CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

>>

Title: Wind Energy Project in Dewas, Madhya Pradesh (India)

Version: 10.0

Date of completion of PDD: 03/10/2012

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

>>

The project activity is to install 14.4 MW wind energy project comprising eighteen Wind Energy Converters (WECs) of capacity 800 kW each in Madhya Pradesh state of India. The WEC are of type E-53 supplied by Enercon (India) Ltd (Enercon). Electricity produced with renewable source will be supplied to Madhya Pradesh state electricity grid which is part of the NEWNE (Northern, Eastern, Western and North-Eastern) grid of India. The project participants (PP) are CEPCO Industries Pvt. Ltd. (CIPL) and Enercon (India) Power Development Pvt. Ltd. (EIPDPL). PP has entered into agreement with Enercon for operation and maintenance of the project activity.

Objective of the Project

The objective of the project activity is to generate electricity from renewable and clean source of energy. The electricity will be supplied to Madhya Pradesh state electricity grid which is part of the NEWNE (Northern, Eastern, Western and North-Eastern) grid of India, thus displacing electricity produced in mainly fossil fuels based power plants. It shall help in mitigating the climate change impact.

Nature of Project

The project utilises the wind energy potential to generate electricity. The adoption of clean technology like WEC provides an opportunity to reduce dependency on non-renewable source of energy and simultaneously displacing electricity from NEWNE (Northern, Eastern, Western and North-Eastern) grid dominated by fossil fuels based power plants. Electricity generated will be supplied to Madhya Pradesh Power Trading Company Ltd (MPPTCL) under a long-term power purchase agreement (PPA). Operation and maintenance of the project activity will be carried out by Enercon.

The machines of the project activity and machines of other project developers are connected to Ratedi Hills Substation. Electricity supplied to the grid is metered continuously and recorded monthly at the metering point connecting 18 machines of the project activity along with other wind farm developers at Ratedi Hills site. The common metering point comprises one main meter and check meter that is installed at 132 kV metering point at the Ratedi Hills substation. The electricity supplied to the grid is recorded monthly by taking a Joint Meter Reading (JMR) in the presence of Officials from the MPPTCL and Enercon. The Joint meter reading consist the value of energy imported and exported. These certified readings are then used by the Enercon officials to prepare the breakup sheet for individual customers and then breakup sheet is approved by state utility authorities. The breakup sheet is used by project developer to raise the invoices.

Contribution to Sustainable Development

The details that how the project activity contributes to sustainable development of India is described below:

Social well being

The project site preparation and building of infrastructure necessary to operate wind energy plant helps in generating local employment. Operation and maintenance of project also engages local manpower. Thus, help in upliftment of rural communities. Overall it improves the living standard of local population.

Economic well being

The overall social well being helps in accelerating the economic growth of the nation. The renewable energy source like wind provides an opportunity to generate electricity in addition to electricity generated by continuously depleting non-renewable source of energy, thus helping in reducing the gap in demand-supply of electricity in the region.

Environmental well being

Wind energy is clean source of energy. Generation of electricity through this route lessens the burden on non-renewable sources which are contributing to atmosphere negatively as their use leads to induction of pollutants. Implementation of such project activity will help in reducing the impact of climate change.

Technological well being

The project activity leads to the promotion of clean technology in the region. Success of such project motivates industry to participate actively to further advance the existing technology and giving a way to technology of future. It helps in deployment of resources globally to fight problem of climate change through technological up-gradation and implementation.

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)	1. CEPCO Industries Pvt. Ltd. 2. Enercon (India) Power Development Pvt. Ltd.	No

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

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

A.4.1.1. Host Party(ies):

>>

The host party to the project activity is India.

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

>>

The Project is located in the State of Madhya Pradesh in India.

A.4.1.3. City/Town/Community etc:

>>

The project is located in Ratedi Hills site, District: Dewas, State: Madhya Pradesh

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

>>

The project activity is situated between latitude 22° 48' & 22° 50' North and longitude 76° 13' & 76° 15' East (as shown in table below). The Project activity has eighteen WEC of type E-53 of Enercon make. Capacity of each WEC is 800 kW. The Substation, which is maintained by Enercon, is located at Ratedi hills site.

The nearest major city is Indore which is about 40 km from Dewas.

