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

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SECTION A. General description of project activity

A.1 Title of the project activity:

Title: 50.4 MW wind power project by EN Renewable Energy Pvt. Ltd
Version: 5.0
Date of completion of PDD: 21/12/2010

A.2. Description of the project activity:

EN Renewable Energy Limited ("ENRE[1]") is developing 50.4 MW wind farm in the state of Karnataka in India. The project activity involves supply, erection, commissioning and operation of 63 machines of rated capacity 800 KW each. The machines are Enercon E-53 make. The project will generate 111347.31 MWh of electricity per year which shall be supplied to the southern grid. The project activity will assist the sustainable growth of the region by providing clean and green electricity to the state electricity grid.

Purpose of the project activity:

The purpose of the project activity is to utilize renewable wind energy for generation of electricity. The project activity replaces anthropogenic emissions of greenhouse gases (GHG's) into the atmosphere, which is estimated to be approximately 105,239 tCO_2e per year, by displacing the equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansions connected to the grid.

In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants in the southern grid, which are/ will be predominantly based on fossil fuels[2]. Whereas the operation of Wind Energy Convertors (WEC's) is emission free and no emissions occur during the lifetime of the project activity. As per the applicable methodology the baseline scenario for the project activity is the grid based electricity system, which is also the pre-project scenario.

Nature of Project

The project activity harnesses renewable resources in the region, and thereby displacing non-renewable natural resources thereby ultimately leading to sustainable economic and environmental development. Enercon (India) Limited ("Enercon") will be the equipment supplier and the operations and maintenance contractor for the project activity. The project activity is owned by ENRE and Enercon is having the responsibility of operation and maintenance of the wind farm. The generated electricity will be supplied to Electricity Distribution Company (DISCOM) under a long-term power purchase agreement (PPA).

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[1] The company status has been changed from private limited to limited on 7th December 2009.

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

Contribution to Sustainable Development:

The National CDM Authority (NCDNA) which is the Designated National Authority (DNA) for the Government of India (GoI) in the Ministry of Environment and Forests (MoEF) has stipulated four indicators for sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India[3]. The contribution of this project activity towards in terms of these four indicators is provided below:

1. **Social well being:**

- The project activity has led to the development of supporting infrastructure such as road network etc., in the wind park location, which also provides access to the local population.
- The project activity leads to alleviation of poverty by establishing direct and indirect benefits through employment generation and improved economic activities by strengthening of local grid of the state electricity utility.
- Use of a renewable source of energy reduces the dependence on imported fossil fuels and associated price variation thereby leading increased energy security.

2. **Environmental well being:**

- The project activity involves use of renewable energy source for electricity generation instead of fossil fuel based electricity generation which would have emitted gaseous, liquid and/or solid effluents/wastes.
- Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment contributing to environmental well-being.

3. **Economic well being:**

- The project activity requires temporary and permanent, skilled and semi-skilled manpower at the wind park; this will create additional employment opportunities in the region
- The generated electricity will be fed into the Southern regional grid through local grid, thereby improving the grid frequency and availability of electricity to the local consumers (villagers & sub-urban habitants) which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development.

4. **Technological well being:**

- Increased interest in wind energy projects will further push R&D efforts by technology providers to develop more efficient and better machinery in future.

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

In addition to this, the project proponent will contribute 2% of the CDM revenue realized from the CDM project for sustainable development including society / community development in the host country.

A.3. Project participants:

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	EN Renewable Energy Limited (Private Entity)	No

The contact details of the entities are provided in Annex – 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

India

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

Southern Region/Karnataka State

A.4.1.3. City/Town/Community etc:

The Project is spread across Sunahatti, Ganginahal, Kakti, Kanabargi, Baramanhatti, Nandi and Deshnur villages in Bailhongal and Belgaum Taluk of Belgaum District of Karnataka state in India.

Nearest airport and railway station are at Belgaum.

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

Details of physical location of project activities are provided in Appendix 2.

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

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', 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:

The project activity involves 63-wind energy converters (WECs) of Enercon make (800 kW E-53) with internal electrical lines connecting the project activity with local evacuation facility. The WECs generates 3-phase power at 400V, which is stepped up to 33 KV. The project activity can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The average life time of the WEC is around 20 years as per the industry standards; however the project activity is yet to be commissioned. The other salient features of the state-of-art-technology are:

E 53 Specifications

Turbine model	Enercon E- 53
Rated power	800 KW
Rotor diameter	53 m
Hub height	75 m
Turbine Type	Gearless horizontal axis wind turbine with variable rotor speed
Power regulation	Independent electromechanical pitch system for each blade.
Cut-in wind speed	2.5 m/s
Rated wind speed	12 m/s
Cut-out Wind speed	28-34 m/s
Extreme Wind Speed	59.5 m/s
Rated rotational speed	32 rpm
Operating range rot. speed	12-29 rpm
Orientation	Upwind
No of Blades	3
Blade Material	Glass Fibre reinforced Epoxy
Gear box type	Gear less
Generator type	Synchronous generator
Braking	Aerodynamic

Output Voltage	400 V
Yaw System	Active yawing with 4 electric yaw drives with brake motor and friction bearing
Tower	74 m concrete

Enercon 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.

The Enercon annular generator is of primary importance in the gearless system design. Combined with the rotor hub it provides an almost frictionless flow of energy, while the gentle running of fewer moving components guarantees minimal material wear. Unlike conventional asynchronous generators, the Enercon annual generator is subjected to very little mechanical wear, which makes it ideal for particularly heavy demands and a long service life. Time consuming repair work and the associated turbine downtimes are also prevented.

The advantages of Enercon annular generator are:

- Yield optimized control
- High level of grid compatibility
- No gear
- Low wear due to slow machine rotation
- Low machine stress due to high level of speed variability

In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants in the southern grid, which are/ will be predominantly based on fossil fuels[4], hence baseline scenario of the project activity is the grid based electricity system, which is also the pre-project scenario. Since the project activity involves power generation from wind, it does not emit any emissions in the atmosphere.

The power generation from wind is a clean technology as there are no GHG emissions associated with it, the power generation from wind turbines depends upon the wind speed and it does not require any fuel combustion for generating power, which is the major source of GHG emissions.

The power production through WEC's depends on several factors i.e. wind speed and grid availability. Grid availability as well as wind speed varies, based on different external factors. Enercon (India) Limited has conducted a study through Centre for Wind Energy Technology (C-WET) for estimating the PLF of the site, as per the report of 'site validation and generation estimation' the PLF of the site of the project activity comes out to be 26%. The same value of PLF has been used in the financial analysis in additionality demonstration.

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

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

The estimated emission reductions over the 7 year renewable crediting period would be 736,582 tCO_2e as per details on annual emission reductions provided below:

Years	Annual estimation of emission reductions in tonnes of CO_2e
*1st year	105,239
2nd year	105,239
3rd year	105,239
4th year	105,239
5th year	105,239
6th year	105,239
7th year	105,239
Total estimated reductions (tonnes of CO_2e)	736,673
Total number of crediting years	07
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	105,239

*1st year begins from the date of registration, and each year extends for 12 months.

A.4.5. Public funding of the project activity:

There is no public funding from Annex 1 countries and no diversion of Official Development Assistance (ODA) involved in the project activity.

The project activity has got loan assistance from Indian Renewable Energy Development Agency (IREDA) and does not involve any public funding and ODA component.

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:

Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"
Reference: Approved consolidated baseline methodology ACM0002 (Version 12.1.0, EB 58)

ACM0002 draws upon the following tools which have been used in the PDD:

- Tool to calculate the emission factor for an electricity system – Version 02
- Tool for the demonstration and assessment of additionality – Version 5.2

Further information with regards to the methodology / tools can be obtained at:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

The project activity 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 activity 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 12.1.0 is the choice of the baseline and monitoring methodology and it is applicable because:

Para No.	Applicability Conditions as per ACM 0002	Applicability to this Project Activity
1.	The project activity is the installation capacity addition, retrofit or replacement of a power plant/unit of one of the following types: • Hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir) • Wind power plant/unit, • Geothermal power plant/unit, • Solar power plant/unit, • Wave power plant/unit • Tidal power plant/unit.	The project activity is grid connected renewable power generation from wind.
2.	In the case of capacity additions, retrofits or replacements: the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	This condition is not relevant, as the project activity does not involve capacity additions, retrofits or replacements.
3.	In case of hydro power plants: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir. • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater	This condition is not relevant, as the project activity is not the installation of a hydro power plant.

