied to the grid. The Project is operated and managed by Enercon (India) Ltd. The operational and management structure implemented by Enercon is as follows:



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

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Date of completion: 15/11/2006

Name of responsible person/entity:
PricewaterhouseCoopers (not a Project Participant)

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

22/01/2003, being the date of purchase order of the first sub-project in the bundle

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

>>

20 years

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

C.2.1. Renewable crediting period

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

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

01/04/2007, being the expected date of registration of the Project.

C.2.2.2. Length:

>>

10 years

SECTION D. Environmental impacts

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D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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Enercon appointed Aditya Environmental Services Private Limited to conduct Rapid Environmental Impact Assessment study to assess the impact of the project on the local environment.

Environmental Impact Assessment (EIA) of this project is not an essential regulatory requirement, as it is not covered under the categories as described in EIA Notification of 1994 or the Amended Notification of 2006. However, Enercon conducted the EIA to study impacts on the environment resulting from the project activity.

The EIA study included identification, prediction and evaluation of potential impacts of the CDM activities on air, water, noise, land, biological and socio-economic environment within the study area. The ambient air concentrations of Suspended Particulate Matter, respirable Particulate Matter, Oxides of Nitrogen, Sulphur dioxide and Carbon Monoxide were monitored and were found under limits as specified by CPCB. The noise levels were observed through out the study period and were found to be in the permissible range. Water quality monitoring studies were carried out for determination of physiochemical characteristics of bore wells. The ph level of water was found to be under the specified limits.

The study area represents part of Chitradurga district. The terrain comprises hilly areas, which are sparingly populated, the hills are generally covered with shrubs and grass, and trees are not found on the hilltops. Moreover the project area doesn't fall under any protected land for wildlife and it has no adverse

ecological impacts on the surroundings, flora and fauna found in the vicinity of the project area. The wind-farms do not affect the path of migratory birds.

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:

>>

EIA demonstrated that there is no major impact on the environment due to the installation and operation of the windmills. The local ecology is not likely to get impacted by this type of project activity. The local population confirmed that there is no noise or dust nuisance due to windmills. The EIA also ruled out any adverse impacts due to the project activity.

SECTION E. Stakeholders' comments

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

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The comments from local stakeholders were invited through local stakeholder meeting conducted on 02 September at Arashinagundi Village, Hiriyur in Chitradurga District. An advertisement was placed in a local newspaper in Vijaya Karnataka on19-Aug-2006 inviting the local stakeholders for the meeting.

The local stakeholder consultation meeting had representatives from the nearby villages, representatives of Enercon and representative of Aditya Environmental Services (consultant to Enercon). The minutes of the meeting are set out in Appendix 2.

E.2. Summary of the comments received:

>>

The queries/comments from local villagers covered:

- Comment that there is a significant impact on the economic and social life in and around Chitradurga villages due to the wind power projects. Further, there are no rainfall shortages due to wind mills.
- Query on afforestation work carried out by Enercon
- Query on impact on ground water
- Query on generation capacity of wind mills
- Query on scope of purchasing wind mills by the public
- Query on revenue land being used wherever electrical overhead lines pass

The local villagers responded to the questions queries made by Enercon as follows:

- No noise pollution as the projects are located in hilltops and away from villages
- No water draining, soil erosion due to wind mills
- No problem with cattle grazing in the hills
- Better food production due to better quality of electricity and less load shedding
- No deforestation except while road formation and installation of machines
- No damage or accidents during construction or erection

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

>>

Enercon provided the following responses in relation to the comments received from the local stakeholders:

- Enercon is carrying out afforestation work in all the hills where the wind turbines are installed.
- There is no impact on ground water due to wind mills.
- Generation capacity of wind mills is 800 kW.
- It is possible to purchase wind mills. In Maharashtra, farmers association has purchased one wind machine.
- Revenue land is not being used wherever electrical overhead lines pass. Access to the land is required only for line inspection in case of a fault.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Enercon (India) Limited
Street/P.O.Box:	Kolsite House, Plot No. 31, Shah Industrial Estate, Veera Desai Road, Andheri (West)
Building:	
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400 053
Country:	India
Telephone:	+91-22-5522 7794
FAX:	+91-22-5692 1175
E-Mail:	a.raghavan@enerconindia.net
URL:	
Represented by:	
Title:	Associate Vice President
Salutation:	Mr.
Last Name:	Raghavan
Middle Name:	
First Name:	A
Department:	Corporate
Mobile:	+91-98200 45724
Direct FAX:	+91-22-5692 1175
Direct tel:	+91-22-5522 7794
Personal E-Mail:	a.raghavan@enerconindia.net

