



**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:**

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Title: Wind Energy Project in Harapanahalli, Karnataka

Version: 08

Date of Completion: 07/06/2012

A.2. Description of the project activity:

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Introduction:

CLP Wind Farms (India) Private Limited (CLPWFPL) has implemented a wind power project of capacity 39.6 MW comprising of 24 number of Wind Turbine Generators (WTGs), each with rated capacity of 1650 kW. The project area is spread across 4 villages - Harakanalu, Arsanahalu, Hyarada, Dasanahalli which are part of Harapanahalli Taluk of Davangere District in the State of Karnataka. The electricity generated from the Project activity is sold to the local electricity distribution company in the state.

Purpose of the project activity:

To generate electricity by utilizing the wind power potential using WTGs at a site located in Harapanahalli taluk of Davangere district in the State of Karnataka.

The Project activity is contributing towards reduction of the Green House Gas (GHG) emissions by the Southern Grid generation mix, which is mainly dominated by fossil fuel based power.

Baseline:

The project activity harnesses wind energy to generate and supply electricity to the Southern Electricity Grid of India. The Project displaces fossil fuel based (non-renewable) electricity generation that would have otherwise been provided by the operation and expansion of the fossil fuel based power plants in the Southern Electricity Grid. The Project thereby leads to reduction in emission of GHGs associated with fossil fuel based electricity generation and enables sustainable development.

Contribution to sustainable development:

The contribution of this project activity in terms of following four indicators of sustainable development as stipulated by the National CDM Authority (NCDMA) of India is provided below:

Social well being: Since, the project activity is in a rural area, it will aid in the development of the region by generating direct and indirect employment opportunities for the local people. The project activity will also cause development of infrastructure like roads which will benefit the population in the nearby areas.



Economical well being: The project has created a business opportunity for local stakeholders such as suppliers, manufacturers, contractors etc. Use of wind as a source of energy reduces the dependence on imported fossil fuels like coal and associated price variation thereby leading to increased energy security. It will also narrow the existing electricity supply gap in the State of Karnataka.

Environmental well being: Since, the project uses renewable source for power generation; it does not lead to any green house gas emission. Avoidance of fossil fuel consumption results in reduction of Sulphur oxides (SO_x), Oxides of nitrates (NO_x) and particulate matter emission thus avoiding air pollution. The project activity is a step towards environmental sustainability by preventing exploitation and depletion of a natural, finite and non-renewable resource (fossil fuels). Consumption of large quantities of water that is required in generation of electricity in current mix of power plants is avoided.

Technological well being: The technology leads to utilization of environmentally safe and sound technologies in power sector. The project harnesses wind power potential in the region and encourages setting up such projects in near future. Increased interest in wind energy projects will encourage Research & Development efforts by technology providers to develop more efficient and better equipments in future.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/ or Public Entity (ies) Project Participants (as applicable)	Kindly indicate if the party involved wishes to be considered as Project Participant (Yes/No)
India (Host)	CLP Wind Farms (India) Private Limited (Private Entity)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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India

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

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State: Karnataka

A.4.1.3. City/Town/Community etc.:

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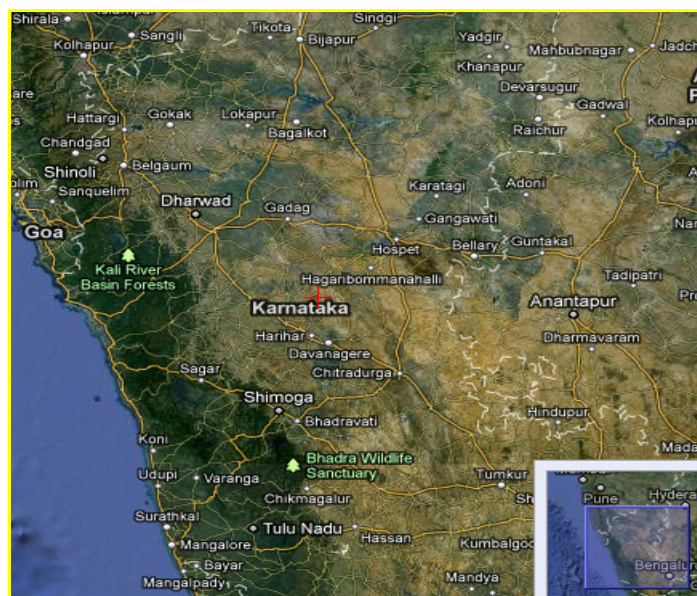
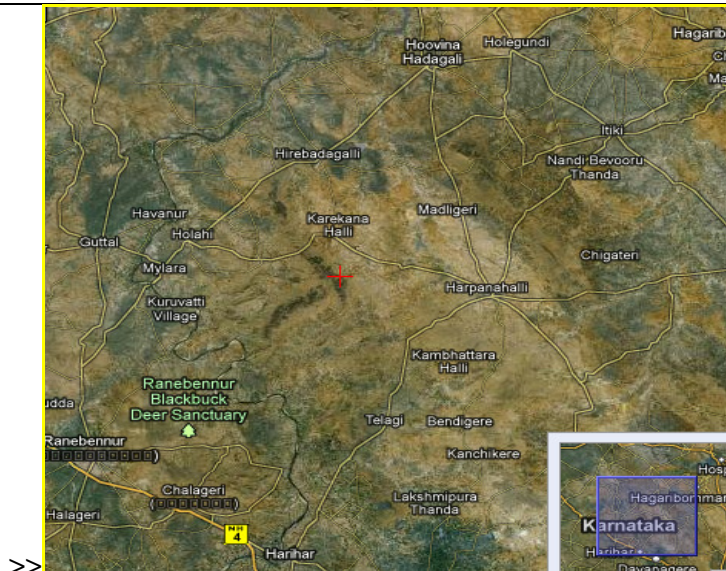
Villages: Harakanalu, Arsanahalu, Hyarada, Dasanahalli ,

Taluka: Harapanahalli,

District: Davangere



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



+ Project location

Reference: <http://www.meteonorm.com/pages/en/meteonorm-6-online.php?glat=14.804&glon=75.849>

Note: The detailed wind turbine-wise co-ordinates are given in Appendix 2 of this PDD.

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

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Sectoral Scope : 1 Energy industries (renewable / non renewable sources)
Type and Category : ACM 0002 Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 12.3.0)

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

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The project involves installation of 24 Vestas make WTGs of 1650 kW capacity each at Harapanahalli in Davangere district of Karnataka. Brief technical details of the WTGs used in the Project are as follows.

Model: V82- 1650 kW

The average life time of the wind turbine: 20 years

Technical Specifications:**Turbine**

1. Cut in wind speed: 3 m/s
2. Cut out wind speed: 20 m/s
3. Rated wind speed: 13 m/s
4. Hub height: 78 m

Generator

1. One speed and water cooled
2. Capacity: 1650 kW
3. Type: Asynchronous

Gear box

1. A. Step planet, B. Step helical
2. Ration: 1:70.2

Tower

1. Type: Conical, Tubular
2. Material: S355 or ASTM A 709 grade 50

Rotor

1. No of blades: 3
2. Diameter: 82 m
3. Swept area: 5281 m²

The monitoring equipments and their location in the system:

In present project activity, the electricity being generated by 24 wind turbines is monitored at the dedicated Haraknal substation located at Harapanahalli. In the substation, metering is done at two outgoing feeders. These would be used for monitoring the electricity generation by the project activity and their locations are demonstrated in PDD section B.3.