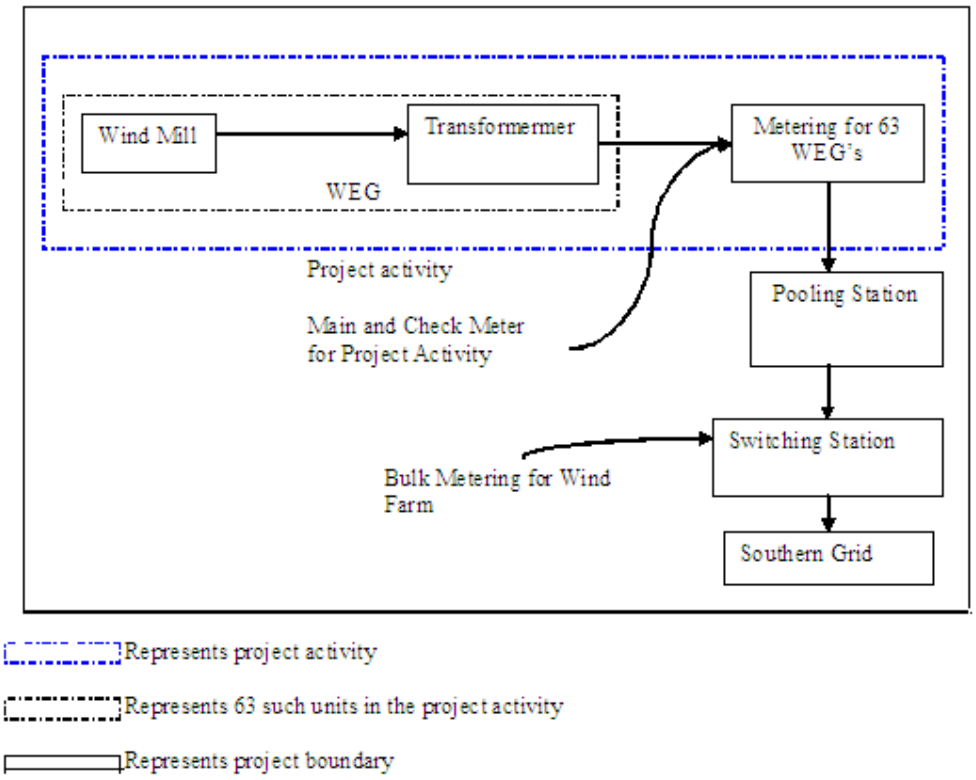
	than 4 W/m2. • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	
4.	The methodology is not applicable to the following: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m2.	The project activity does not involve any of the given criteria hence methodology is applicable for the project activity.
5.	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	The project activity is a new wind power plant. Also no replacement, modification and retrofit measures are implemented here. Hence, this criterion is also not relevant to the project activity.

The description provided in table above shows that the project activity satisfies the applicable conditions of the methodology, ACM0002.

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

According to the applicable methodology, spatial extent of this project activity includes the project site and all the power plants connected physically to the electricity system that the CDM power project is connected to. The project activity is connected to the network of state transmission utility which falls in Southern grid. Thus the project boundary includes all the power plants physically connected to the Southern grid.

Flow diagram of the project boundary:



The baseline study of southern grid shows that the main sources of GHG emissions in the baseline are CO_2 emissions from the conventional power generating systems, the other emissions are that of CH_4 and N_2O but both emissions were conservative and are excluded for simplification of the project. The project activity is the emission free electricity generation from renewable sources and hence emits no gases in the atmosphere.

Following table indicates the sources and gases included in the project boundary:

	Source	Gas	Included?	Justification/Explanation
Baseline	Grid-connected electricity generation	CO_2	Yes	In the baseline scenario the electricity would have been sourced from the Southern grid which in turn would be connected to fossil fuel fired power plants which emit CO_2.
		CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.
Project	Greenfield	CO_2	No	The project activity does not emit any emissions.

	wind energy conversion system	CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.

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

According to the applied methodology ACM 0002, if the project activity is the installation of a new grid-connected renewable power plant/ unit, 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 in the "Tool to calculate the emission factor of an electricity system".

The proposed project activity is the installation of 63 WEC's of Enercon make E-53 of 800 KW each contributing 50.4 MW of power to the southern grid; the project activity is the installation of a new grid connected power plant hence as per the applied methodology the baseline scenario is the emissions 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 in Section B.6 of the PDD. The grid system for the project activity is described below:

Grid system for the project activity:

The southern region of India comprises of four states and 2 union territories (UT's) namely Karnataka, Tamilnadu, Kerala, Andhra Pradesh, Pondicherry and Lakshadweep. The power sector in India including the southern region is driven by thermal power stations[5] on majority; hence in the absence of the project activity equivalent amount of electricity would have been generated from the fossil fuel based power plants. Thus the generation from the project activity displaces the energy generated using fossil fuel fired power plant and leads to an emission reductions of 105,239 tCO_2e annually.

The baseline emissions and emission reductions from the project activity are estimated based on the amount of electricity exported by the project activity to the southern grid multiplied by the emission factor of the southern grid calculated as the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors.

[5] http://www.cea.nic.in/

Variable	Data Source
EG_y – Electricity generated	Records maintained by project proponents
Parameter	**Data Source**
$EF_{grid, OM, y}$ = Operating Margin Emission Factor (tCO2/MWh)	CEA Database for CO_2 emission factor, version 5
$EF_{grid, BM, y}$ = Build Margin Emission Factor (tCO2/MWh)	CEA Database for CO_2 emission factor, version 5
$EF_{grid, CM, y}$ – Grid Emission Factor	Calculated as the weighted average of the operating margin and build margin

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):

CDM Consideration:

The project activity has been conceived as a CDM project since its inception. The offer for the project was submitted by the Enercon (WTG supplier) to the project proponent on 8 October 2008. The project proponent passed the resolution dated 30 October 2008, the minutes of Board meeting clearly reflects that CDM is seriously considered before the inception of the project.

The project start date is 20 January 2009 which is the date of issuing purchase order for the project activity. The PP has intimated UNFCCC about the project activity initiative within six months of the start date on 17th July 2009 and received the acknowledgement from UNFCCC on the same day. The acknowledgement from UNFCCC and intimation by Project participant shall be provided to the DOE for verification.

As per EB 49, Annex 22, the chronology of events leading up to web-hosting of the PDD for global stakeholder consultation and the actions taken by the project proponent to secure CDM status of the project are presented below:

Event	Date
Offer letter for WTGs	8th October 2008
Board resolution on project activity	30th October 2008
Purchase order for WTGs	20th January 2009
Loan application	15th July 2009
Intimation to UNFCCC and DNA	17th July 2009
Stakeholder consultation meeting	6th October 2009
Loan sanction	7th October 2009
Appointment of DOE	20th November 2009
PDD Webhosted for global stakeholder consultation	21 November 2009

Demonstration of Additionality for the project activity:

The latest additionality tool i.e. Tool for the demonstration and assessment of additionality version 5.2 approved by CDM Executive Board is used to demonstrate project additionality.

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

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

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 undertaken without being registered as a CDM project activity;
- Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services (e.g., cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;
- If applicable, continuation of the current situation (no project activity or other alternatives\ undertaken).

The baseline alternative for the project activity is pre-defined in ACM0002 as generation of equivalent amount of electricity by operation of grid-connected power plants and by addition of new generation sources. Accordingly, the realistic and credible alternatives to the project activity are:

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

As per this alternative the project participant would have gone ahead with the implementation of the project activity, generating renewable electricity and exporting the same to the grid under the power purchase agreement thereby displacing equivalent amount of electricity generated by the currently running power plants in the grid.

No emissions of greenhouse gases to atmosphere through this alternative. This alternative may be a part of the baseline. However, this alternative faces investment barrier as shown by the investment analysis conducted in the subsequent step 2.

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

This alternative is to construct renewable power plants whose annual power supply is equivalent to the projects. However, those kinds of renewable power plants, such as photovoltaic, tidal/wave, hydro, geothermal and renewable biomass etc., are strongly dependent on climate and natural resources. There are not exploitable renewable (tidal/wave/hydro), and biomass energy source at the project site since the project is located in dry land site. Further the solar photovoltaic power generation is not feasible because of its cost of electricity generation[6]. Therefore, this alternative is not a possible baseline scenario.

PDD do not consider coal or gas fired power plants as the viable alternative to the wind farm. As per the tool for additionality "a coal/gas -fired power station or hydropower may not be an alternative for an independent power producer investing in wind energy.

(c) Continuation of the current situation

The "no project option" where in the equivalent amount of energy would have been produced by the project grid electricity system through its currently running power plants and by new capacity additions (which are mostly thermal) is the most plausible alternative as baseline option for the project. Thus, suitable grid mix has been selected as baseline option and therefore for calculation of baseline emission. So, the baseline scenario of the project is Equivalent annual electricity supplied by Southern Grid, which is the continued operation of the existing power plants and the addition of new generation sources on the Southern regional grid to meet the electricity demand. The project involves constructing a wind farm by using wind resources for power generation. The emission reductions of the project are equal to the baseline emissions since the project emissions and leakage is zero respectively.