Organization:	Japan Carbon Finance, Ltd.
Street/P.O.Box:	6th Floor, 1-3 Kundankita, 4-chrome
Building:	Chiyoda-ku
City:	Tokyo
State/Region:	
Postfix/ZIP:	102-0073
Country:	Japan
Telephone:	+81 3 5212 8870
FAX:	+81 3 5212 8886
E-Mail:	jcf@jcarbon.co.jp
URL:	http://www.japancarbon.co.jp/
Represented by:	
Title:	Director General
Salutation:	Mr.
Last Name:	Ari
Middle Name:	
First Name:	Masato

Department:	Carbon Finance Department
Mobile:	
Direct FAX:	+81 3 5212 8886
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Personal E-Mail:	m-ari@jcarbon.co.jp

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Emission Coefficients

2004-2005

Type of FUEL	Net Calorific Value (TJ/ 10^3 tonnes or TJ/Mcum)	Carbon Emission Factor (t C/ TJ)	Fraction of Carbon Oxidised Oxidation Factor	Emission Coefficient (tCO2/ 10^3 tonnes or tCO2/Mcum)
Steam stations				
Coal	15.72	26.13	0.98	1,476
Furnace oil	43.68	21.10	0.99	3,346
Light oil	43.00	20.00	0.99	3,122
LSHS/HHS/HSD	43.64	20.20	0.99	3,200
GAS	34.12	15.30	1.00	1,905
Lignite	11.40	28.95	0.98	1,186
Gas Stations				
Natural Gas	34.12	15.30	1.00	1,905
HSD	42.71	20.20	0.99	3,131
Naphtha	46.89	20.00	0.99	3,404
Diesel Stations				
LSHS	43.64	20.20	0.99	3,200
Diesel	43.00	20.20	0.99	3,153

2003-2004

Type of FUEL	Net Calorific Value (TJ/ 10^3 tonnes or TJ/Mcum)	Carbon Emission Factor (t C/ TJ)	Fraction of Carbon Oxidised Oxidation Factor	Emission Coefficient (tCO2/ 10^3 tonnes or tCO2/Mcum)
Steam stations				
Coal	15.99	26.13	0.98	1,502
Furnace oil	43.40	21.10	0.99	3,324
Light oil	42.65	20.00	0.99	3,096
LSHS/HHS/HSD	43.13	20.20	0.99	3,163
GAS	34.12	15.30	1.00	1,905
Lignite	11.46	28.95	0.98	1,192
Gas Stations				
Natural Gas	34.12	15.30	1.00	1,905
HSD	42.71	20.20	0.99	3,131
Naphtha	46.89	20.00	0.99	3,404
Diesel Stations				
LSHS	43.13	20.20	0.99	3,163
Diesel	42.65	20.20	0.99	3,127

2002-2003

Type of FUEL	Net Calorific Value (TJ/ 10^3 tonnes or TJ/Mcum)	Carbon Emission Factor (t C/ TJ)	Fraction of Carbon Oxidised Oxidation Factor	Emission Coefficient (tCO2/ 10^3 tonnes or tCO2/Mcum)
Steam stations				
Coal	17.46	26.13	0.98	1,640
Furnace oil	44.91	21.10	0.99	3,440
Light oil	40.86	20.00	0.99	2,967
LSHS/HHS/HSD	44.06	20.20	0.99	3,231
GAS	34.12	15.30	1.00	1,905
Lignite	11.25	28.95	0.98	1,170
Gas Stations				
Natural Gas	34.12	15.30	1.00	1,905
HSD	42.71	20.20	0.99	3,131
Naphtha	46.89	20.00	0.99	3,404
Diesel Stations				
LSHS	44.06	20.20	0.99	3,231
Diesel	40.86	20.20	0.99	2,996