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

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Year*	Annual estimation of emission reductions in tonnes of CO₂ e
Year 1	72,834
Year 2	72,834
Year 3	72,834
Year 4	72,834
Year 5	72,834
Year 6	72,834
Year 7	72,834
Total estimated reductions (tonnes of CO₂ e)	509,838
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO₂ e)	72,834

* In this case, Year 1 would commence from the expected start of the crediting period as mentioned in the Section C of the PDD.

A.4.5. Public funding of the project activity:

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There is no public funding involved in the project activity.

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

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Title:

Consolidated methodology for “Grid-connected electricity generation from renewable sources”

Reference:

Consolidated baseline methodology ACM0002 (Version 12.3.0, EB 66)

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

1. Tool to calculate the emission factor for an electricity system (Version 02, EB 50)
2. Tool for demonstration and assessment of additionality (Version 6.0.0, EB 65)

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

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S No	Applicability criterion	Justification
1	This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The Project activity meets this requirement as the Project activity involves installation of a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant);
2	The methodology is applicable under the following conditions: • 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 or tidal power plant/unit; • In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): 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 addition	The Project activity involves installation of a new wind power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant). Hence, it meets the requirement.



S No	Applicability criterion	Justification
	or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	
3	In case of hydro power plants: At least one of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or • The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m² after the implementation of the project activity; or • The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m² after the implementation of the project activity.	The Project activity involves installation of a new wind power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant). Hence, it meets the requirement.
4	In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m² after the implementation of the project activity all of the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m²; • All reservoirs and hydro power plants are located at the same river and were designed together to function as an integrated project that collectively constitutes the generation capacity of the combined power plant; • The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • The total installed capacity of the power units, which are driven using water from the reservoirs with a power density lower than 4 W/m², is lower than 15 MW; • The total installed capacity of the power units, which are driven using water from reservoirs with a power density lower than 4 W/m², is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	Not applicable to the Project activity as the Project activity involves installation of a wind power plant.



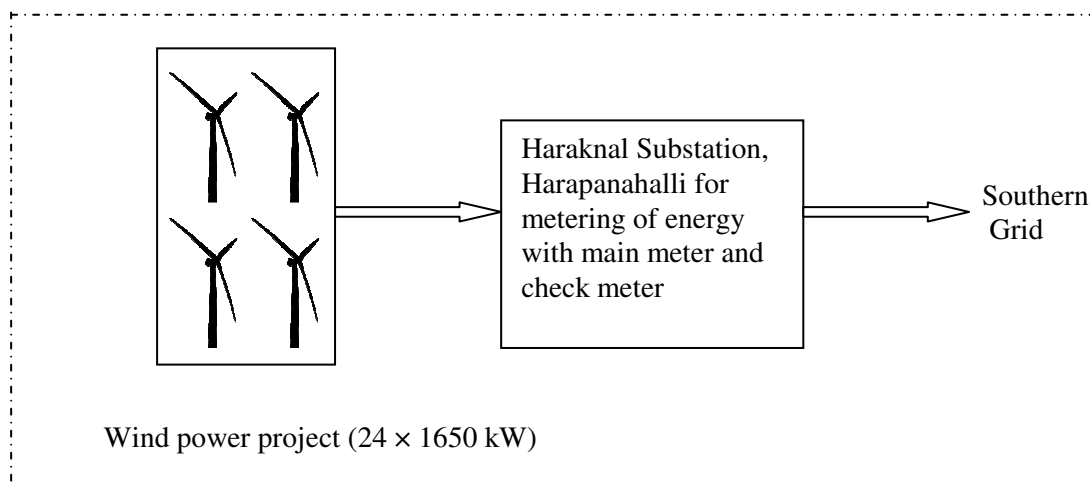
S No	Applicability criterion	Justification
5	The methodology is not applicable to the following: Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; Biomass fired power plants; A hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the reservoir is less than 4 W/m²	Not applicable to the Project activity as the Project activity involves installation of a wind power plant.

Hence, as per the justifications presented in the table above, it can be concluded that the proposed project activity satisfies all the necessary/relevant applicability criteria of ACM0002, version 12.3.0.

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

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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 ₂ O	No	No nitrous oxide generation is expected to be emitted.
Project Activity	Greenfield wind energy conversion system	CO ₂	No	The project activity does not emit any emission.
		CH ₄	No	No methane generation is expected to be emitted.
		N ₂ O	No	No nitrous oxide generation is expected to be emitted.



Project Boundary

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

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The Project activity is a Greenfield project and it does not modify or retrofit an existing electricity generation facility, hence the baseline scenario as per ACM0002 version 12.3.0 is,,

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 activity 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 for an electricity system".

As the power generated from this Project activity is supplied to Southern Grid, hence as per the methodology, the generation mix of the Southern Grid is selected as the baseline.

In the absence of the proposed CDM Project activity the electricity delivered to the grid by the Project would have been generated by the continued operation of existing grid-connected power plants and by the addition of new generation sources to meet the existing and future power requirement.

After evaluation of the alternatives (presented in the section B.5 below), the generating units connected to the Southern grid have been chosen as the baseline scenario.

**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):**

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The additionality of the project is ascertained in line with the applicable guidance from the UNFCCC. Accordingly the decision 17/cp.7, paragraph 43 is consulted; which states a CDM project activity is additional if anthropogenic emissions of green house gases by sources are reduced below those that would have occurred in absence of registered CDM project activity.

The demonstration of the additionality of the said project activity is being carried out in accordance with the additionality tool provided by the UNFCCC i.e. “*Tool for demonstration and assessment of Additionality*” Version 6.0.0. This tool provides a step-wise approach to demonstrate additionality, which is dealt with below:

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations***Sub-step 1a: Define alternatives to the project activity:***

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.

The proposed project activity envisages the installation of 24 WTGs of Vestas V-82 make, with each WTG having a capacity of 1650 kW. The project activity will have a total installed generation capacity of 39.6 MW. Thus, in view of the purpose of the project activity being to generate electrical power to be fed to the grid, the following alternatives are considered:

Alternative 1 - The proposed Project activity not undertaken as a CDM project activity.

The Project Proponent would have gone ahead with the implementation of the Project without CDM benefits. The Project would have produced electricity from the renewable source and the generating electricity would have been sold to the grid. This is in compliance with all applicable legal and regulatory requirements and can be a part of the baseline. However, the project activity is not feasible enough without CDM revenues. This argument has been discussed in step 2 of the Additionality section.

Alternative 2: No Project activity and equivalent amount of energy would have been produced by the Project grid electricity system through its currently running power plants and by new capacity addition to the grid i.e. Continuation of current situation.

The Project Proponent would have continued without investment in Project activity and would have continued with usual business activities. The grid could have continued with the fossil fuel based power projects and thus there would also be the associated GHG emissions. Thus new capacity add-on from a fossil fuel based power plant is the most probable baseline alternative for the project.



Outcome of Sub-step 1a: All the credible and realistic alternatives for the project activity have been mentioned above and Alternative 2 has been selected as the appropriate baseline alternative.

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

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

The relevant national laws and regulation pertaining to generation of energy are:

- Electricity Act 2003
- National Electricity Policy 2005
- Tariff Policy 2006

The project activity conforms to all the applicable laws and regulations in India:

- Power generation using wind energy is not a legal requirement or a mandatory option. There are state and sectoral policies, framed primarily to encourage wind power projects. These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments.
- The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation.
- There is no legal requirement on the choice of a particular technology for power generation.

Outcome of Sub-step 1b: Hence, both the alternatives above are found to comply with the mandatory legislation and regulations taking into account the enforcement of in the region or country and EB decisions on national and/or sectoral policies and regulations.