Sr. no.	Capacity (MW)	District	State	Loc. No.	Latitude (North)			Longitude (East)		
					Deg.	Minutes	Seconds	Deg.	Minutes	Seconds
1	0.8	Dewas	Madhya Pradesh	95	22	48	18.2	76	14	59.5
2	0.8			96	22	48	20.7	76	15	16.4
3	0.8			97	22	48	24.7	76	14	59.6
4	0.8			98	22	48	31.6	76	14	58.6
5	0.8			99	22	48	37.7	76	15	1.2
6	0.8			100	22	48	44.2	76	15	2.7
7	0.8			101	22	48	50.8	76	15	1.3
8	0.8			102	22	48	57.1	76	15	0.0
9	0.8			103	22	49	3.2	76	15	1.1
10	0.8			104	22	49	10.6	76	13	34.0
11	0.8			105	22	49	16.7	76	15	1.9
12	0.8			106	22	49	19.8	76	15	20.5
13	0.8			107	22	49	26.3	76	15	30.0
14	0.8			108	22	49	31.6	76	15	38.1
15	0.8			109	22	49	37.0	76	15	48.5
16	0.8			110	22	49	44.3	76	15	55.7
17	0.8			111	22	49	52.1	76	15	58.2
18	0.8			112	22	50	0.1	76	15	55.6

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

>>

The type and category of project activity as per Appendix B to the simplified modalities and procedures for small-scale CDM project activities are as under:

Sectoral Scope I, Energy Industries (renewable/non-renewable sources).

Project Type: I, Renewable energy projects

Project Category: D, Grid connected renewable electricity generation

Version: 17, EB 61

The project activity comprises of eighteen WECs of Enercon's model E-53. The project uses technology that is environmentally clean and safe since there are no GHG emissions associated with the electricity generation from the windmills.

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. The other salient features of the state-of-art-technology are:

Turbine model	**Enercon E- 53**
Rated power	800 KW
Rotor diameter	53 m
Hub heighten	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	Fibre Glass Epoxy reinforced with integral lightning protection
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

There is no technology transfer involved in the project activity.

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

>>

Fixed Crediting Period is chosen for the project activity for 10 years.

Years	Annual estimation of emission reductions in tonnes of CO2e
Year 1*	23,338
Year 2	23,338
Year 3	23,338
Year 4	23,338
Year 5	23,338
Year 6	23,338
Year 7	23,338
Year 8	23,338
Year 9	23,338
Year 10	23,338
Total estimated reductions (tonnes of CO_2e)	233380
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	23,338

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

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

>>

There is no ODA financing involved in the Project.

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

>>

According to guidelines on assessment of debundling for small-scale project activities (EB 54, Annex 13,Version 03), 'debundling' is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities.

According to Para 2 of guidelines on assessment of debundling for small-scale project activities (EB 54, Annex 13,Version 03)

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

- *With the same project participants;*
- *In the same project category and technology/measure; and*

- *Registered within the previous 2 years; and*
- *Whose project boundary is within 1 km of the project boundary of the proposed small- scale activity at the closest point*

The project participant hereby confirm that there is no registered small scale project activity within the previous two years with them in the same project category and technology whose project boundary is within 1 km of the project boundary of the proposed small scale activity. Thus the project is not a de-bundled component of any other large-scale project activity.

SECTION B. Application of a baseline and monitoring methodology

>>

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

>>

The project activity is a small scale CDM project activity based on Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The project activity conforms to the following category:

Main Type: I **- Renewable energy project**

Sub Category: I D - **Grid connected renewable electricity generation (Version 17, SC 01, EB 61)**

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

S. No.	Applicability Criteria	Project Case
1	This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: 1. Supplying electricity to a national or a regional grid; or 2. Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The project activity generates electricity using renewable energy source- wind power. Generated electricity is supplied to NEWNE (Northern, Eastern, Western and North-Eastern) of India. It does not supply electricity to an identified consumer facility under a contractual arrangement such as wheeling. Hence displaces the electricity which would have otherwise been generated from the fossil fuels based power plants connected to the grid.
2	Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies	The Project supplies electricity to a national/regional grid so methodology AMS-I.D is applicable. The project does not displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be

		supplied to a grid), also the project does not supplies electricity to a mini grid system where in the baseline all generators use exclusively fuel oil and/or diesel fuel so methodology AMS-I.F is not applicable. The project does not supplies electricity to household users (included in the project boundary) located in off grid areas so methodology AMS-I.A is not applicable.
3	This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is Greenfield project where eighteen new WEC have been installed. Total capacity of project is 14.4 MW.
4	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/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.	Not applicable as project under consideration is wind based power project.
5	If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project has only renewable component totaling to 14.4 MW (eighteen WEC of 800 kW each). This capacity is less than 15 MW.
6	Combined heat and power (co-generation) systems are not eligible under this category.	It is not a combined heat and power system.
7	In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	The project activity does not involve the addition of renewable energy generation units at an existing renewable power generation facility. The project activity under consideration involves installation of new eighteen WEC, totaling to capacity