Operating Margin for Southern Grid

Fuel	Units	2004-05		2003-04		2002-03	
		Fuel Cons	Emissions (tCO2)	Fuel Cons	Emissions (tCO2)	Fuel Cons	Emissions (tCO2)
Steam stations							
Coal	000MT	53,144	78,448,259	52,985	79,567,449	65,997	108,214,016
Furnace oil	KL	45,848	142,654	56,498	174,645	115,914	370,790
Light oil	KL	24,330	62,811	33,031	84,577	8,407	20,626
LSHS/HHS/HSD	KL	2,612	6,912	5,310	13,889	6,093	16,280
GAS	KL		-		-		-
Lignite	000MT	22,121	26,244,612	20,755	24,741,489	17,738	20,750,996
Gas Stations							
Natural Gas	M Cu M	2,203	4,196,046	2,010	3,828,440	3,130	5,961,700
HSD	KL	81,254	210,422	226,981	587,808	275,122	712,478
Naphtha	KL	289,451	748,903	719,694	1,862,080	485,496	1,256,134
Diesel Stations							
LSHS	KL	465,220	1,231,110	647,451	1,693,457	-	-
Diesel	KL	63,039	164,371	14,903	38,541	865,938	2,145,766
Grid imports	**Units**	**Electricity import**	**Emissions (tCO2)**	**Electricity import**	**Emissions (tCO2)**	**Electricity import**	**Emissions (tCO2)**
From region							
Western Region	GWh	2	2,215			116	138,328
Eastern Region	GWh	292	324,360			77	97,983
Northern Region	GWh			13	9,620.71		
North-eastern Region	GWh						
Total emissions		295	111,782,675		112,601,994		139,685,097

Net electricity generation	Units	2004-05	2003-04	2002-03
Steam stations	GWh	90,726	90,104	84,255
Gas stations	GWh	12,007	13,811	13,637
Diesel stations	GWh	2,363	3,205	4,283
Grid imports	GWh	295	13	194
Total	GWh	105,391	107,133	102,368

	Units	2004-05	2003-04	2002-03
Operating Margin	tCO2/GWh	1,060.65	1,051.05	1,364.54

Average Emission Rate of Western Grid

Fuel	Units	2004-05		2003-04		2002-03	
		Cons	Emissions (tCO2)	Cons	Emissions (tCO2)	Cons	Emissions (tCO2)
Steam stations							
Coal	'000' MT	94,123	138,939,213	89,075	133,763,716	91,350	149,784,844
Furnace oil	KL	1,066,231	3,317,529	1,187,213	3,669,883	135,786	434,357
Light oil	KL	10,028	25,889	10,685	27,359	46,383	113,798
LSHS/HHS/HSD	KL	574,238	1,519,604	423,797	1,108,473	2,006,346	5,360,834
GAS	MT	39,012	74,306	33,884	64,539	204,166	388,874
Lignite	'000' MT	2,609	3,095,348	2,560	3,051,709	19,311	22,591,188
Gas Stations							
Natural Gas	M Cu M	4,667	8,889,218	3,721	7,087,375	3,505	6,675,961
HSD	KL	1,625	4,208	2,767	7,166	697,009	1,805,029
Naphtha	KL	776,908	2,010,111	1,082,436	2,800,610	426,280	1,102,924
Diesel Stations							
LSHS	KL	-	-		-	-	-
Diesel	KL	-	-		-	-	-
Total			**157,875,426**		**151,580,830**		**188,257,809**
Net Grid Generations	GWh		**171,027**		**161,528**		**158,333**
Average Emission Rate	tCO2e/GWh		**923.10**		**938.42**		**1,189.00**

Average Emission Rate of Eastern Grid

Fuel	Units	2004-05		2003-04		2002-03	
		Cons	Emissions (tCO2)	Cons	Emissions (tCO2)	Cons	Emissions (tCO2)
Steam stations							
Coal	'000' MT	58,372	86,165,546	53,212	79,908,334	45,146	74,025,031
Furnace oil	KL	54,976	171,055	78,230	241,823	52,510	167,971
Light oil	KL	121,186	312,858	170,917	437,636	98,608	241,928
LSHS/HHS/HSD	KL	-	-	-	-	-	-
GAS	MT	-	-	-	-	-	-
Lignite	'000' MT	-	-	-	-	-	-
Gas Stations							
Natural Gas	M Cu M	-	-	-	-	-	-
HSD	KL	-	-	2,596	6,723	3,423	8,864
Naphtha	KL	-	-	-	-	-	-
Diesel Stations							
LSHS	KL	219	580	-	-	-	-
Diesel	KL	29,880	77,911	38,881	100,551	14,847	36,790
Total			**86,727,950**		**80,695,067**		**74,480,585**
Net Grid Generations	GWh		**78,164**		**70,253**		**58,652**
Average Emission Rate	tCO2e/GWh		**1,109.57**		**1,148.64**		**1,269.86**