Step 2: Investment analysis

Determine whether the proposed project activity is economically or financially less attractive than at least one other alternative, identified in step 1, 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

The Project activity envisages the export of the power generated by the WTGs to the grid and the revenues from the sale would be generated in accordance with the terms and tariffs established in the PPA. Thus, simple cost analysis cannot be used as the analysis method as the sale of the units of generated electricity shall result in a revenue stream during the operations of the project.

After eliminating Option I, the use of Benchmark analysis (Option III) is the method of analysis that has been selected as the most suitable method. This method determines the attractiveness of the project activity for the investors, as well as provides a measure of the viability of the investment to generate



revenues during its operation, as compared with other avenues and investment options. Hence, the Benchmark analysis method is to be employed for analysis of the said project.

Sub-step 2b (Option III): Apply benchmark analysis

The investment analysis using Benchmark analysis (Option III) is determined to be the most accurate indicator of the financial attractiveness of the project. Further, this method illustrates the evaluation of the project by the Project Proponent before the decision to undertake the project was taken and management approval granted.

CLP wind Farms (India) Pvt Ltd follows a business model of an Independent Power Producer (IPP) which is different as compared to other small scale investors (who largely investing in the wind power sector for availing tax benefits due to accelerated depreciation & other such incentives). The typical CLPWFPL business model is described in brief below:

CLPWFPL selects the number of locations out of the proposed site/locations. This selection is based on the Energy output/ wind assessment carried out by third party. Size of the project gets determined by selecting locations from the site offered to CLPWFPL that gives the optimum output. CLPWFPL selects the location from proposed sites for the optimum output.

Choice of Financial Indicator:

As allowed by the Guidance on the Assessment of Investment Analysis (Version 05)¹, Equity Internal Rate of Return (Post Tax) was selected as the financial indicator to assess the attractiveness of the project.

Choice of Benchmark:

The Project Proponent has conducted financial analysis taking the Equity IRR as the financial indicator to prove additionality.

As per paragraph 12 of the Guidance on the Assessment of Investment Analysis (Version 5.0) “Required/expected returns on equity are appropriate benchmarks for an equity IRR.” The return on equity has been calculated using the Capital Asset Pricing Model (CAPM). The following formula has been used:

$$\text{Expected Return on Equity} = R_f + \beta * (R_m - R_f)$$

Where:

R_f = Risk free rate of return

β = Beta

R_m = Expected Return of the market

¹ http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf



In order to calculate the benchmark for the Equity IRR, following steps have been undertaken:

Risk free rate of return (R_f):

The Yield-To-Maturity (YTM) of SGL transactions in central government dated securities for 20 Yr Maturity at the end of June 2010² (viz. 8.2307%) has been considered as the risk free rate of return (R_f).

Beta (β): The beta (β) for this project has been calculated taking the variance in the market (BSE 500) and variance in stocks (For a set of comparable companies engaged predominantly in the business of power generation) for a period of five years (60 months) prior to the decision making date.

The list of companies used for comparison is as below:

Sr. No	Company Name
1	CESC Ltd.
2	Gujarat Industries Power Co.Ltd.
3	Neyveli Lignite Corpn.
4	BF Utilities
5	Reliance Infrastructure Ltd.
6	Tata Power Co. Ltd.
7	Torrent Power Ltd.
8	Jaiprakash Power Ventures Limited
9	NTPC

Note: For some companies which do not have data available for 60 months prior to decision making date, the β has been calculated using the data available from the date of listing on the stock exchange. The companies which were listed for a period of less than 24 months at the time of decision making, have been excluded in this analysis. Based on the calculations, the average β for these companies comes out to be 1.38. After removing certain outliers (companies with $\beta > 1.4$), an average β of 1.0642 has been arrived at for the project. This is conservative.

Return on market (R_m): This is calculated based on BSE 500 close value for base year (February 1999) and data prior to decision making (June 2010). Using Compound Annual Growth Rate (CAGR) formula,

$$R_m = (7092.2/1000)^{(1/11.41)} - 1 = 18.72\%.$$

This beta (β), return on market (R_m) and risk free rate of return (R_f) has been used in the standard Capital Asset Pricing Model (CAPM) formula to arrive at a benchmark for comparing the Equity IRR i.e Return on Equity (ROE). Using the above values in the CAPM formula, benchmark has been calculated as 19.40%.

² http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/26CT_BU090810_F.pdf



Equity IRR:

The Equity IRR has been calculated to be 7.54%. The key assumptions/parameters used for this calculation are listed in the table below:

Particulars	Value	Unit	Source
No. of wind turbines	24	Nos	Vestas Proposal
Capacity of each wind turbine	1.65	MW	Vestas Proposal
Capacity of the project	39.6	MW	Calculated
Net Generation	81.20	Million units	Third party Assessment Report, page 69, Table 7.5
Plant Load Factor	23.41	%	Calculated
Project Cost	2316.00	INR Million	Vestas Proposal and other supporting documents
Debt	70	%	As per CLP Group's earlier project
Equity	30	%	As per CLP Group's earlier project
Debt	1,621.20	INR Million	Calculated
Equity	694.80	INR Million	Calculated
Interest rate	11.25	%	As per CLP Group's earlier project
Debt tenure	12	Years	As per CLP Group's earlier project
Moratorium	0	Year	As per CLP Group's earlier project
Operation and Maintenance (first 3 years)	0	INR Million	Vestas proposal
Operation and Maintenance (4th year)	40.80	INR Million	Vestas proposal
Escalation in O & M (5 to 20)	5%	%	Vestas proposal
Service tax on O & M fees	10.30%	%	As per prevalent service tax rates
Insurance cost per turbine	0.07227	INR Million	As per quotation received from insurance brokers
Insurance cost for the project	1.73	INR Million	Calculated
Tariff	3.70	INR/kWh	Karnataka Electricity Regulatory Commission (KERC)'s tariff order for non-conventional energy dated December 2009
Depreciation Rate (Book)	5.28	%	Indian Companies Act
IT Depreciation Rate	7.69	%	Appendix IA of Income Tax (IT) Rules
Generation Based Incentive (GBI)	0.5	INR/kWh	Ministry of New and Renewable Energy (MNRE)'s Generation Based Incentive (GBI) scheme/ Indian Renewable Energy Development Agency (IREDA)
GBI cumulative cap	6.20	INR Million per MW	MNRE GBI scheme/ IREDA



Max. GBI allowed in a year	1.55	INR Million per MW	MNRE GBI scheme/ IREDA
Max. GBI allowed in a year	61.38	INR Million	MNRE GBI scheme/ IREDA
GBI cumulative cap	245.52	INR Million	MNRE GBI scheme/ IREDA
Max duration for GBI	10	Years	MNRE GBI scheme/ IREDA
Income tax rate	33.22%	%	IT rate
MAT rate	19.93%	%	Finance Bill 2010
Salvage Value	5.00%	%	Assumed

Sub-step 2c: Sensitivity Analysis:

As per guidance provided in the latest version of “Tool for the demonstration and assessment of additionality”, the variables, including the initial investment cost, that constitute more than 20% of total project costs or total project revenues have been identified and subjected to a reasonable variation and the results of this variation have been presented below:

Change in net generation	+10%	0%	-10%
Equity IRR	10.54%	7.54%	3.76%
Change in Power Sale tariff	+10%	0%	-10%
Equity IRR	10.49%	7.54%	3.78%
Change in O&M Cost	+10%	0%	-10%
Equity IRR	7.06%	7.54%	8.00%
Change in Total Project Cost	+10%	0%	-10%
Equity IRR	4.68%	7.54%	10.56%

The purpose of the sensitivity analysis is to demonstrate the sensitivity of the returns from the project activity due to uncertainty in plant load factor, capital cost and Operation and Maintenance (O&M) costs for the project. This is an assessment of the impact of variations in above parameters from the assumed/design values, and represents magnitude of the sort of effects these variations may have on the returns from the project.