Outcome of Step 1a: Alternatives (a) and (c) above have been identified as realistic and credible alternative scenario(s) to the project activity

[6] Cost of electricity generation from solar is about Rs. 15 per kWH
http://www.mnre.gov.in/pdf/guidelines_spg.pdf

Sub-step 1b: Consistency with mandatory laws and regulations:

2. The alternative(s) shall be in compliance with all mandatory 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 mandatory 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 mandatory regulations with which there is general compliance, then the proposed CDM project activity is not additional.

Both above mentioned alternatives are in compliance with all mandatory applicable legal and regulatory requirements as shown below:

- The implementation of the project activity is a voluntary initiative and it is not mandatory or a legal requirement.
- The Indian Electricity Act, 2003 does not restrict or empower any authority to restrict the fuel choice for power generation.
- The applicable environmental regulations do not restrict the use of wind energy for power generation.
- There is no legal requirement on the choice of a particular technology for power generation.

Outcome of Step 1b: Identified realistic and credible alternative scenario(s) to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

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 not:

(a) The most economically or financially attractive; or

(b) Economically or financially feasible, 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 and the alternatives identified in Step 1 generate 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 the alternatives identified in Step 1 and demonstrate that there is at least one alternative which is less costly than the project activity.

"If it is concluded that the proposed CDM project activity is more costly than at least one alternative then proceed to Step 4 (Common practice analysis)".

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

1. 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

2. Identify the financial/economic indicator, such as IRR, most suitable for the project type and decision context.
3. When applying Option II or Option III, the financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer. Only in the particular case where the project activity can be implemented by the project participant, the specific financial/economic situation of the company undertaking the project activity can be considered.
4. Discount rates and benchmarks shall be derived from:
    a. Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data;
    b. Estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on bankers views and private equity investors/funds' required return on comparable projects;
    c. A company internal benchmark (weighted average capital cost of the company), only in the particular case referred to above in paragraph 5. The project developers shall demonstrate that this benchmark has been consistently used in the past, i.e. that project activities under similar conditions developed by the same company used the same benchmark;
    d. Government/official approved benchmark where such benchmarks are used for investment decisions;
    e. Any other indicators, if the project participants can demonstrate that the above Options are not applicable and their indicator is appropriately justified.

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

The alternative to the project activity is continuation of current situation i.e. no project activity, in that case equivalent amount of electricity would have been produced by the grid electricity system. This option will not require capital investment. Hence investment comparison analysis (option II) cannot be applied.

The Project Proponent proposes to use **Option III – Benchmark Analysis** and the financial indicator that are identified as the *post-tax* equity IRR.

The guidance to investment analysis issued in EB 51, Annex 58 (paragraph 12) states that in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity (Cost of Equity) are appropriate benchmarks for equity IRR.

The tool for demonstration and assessment of additionality [para-5, sub step 2(b)] states that in cases where the project has more than one potential developer, the benchmark shall be based on parameters that are standard in the market, considering the specific characteristics of the project type. Accordingly, the cost of equity applicable to the project type has been considered as the benchmark to be compared against equity IRR.

The benchmark Cost of equity for the project is **15.95**%.

Please refer to Appendix 1 for detailed calculations on the Benchmark cost of equity

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 possibly including *inter alia* subsidies/fiscal incentives, ODA, etc, where applicable), and, as appropriate, non-market cost and benefits in the case of public investors if this is standard practice for the selection of public investments in the host country.
6. Present the investment analysis in a transparent manner and provide all the relevant assumptions, preferably in the CDM-PDD, or in separate annexes to the CDM-PDD, so that a reader can reproduce the analysis and obtain the same results. Refer to all 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/economic 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 post-tax Equity IRR are set out below:

Capacity of Machines in kW	800		Enercon Offer
Number of Machines	63		Enercon Offer
Project Capacity in MW	50.40		Enercon Offer
Expected date of project Commissioning	30-Sep-10		Detailed Project Report
Project Cost per MW (Rs. In Millions)	52.1000		Enercon Offer
Operations			
Plant Load Factor Base Case	26%		Generation estimated by C-WET
Transformation loss and Transmission Loss up to metering point	3.0%		Detailed Project Report
Effective PLF	25.22%		Calculated
Insurance Charges @ % of capital cost	0.18%		Detailed Project Report
Operation & Maintanance Cost base year @ % of capital cost	1.25%		Enercon's offer
% of escalation per annum on O & M Charges	5.0%		Enercon's offer
Tariff			
Base year Tariff for 10 years - Rs./Kwh	3.40		KERC Order
Annual Escalation (Rs./kWh per Year)	0.00		KERC Order
Tariff applicable after 10 years (Rs/kWh)	2.80		Please refer for explanation for tariff beyond 10th year below.
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	**2,625.84**		Enercon Offer

	Cost/Machine (Rs Million)	Project Cost (Rs Million)	
WTG's	29.5	1858.50	Enercon Offer
Concrete Tower	4.68	294.84	Enercon Offer
Distribution Transformer	2.7	170.10	Enercon Offer
Civil works, foundation and electrical lines	1.4	88.20	Enercon Offer
Erection, commissioning, insurance and other works	1.4	88.20	Enercon Offer
Land and Transportation charges	2	126.00	Enercon Offer
	41.68	2625.84	
Means of Finance		**Rs Million**	
Own Source	30.00%	787.75	
Term Loan	70.00%	1,838.09	
Total Source		2,625.84	Enercon Offer
Terms of Loan			
Interest Rate	13.25%		PLR rate published by RBI (http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/wss250909_F.pdf)
Tenure	10	Years	Normative for power generation Sector in India
Income Tax Depreciation Rate (Written Down Value basis)			
on Wind Energy Generators	80%		Income Tax Act
Book Depreciation Rate (Straight Line Method basis)			
On all assets	4.50%		Straight line Method Adopted
Book Depreciation up to (% of asset value)	90%		
Income Tax			
Income Tax rate	33.99%		Income Tax Act
Minimum Alternate Tax	11.33%		Income Tax Act
Working capital			
Receivables (no of days)	30		Billing Cycle

O & m expenses (no of days)	120		Enercon's Offer

The post tax equity IRR for the Project without CDM revenues is 6.36% i.e. less than the benchmark.

Tariff beyond 10th year (i.e. beyond the term of PPA)
Karnataka state electricity commission has fixed the tariff for the period of 10 years. The tariff computed by the KERC order for the first year is INR 3.97 per unit and its decreases progressively to INR 2.80 per unit in the 10th year. According to KERC order dated 18 Jan 2005, the reduction in tariff year on year is on the account of repayment of debt and also there are no running cost other than O&M which increases only marginally.

Therefore from 11th year to the 20th year, the tariff number cannot contain the element of debt service (principal repayment and interest payment) and even with the increased operating costs, the overall tariff number is lower in the 11th year. In the public hearing held by KERC on 28-December-2004 to seek inputs on its "Consultation Paper on Back ground Issues on treatment of Renewable Energy Projects in the light of Electricity Act- 2003" under article (8-vii), common issues raised in the discussion paper on renewable energy projects: Tariff determination for old and new projects, KERC has ruled that the same tariff cannot be applied for projects that have completed 10 years of operational life since these projects has completed their loan repayment obligations. Therefore conservatively we have assumed tariff of INR 2.80 for substantiating additionality.

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/economic attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour 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/economically attractive (as per Step 2c para 11a) or is unlikely to be financially/economically attractive (as per Step 2c para 11b).

Sensitivity Analysis

As per the investment guidelines only those parameters should be selected for the sensitivity analysis that constitute more than 20% of either total project costs or total project revenues. Capital cost, tariff and PLF are such parameters and hence these are selected for sensitivity analysis. However to show the robustness of the sensitivity analysis we have considered O&M cost and Debt-Equity ratio also as a sensitivity parameter along with the above mentioned parameters.

- Capital Cost
- Tariff
- Plant Load Factor
- Debt Equity Ratio
- O&M cost

Capital Cost

In accordance with the investment guidance, the additionality for the project activity is demonstrated at the time of decision making. We have indicated post tax equity IRR for the project activity with the variation of 10% over the base cost. The equity IRR is below the benchmark even with 10% decrease on capital cost.

	10% decrease in Capital Cost	Base Capital Cost	10% Increase In Capital Cost
Post tax Equity IRR	9.01%	6.36%	4.17%

The equity IRR crosses the benchmark at capital cost variation of 28.6% which is not possible as such a huge deviation for a large capital intensive project after finalisation of Purchase Order is not realistic.

Tariff

Karnataka state electricity commission has fixed the tariff for the period of 10 years. The tariff computed by the KERC order for the first year is INR 3.97 per unit and its decreases progressively to INR 2.80 per unit in the 10th year. According to KERC order dated 18 Jan 2005, the reduction in tariff year on year is on the account of repayment of debt and also there are no running cost other than O&M which increases only marginally. Therefore conservatively we have assumed tariff of INR 2.80 for substantiating additionality.