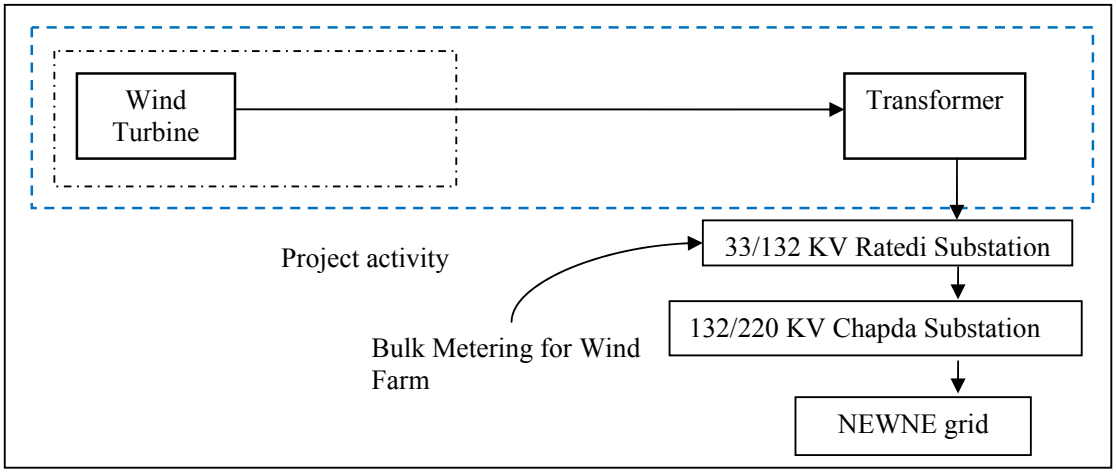
		of 14.4 MW.
8	In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	The project activity under consideration does not involve any retrofit or replacement. The installed system is new.

The project applicability criteria and their agreement with project activity under consideration described above clearly establish that project fulfill the requirement of methodology guidelines.

B.3. Description of the project boundary:

>>

The project boundary includes the wind mills, transformer, Metering point, Ratedi Hills site substation, Chapda substation and NEWNE (Northern, Eastern, Western and North-Eastern) Grid of India (the physical extent of the electricity grid which includes all power plants connected physically to the electricity system). The 18 machines of the project activity and machines of other wind farm project developers are connected to Ratedi Hills Substation.



Represents project activity

Represents 1 unit of WEC (there are 18 such units in the project activity)

Represents project boundary

B.4. Description of baseline and its development:

>>

In spite of significant growth in electricity generation over the years, the shortage of power continues to exist in India primarily on account of growth in demand for power, outstripping the growth in generation and generating capacity addition. Therefore in the absence of the project activity, equal amount of electricity would have been generated from the operation of existing fuel mix in the grids comprising mainly fossil fuel based power plants and future capacity expansion connected to the grids.

Establishing Baseline:

As per Appendix B of the simplified M&P for small-scale CDM project activities of the UNFCCC the project activity falls under category AMS I.D – "Grid connected renewable electricity generation."

Para 10, 11 and 12 of the AMS ID version 17 are relevant for baseline determination. Therefore baseline under section B.4 is determined using para 10, 11 and 12 of the approved methodology AMS ID version 17.

As per paragraph 10 of applied methodology-

The baseline scenario is that the 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 into the grid.

> The project activity is a new grid connected power plant supplying electricity to NEWNE (Northern, Eastern, Western and North-Eastern) grid, hence as per the applied methodology the baseline scenario for the project activity is the electricity delivered to the grid by the WEC's that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

As per paragraph 11 of applied methodology-

The baseline emissions are the product of electrical energy baseline $EG_{BL,\ y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

$$\mathbf{BE_{\ y} = EG_{BL,\ y} * EF_{\ CO2,\ grid,\ y}}$$

Where:

$BE_{\ y}$ = Baseline emissions in year y tCO_2.