Average Emission Rate of North – Eastern Grid

Fuel	Units	2004-05		2003-04		2002-03	
		Cons	Emissions (tCO2)	Cons	Emissions (tCO2)	Cons	Emissions (tCO2)
Steam stations							
Coal	'000' MT						
Furnace oil	KL						
Light oil	KL						
LSHS/HHS/HSD	KL						
GAS	MT						
Lignite	'000' MT						
Gas Stations							
Natural Gas	M Cu M	1,309	2,493,248	1,246	2,373,252	930	1,771,368
HSD	KL						
Naphtha	KL						
Diesel Stations							
LSHS	KL						
Diesel	KL	353	920	3,431	8,873	4,948	12,261
Total			**2,494,168**		**2,382,125**		**1,783,629**
Net Grid Generations	GWh		**7,814**		**6,569**		**5,308**
Average Emission Rate	tCO2e/GWh		**319.20**		**362.63**		**336.05**

Average Emission Rate of Northern Grid

Fuel	Units	2004-05		2003-04		2002-03	
		Cons	Emissions (tCO2)	Cons	Emissions (tCO2)	Cons	Emissions (tCO2)
Steam stations							
Coal	'000' MT	72,943	107,674,458	70,085	105,246,478	68,594	112,472,267
Furnace oil	KL	26,071	81,119	43,377	134,086	57,666	184,464
Light oil	KL	94,208	243,211	254,855	652,561	60,211	147,724
LSHS/HHS/HSD	KL	3,126	8,272	2,377	6,217	32,761	87,535
GAS	MT	-	-	-	-	-	-
Lignite	'000' MT	-	-	-	-	-	-
Gas Stations							
Natural Gas	M Cu M	4,058	7,729,258	3,808	7,253,084	3,953	7,529,265
HSD	KL	275,047	712,283	240,593	623,059	401,257	1,039,127
Naphtha	KL	243,961	631,206	188,981	488,955	-	-
Diesel Stations							
LSHS	KL	-	-	-	-	-	-
Diesel	KL	-	-	-	-	-	-
Sub total			**117,079,807**		**114,404,440**		**121,460,382**
Net Grid Generations	GWh		**158,836**		**157,086**		**146,314**
Average Emission Rate	tCO2e/GWh		**737.11**		**728.29**		**830.14**