The break-even point (scenario when the Equity IRR crosses the benchmark) has also been calculated for all the above parameters. Since a significant increase/decrease (at least 30%) in the respective parameters demonstrated above is required for Equity IRR to cross the benchmark, the likelihood of occurrence of such a scenario is low.

It can be observed from above table that in various scenarios wherein there are changes in tariff, O&M cost, net saleable units and project's capital cost, the Equity IRR does not cross the benchmark. Thus, it can be concluded that revenue from sale of CERs is important to alleviate this gap and hence the project has been considered to be additional.

Step 4 – Common practice Analysis

In the context of the present project activity, the following parameters are defined in line with paragraphs 5 – 10 of this approved methodological tool:

Measure: As per paragraph 6, the project activity falls under the following measure:

“(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);”

Output: As per paragraph 7, “power generation” may be considered to be the output in the context of the project activity. Further as per Step 1 of paragraph 47 of the same tool, the applicable output range will be 19.80 MW to 59.40 MW, i.e. $\pm 50\%$ of installed capacity of the project activity (39.6 MW)

As per Guidelines on Common Practice EB 63, Annex 12 the following Stepwise approach for Common Practice has been followed for the project activity.

Step 1: Calculate applicable output range as $\pm 50\%$ of the design output or capacity of the proposed project activity

The capacity of the project activity is 39.6 MW. The project capacity has been subject to the variation in the range of $\pm 50\%$, the following table depicts the outcome of the variation applied. Hence, the applicable output range will be 19.80 MW to 59.40 MW, i.e. $\pm 50\%$ of installed capacity of the project activity (39.6 MW)

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all} . Registered CDM project activities shall not be included in this step.



India has been considered applicable geographical area as a default, for the common practice analysis of project activity. All power plants generating electricity within the capacity range of 19.6 MW to 59.4 MW and having commercial operations date before project activity start date (27/07/2010) have been considered. The power generation plants identified in this step are hydro, thermal, nuclear, solar, biomass and wind power projects. The total number of power plants is 439

Category of Power plants	No. of Projects
Thermal (Including Coal, Gas, Naptha, Lignite and Liquid fuel)	140
Hydro	222
Wind	9
Nuclear	0
Solar	0
Biomass	68
Total (N_{all})	439

Therefore $N_{all}=439$.

Registered/Under Validation CDM project activities have been excluded in this step .

Step 3: *Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff} .*

In accordance with Guidelines on Common practice following criterion has been used to arrive at the number of different technology power plants;



Different technologies in the context of the project activity:

Energy Source / Fuel

The project activity involves electricity generation from wind. The other project activities using water (Hydro), conventional fuels (Coal, Lignite, Natural Gas & Liquid Fuel based – Thermal), Nuclear, Biomass and Solar as energy sources for the generation of electricity respectively are considered as plants with different technologies and included under N_{diff} .

The N_{diff} value is thus arrived at as tabulated below:

Category of Power plants	No. of Projects
Thermal (Including Coal, Gas, Naptha, Lignite and Liquid fuel)	140
Hydro	222
Wind	0
Nuclear	0
Solar	0
Biomass	68
Total (N_{diff})	430

Step 4: Calculate factor $F = 1 - N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity

N_{all}	439
N_{diff}	430
$N_{all} - N_{diff}$	9
N_{diff}/N_{all}	0.9795
$F = 1 - N_{diff}/N_{all}$	0.0205



The factor F and $N_{all}-N_{diff}$ is calculated and following values are arrived at;

$$F = 0.0205;$$

$$N_{all}-N_{diff} = 9$$

As value of F is less than 0.2, it can be concluded that the project activity is not a common practice in the applicable geographical area.

Awareness of CDM and Seriousness of CDM consideration

As per paragraph 6(a) of the latest version 04 of the “Guidelines on the demonstration and assessment of prior consideration of CDM”, Annex 13, EB 62, Project Participants must indicate awareness of CDM and that CDM was a decisive factor for investment in the project.

It can be noted that the PP already has various projects under the CDM cycle and hence they were well aware of CDM prior to conceptualization of this particular project activity.

With respect to this project activity, right at the outset, while the PP (Project Proponent) was analyzing the feasibility of investing in wind power in Karnataka, the intention was always to take the project forward as a CDM initiative. The board resolution taken by PP’s board clearly spells out the PP’s intentions of taking up the wind project as a CDM project.

The chronology of events related to the project activity and the efforts of the project proponent to secure CDM funding for the project activity are summarized below:

Sl. No.	Event	Date
1	Board Decision to implement the project	27/07/2010
2	Intimation to UNFCCC & DNA for the CDM project	17/08/2010
3	Signing of Power Purchase Agreement (PPA) with Bangalore Electricity Supply Company (BESCOM)	28/12/2010
4	Commissioning of Phase – I	21/01/2011
5	Commissioning of Phase – II & III	28/02/2011
6	Appointment of CDM Consultant	16/03/2011
7	Appointment of DoE	01/04/2011

**B.6. Emission reductions:****B.6.1. Explanation of methodological choices:**

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The power generated by the project activity will be supplied to the grid, which will directly displace the equivalent amount of power fed to the grid, which is dominated by fossil fuel source. Hence the resultant wind power, supplied to the grid, will avoid the fossil fuels used for power generation and will avoid the corresponding amount of GHG emissions, mainly CO₂, associated with fossil fuel based power in the grid.

The emissions reductions claimed from the project will be the amount of electricity fed to the relevant grid multiplied by the emission co-efficient for that grid, calculated as prescribed in the applied baseline methodology. The emission co-efficient is calculated based on a combined margin (CM), consisting of the combination of an operating margin (OM) and a build margin (BM), according to the procedures prescribed in the approved methodology ACM0002.

Project Emissions:

According to the chosen baseline methodology ACM0002, for wind energy based renewable energy project activities, PE_y = 0.

Baseline Emissions:

Baseline emissions include only CO₂ 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:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \dots\dots\dots (1)$$

Where:

- BE_y = Baseline emissions in year y (tCO₂/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 CO₂ 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” (tCO₂/MWh)

Calculation of $EG_{PJ,y}$ Greenfield renewable energy power plants

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{facility,y} \dots\dots\dots (2)$$

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)

Calculation of $EF_{grid,CM,y}$

In accordance with the “Tool to calculate the emission factor for an electricity system” Version 02, combined margin CO₂ emission factor for grid connected power generation is calculated stepwise as below:

- STEP 1: Identify the relevant electricity systems.
- STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional).
- STEP 3: Select a method to determine the operating margin (OM).
- STEP 4: Calculate the operating margin emission factor according to the selected method.
- STEP 5: Identify the group of power units to be included in the build margin (BM).
- STEP 6: Calculate the build margin emission factor.
- STEP 7: Calculate the combined margin (CM) emissions factor.

Step 1: Identifying the relevant electricity system

For the purpose of determining the electricity emission factors, a **project electricity system** is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

The Indian power system is divided into two independent regional grids, namely Northern-Eastern-Western and North-Eastern (NEWNE) and Southern grid. Each grid covers several states. 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 their demand with their 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. There are also electricity transfers between regional grids, and small exchanges in the form of cross-border imports and exports (e.g. from Bhutan).