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

$EF_{\ CO2}$ = CO_2 emission factor in year y, tCO_2/MWh

The baseline emissions for the project activity are the electricity generated by the project activity multiplied by the emission factor of the concerned grid. The project activity is connected to state grid which is the part of NEWNE (Northern, Eastern, Western and North-Eastern) grid hence NEWNE (Northern, Eastern, Western and North-Eastern) grid is considered as baseline grid and emission factor of NEWNE (Northern, Eastern, Western and North-Eastern) grid is used for the calculation of baseline emissions.

As per para 12 of applied methodology-

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

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system'

OR

(b) The weighted average emissions (in tCO_2e/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

We have used option (a) combined margin consisting of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system", version 2.2.1, as the applicable emission factor for determining baseline emissions.

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 NEWNE (Northern, Eastern, Western and North-Eastern) grid multiplied by the emission factor of the NEWNE (Northern, Eastern, Western and North-Eastern) grid calculated as the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors.

Variable	**Data Source**
$EG_{BL, y}$ – Net electricity exported to the grid.	Records maintained by project proponents
Parameter	**Data Source**
$EF_{OM, y}$ = Operating Margin Emission Factor (tCO_2/MWh)	CEA Database for CO_2 emission factor, version 6
$EF_{BM, y}$ = Build Margin Emission Factor (tCO_2/MWh)	CEA Database for CO_2 emission factor, version 6
$EF_{CO2, grid, y}$ – CO2 emission factor of the grid in year *y* (t CO2/MWh)	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 small-scale CDM project activity:

>>

The project activity has been conceived as a CDM project since its inception. The project start date is 28 October 2010 and the PP has intimated UNFCCC and DNA about the project activity initiative within six months of the start date. As per Annex 13, EB 62, the notification was made on 29th March 2011 to UNFCCC and Indian DNA whereas the project start date is 28th October 2010, thus the notification was made within six months of the project activity start date.

Additionality:

The project activity reduces anthropogenic emissions of greenhouse gases that would have occurred in absence of the project activity. As per the decision 17/cp.7[1] Para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

Referring to attachment A to appendix B (EB 63, Annex 24), Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

[1] http://unfccc.int/resource/docs/cop7/13a02.pdf#page=36

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The project participant has chosen Investment barrier to demonstrate additionality.

Investment barrier:

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.** The guidelines on the assessment of investment analysis issued in EB 62 (Annex 5, para 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 "Guidelins for Assessment of Investment analysis issued in EB 62 (Annex 5, para 13) states that in the cases of projects which could be developed by an entity other than the project participant , the benchmark shall be based on parameters that are standard in the market.

Expected returns on equity (Cost of Equity) has been considered as appropriate benchmark for the project activity and accordingly post tax equity IRR has been calculated.

As per investment guidance paragraph 15; cost of equity can be determined by (a) selecting the default values provided in the invest guidance or (b) calculating the cost of equity by using the best available practice. PP has computed cost of equity using Option (b).
The benchmark Cost of equity for the project is 18.21 %. The detail calculation of benchmark has been provided in Appendix-1: Calculation of financial benchmark.
The project participant used following assumptions for investment analysis as per the information available at the time of project decision making. Detail project report (DPR) dated 24 September 2010 was considered by CIPL's board for decision making. The DPR for the project activity was prepared using accelerated depreciation approach as well as using GBI approach and these approaches are mutually exclusive. The financial parameters used in DPR were sourced from Enercon offer dated as 14 September 2010. The accelerated depreciation approach provided marginally better results and therefore it was selected by PP.

Project Parameter (Unit)	Value		Reference
Capacity of Machines in kW	800		Enercon Offer (Dated 14th Sep 2010)
Number of Machines	18		Enercon Offer (Dated 14th Sep 2010)
Project Capacity in MW	14.40		Enercon Offer (Dated 14th Sep 2010)
Project Cost per MW (Rs. In Millions)	58.05		Calculated
Operations			
Plant Load Factor Base Case (%)	19.7%		Enercon Offer (Dated 14th Sep 2010)
Transformation loss and Transmission Loss up to metering point (%)	1.0%		Enercon Offer (Dated 14th Sep 2010)
Effective PLF (%)	19.5%		Calculated
Insurance Charges @ % of capital cost	0.12%		Offer from Insurance provider (United India Insurance Co. Ltd.)
Operation & Maintenance Cost base year @ % of capital cost	1.40%		Enercon Offer (Dated 14th Sep 2010)
Service tax rate	10.3%		http://www.cbec.gov.in/budget1011/bh1.pdf
% of escalation per annum on O & M Charges	6.0%		Enercon Offer (Dated 14th Sep 2010)
Tariff			
Base year Tariff for 20 years (Rs./Kwh)	4.35		MPERC Order (May-2010)
Project Cost	**Rs Million**		
Total Project Cost	**835.92**		Enercon Offer (Dated 14th Sep 2010)
Means of Finance		**Rs Million**	
Own Source	30%	250.78	CEPCO Board resolution
Term Loan	70%	585.14	
Total Source		**835.92**	
Terms of Loan			
Interest Rate (%)	10.25%		http://www.rbi.org.in/scripts/WSSView.aspx?Id=15195
Tenure (Years)	10	Years	MPERC Order (May-2010)
Income Tax Depreciation Rate (Written Down Value basis)			
on Wind Energy Generators (%)	80%		Income Tax Act 1961