Therefore from 11th year to the 20th year, the tariff number cannot contain the element of debt service (principal repayment and interest payment) and even with the increased operating costs, the overall tariff number is lower in the 11th year. In the public hearing held by KERC on 28-December-2004 to seek inputs on its "Consultation Paper on Back ground Issues on treatment of Renewable Energy Projects in the light of Electricity Act- 2003" under article (8-vii), common issues raised in the discussion paper on renewable energy projects: Tariff determination for old and new projects, KERC has ruled that the same tariff cannot be applied for projects that have completed 10 years of operational life since these projects has completed their loan repayment obligations.

Therefore we have conducted sensitivity assuming a variation of 10% over the tariff of Rs. 2.80 per unit for the period beyond the term of PPA. Further, we have included the tariff of Rs. 3.40 for the period from 11th to 20th year in the sensitivity analysis.

Tariff beyond the term of PPA	10% decrease over base tariff	Base tariff (Rs. 2.80 per unit beyond the term of PPA)	10% Increase over base tariff	Tariff of Rs. 3.40 per Kwh for the period beyond 10th year
Post tax Equity IRR	5.61%	6.36%	7.05%	7.77%

The project does not cross the benchmark even at the tariff of Rs. 5.00 per unit after 10th year which is not realistic.

Plant Load Factor

Plant Load Factor is the key variable encompassing variation in wind profile, variation in off-take (including grid availability) including machine downtime. We have conducted sensitivity at the variation of 10% from the base case.

Sensitivity is summarized in below table:

	PLF @ 23.4 % (-10%)	**PLF 26% (Base Case)**	**PLF @ 28.6% (+10%)**
Post tax Equity IRR	3.97%	6.36%	8.73%

The sensitivity analysis clearly shows even with a higher PLF, the project is not able to generate sufficient returns. It can therefore be concluded that the project is financially not viable without CDM benefits. The project does not cross the benchmark even at PLF variation of 30% which is not realistic.

Debt Equity Ratio

The debt equity ratio envisaged for the project activity is 70:30. We have conducted sensitivity on debt equity ratio at the variation of +/-10%.

	Debt equity [2.13]	**Debt equity Ratio [2.33]**	**Debt equity [2.57]**
Post tax Equity IRR	6.31 %	6.36%	6.42%

The project does not cross the benchmark even at 100% variation in debt equity ratio (i.e. 100% equity finance).

O&M Cost

The Sensitivity in O&M maintenance cost is conducted after taking to consideration +/-10% decrease in O&M Cost.

	10% decrease in O&M cost	**Base O&M Cost**	**10% Increase In O&M cost**
Post tax Equity IRR	6.70%	6.36%	6.02%

The project does not cross the benchmark even at 100% variation in O&M cost.

Outcome of Step 2: If after the sensitivity analysis it is concluded that: (1) the proposed CDM project activity is unlikely to be the most financially/economically attractive (as per Step 2c para 11a) or is

unlikely to be financially/economically attractive (as per Step 2c para 11b), then proceed to Step 4 (Common practice analysis).

Step 3: Barrier analysis

Not Opted for.

Step 4: Common practice analysis

Unless the proposed project type has demonstrated to be first-of-its kind (according to Sub-step 3a), the above generic additionality tests shall be complemented with an analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and region. This test is a **credibility check** to complement the investment analysis (Step 2) or barrier analysis (Step 3). Identify and discuss the existing common practice through the following Sub-steps:

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

1. Provide an analysis of any other activities that are operational and 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 (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis. Provide documented evidence and, where relevant, quantitative information. On the basis of that analysis, describe whether and to which extent similar activities have already diffused in the relevant region.

The additionality tool version 5.2 describes similar project activities are those that 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.

The proposed project activity is in the state of Karnataka by EN Renewable Energy Limited. The tariff is determined by the state electricity regulatory commissions in their respective states and hence investment climate is different for each state. The proposed project activity is the wind based power generation project of 50.4 MW (large scale) by a single investor. In light of the above definition, all large scale wind projects, (greater than 15 MW) set up by a single investor in the state of Karnataka, have been analyzed. In India there 95[7] individual investors who have wind installations greater than 15 MW. Out of these there are 8[8] investors who have wind installations greater than 15 MW in the state of Karnataka. An analysis of these installations has been presented below.

[7] The list of wind power investors was analyzed using the Directory for Indian wind Power 2008

[8] The list of wind power investors was analysed using the Directory for Indian wind Power 2008 to identify the capacity of installations in each state for each investor.

Sl. No.	Name of Owner	Capacity in Karnataka (MW)[9]	CDM status
1	MSPL Limited	92.15	CDM project under 3 PDDs titled: 1) **"Emission free electricity generation at Harihar, Karnataka"** http://cdm.unfccc.int/UserManagement/FileStorage/Q7FCFG27XNUZ6IB32EM7CTVC7KZG6R and 2) **"8.35 MW wind power project at Guddarangavana Halli, Chitradurga, Karnataka in India"** http://www.sgsqualitynetwork.com/tradeassurance/ccp/projects/434/Revised%20Final%20CDM_4_Kar_PDD.pdf. 3) **"125 MW Wind Power Project in Karnataka, India"** http://cdm.unfccc.int/UserManagement/FileStorage/6TU55OXGCAEHNZQV27694ATC31SOM3 All of MSPL's installations are under CDM or the voluntary carbon market as given in their website http://www.mspllimited.com/wind%20power.htm
2	Enercon Windfarms (Hindustan) P. Ltd.	68.8	CDM project under the PDD titled: **" Enercon Wind Farm (Hindustan) Ltd in Karnataka"** http://cdm.unfccc.int/UserManagement/FileStorage/4N3W9XGUHAIZYL0CJDFQRV6S17K5ET
3	Vijayanand Roadlines Ltd	42.5	CDM project under the PDD titled: **"42.5 MW Wind Power Project by VRL Logistics Ltd. In Karnataka State (India)"** http://cdm.unfccc.int/Projects/Validation/DB/5M0UJB3T8IVQ6OW8VMYEPCZ8WQBBGM/view.html
4	Ramgad Minerals & Mining Pvt. Ltd.	39.5	CDM project under 2 PDDs titled: 1) **"125 MW Wind Power Project in Karnataka, India"** http://cdm.unfccc.int/UserManagement/FileStorage/6TU55OXGCAEHNZQV27694ATC31SOM3, and 2) **"8.35 MW wind power project at Guddarangavana Halli, Chitradurga, Karnataka in India"** http://www.sgsqualitynetwork.com/tradeassurance/ccp/projects/434/Revised%20Final%20CDM_4_Kar_PDD.pdf
5	Nuziveedu Seeds Ltd	32.65	The company website states that the company's wind installations are under CDM. http://www.nuziveeduseeds.co.in/wind.html; CDM project titled: 1) **"NSL 27.65 MW Wind Power Project in Karnataka, India"** http://cdm.unfccc.int/UserManagement/FileStorage/7MKGRE0K2J0D6O1WKHV6XTW67UCAD6

[9] The capacity of each investor in Karnataka is taken from Directory for Indian Wind Power 2008

			2) **"33MW Wind Power Project at Linganahalli and Rangayyanadurga"** http://cdm.unfccc.int/UserManagement/FileStorage/S2I3TPZ8NYWX5MH014UDJECF7Q9OGA
6	Enercon Wind Farms (Karnataka) Ltd.	24.2	CDM project under 2 PDDs titled: 1) **"**Enercon Wind Farms in Karnataka Bundled Project - 73.60 MW " http://cdm.unfccc.int/UserManagement/FileStorage/CE6EYN7KWO13MRE0Q3FLKEAGANOXMS and 2) **"Enercon Wind Farms in Karnataka Bundled Project-33 MW"** http://cdm.unfccc.int/UserManagement/FileStorage/QB4LN5D6YY0EZ9MDEUUCSB99HHER7R,
7	VSL Mining Company (P) Ltd	19	CDM project under the PDD titled: **"VSL Wind Power project"** http://cdm.unfccc.int/UserManagement/FileStorage/1V5DW5ZJNU9BGYUL8N04SIF0NERRP4
8	Hindustan Zinc Limited	18.4	CDM project under the PDD titled: **"Wind power project by HZL in Karnataka"** http://cdm.unfccc.int/UserManagement/FileStorage/N9L0SY7CEOBTXFVGZQP5UH218WI6AJ

It can be seen that, without exception, all private investors in the state of Karnataka with installations greater than 15 MW have developed these projects as CDM projects.

Out of the remaining investors with greater than 15 MW installations in the whole of India, even the investors with 10 to 15 MW of installations in Karnataka were also either CDM or VER projects (even though as they did not have over 15 MW capacity in Karnataka, they are not similar activities to the project activity).