Table: States connected to different regional grids³

Regional grid	NEWNE Grid				Southern grid
	Northern	Eastern	Western	North Eastern	Southern
States	Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh and Uttarakhand	Bihar, Orissa, West Bengal, Jharkhand and Sikkim	Gujarat, Madhya Pradesh, Maharashtra, Goa and Chattisgarh	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura	Andhra Pradesh, Karnataka, Kerala and Tamil Nadu
Union Territories	Delhi and Chandigarh	Andaman-Nicobar	Daman & Diu, Dadar & Nagar Haveli	-	Pondicherry, Lakshadweep

The Southern grid constitutes several states including Karnataka. These states under the regional grid have their own power generating stations as well as centrally shared power-generating stations. While the power generated by own generating stations is fully owned and consumed through the respective state's grid systems, the power generated by central generating stations is shared by more than one state depending on their allocated share.

Since the CDM project would be supplying electricity to the Southern grid, it is preferable to take this grid as the project boundary rather than the state boundary. It also minimizes the effect of inter-state power transactions, which are dynamic and vary widely. Considering free flow of electricity among the member states and the union territory, the entire Southern grid is considered as a single entity for estimation of baseline.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional).
Off-grid power plants have not been included in the project electricity system

Step 3: Selection of an Operating Margin method

The project proponent wishes to use the Simple Operating Margin (OM) method for the estimation of the baseline. The use of the Simple OM method is justified as the share of the low cost/ run resources constitute less than 50% of the total grid generation.

This can be established as per the data extracted from CEA database version 4.0, 5.0 and 6.0

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)						
	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
NEWNE	16.8%	18.0%	18.5%	19.0%	17.4%	15.9%
South	21.6%	27.0%	28.3%	27.1%	22.8%	20.6%
India	18.0%	20.1%	20.9%	21.0%	18.7%	17.1%

³ http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf



With regards to data vintage, the project participant wishes to use the Ex-post option wherein the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring as per the procedure given in the tool.

Step 4: Calculation of the OM according to the Simple OM method

The simple OM emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring as per the procedure given in the tool.

The data provided by the Central Electricity Authority (CEA), an official data source has been relied upon for the calculation of the OM. The same has been detailed in Annex 3. The latest version of the database, **Version 6.0 (March 2011)** has been used. The OM calculations have been based upon generation data, fuel consumption and the Gross Calorific value (GCV) of the fuel.

Option A has been chosen for calculating Operating Margin emission factor for the project. OM has been determined based on fuel consumption and net efficiency generation of each power plant/ unit, since fuel consumption data for each power plant/ unit is available.

Assumptions

The following assumptions have been made in case of unavailability of data at station level:

Net generation: In case of stations where only gross generation is available, CEA standard values for auxiliary consumption have been applied to calculate the net generation data.

GCV: Default GCV values for some thermal power stations have been used for cases where station specific data was unavailable.

The following assumptions have been in case of unavailability of data at unit level:

Net generation: The data is not monitored at a unit level and hence the following assumptions have been made:

1. The auxiliary consumption (in % of gross generation) of the unit was assumed to be equal to that of the respective stations in the following cases:

- All units of a station fall into the build margin; or
- All units of a station have the same installed capacity; or
- The units in the station have different capacities but do not differ with respect the applicable standard auxiliary consumption.

2. In all other cases, standard values for auxiliary consumption adopted by CEA were applied.

Fuel consumption and GCV: Fuel consumption and GCV are generally not measured at unit level. Instead, the specific CO₂ emissions of the relevant units were directly calculated based on heat rates.

Calculation Approach

The Simple OM has been calculated using the following formula:

$$EF_{\text{grid,OMsimple},y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{\text{CO}_2,i,y})}{EG_y} \dots\dots\dots(3)$$

Where:

$EF_{\text{grid,OMsimple},y}$ = Simple operating margin CO₂ emission factor in year y (tCO₂/MWh)

$FC_{i,y}$ = Amount of fossil fuel type i consumed in the project electricity system 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)

$EF_{\text{CO}_2,i,y}$ = CO₂ emission factor of fossil fuel type i in year y (tCO₂/GJ)

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year y

y = The relevant year as per the data vintage chosen in Step 3

The most recent year for which data was available (2009-10) was taken and the same is presented in Annex 3 of the PDD. The value of $EF_{\text{grid,OM},y} = 0.9415$ tCO₂/MWh

Step 5: Identification of the group of power units to be included in the Build Margin

The sample group of power units m selected for calculation of the build margin consists of 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. The data pertaining to the units thus identified are detailed in the Version 6.0 of the Baseline Carbon Dioxide Emissions database of the Central Electricity Authority (CEA)

With regards to data vintage, the project participant wishes to use the Option 2 viz. Ex-post option. For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second & third crediting period, the build margin emissions factor shall be calculated as described in the latest version of the ‘Tool to calculate the Emission Factor for an electricity system’

Step 6: Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO₂/MWh) of all power units m during the most recent year y for which power generation data is available and will be calculated as follows:



$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \dots\dots\dots(4)$$

Where:

- $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)
 $EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
 $EF_{EL,m,y}$ = CO₂ emission factor of power unit m in year y (tCO₂/MWh)
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

As described above, the Build Margin would be calculated annually during the entire crediting period. For the purpose of ex-ante emission reduction calculations the most recent data available (from CEA for 2009-10) has been used and the build margin thus calculated is 0.7634 tCO₂/MWh

Therefore, $EF_{grid,BM,y} = 0.7634$ tCO₂/MWh

Step 7: Calculation of the combined margin emission factor

The combined margin emission factor will be calculated as follows

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \dots\dots\dots(5)$$

Where,

- $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)
 $EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh)
 w_{OM} = Weightage of operating margin emissions factor (%)
 w_{BM} = Weightage of build margin emissions factor (%)

As per the ‘Tool to calculate the Emission Factor for an electricity system’ version 2, the default values for w_{OM} and w_{BM} are taken as 0.75 and 0.25 respectively as per the guidance provided for wind and solar power generation activities for the first crediting period and subsequent crediting periods.

Hence, the Baseline Emission Factor can be calculated as below:

$$\begin{aligned} EF_{grid,CM,y} &= w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y} \\ &= 0.75 * 0.9415 + 0.25 * 0.7634 \\ &= 0.8970 \text{ tCO}_2/\text{MWh} \end{aligned}$$

Thus for ex-ante emission reduction calculations, the baseline emission factor for the grid = 0.8970 tCO₂/MWh

**Leakage**

According to ACM0002, No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, & transport). These emissions sources are neglected.