Book Depreciation Rate (Straight Line Method basis)			
On all assets; average yearly depreciation (%)	4.5 %		Calculated
Book Depreciation up to (other than land) (%)	90%		MPERC Order (May-2010)
Income Tax			
Income Tax rate (%)	33.22%		http://www.moneycontrol.com/news/economy/budget-2010-pranab-cuts-surcharge-for-corporates-ups-mat_443912.html
Minimum Alternate Tax (%)	19.93%		
Working capital			
Receivables (no of days)	45		Billing Cycle, Enercon Offer (Dated 14th Sep 2010)
O & M expenses (no of days)	90		Enercon Offer (Dated 14th Sep 2010)

Debt Equity Ratio: The project was envisaged to be financed through mix of source of finances in the ratio of 70:30(debt: equity) hence we have considered the same ratio in the financial calculations.

Plant Load Factor: Input value of PLF used in investment analysis, has been taken from the supplier offer at the time of investment decision which meets the criteria of EB 62 (annex 5, Para 6). However, to justify the requirement of EB 48 Annex 11, which require plant load factor to be determined by a third party contracted by the project participant; the project participant has contracted a third party (M/s Ravi Enteck Limited) to determine the plant load factor for the project activity under consideration.

The supplier offer mentions value of PLF as 19.7% and transmission losses as 1.0%. Thus the effective value of PLF as per supplier offer is 19.5%. The third party assessment report gives the PLF value as 19.5% at the hub of WEC and transmission losses as 4%. The conservative value of PLF from supplier offer is used for investment analysis.

Salvage Value: The project is depreciated up to 90% of the project cost (except for land that is non depreciable item); therefore we have considered land cost and 10% of the remaining value as salvage in the cash flow for computing equity IRR.

The post tax equity IRR for the Project without CDM revenues is 9.37 % i.e. less than the benchmark.

Sensitivity Analysis:

The following sensitivity analysis has been conducted to check the robustness of the financial attractiveness of the project without CDM revenue by using Guidelines on the Assessment of Investment Analysis, version-05, Annex-5, EB 62.

The project viability is affected by the following cost parameters more than 20% during its complete life time of 20 years:

- Capital Cost

- Plant Load Factor
- O&M Charges
- Tariff

The details for each sensitive parameter and sensitivity analysis are provided as:

Capital Cost

The capital cost for the project activity is taken from the offer provided by the WEC supplier and hence capital cost is subjected to the variation of +/-10%. Therefore we have considered it appropriate to conduct sensitivity on capital cost.

Capital Cost [In Millions]	**(-10%) 752.33**	**(Base Value) 835.92**	**(+10%) 919.51**
Equity IRR	13.71%	9.37%	6.15%

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.

PLF	**(-10%) 17.55%**	**(Base Value) 19.5 %**	**(+10%) 21.45%**
Equity IRR	6.05%	9.37%	12.71%

Operation and Maintenance cost

In the financial analysis of the project activity we have taken the O&M cost as per the offer letter provided by the WEC supplier. Therefore we have conducted sensitivity at variation of +/-10%.

O&M (% of capital cost)	**(-10%) (1.26% of Capital Cost)**	**(Base Value) (1.40% of Capital Cost)**	**(+10%) (1.54% of Capital Cost)**
Equity IRR	9.89%	9.37%	8.84%

O&M escalation

In the financial analysis of the project activity we have taken the O&M escalation as per the offer letter provided by the WEC supplier. Therefore we have conducted sensitivity from 5.4% to 6.6%.

O&M escalation	**5.4% (-10%)**	**6% (Base Case)**	**6.6% (+10%)**
Equity IRR	9.6%	9.37%	9.12%

Tariff

Madhya Pradesh Electricity Regulatory Commission has fixed the tariff for the life of project. The tariff for the entire life of the project activity is fixed at Rs. 4.35 per KWh Hence, sensitivity has not been considered for this parameter.