It is clear from the above discussions and the overall trends that wind power project development in Karnataka is not common practice when compared to the power sector of Karnataka as a whole. In addition, all similar activities over 15 MW in size in the state of Karnataka are CDM projects.

Sub-steps 4a is satisfied.

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

Sub-step 4a shows that all similar activities i.e large scale wind investments by a single investor in the state of Karnataka are under CDM pipeline. This proves that similar activities are not widely observed or commonly carried out, and hence substep 4 (b) is not required.

Sub-steps 4a is satisfied and 4b is not required as no similar activities are observed.

The above additionality discussions shows that wind power development is not a common practice in the state of Karnataka and the project activity is not financially attractive; hence the project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to the approved methodology ACM0002 (Version 12.1.0) Emission Reductions are calculated as:-

$\mathbf{ER_y = BE_y – PE_y}$

Where:

BE_y	Baseline Emissions in year *y* (t CO_2e/yr)
PE_y	Project Emissions in year *y* (t CO_2e/yr)

Estimation of Baseline Emissions:
Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$BE_{y} = EG_{PJ, y} * EF_{grid, CM, y}$

Where:
BE_y = Baseline emissions in year *y* (tCO_2/yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Since the project activity is the installation of a new grid connected renewable power plant the $EG_{PJ,y}$ is calculated as :

$EG_{PJ,y} = EG_{facility,y}$

Where:
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

The proposed project activity is in the state of Karnataka which falls under southern grid, baseline emission factor is calculated as combined margin, consisting of a combination of operating margin and build margin factors according to the procedures prescribed in the latest tool for calculating the emission factor for an electricity system. The steps of calculation are as follows:

STEP 1. Identifying the relevant electricity systems:

The Indian electricity system is divided into two regional grids, viz. (1) Northern, Eastern, Western, North-Eastern and (2) Southern grid. 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 activity. As the project activity is connected to the southern regional electricity grid, the southern grid is the "project electricity system".

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

Option I is opted for the project activity i.e. only grid power plants are included in the calculation.

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

According to the tool, the calculation of the operating margin emission factor is based on one of the following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

Any of the four methods can be used for calculating OM, The simple adjusted OM and dispatch data analysis OM cannot be currently applied in India due to lack of necessary data however, the simple OM method (option a) can only be used if low cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The Share of Low Cost / Must-Run (% of Net Generation) in the generation profile of the different grids in India in the last five years is as follows:

	2004-05	**2005-06**	**2006-07**	**2007-08**	**2008-09**
South	21.61%	27.0%	28.3%	27.1%	22.8%

Source: CEA database version 5

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) for the southern regional grid is less than 50 % of the total generation. Hence the Simple OM method can be used to calculate the Operating Margin Emission factor. The average operating margin method cannot be applied, as low cost/ must run resources in southern grid constitute less than 50% of total grid generation.

The project proponents choose an ex ante option for calculation of the OM with a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

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

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

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

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO_2 Baseline Database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India. The Combined Margin in the CEA database is calculated ex ante using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system". We have, therefore, used the Combined Margin data published in the CEA database, for calculating the Baseline Emission Factor.

The CEA database uses the option A i.e. data on net electricity generation and CO_2 emission factor for each power unit, the average efficiency of each power unit and the fuel type(s) used in each power unit, to calculate the OM of the different regional grids.

The simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

$$\mathbf{EF_{grid,OMsimple,y} = \Sigma\ (EG_{m,y}\ x\ EF_{EL,m,y})\ /\ \Sigma EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO2/MWh)
m	All power units serving the grid in year y except low-cost / must-run power units
y	The relevant year as per the data vintage chosen in step 3

The emission factor of each power unit m has been determined as follows:

$$EF_{EL,m,y} = (\Sigma FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,I,y}) / EG_{m,y}$$

Where:

$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$	Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,I,y}$	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m	All power units serving the grid in year y except low-cost / must-run power units
i	All fossil fuel types combusted in power unit m in year y
y	The relevant year as per the data vintage chosen in step 3

STEP 5. Identify the group of power units to be included in the build margin:

The sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or

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

Project participants should use the set of power units that comprises the larger annual generation.
Accordingly, the CEA database calculates the build margin as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation.
The build margin emission factor has been calculated ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. This option does not require monitoring the emission factor during the crediting period.

STEP 6. Calculate the build margin emission factor:

The build margin emissions factor is the generation-weighted average emission factor of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = (\Sigma EG_{m,y} \times EF_{EL,m,}) / \Sigma EG_{m,y}$$

Where:

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

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) is determined as per the procedures given in step 4 (a) for the simple OM, using option A1 for *y* most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

STEP 7. Calculate the combined margin emissions factor:

The emission factor $EF_{grid, CDM, y}$ 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 $EF_{grid, OM,, y}$ and $EF_{grid, BM, ,y}$, then the $EF_{grid, CM, y}$ is given by:

$$\mathbf{EF}y = w_{OM} * \mathbf{EF}_{grid,OM,y} + w_{BM} * \mathbf{EF}_{grid,BM,y}$$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

(where $w_{OM} + w_{BM} = 1$).

According to ACM0002 the weights for OM and BM are 0.75 and 0.25 respectively.

Using the values for operating and build margin emission factor provided in the CEA database and their respective weights for calculation of combined margin emission factor, the baseline carbon emission factor (CM) is 0.94515 tCO_2e/MWh.

Details of Baseline data:

Data of Operating margin for the three financial years from 2006-07, 2007-08 and 2008-09 and Build Margin for 2008-09 has been obtained from -

The CO_2 Baseline Database for the Indian Power Sector
Ministry of Power: Central Electricity Authority (CEA)
Version 5
Key baseline information is reproduced in Annex 3.
The detailed excel sheet is available at:
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Estimation of Project Emissions
The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 12.1.0, there will be no project emissions in the project activity (PE_y = 0).

Estimation of Leakage Emissions
As per ACM0002 Version 12.1.0, no leakage has been considered.(LE_y = 0).

The details on OM, BM and CM estimates as provided by the CEA are shown in Annex-3.

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

Data / Parameter:	$EF_{grid, OM, y}$
Data unit:	tCO_2e/MWh
Description:	Operating Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.9876
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated as per ACM002 with 3 years vintage (2006-2007, 2007-2008, 2008-2009) data obtained from "CO_2 Baseline Database for Indian Power Sector" version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system"..
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	$EF_{grid, BM, y}$
Data unit:	tCO_2e/MWh
Description:	Build Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.8179
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated as per ACM002 with year 2008-09 data obtained from "CO_2 Baseline Database for Indian Power Sector" version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system".
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	EFy or $EF_{grid, CM, y}$
Data unit:	tCO_2e/MWh
Description:	Combined Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.

	The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	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. Combined Margin Emission Factor (EFy or $EF_{CM,y}$) : 0.94515 Refer Annex – 3 for comprehensive calculation of Combined Margin Emission Factor.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System.
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

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) (EFy)
= 0.9451 tCO_2e/MWh

Annual electricity supplied to the grid by the Project (EGy)
= 50.4 MW (Capacity) x 25.22% (PLF) x 8,760 (hours) MWh
= 111,347.31 MWh

Annual Baseline Emissions : BEy = EFy * EGy
= 0.9451 tCO_2e/MWh x 111347.31 MWh
= 105,239 tCO_2e

Project emissions = 0

Leakage = 0

Hence BEy = PEy

The emission reductions per year are estimated to be 105,239 tCO_2e.

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
1st year*	0	105,239	0	105,239
2nd year	0	105,239	0	105,239
3rd year	0	105,239	0	105,239
4th year	0	105,239	0	105,239
5th year	0	105,239	0	105,239
6th year	0	105,239	0	105,239
7th year	0	105,239	0	105,239
Total (tonnes of CO_2e)	0	736,673	0	736,673

*1st year begins from the date of registration, and each year extends for 12 months.

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 Activity
Source of data to be used:	Electricity supplied to the grid as per the joint meter report.
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. = 50.4 MW (Capacity) x 25.22% (PLF) x 8,760 (hours) MWh = 111,347.31 MWh
Description of measurement methods and procedures to be applied:	Electricity supplied to grid for the project activity will be calculated. 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 state utility and the PP. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be stored in hard formula and values will be taken from JMR.

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

Description:	Electricity Export recorded at the meter(s) connected 63 machines of the project activity.
Source of data to be used:	Electricity export to the grid as per the joint meter report.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be taken from the JMR (Form B) and will be applied directly.
Description of measurement methods and procedures to be applied:	Electricity export to the grid will be recorded by the meter(s) connected to the 63 machines of the project activity feeding the pooling substation of Enercon. 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 state utility and the PP. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be stored in hard formula and values will be taken from JMR.