Emission Reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year y (t CO₂e/yr)

BE_y = Baseline emissions in year y (t CO₂/yr)

PE_y = Project emissions in year y (t CO₂e/yr)

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

Data / Parameter:	W_{OM}
Data unit:	%
Description:	Weightage of operating margin emissions factor
Source of data used:	“Tool to calculate the emission factor for an electricity system” (Version 2)
Value applied:	0.75
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default values used as per the “Tool to calculate the emission factor for an electricity system” Version 2
Any comment:	-

Data / Parameter:	W_{BM}
Data unit:	%
Description:	Weightage of build margin emissions factor
Source of data used:	“Tool to calculate the emission factor for an electricity system” (Version 2)
Value applied:	0.25
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default values used as per the “Tool to calculate the emission factor for an electricity system” Version 2

**B.6.3. Ex-ante calculation of emission reductions:**

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Illustrated below are the ex-ante calculations for the estimation of annual emission reductions:

Summary:

No. of WTGs	24
Capacity per WTG (MW)	1.65
Net Generation from the project ($EG_{BL,y}$) (MWh)	81,200
Baseline emission factor Southern grid ($EF_{CO_2, grid,y}$) $EF_y = W_{OM} EF_{OM,y} + W_{BM} EF_{BM,y}$ $= (0.75 \times 0.9415) + (0.25 \times 0.7634)$	0.8970 tCO ₂ /MWh
Baseline Emissions – $BE_y = EG_{PJ,y} * EF_{CO_2, grid,y}$	72,834 tCO ₂
Project Emissions (PE_y)	0
Leakage Emissions (L_y)	0
Emission Reduction (ER_y) $ER_y = BE_y - PE_y - L_y$	72,834 tCO ₂

Detailed Calculations:

According equation (1), the baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y}$$

According to equation (5), Combined margin CO₂ emission factor for grid connected power generation ($EF_{grid,CM,y}$)

$$= 0.897 \text{ tCO}_2/\text{MWh}$$

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

$$= 81200 \text{ MWh}$$

Baseline emissions (BE_y)

$$= 0.8970 \text{ tCO}_2/\text{MWh} * 81200 \text{ MWh}$$

$$= 72,834 \text{ tCO}_2$$

Leakage emissions

No leakage emissions are considered.

**Project activity emissions**

The project activity does not involve usage of fossil fuel. Thus, $PE_{FF,y}=0$

The project activity does not involve operation of geothermal power plants, thus, $PE_{GP,y}=0$

The project activity does not involve water reservoir and hydro power plant, thus, $PE_{HP,y}=0$

Thus, according to equation (1), $PE_y=0$

According to equation (6), overall **emission reductions** (ER_y) are

$$ER_y = 72,834 - 0 - 0$$

$$ER_y = 72,834 \text{ tCO}_2$$

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

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Year *	Estimation of project activity emissions (tCO ₂ e)	Estimation of baseline emissions (tCO ₂ e)	Estimation of leakage (tCO ₂ e)	Estimation of overall emission reductions (tCO ₂ e)
Year 1	0	72,834	0	72,834
Year 2	0	72,834	0	72,834
Year 3	0	72,834	0	72,834
Year 4	0	72,834	0	72,834
Year 5	0	72,834	0	72,834
Year 6	0	72,834	0	72,834
Year 7	0	72,834	0	72,834
Total (tonnes of CO ₂ e)	0	509,838	0	509,838

* In this case, the year has been defined as April to March as per the expected start date of the crediting period mentioned further in section C of this CDM-PDD.

**B.7. Application of the monitoring methodology and description of the monitoring plan:****B.7.1 Data and parameters monitored:**

Data / Parameter:	$EG_{\text{facility},y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data to be used:	Form- B of Karnataka Power Transmission Corporation Limited (KPTCL)
Value of data	81,200
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> These values are monitored through the main meter readings at two outgoing feeders or from check meters as per emergency preparedness procedure. <u>Data type:</u> Measured at Feeder as described in PDD section A.4.3 <u>Archiving:</u> Paper/Electronic <u>Recording Frequency:</u> Continuous monitoring and monthly recording <u>Responsibility:</u> The plant management shall be responsible for the regular recording of data. <u>This parameter accounts for the project imports and export, hence showing the net (export – import) electricity supplied to the grid.</u> <u>Note1:</u> In case during verification, the time period time period during start and end of each crediting period does not match with the BESCOM's billing cycle, the electricity export and import shall be calculated using apportioning formula as detailed under B.7.2. Note 2: At anytime during the crediting period, if there are additional WTGs (which are not a part of this project activity) connected with the bulk meter(s) at Haraknal sub-station, the apportioning mechanism listed in PDD section B.7.2 would be used.
QA/QC procedures to be applied:	The main meter readings can be cross checked with the check meter readings to ensure correctness. The main and check meters shall be calibrated and maintained by BESCOM as per their own schedule and this frequency of meter calibration is not within the control of the Project Proponent. Accuracy class of Main meter and Check meter: 0.2 Frequency of testing: once in a quarter of a calendar year Responsibility: BESCOM will test and calibrate the meters. Cross check measurement results with records for sold electricity (Invoices



	raised by PP)
Any comment:	Data will be kept for crediting period + 2 Years

Data / Parameter:	$EF_{grid\ CM,y}$
Data unit:	t CO ₂ /MWh
Description:	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”
Source of data to be used:	Latest version of the CO ₂ baseline database for the Indian Power Sector published by CEA ⁴
Value of data:	0.8970
Description of measurement methods and procedures to be applied:	This value is calculated using OM and BM values as per ‘Tool to calculate the Emission Factor for an electricity system’
QA/QC procedures to be applied:	Not applicable as this data would be sourced from a third party
Any comment:	Data will be kept for crediting period + 2 Years

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO ₂ /MWh
Description:	Simple operating margin for Southern grid of India in year y
Source of data to be used:	Latest version of the CO ₂ baseline database for the Indian Power Sector published by CEA ⁵
Value of data:	0.9415
Description of measurement methods and procedures to be applied:	This value would be taken from the ‘Simple Operating Margin’ (including imports) for Southern grid which is calculated and published by CEA in their latest version of the CO ₂ baseline database for the Indian Power Sector (viz. National Data) ⁶ <u>Monitoring frequency:</u> Annually during the crediting period for the relevant year
QA/QC procedures to be applied:	Not applicable as this data would be sourced from a third party
Any comment:	Data will be kept for crediting period + 2 Years

⁴ CEA - Central Electricity Authority under the Ministry of Power, Government of India

⁵ CEA - Central Electricity Authority under the Ministry of Power, Government of India

⁶ Available at <http://www.cea.nic.in/>



Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO ₂ /MWh
Description:	Build margin for Southern grid of India in year y
Source of data to be used:	Latest version of the CO ₂ baseline database for the Indian Power Sector published by CEA ⁷
Value of data:	0.7634
Description of measurement methods and procedures to be applied:	This value would be taken from the ‘Build Margin’ (not adjusted for imports) for NEWNE grid which is calculated and published by CEA in their latest version of the CO₂ baseline database for the Indian Power Sector (viz. National Data) . <u>Monitoring frequency:</u> BM: For the first crediting period, either once ex ante or annually ex post, following the guidance included in Step 5. For the second and third crediting period, only once ex ante at the start of the second crediting period
QA/QC procedures to be applied:	Not applicable as this data would be sourced from a third party
Any comment:	Data will be kept for crediting period + 2 Years

B.7.2. Description of the monitoring plan:

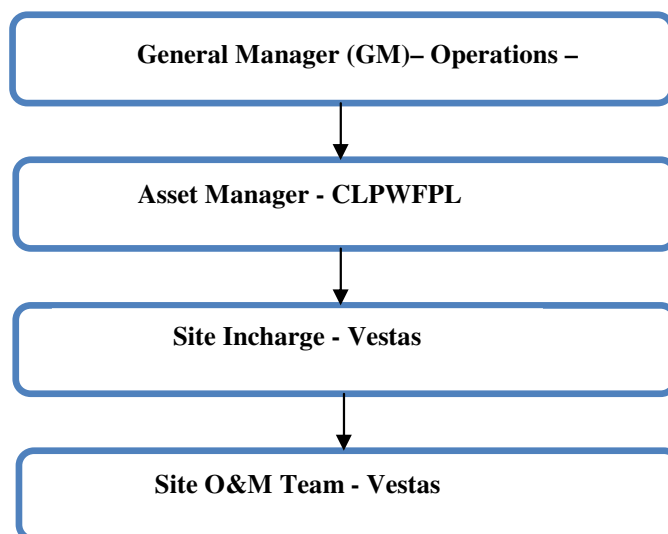
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The Monitoring and Verification procedures define a project specific standard against which the project’s performance (i.e. GHG emissions) and compliance with all relevant criteria will be monitored and verified. It includes developing suitable data collection methods and techniques for data interpretation, for monitoring and verifying GHG emissions with specific focus on technical/efficiency/performance parameters. It also allows scope for review, scrutiny and benchmarking against established norms for monitoring and verification.