Build Margin Emission Factor for Southern Grid

Name of the plant	State	Date of addition	Inst. Cap	Gross Gen	Aux Cons	Net supply to grid	Emission factor (tCO2/ GWh)	Total tCO2
			MW	GWh	%	GWh	(for 2004-05)	
Hydro								
Almattidam 4	Karnataka	26-Mar-05	55	43	0.50%	43		
Almattidam 3	Karnataka	13-Jan-05	55	43	0.50%	43		
Almattidam 2	Karnataka	4-Nov-04	55	43	0.50%	43		
Almattidam 1	Karnataka	26-Mar-04	15	12	0.50%	12		
Srisailam Left 6	AP	4-Sep-03	150	235	0.50%	234		
Srisailam Left 5	AP	28-Mar-03	150	235	0.50%	234		
Srisailam Left 4	AP	26-Nov-02	150	235	0.50%	234		
Sharavathy Tail Race (3)	Karnataka	30-Mar-02	60	260	0.50%	258		
Srisailam Left 3	AP	29-Mar-02	150	235	0.50%	234		
Madhava Mantri	Karnataka	3-Mar-02	5	23	0.50%	23		
Srisailam Left 2	AP	12-Nov-01	150	235	0.50%	234		
Sharavathy Tail Race (3)	Karnataka	25-Oct-01	60	260	0.50%	258		
Kuthungal	Kerala	1-Jun-01	21	36	0.50%	36		
Srisailam Left 1	AP	30-Mar-01	150	235	0.50%	234		
Kuttiyadi	Kerala	15-Mar-01	50	148	0.50%	148		
Sharavathy Tail Race (2)	Karnataka	20-Feb-01	60	260	0.50%	258		
Shahpur	Karnataka	1-Jun-00	7	24	0.50%	24		
Singur	AP	28-Mar-00	8	1	0.50%	0		
Parson's valley (1)	Tamilnadu	6-Mar-00	30	55	0.50%	55		
Singur	AP	6-Dec-99	8	1	0.50%	0		
Steam - Coal								
Ramagundam S.T.P.S unit 7	AP	31-Aug-04	500	310	6.59%	290	978	283,169
Raichur TPS - 7	Karnataka	11-Dec-02	210	1,500	8.82%	1,368	1,044	1,427,683
Simhadri - 1	AP	24-Aug-02	500	4,088	5.65%	3,857	1,070	4,127,487
Simhadri - 2	AP	22-Feb-02	500	4,035	5.65%	3,807	1,070	4,073,975
Steam - Lignite								
Neyveli FST (Ext) - unit 2	Tamilnadu	22-Jul-03	210	1,588	9.00%	1,445	1,357	1,961,569
Neyveli FST (Ext) - unit 1	Tamilnadu	21-Oct-02	210	1,650	9.00%	1,502	1,357	2,038,154
Neyvelli TPS (Zero unit)	Tamilnadu	11-Oct-02	250	1,248	9.00%	1,135	1,303	1,479,103
Diesel								
Kasargode DG	Karnataka	3-Mar-02	22	16	4.00%	15	601	9,046
Samayanallur DGPP	Tamilnadu	22-Sep-01	106	342	4.00%	328	601	197,202
Samalpatti DGPP	Tamilnadu	1-Mar-01	106	356	4.00%	341	601	205,296
Kozhikode DG Power	Kerala	6-Nov-99	128	161	4.00%	154	601	92,799
Gas								
Kuttalam CCPP	Tamilnadu	24-Mar-04	36	234	5.28%	222	446	98,945

Name of the plant	State	Date of addition	Inst. Cap	Gross Gen	Aux Cons	Net supply to grid	Emission factor (tCO2/ GWh)	Total tCO2
			MW	GWh	%	GWh	(for 2004-05)	
Kuttalam CCPP	Tamilnadu	30-Nov-03	64	417	5.28%	395	446	175,902
Valthur GTPP (ST)	Tamilnadu	13-Mar-03	34	202	5.28%	191	446	85,135
Valthur GTPP	Tamilnadu	24-Dec-02	60	356	5.28%	337	446	150,237
Peddapuram CCGT	AP	12-Sep-02	78	413	2.57%	402	446	179,294
Peddapuram CCGT	AP	26-Jan-02	142	752	2.57%	732	446	326,406
Pillaiperumalnallur GTPP (1)	Tamilnadu	5-Apr-01	106	148	5.28%	140	446	62,572
Kovilkalapai GT	Tamilnadu	30-Mar-01	38	271	5.28%	257	446	114,450
Pillaiperumalnallur GTPP (1)	Tamilnadu	22-Feb-01	225	316	5.28%	299	446	133,447
Kovilkalapal GT	Tamilnadu	5-Feb-01	69	492	5.28%	466	446	207,817
Lanco Kondapalli	AP	18-Oct-00	126	810	2.57%	789	446	351,825
Lanco Kondapalli	AP	19-Sep-00	224	1,440	2.57%	1,403	446	625,467
Kayamkulam CCGT	Kerala	30-Oct-99	119	212	5.21%	201	446	89,435
Wind								
Wind projects from 1999 to 2005	Southern region	31-Mar-05	1,248	2,187	0.00%	2,187		
Nuclear								
Kaiga (1)	Karnataka	10-Sep-00	220	1,515	11.34%	1,343		
Kaiga (2)	Karnataka	2-Dec-99	220	1,411	11.34%	1,251		
Total		**30-Oct-99**	**5,751**	**29,085**		**27,462**		**18,496,416**

Test of Build Margin Sampling

Net Generation from five most recent plants in GWh:	429
Total Net Electricity Generation for SR grid (2004-05) in GWh:	137,025
Total Net Electricity Generation from power plants added to the system in GWh:	27,462
of Grid Generation :	**20.04%**

Therefore the power plants as per table above have been considered in Build Margin calculations