Data / Parameter:	**G*pi***
Data unit:	MWh (Mega-watt hour)
Description:	Electricity Import recorded at the meter(s) connected 63 machines of the project activity.
Source of data to be used:	Electricity import from the grid as per the joint meter report.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be taken from the JMR (Form B) and will be applied directly.
Description of measurement methods and procedures to be applied:	Electricity import from the grid will be recorded by the meter(s) connected to the 63 machines of the project activity feeding the pooling substation of Enercon. 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 state utility and the PP. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be stored in hard formula and values will be taken from JMR.

Data / Parameter:	**L*i***
Data unit:	MWh (Mega-watt hour)
Description:	Transmission loss between the metering point for the project activity feeding the pooling substation of Enercon and the metering point at EB Substation/Switching Station.
Source of data to be used:	Transmission Loss will directly applied from the joint meter report (Form B) for the project activity.

Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value is certified by the State utility in the JMR (Form B). This value will be directly applied from the JMR (Form B).
Description of measurement methods and procedures to be applied:	Transmission loss between metering point feeding the pooling substation of Enercon and the metering point at the EB Substation/Switching Station is applied to the meter reading taken at the feeder connecting 63 turbines of the project activity and feeding the pooling substation of Enercon. Switching station/EB Substation is connected to the machines of the project activity and the machines commissioned by the other project developers. The project proponent does not have control over the data of the other project developers. Therefore the project developer has to rely upon the transmission loss applied to the project activity by the state utility as reflected in the JMR (Form B). The JMR is signed by the representatives of Enercon and the state utility. 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 state utility and the PP. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be stored in hard formula and values will be taken from JMR.

The data will be stored in hard format. Joint meter report is taken in the presence of the persons representing Enercon [Operation and Maintenance Contractor]. The copies of the joint meter report will be presented to the validator during the verification exercise. The archive will be kept for the period up to two years after the completion of the crediting period.

The continuous and daily records for parameters such as power generation, frequency and voltage of the individual machines are noted by the SCADA system. These records are maintained by Enercon India Limited (the O&M contractor) and the PP.

B.7.2 Description of the monitoring plan:

Approved monitoring methodology ACM0002 Version 12.1.0 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:

- Net 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. Further, wind based electricity generation is not associated with any kind of leakages. Hence, the sole parameter for monitoring is the electricity generated by the project and supplied to the grid.

The reading will be taken by the representatives of Enercon and the State utility at the meter(s) for the project activity connecting 63 turbines at the project site and feeding the pooling substation. This reading is recorded in the form of JMR (Form B) and is signed by the representatives of Enercon and State Utility. The electricity export and import will be metered at this metering point. Transmission loss between metering point feeding the pooling substation and the metering point at the EB Substation/Switching Station is applied to the meter reading taken at the feeder connecting 63 turbines of the project activity and feeding the pooling substation.

Transmission loss given in the JMR will be directly applied to the meter readings taken at the metering point of the project activity and feeding to pooling substation of Enercon. Net Electricity exported to the grid is calculated by applying transmission loss to the meter reading taken at the metering point of the project activity connecting 63 turbines and feeding to pooling substation of Enercon.

The Joint meter reading contains the following data:-

1. Electricity Export
2. Electricity Import
3. Transmission Loss (Between the metering point feeding the pooling substation and the EB/Switching substation)
4. Net Electricity exported to the Grid [Electricity Export-115%*Electricity Import-Transmission Loss]

Joint Meter reading is signed by the representatives of Enercon and the state utility. The meter readings (both export and import), transmission loss and net electricity exported to the grid are noted in the JMR. Hence all these values will be reproduced from the JMR at the time of verification. Please refer Annex 4 for details on calibration and QA/QC procedures.

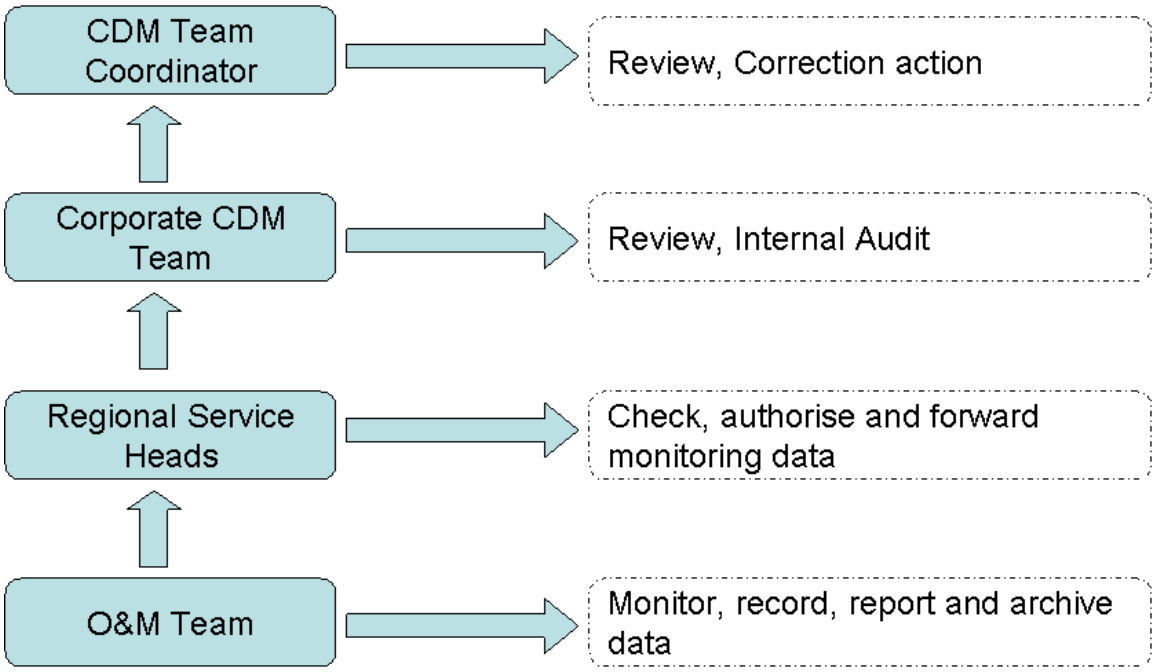
The Project is operated and managed by ENRE. The operational and maintenance contract for the project is with Enercon. Enercon is an ISO 9001:2000 certified Quality Management system from Germanischer Lloyd. Enercon follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project.

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure. The project will adhere to all the mandatory regulatory and statutory requirements at the state as well as national level. Enercon is Operation and Maintenance contractor for the project activity and provides the daily generation report to the project proponent. The project proponent also maintains the records of daily generation report and joint meter report.

Training and maintenance requirements:

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Energy Converters (WECs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that Enercon's service staff is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. The Enercon Training Academy provides need-based training to meet the training requirements of Enercon projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving.

The operational and management structure implemented 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)

Date of completion: 01/11/2009

Name of responsible person/entity: EN Renewable Energy Limited (Project Participant). Enercon (India) Limited (Not a project participant). The details are given in Annex-1

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:

20/01/2009, being the date of placement of purchase order for the wind energy converters.

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 proponent has selected the renewable crediting period for the project activity.

C.2.1. Renewable crediting period

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

01/04/2011, being the expected date of registration with UNFCCC or commissioning whichever occurs later.

C.2.1.2. Length of the first crediting period:

7 Years 0 Months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not Applicable

C.2.2.2. Length:

Not Applicable

SECTION D. Environmental impacts

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

As per the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated January 27, 1994 and EIA Notification (S.O 1533) dated 14th September 2006, a list of activities that require to undertake environmental impact assessment studies[10] has been provided. EIA is not a regulatory requirement in India for wind energy projects, since the project activity is the wind based renewable electricity generation it does not expect any adverse impacts on the environment. Thus no detailed EIA study was conducted.

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:

[10] http://envfor.nic.in/legis/eia/so1533.pdf

The project activity would not have any significant adverse environmental impacts and also it does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India Hence, EIA is not required by the host party.

SECTION E. Stakeholders' comments

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

The comments from local stakeholders were invited through a local stakeholder meeting conducted at Belgaum District in Karnataka on 6 October 2009. A local newspaper advertisement was placed in Vijay Karnataka on 21 September 2009 inviting the local stakeholders for the meeting. The meeting was presided over by Mr. Navin Kumar, (EIL-Asst. Manager), C.B. Poonacha (EIL), Saujanya Kumar (EIL-CDM), Mr. Sreedhar Kumar , and R.P. Chavate (KPTCL).

Mr. Navin Kumar welcomed the gathering and introduced the company and its initiative to the stakeholders. He further briefed the gathering about the environmental hazards faced by the society in the present scenario and highlighted the importance of CDM and clean energy. He also explained how wind energy can be instrumental in promoting clean and pollution free environment. He invited Mr. C.B. Poonacha to explain the project activity and discuss the benefits of upcoming wind farm project. Mr. Saujanya Kumar further stressed on the need for climate change mitigation and presented the global warming scenario across the world for better understanding of the need for the proposed CDM project activity. Mr. R.P. Chavate explain the importance of KPTCL's role in WPPs. Mr. Sreedhar Kumar then delivered the vote of thanks and appreciated the villagers for their active participation.