The Monitoring & Verification protocol provides a range of data estimation, measurement and collection options and techniques, in each case indicating preferred options consistent with good practice to allow Asset Manager, Site Incharge and the Site O&M team to apply the most practical and cost effective measurement approaches to the proposed project activity. The aim is to enable this project to have clear, credible and accurate monitoring, evaluation and verification procedures.

The operation and management structure implemented by the project proponent for the purpose of the project activity is illustrated below:

⁷ CEA - Central Electricity Authority under the Ministry of Power, Government of India



In present project activity, the electricity being generated by 24 wind turbines is monitored at the dedicated Haraknal substation located at Harapanahalli. In the substation, there are two meters namely- Check Meter and Main Meter (static type Trivector meter, Accuracy class: 0.2).

Every month BESCOM Official visits the substation in the presence of O&M team of wind turbine Supplier (Vestas) and the Main meter reading is taken jointly and recorded by BESCOM. The said meter readings are reported by the Field Officer to the concerned distribution circle who in turn informs to the consumption circle, which is authorized to prepare the Bill and give the credit for the energy generated by the wind turbines.

The Haraknal sub-station has the provision for 4 feeders of which two are currently in operation. At the time of commissioning, 13 nos of WTGs were connected to Feeder 1 and the remaining 11 WTGs of the project activity were connected to Feeder 2 at the Haraknal Substation.

Currently the Haraknal sub-station handles only 24 WTGs which are owned by CLPWFL. The meter readings are taken at the sub-station every 24 hours. A 33 kV reference meter is also present which is generally used by KPTCL for comparison. Since the capacity of the wind farm is higher, there is a possibility of more machines (WTGs) being installed and hence the bulk meter may have (in future) more machines connected to it. If this scenario occurs, the following apportioning mechanism will be used:

Apportioning mechanism

The net electricity recorded at the substation is apportioned to individual WTGs based on the generation at the WTG as per the formula given below:

Electricity exported by WTG to Grid, $EG_{exp, y} = (\% \text{ generation of individual WTG connected to feeder}) \times$
(Electricity Export recorded at substation),



Where,

% generation of individual WTG connected to feeder

= (Controller reading @ Individual WTG)/ (Sum of Controller reading of all WTGs connected on feeder)

Similarly, electricity imported by the WTG from the grid, $EG_{imp, y}$ = (% generation of individual WTG connected to feeder) x (Electricity Import recorded at substation)

$$EG_{facility, y} = EG_{exp, y} - EG_{imp, y}$$

Emergency Preparedness

In case of Main meter failure or errors, the grid officials would immediately replace the meter with a calibrated meter. There will be two meters provided at the pooling station: a Main Meter and a Check Meter.

Specific Calculation Procedure (For the time period during start and end of each crediting period) :
For the time period during start and end of each crediting period, the following apportioning formula would be used to estimate the electricity generation for calculating emission reductions:

X = No. of days between start/end date of crediting period and date of BESCOM's billing cycle⁸

Y = Total no. of days in a particular month for which Form B reading has been taken

Z = No. of units as per Form B for that particular month

Electricity Generation = $(X/Y) * Z$

OR alternatively the daily readings taken by the technology supplier at the site will be referred for calculating the generation for X days.

Extract from Article 7 of the Power Purchase Agreement signed with BESCOM:

Meter Test Checking:

All the main and check meters shall be tested for accuracy once in a quarter of a calendar year with reference to a portable standard meter which shall be of an accuracy class of 0.1%. The portable standard shall be owned by the BESCOM at its own cost and expense and tested and certified at least once every year against an accepted laboratory standard meter in accordance with electricity standards. The meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2 accuracy class. The consumption registered by the main meters alone will hold good for the purpose of billing as long as the error in the main meter is within the permissible limits⁹.

⁸ Note: Days wherein no (zero) generation occurs will be excluded

⁹ Permissible limits of +/- 0.2%



- (i) If during the quarterly tests, the main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the permissible limits, then billing will be as per the main meter as usual. The check meter shall however, be calibrated immediately.
- (ii) If during the quarterly tests, the main meter is found to be beyond permissible limits of error, but the corresponding check meter is found to be within permissible limits of error, then the billing for the month up to the date and time of such test shall be as per the check meter. There will be a revision in the bills for the period from the previous calibration test up to the current test based on the readings of the check meter. The main meter shall be calibrated immediately and billing for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.
- (iii) If the during quarterly tests, both 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 applied to the reading registered by the main meter to arrive at the correct reading of energy supplied for billing purposes for the period from the last month's meter reading up to the current test. Billing for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.
- (iv) If during any of the monthly meter readings, the variation between the main meter and the check meter is more than that permissible for meters of 0.2% accuracy class, all the meters shall re-tested and calibrated immediately.

The O&M service provider would be responsible for maintenance of the necessary spare parts and consumables for the maintenance of the WTGs such as anemometers, wind vanes and sensors, oil filters, batteries, auxiliary motors and pumps, WTG controllers, slip rings, limit switches and sensors, detergents & solvents etc. The service provider would also be responsible for supply of necessary main components of the WTG such as main gearboxes, blades, generators, towers, hubs, main shafts & bearings, ground and top controller and hydraulic systems. The service provider would also ensure that occupational health and safety procedures are adhered to during the operation & maintenance activities.

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 of the application of the baseline study and monitoring methodology:

12/04/2011

Name of the responsible person(s)/entity(ies) has been mentioned in the Annex I to this PDD.

**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:**

>>

13/08/2010 (The date of signing of agreement with technology supplier – Vestas)

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

>>

20 years- 0 months

C.2. Choice of the crediting period and related information:**C.2.1. Renewable crediting period:****C.2.1.1. Starting date of the first crediting period:**

>>

15/06/2012 (or date of registration with UNFCCC whichever is 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 the Environmental Impact Assessment (EIA) notification dated 1/12/2009, given by the Ministry of Environment and Forests under the Environment (Protection) Act 1986, the proposed project doesn't fall under the list of activities requiring EIA. The project will not involve any negative environmental impacts, as the WTGs are installed for generation of power using wind which is a clean source of energy, thus EIA study is not required..

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:

>>

There are no significant environmental impacts due to the implementation of the project activity. Environmental Impact Assessment is not required as per the regulations laid down by the Ministry of Environment and Forests, Govt. of India. Thus no references have been provided here.

**SECTION E. Stakeholders' comments**

>>

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

>>

CLP Wind Farms (India) Private Limited had identified different stakeholders for its wind power project at Harapanahalli in the district Davangere of Karnataka. The meeting was carried out by CLP Wind Farms (India) Private Limited on 01/02/2011 at Harapanahalli Substation. Following are the stakeholders who attended the meeting.

1. Representatives from Vestas India
2. Employees of CLP Wind Farms (India) Private Limited
3. Villagers from nearby villages

All the stakeholders were invited via personal invitation letters and open public notice.