BUILD MARGIN **673.52 tCO2/GWh**

Combined Margin for Southern Grid

		Southern Grid (tCO2e/GWh)
Operating Margin - 2002-03		1,365
Operating Margin - 2003-04		1,051
Operating Margin - 2004-05		1,061
Average Operating Margin of last three years		1,159

Build Margin	tCO2e/GWh	673.52

Combined Margin for Wind Power Plants		**Southern Grid (tCO2e/GWh)**
	Weights	
Operating Margin	0.75	1,159
Build Margin	0.25	674
Combined Margin		1,037.438

Annex 4

MONITORING INFORMATION

- **Metering:** Electricity supplied to the grid is metered by the Parties (KPTCL, Enercon and the Project) at the high voltage side of the step up transformer installed at the Project Site.

- **Metering Equipment:** Metering equipment is electronic trivector meters of accuracy class 0.2% required for the Project (both main and check meters). The main meter is installed and owned by the Project, whereas check meters are owned by KPTCL. The metering equipment is maintained in accordance with electricity standards prevalent in Karnataka. The meters installed are capable of recording and storing half hourly readings of all the electrical parameters for a minimum period of 35 days with digital output.

- **Meter Readings:** The monthly meter readings (both main and check meters) is taken jointly by the parties on the first day of the following month at 12 Noon. At the conclusion of each meter reading an appointed representative of KPTCL and Enercon sign a document indicating the number of Kilowatt-hours indicated by the main meter.

- **Inspection of Energy Meters:** All the main and check energy meters (export and import) and all associated instruments, transformers installed at the Project are of 0.2% accuracy class. Each meter is jointly inspected and sealed on behalf of the Parties and is not to be interfered with by either Party except in the presence of the other Party or its accredited representatives.

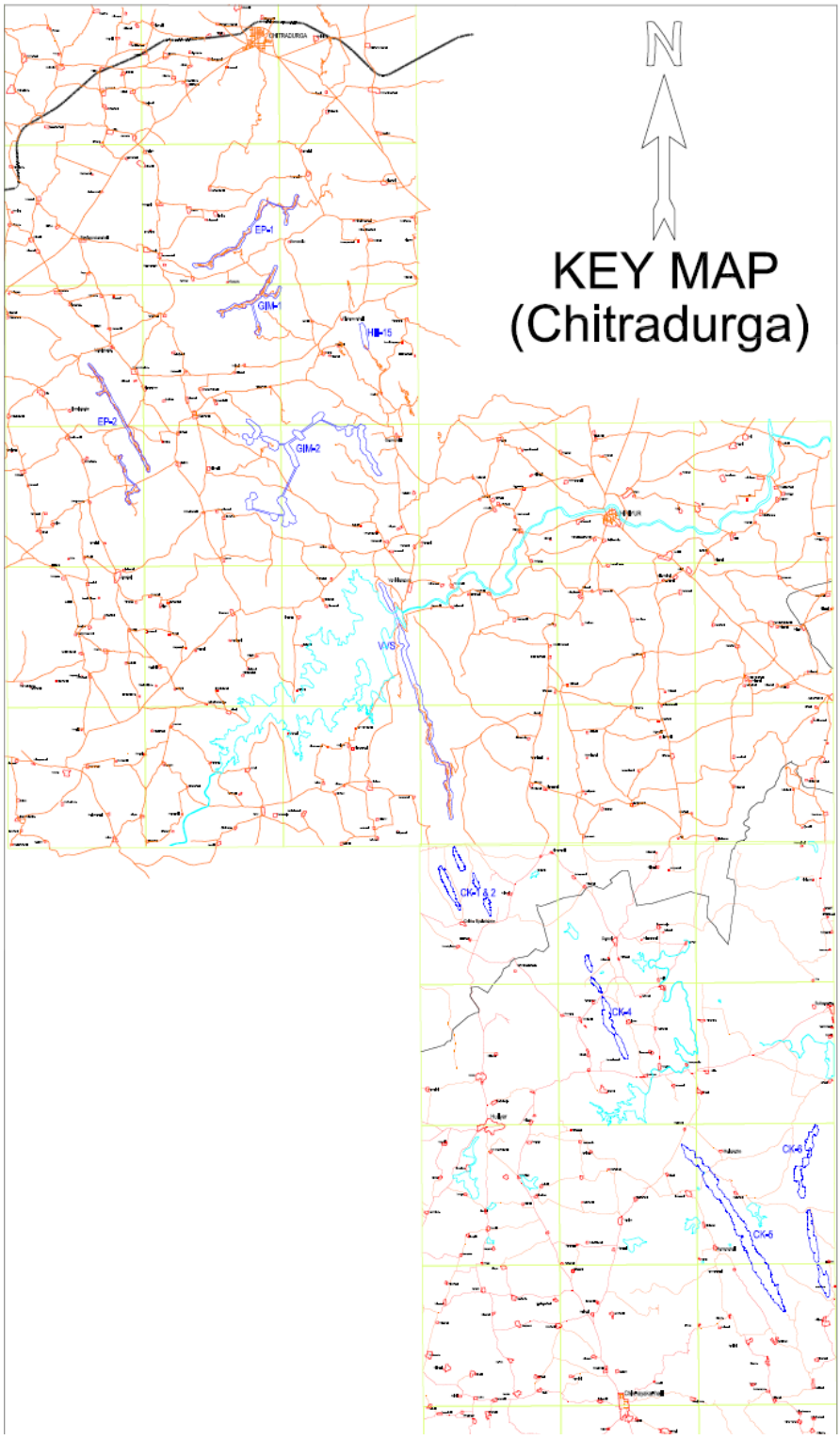
- **Meter Test Checking:** All the main and check meters are tested for accuracy with reference to a portable standard meter. The portable standard meter is owned by KPTCL. The main and check meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2 accuracy class. The consumption registered by the main meters alone will hold good for the purpose of metering electricity supplied to the grid as long as the error in the main meters is within the permissible limits.