The meeting was very cordial and ended on a positive note. No adverse comments were received. The following queries were raised by the stakeholders:

I. Whether there would be any effect on rain due to wind power projects?
II. Whether the project is useful to the villagers?
III. Whether there is any use for farmers?
IV. Whether there is any effect on the cattle grazing near wind farms?

E.2. Summary of the comments received:

The clarifications that were addressed by the representatives of Enercon (Enercon is authorized by the PP to execute all the activities in relation to CDM i.e. project registration and verification including local stakeholder consultation) are listed in the table below:

S.No.	Villager Name	Question	Reply by Enercon representatives
1	Prashant Patil	Whether there would be any effect on rain due to wind power projects?	The height of machines are much lower than the clouds and it has been proven scientifically that WTGs does not impact the rainfall pattern
2	Virag	Whether the project is useful to the	The project will help in local

	Harakuni	villagers?	jobs being created during implementation phase and security staff jobs during operational phase of the project.
3	Vikram Patil	Whether there is any use for farmers?	The project will help the farmers indirectly as the project will help in reducing the demand supply gap and may help in longer hours of power supply in the local areas.
4	Laxman Kangrali	Whether there is any effect on the cattle grazing near wind farms?	There is no effect and no reduction on the flora and fauna due to the project activity

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

No negative comments were received from the villagers.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	EN Renewable Energy Limited
Street/P.O.Box:	Travesera de Gracia, 30, 5th Floor
Building:	
City:	Barcelona
State/Region:	Barcelona
Postfix/ZIP:	08021
Country:	Spain
Telephone:	+34 932405306
FAX:	+34 933620405
E-Mail:	jmre@fersa.es
URL:	
Represented by:	Mr. Jose Maria Roger Ezpeleda
Title:	Chairman
Salutation:	Mr.
Last Name:	Roger Ezpeleda
Middle Name:	Maria
First Name:	Jose
Department:	
Mobile:	N.A
Direct FAX:	+34 933620405
Direct tel:	+34 932405306
Personal E-Mail:	jmre@fersa.es

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project activity does not involve any public funding from parties included in Annex 1.

Annex 3

BASELINE INFORMATION

The Operating Margin data for the most recent three years and the Build Margin data for the Southern Region Electricity Grid as published in the CEA database are as follows:

Simple Operating Margin

	Southern Grid (tCO_2e/MWh)
Simple Operating Margin – 2006-07	0.99912
Simple Operating Margin – 2007-08	0.99062
Simple Operating Margin – 2008-09	0.97293
Average Operating Margin of last three years	0.98756

Build Margin

	Southern Grid (tCO_2e/MWh)
Build Margin- 2008-09	0.81792

Combined Margin Calculations

	Weights	Southern Grid (tCO_2e/MWh)
Operating Margin	0.75	0.98756
Build Margin	0.25	0.81792
Combined Margin		0.94515

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at www.cea.nic.in.

Annex 4

MONITORING INFORMATION

- **Metering:** Electricity supplied to the grid is metered at the metering point connecting 63 machines of the project activity. The meter reading is taken in the presence of representatives of Enercon (O&M Contractor for the project activity) and KPTCL.

- **Metering Equipment:** Metering system for the project activity consists of main and check meter. Both the meters are two-way trivector meters capable of recording import and export of electricity. The metering equipment is calibrated annually.

- **Meter Readings:** The electricity supplied to the grid is recorded by taking a Joint Meter Reading (JMR) in the presence of Officials from the Utility and Enercon, O&M contractor, on behalf of project owner. The Joint meter reading contains the value of energy imported and exported. These certified readings are then used by the DISCOM officials to prepare the tariff invoices. Thus the monitoring parameters for the project activity are the electricity import and electricity export to the grid as mentioned in the JMR. The readings are then adjusted for the transmission loss in the JMR, which can be crosschecked with the value mentioned in the invoices.

- **Inspection of Energy Meters:** All 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**: There is a separate check and main meter. The Main and Check Meters are close to each other and will be tested for accuracy, with a standard meter, by the KPTCL's testing Division. The KPTCL will carry out the calibration, periodical testing, sealing and maintenance of meters. The KPTCL will provide a copy of the test reports.

  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 limit 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.
  - If both the main meters and the corresponding check meters are found to be beyond the permissible limits of error, both the meters shall be immediately calibrated and the correction will be applied to the reading registered by the main meter to arrive the correct reading of energy supplied to the grid for the period up to last test.
  - 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 and the correction will be applied to the reading registered by the main meter to arrive the correct reading of energy supplied to the grid for the period up to last test.
  - In case of the failures such as burning of the meter and the erratic display of the metered parameters and when the error found in testing the meters is beyond the permissible limit of error, the meter shall be calibrated immediately and the correction will be applied to the reading

registered by the main meter to arrive the correct reading of energy supplied to the grid for the period up to last test.

The continuous and daily records for parameters such as power generation, frequency and voltage of the individual machines are noted by the SCADA system. These records are maintained by Enercon India Limited (the O&M contractor) and the PP.

Calculation of Data to be monitored:

$EG_y = G_p - L_i$

EG_y : Net Electricity supplied to grid by the project activity

G_p : Generation of electricity by the project activity recorded at the feeder connected to 63 turbines of the project activity [export (G_{pe}) –115%* Import (G_{pi})]

L_i : Transmission loss

Transmission loss is certified by the state utility in JMR:

L : $\sum_j G_j - N$

$\sum_j G_j$: Summation of electricity generation data measured at all the feeders connected to pooling substation (export – Import)

N : Electricity generation data measured at Switching station/Substation at Belgaum from the feeders emanating from the pooling substation

L : Total transmission loss

Li : $G_p * (L/\sum_j G_j)$

- - - -

Appendix 1:
Calculation on Cost of Equity

Selection of Appropriate Benchmark:

In choosing an appropriate benchmark we have based our approach on the principles of financing and investment decision making that are well found in theory and practice of corporate financing worldwide. We have derived from text book on "Corporate Finance Theory and Practice" by Dr. Aswath Damodaran of Stern School of Business, New York University. Dr. Damodaran is one of the foremost authorities in the world in the field of Investment Analysis.

The guidance to investment analysis issued in EB 51states that in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR and cost of Equity is appropriate benchmark for equity IRR.

It is also worthwhile to note that the captioned project is a Greenfield wind power generation project that generates and supplies electricity to the state grid, therefore the project cannot have only one possible project developer. The tool for demonstration and assessment of additionality [para-5, sub step 2(b)] states that in such cases (where the project has more than one potential developer) the benchmark cannot be based on internal cost of equity or WACC and shall be based on parameters that are standard in the market, considering the specific characteristics of the project type. Hence, we have not used company or project specific parameters for the calculation of the benchmark.

Risk free rate:

The risk free rate is understood as the rate of return on an asset that is theoretically free of any risks, therefore the yeild rates are considered as risk free rates. Page 188 of text book on "Corporate Finance Theory and Practice" by Dr. Aswath Damodaran[11], Stern School of Business, New York University, describes that the yield rates are suitable indicators of risk free rates when the time horizon for the investment is long term.

Accordingly the risk free rate has been taken from yield rates available at the decision making date. This has been considered as it was in the year of investment (i.e in that year, the company had the alternative of this long term risk free investment). The data on yield rates is published by Reserve Bank of India. (RBI Web-link: http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/87456.pdf)

The applicable risk free rate is 7.53% (average of 6.17% to 8.88%).

Risk Premium:

The most common approach for estimating the risk premium is to base it on historical data, in the CAPM, the premium is estimated by looking at the difference between average return on stocks and risk free return. It is preferred to use long term premimums, i.e over a period of 25 years, since considering shorter time periods can lead to large standard errors because volatility in stock returns [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran]. It is also preferred to calculate the risk premium based on geometric mean of the returns since arithmetic mean overstates the risk premium. Geometric mean is defined as the compounded annual return over the same period [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran].

[11] Dr. Damodaran, one of the foremost authorities in the world in the field of Investment Analysis

Therefore the risk premium has been calculated as the difference in compounded annual return bewteen the BSE-Sensex and the yield rate since the year of inception of BSE Sensex. The detailed calculations are presented in the attached excel sheet.

The applicable risk premium is 10.64%.

Beta:

Beta (B) indicates the sensitivity of the company to market risk factors. Beta represents the market risk for an asset and is calculated as the statistical measure of volatility of a specific asset/investment relative to the movement of a market group. The conventional approach for estimating beta of an investment is a regression of returns on investment against returns on a market index. For companies that are not publicly listed, the beta is determined by referring beta values of publicly listed companies that are engaged in similar types of business. The project activity type is wind power generation; the approach therefore should be to base the beta for the project on the beta values of listed wind power generation companies in India. Therefore, in the absence of adequate data on companies which are exclusively into the exactly same type of business (i.e wind power projects), the next best option for assessing the risk of these projects is to consider the data available on companies which are involved in similar businesses.