During the meeting, representative of CLP Wind Farms (India) Private Limited explained all the stakeholders about the project activity. He also discussed CLP's aim to generate energy from a renewable source (viz. wind) and how they intended to avail CDM benefits under the Kyoto Protocol.

Post this discussion, the meeting was open for questions and representatives from CLPWFPL answered all the queries raised by the stakeholders.

E.2. Summary of the comments received:

>>

The Deputy Manager, CLP Wind Farms (India) Private Limited described the project activity to all stakeholders. He further explained the business activities of CLP Wind Farms (India) Private Limited. He described the different reasons of climate change and highlighted the importance of the renewable energy. The representative from Vestas India shared his experience of the project development.

School teachers from nearby schools appreciated the project activity. They expressed their gratitude towards the project developers and project proponents for providing different facilities for schools and students. They also anticipated that such positive initiatives would be taken by CLP Wind Farms (India) Private Limited in near future in their region.

Other villagers mentioned about job opportunities created in their villages due to the project activity. They also revealed that the present project activity has created positive development in their villages in terms of infrastructure, employment and environment.



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

>>

In summing up, the project has not received any negative or discouraging from the stakeholders. All the stakeholders appreciated and encouraged project proponent to carry out such activity in the region. In view of direct and indirect benefits (social, economic, and environmental), all stakeholders have supported the project activity. Hence, it is not required to take due account of the comments.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	CLP Wind Farms (India) Private Limited
Street/P.O.Box:	Off Western Express Highway
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City:	Goregaon (E), Mumbai
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E-Mail:	carbon@clpindia.in
URL:	www.clpindia.in
Represented by:	
Title:	Head – CDM
Salutation:	Mr.
Last name:	Sanchania
Middle name:	-
First name:	Dipjay
Department:	Business Development
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Direct FAX:	+91-22-6758 8811
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Personal e-mail:	carbon@clpindia.in



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the project.

**Annex 3****BASELINE INFORMATION**

The latest data available has been used for the estimation of the baseline emissions. The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the Build Margin and the Simple Operating Margin for the Southern grid, the details of which is available on the following website and is detailed below as well:

<http://www.cea.nic.in/>

Version 6.0 of the database has been used for ex-ante emission reduction estimation.

Weighted Average Emission Rate (tCO₂/MWh) (incl. Imports) (2)

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
NEWNE	0.8557	0.8387	0.8245	0.8127	0.8334	0.8234
South	0.7824	0.7341	0.7163	0.7223	0.7597	0.7483
India	0.8377	0.8127	0.7972	0.7902	0.8209	0.8113

Simple Operating Margin (tCO₂/MWh) (incl. Imports) (1) (2)

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
NEWNE	1.0279	1.0196	1.0085	0.9999	1.0066	0.9777
South	0.9981	1.0057	0.9991	0.9909	0.9729	0.9415
India	1.0210	1.0167	1.0064	0.9980	1.0094	0.9782

Build Margin (tCO₂/MWh) (not adjusted for imports)

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
NEWNE	0.7030	0.6725	0.6313	0.5977	0.6755	0.8123
South	0.7010	0.7067	0.7013	0.7133	0.8179	0.7634
India	0.7024	0.6808	0.6485	0.6253	0.7090	0.8001

Combined Margin in tCO₂/MWh (incl. Imports) (1) (2)

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
NEWNE	0.8655	0.8461	0.8199	0.7988	0.8410	0.8950
South	0.8495	0.8562	0.8502	0.8521	0.8954	0.8525
India	0.8617	0.8488	0.8275	0.8117	0.8592	0.8892



Annex 4

MONITORING INFORMATION

Please refer section B.7 of this PDD for monitoring related information.

**Appendix 1**

Proposed action plan for Sustainable Development



July 25, 2011

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 International Business Park
 Oberoi Garden City
 Off. Western Express Highway
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**Proposed Action Plan for Sustainable Development Activities
 for
 Harapanahalli CDM project of CLP Wind Farms (India) Private Limited
 (2% of annual CER revenue)**

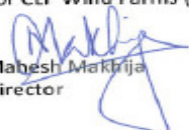
CLP Wind Farms (India) Private Limited (CLP WF) propose to use 2% of the net CER revenues from our CDM project "Wind Energy Project in Harapanahalli, Karnataka" post its accruals in areas related to sustainable development. The following table summarizes activities that we have envisage to include under this initiative,

Area	Project Brief	Activity Description
Education	Support wind farm O&M contractor/NGOs/ relevant organization in their programs related to following areas, 1. Create awareness about benefits of education 2. Support needy for the education 3. Improved school infrastructure 4. Improve quality of education	Identify and support deserving children to pursue their educational aspirations
		Up-gradation of existing infrastructure at local schools
		Organize cultural & sports competitions for school children
Health & Sanitation	Support wind farm O&M contractor/NGOs/ relevant organization in their programs related to Health & Sanitation.	Organize health check-up camps for the local community
		Organize animal health check-up camps for the local community
		Organize awareness workshops for basic health & sanitation for the local community

Since, CER revenue from this project is expected to come only after 2 – 3 years from now, CLP WF would revisit above mentioned plan at the time of CER issuance. This will help us in addressing concern of the community prevailing at that point in time.

CLP WF would ensure that the above expenditure accrue to a minimum of 2% of the revenues from the sale of Certified Emission Reductions (CERs) from this project activity. The details of expenditure made under this initiative would be included in the subsequent monitoring report for the period.

For CLP Wind Farms (India) Private Limited


 Mahesh Makrija
 Director

Registered Office : 6th Floor, "Chanakya", Off Ashram Road, Ahmedabad-380009, India

CLP Wind Farms (India) Private Limited
 A member of the CLP group
 Incorporated in India with limited liability

**Appendix 2**

Wind turbine-wise detailed geographical co-ordinates have been tabulated below:

Turbine ID	Latitude (Degree,Minute, Second Format)	Longitude (Degree,Minute , Second Format)
H15	14° 48' 20.5"N	75° 50' 36.5"E
H16	14° 48' 31.6" N	75° 50' 25.8"E
H17	14°48' 42.6" N	75° 50' 21.2"E
H18	14° 48' 50.1" N	75° 50' 24.4"E
H19	14° 48' 36.9" N	75° 49' 47.5"E
H20	14° 48' 47.8" N	75° 49' 43.2"E
H21	14° 49' 07.4" N	75° 49' 42.0"E
H22	14° 49' 16.4" N	75° 49' 46.1"E
H23	14° 49' 24.1" N	75° 49' 42.5"E
H24	14° 49' 19.3" N	75° 49' 22.7"E
H25	14° 49' 37.0" N	75° 49' 14.7"E
H26	14° 49' 50.4" N	75° 49' 12.6"E
H27	14° 49' 43.7" N	75° 48' 50.4"E
H28	14° 50' 00.1" N	75° 48' 46.3"E
H29	14° 50' 17.2" N	75° 48' 37.5"E
H30	14° 50' 26.2" N	75° 48' 44.1"E
H31	14° 50' 37.6" N	75° 48' 37.3"E
H32	14° 50' 42.2" N	75° 48' 22.1"E
H33	14° 50' 50.3" N	75° 48' 17.2"E
H34	14° 50' 47.4" N	75° 48' 35.7"E
H35	14° 51' 00.5" N	75° 48' 33.2"E
H36	14° 51' 13.9" N	75° 48' 08.0"E
H37	14° 51' 24.7" N	75° 47' 59.6"E
H38	14° 51' 33.0" N	75° 47' 54.5"E