  If during the meter test checking,
  - the main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the permissible limits, then the meter reading will be as per the main meter as usual. The check meter shall, however, be calibrated immediately.
  - the main meter is found to be beyond permissible limits of error, but the corresponding check meter is found to be within permissible of error, then the meter reading for the month up to the date and time of such test shall be as per the check meter. There will be a revision in the meter reading for the period from the previous calibration test up to the current test based on the readings of the check meter. The main meter shall be calibrated immediately and meter reading for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.
  - both the main meters and the corresponding check meters are found to be beyond the permissible limits of error, both the main meters shall be immediately calibrated and the correction applied to the reading registered by the main meter to arrive the correct reading of energy supplied for metering electricity supplied to the grid for the period from the last month's meter reading up to

the current test. Meter reading for the period thereafter till the next monthly reading shall be as per the calibrated main meter.

- If during any of the monthly meter readings, the variation between the main meter and the check meter is more than the permissible limit for meters of 0.2% accuracy class, all the meters shall be re-tested and calibrated immediately.

Appendix 1 – Location Map



Appendix 2 – Minutes of stakeholder consultation meeting

Public Consultation Meeting for Wind Farm Projects as Clean Development Mechanism Projects at sites – CK 1&2, Gim Sites and VVS, Chitradurga District, Karnataka State.

Venue: Enercon (India) Limited, CK 1 & 2 Site, Arashinagundi Village, Hiriyur, Chitradurga Dist.

Date: 02nd September 2006, 10 am – 12 pm

Members from the Villages:

1. Sri. Thimmanna
2. Sri. Kanumappa
3. Sri. Rajappa
   And 19 participants from the village.

Members from Enercon (India) Ltd., Chitradurga

1. Mr. C.B.Poonacha
2. Mr. Sajith
3. Mr. Fathahulla
4. Mr. Naveen Kumar
5. Mr. Ravidhara

Members from Enercon(India) Ltd., Mumbai

1. Mr. Vivek Sen
2. Mr. Neeraj Gupta

Members from Aditya Environmental Services Pvt. Ltd.

1. **Mr. Gurmeet Singh**

Agenda of the Meeting:

1. Welcome Address and Introduction
2. Project Profile, CDM, Environmental and social issues
3. Description about Wind Energy Conversion.
4. Suggestions and Opinions
5. Queries and Responses from the Stakeholders and Co. Authorities respectively.
6. Vote of Thanks.

1. **Welcome Address:** In the Welcome Address, Mr. C.B.Poonacha has briefed about the purpose of this Public Meeting, how Wind Mills and Wind Energy are occupied major role in generating power thereby rural population is benefited. Further he was pointing out how the benefits of employment opportunities, economical growth taken place in the areas. And also he has quoted examples of various social and religious activities taken up in the villages, for ex. construction of temples, roads through villages etc.