Therefore, we have considered beta values of all electricity generating companies in India. The group of companies considered includes renewable as well as conventional power generating companies. It is understood that risky businesses are likely to have higher cost of equity than safer businesses; projects in riskier businesses will have to cover these higher costs. Hence, investors demand a higher return from renewable energy projects than from conventional energy ones, given the higher risks in renewable, including risks of technology, risks from significantly varying and unpredictable resource availability (e.g. wind), and a lower established support base for such projects relative to that for conventional power (e.g. grid connections, bank finance, suppliers, etc.). The use of this Beta value is therefore considered conservative, as it does not add for the higher risk of non conventional energy.

The applicable Beta value has been determined on the basis of the Beta values of major power generating companies in India which were listed on the stock exchange at the time of this investment. Beta values of individual companies have been sourced from Bloomberg.

The table below summarises the beta values:

Company Name	Beta
Cese Ltd.	1.20
Gujarat Industries	0.93
Tata Power	1.17
NTPC	0.792
Average	1.02
Minimum	0.792
Period: Five years from 1 Oct 2003 to 30 September 2008	

Source: Bloomberg

Calculation of Benchmark Cost of Equity:

Cost of Equity:

The expected return on equity has been determined using the Capital Asset Pricing Model (CAPM)[12]. The CAPM economic model is used worldwide to determine the required/expected return on equity based on potential risk of an investment. The CAPM framework is the Nobel award winning work of financial economist Dr. William Sharpe.

Ke = Rf + B x (Rm - Rf)

where:

Ke = Rate of return on equity capital;

Rf = Risk-free rate of return;

B = Beta;

Rm – Rf = Market risk premium;

Cost of Equity	**=**	**Risk Free Rate + Beta x Market risk premium**
	=	7.53% + 0.792 x 10.64%
	=	15.95%

[12] The Capital Asset Pricing Model (CAPM) was published in 1964 by William Sharpe, for his work on CAPM Sharpe received the Nobel Prize in 1990. http://www.investopedia.com/articles/06/CAPM.asp

Appendix 2
Details of Physical Location of Project Activity

S.No.	Location Number	Village	Taluka	District	Latitude	Longitude
1	HH01	Deshnur	Bailhongal	Belgaum	15°55'50.9"	74°42'2.9"
2	HH02	Deshnur	Bailhongal	Belgaum	15°55'56.6"	74°42'1.3"
3	HH03	Deshnur	Bailhongal	Belgaum	15°56'5.8"	74°42'2.3"
4	HH04	Deshnur	Bailhongal	Belgaum	15°56'10.9"	74°42'0.3"
5	HH06	Deshnur	Bailhongal	Belgaum	15°56'15"	74°42'31.4"
6	HH07	Deshnur	Bailhongal	Belgaum	15°56'21"	74°42'31.2"
7	HH08	Deshnur	Bailhongal	Belgaum	15°56'27.6"	74°42'26.6"
8	HH11	Deshnur	Bailhongal	Belgaum	15°56'35.4"	74°42'36.8"
9	HH12	Deshnur	Bailhongal	Belgaum	15°56'41.3"	74°42'35.5"
10	HH13	Deshnur	Bailhongal	Belgaum	15°56'47.7"	74°42'35.5"
11	HH14	Deshnur	Bailhongal	Belgaum	15°56'53.9"	74°42'36.2"
12	HH15	Deshnur	Bailhongal	Belgaum	15°56'58.2"	74°42'18.8"
13	HH16	Deshnur	Bailhongal	Belgaum	15°57'2.8"	74°42'13.7"
14	HH17	Deshnur	Bailhongal	Belgaum	15°57'15.6"	74°43'5.0"
15	H1	Ganginahal	Belgaum	Belgaum	15°57'26.4"	74°32'44.3"
16	H2	Kakti	Belgaum	Belgaum	15°57'20.1"	74°32'44.2"
17	H3	Kakti	Belgaum	Belgaum	15°57'13.6"	74°32'42.7"
18	H4	Kakti	Belgaum	Belgaum	15°57'4.5"	74°32'39.6"
19	H5	Sunahatti	Belgaum	Belgaum	15°56'57.6"	74°32'42.7"
20	H6	Sunahatti	Belgaum	Belgaum	15°56'51.5"	74°32'44.3"
21	H7	Sunahatti	Belgaum	Belgaum	15°56'44.6"	74°32'43.3"
22	H8	Kakti	Belgaum	Belgaum	15°56'38"	74°32'38.1"
23	H9	Kakti	Belgaum	Belgaum	15°56'30.9"	74°32'38.3"
24	H10	Kakti	Belgaum	Belgaum	15°56'58.1"	74°31'55.5"
25	H11	Kakti	Belgaum	Belgaum	15°56'37.4"	74°32'2.5"
26	H12	Kakti	Belgaum	Belgaum	15°56'31.9"	74°32'7.4"
27	H13	Kakti	Belgaum	Belgaum	15°56'24.2"	74°32'30.9"
28	H14	Kakti	Belgaum	Belgaum	15°56'17.8"	74°32'30.4"
29	H15	Kakti	Belgaum	Belgaum	15°56'12.2"	74°32'33.7"
30	H16	Kakti	Belgaum	Belgaum	15°56'14.5"	74°32'1.4"
31	H17	Kakti	Belgaum	Belgaum	15°56'4.1"	74°32'19.1"
32	H18	Kakti	Belgaum	Belgaum	15°55'58.2"	74°32'20.9"
33	H19	Kakti	Belgaum	Belgaum	15°55'53"	74°32'24.4"
34	H20	Kakti	Belgaum	Belgaum	15°55'47.5"	74°32'29.4"
35	H21	Kakti	Belgaum	Belgaum	15°55'38.3"	74°32'32.7"
36	H22	Kakti	Belgaum	Belgaum	15°55'36.7"	74°32'15.8"
37	H23	Kakti	Belgaum	Belgaum	15°55'41.9"	74°32'10.9"
38	H24	Kakti	Belgaum	Belgaum	15°55'40"	74°33'20.6"
39	H27	Kanabargi	Belgaum	Belgaum	15°55'24.7"	74°33'47.1"
40	H28	Kanabargi	Belgaum	Belgaum	15°55'57.2"	74°34'39.6"
41	H41	Baramanahatti	Belgaum	Belgaum	15°56'20"	74°35'6.3"

42	H42	Baramanahatti	Belgaum	Belgaum	15°56'26.6"	74°34'54.8"
43	H43	Baramanahatti	Belgaum	Belgaum	15°56'32.7"	74°34'46.1"
44	H44	Baramanahatti	Belgaum	Belgaum	15°56'38.2"	74°34'42.1"
45	H45	Baramanahatti	Belgaum	Belgaum	15°56'46.1"	74°34'40.5"
46	H46	Baramanahatti	Belgaum	Belgaum	15°56'53.4"	74°34'38.4"
47	H47	Baramanahatti	Belgaum	Belgaum	15°56'46.9"	74°34'19.4"
48	H48	Baramanahatti	Belgaum	Belgaum	15°56'52.8"	74°34'17.7"
49	H49	Nandi	Belgaum	Belgaum	15°56'60"	74°34'19.3"
50	H50	Nandi	Belgaum	Belgaum	15°57'6.6"	74°34'21"
51	H51	Nandi	Belgaum	Belgaum	15°57'12.8"	74°34'21.1"
52	H52	Nandi	Belgaum	Belgaum	15°57'19.9"	74°34'22.8"
53	H53	Nandi	Belgaum	Belgaum	15°57'26.3"	74°34'23.6"
54	H54	Nandi	Belgaum	Belgaum	15°57'33.3"	74°34'25.2"
55	H55	Nandi	Belgaum	Belgaum	15°57'41.3"	74°34'28.5"
56	H56	Nandi	Belgaum	Belgaum	15°57'48.1"	74°34'30.1"
57	H57	Nandi	Belgaum	Belgaum	15°57'54.5"	74°34'30.4"
58	H58	Nandi	Belgaum	Belgaum	15°57'34.2"	74°35'8"
59	H59	Nandi	Belgaum	Belgaum	15°57'27.7"	74°35'7.3"
60	H60	Baramanahatti	Belgaum	Belgaum	15°57'21.9"	74°35'9.5"
61	H61	Baramanahatti	Belgaum	Belgaum	15°57'11.8"	74°35'21"
62	H62	Baramanahatti	Belgaum	Belgaum	15°57'24.5"	74°35'25.6"
63	H63	Nandi	Belgaum	Belgaum	15°57'31.3"	74°35'26.5"