   Then Mr. C.B.Poonacha invited Mr. Thimmanna, Village Panchayat leader to preside over the meeting and conducts the further proceedings. And also he has invited village leaders viz. Mr. Kanumappa and Mr. Rajappa on the dias.

2. Project Profile:

Mr. Md. Fathahulla: Mr. Md. Fathahulla has described about the Wind Mills and how the Wind Power is generated, why it is called Green Energy and our project is emission free and it is pollution free energy when compared with Thermal power. He reiterated that in Thermal Power, carbon would be emitted into the air, which causes air pollution. He said that the public would not have any bad impact by the Wind Mills. When asked by the villagers about the clouds running away due to running of Wind Mills and thereby causing deficiency in rainfall, Mr. Fathahulla has cleared the doubts of the stakeholders by convincing them about the height of the clouds and the height of the Wind Mill Erector. He said we are conducting aforestation and drainage work to eradicate the soil erosion from the hills. He also informed that the co-operation by the villagers required for successful completion and service of Wind Mills.

Mr. Ravidhara: Mr. Ravidhara has described to the villagers how the power is converted from Wind to Electricity and how the generators are running and generate electricity power. And also he has specified where the generated power will be transmitted and at what rate. He has told about the safety measures taken in our Wind Erectors and automatic stoppage of m/c with more rpm in order to avoid any untoward incidence.

3. President's Address:

a) Sri. Thimmanna who has presided over the meeting has informed the villagers about how Wind Mills are helped our Villagers and Farmers, benefits to the unemployed one. And we have benefited more from wind mills rather loss of any kind. He also strongly quoted that "The economic and social life has changed due to wind mills in and around Chitradurga Villages. He extended fullest cooperation for development of such activities and also stated that lack of rainfall in the region is not due to Wind Mills. Since last two years we had plenty of rainfall. He also pledged that the cooperation from our villagers is there in future also and sought the same from Enercon.
b) Sri. Kanumappa has accepted that the temple work is been completed by Enercon only and praised about the social and religious activities by Enercon. Eco friendly project like wind power should come up in all villages which will not harm any environmental balancing, he specified.
c) Sri. Rajappa, who has told that there was no rainfall shortage due to Wind Mills.

Questionnaire:

a) By the Stakeholders:

i) Are you conducting afforestation work in the hills where the plants are removed?
Ans: Yes, We are doing afforestation work in all the hills where M/cs are installed.
ii) Are there any chances of drying up Ground Water?
Ans: No, Wind Mills do not use any ground water for its process.
iii) What is the generation capacity of the Machine?
Ans: 800 KW per hour.
iv) Is there any scope of purchasing machine by the public?
Ans: Yes, In Maharashtra farmers association has purchased one machine.
v) There is a rumour that revenue land is used wherever the electrical line passes through? Is it true?
Ans: No, Only line inspection will be done.

b) By the Company:

i) Is there any Noise Pollution by running the Wind Mills?

Ans: So far no idea. But as it is in hilltops and away from villages such nuisance may not happen.

ii) Is there any water draining, soil erosion due to Wind Mills?

Ans: No, such incidence not occurred.

iii) Is there any problem for animals grazing in the hills?

Ans: No, Cattle are grazing in hill areas as usual.

iv) How Wind Mills helped in improvement of Crops?

Ans: By increase in voltage capacity and less load shedding results in increase in food grain production.

v) Have you observed any deforestation problem?

Ans: No, Except while forming the roads and installing the machines, there found no deforestation is taken place.

vi) During construction or erection any damages or accidents occurred?

Ans: Absolutely not. The Project work is taken up very smoothly and run with more safety standards.

For further queries the representatives from ENERCON put forward to the participants that they could raise any queries within a week and the same can be submitted at ENERCON Office, Bangalore as the address mentioned in the Paper Notification on 19th Aug. 2006.

Vote of Thanks: **Mr. Naveen Kumar** thanked the village leaders and villagers who have set aside their work and shown interest and eagerness to know about the Wind Mills. He also sought cooperation from all the corners for successful operation of windmills thereby achieving the National Target of self-sufficiency in Power Sector.