Threshold limit of percentage variation in key parameters:

Name of Parameter	*Threshold limit (%)*	*Likelihood of variation*
Capital Cost	-18.35%	PP has considered the project cost as the project cost mentioned in the supplier offer during the investment analysis. The actual project cost is INR 774 Million as per purchase order which is 8.0% lower than project cost mentioned in supplier offer. The sensitivity on project cost is conducted at the variation of +/-10% which is greater than the actual gap between the project cost provided in Offer and Purchase order. For threshold limit, the project cost shall go down by around 18.35% which is not relevant based on the purchase order.
Plant Load Factor	26.3%	Effective PLF shall go up by 26.3% which is equivalent to effective PLF value of 24.63% which is unlikely to happen as third party assessment report provides a value of 19.5% with transmission losses of 4.0%.
O&M Charges	-190%	It is very unlikely that O&M cost shall reduce by 190% against the offer given by O&M contractor which gives an escalation of 6% per annum on O&M charges.
O&M escalation rate		At an escalation rate of 0% (assuming cost remains constant as a decline is unlikely), the equity IRR comes out to be 11.07%.Therefore it is unlikely that the benchmark will be breached.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>

According to the approved methodology AMS I D (Version 17) Emission Reductions are calculated as:-

$ER_y = BE_y – PE_y – LE_y$ …… (1)

Where:

BE_y	Baseline Emissions in year *y* (t CO_2e/yr)
PE_y	Project Emissions in year *y* (t CO_2e/yr)
LE_y	Leakage Emissions in year *y* (t CO_2e/yr)
ER_y	Emission Reduction in year y (t CO_2e/yr)

Estimation of Baseline Emissions:

As per the paragraph 11 of applied methodology the baseline emissions are the product of electrical energy baseline $EG_{BL, y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$BE_{y} = EG_{BL, y} * EF_{CO2, grid, y}$ …… (2)

Where:

BE_{y} = Baseline emissions in year y tCO_2.

$EG_{BL, y}$ = Energy baseline in year y MWh.

$EF_{CO2, grid, y}$ = CO_2 emission factor in year y, tCO_2/MWh.

The project activity is in the state of Madhya Pradesh which falls under NEWNE (Northern, Eastern, Western and North-Eastern) grid, as per the paragraph 12 of the applied methodology 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 methodological tool (EB 63, Annex 19, Version 2.2.1) 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) Southern and (2) NEWNE (Northern, Eastern, Western and North-Eastern) 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 neighboring 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 NEWNE (Northern, Eastern, Western and North-Eastern) regional electricity grid, the NEWNE (Northern, Eastern, Western and North-Eastern) 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:

	2005-06	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**Average**
NEWNE	18.0%	18.5%	19.0%	17.4%	15.9%	17.8%
South	27.0%	28.3%	27.1%	22.8%	20.6%	25.2%
India	20.1%	20.9%	21.0%	18.7%	17.1%	19.5%

Source: CO2 Baseline Database for the Indian Power Sector – Central Electricity Authority

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 NEWNE (Northern, Eastern, Western and North-Eastern) 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 NEWNE (Northern, Eastern, Western and North-Eastern) grid constitute less than 50% of total grid generation.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated

using either of the two following data vintages:

• Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use 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.

For off-grid power plants, use a single calendar year within the five 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.

• Ex post option: If the ex post option is chosen, 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. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

In the project activity, (*ex-ante*) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission has been considered. It is confirmed that ex-ante vintage is considered in the project activity and cannot be changed 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 use 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

Therefore, in line with this, the simple OM emission factor values have been directly sourced from "CO_2 Baseline Database for the Indian Power Sector", Version 6.0, March, 2011 published by Central Electricity Authority (CEA) of India. The calculation of Operating Margin (OM) has been done following ex – ante approach based on the average of the most recent 3 years' (2007-08, 2008-09; 2009-10) Operating Margin (OM) emission factor values, which is available at the time of PDD submission for validation. Therefore, there is no requirement to monitor and recalculate this emission factor during the crediting period.

Last Three years average of the Operating Margin:

Year	2007-08	2008-09	2009-10
Simple OM (including imports) (tCO_2 / MWh)	0.9999	1.00655	0.97774

Net Generation in Operating Margin (MWh)			
	2007-08	**2008-09**	**2009-10**
NEWNE	401641585.97	421802632.89	458043084.56

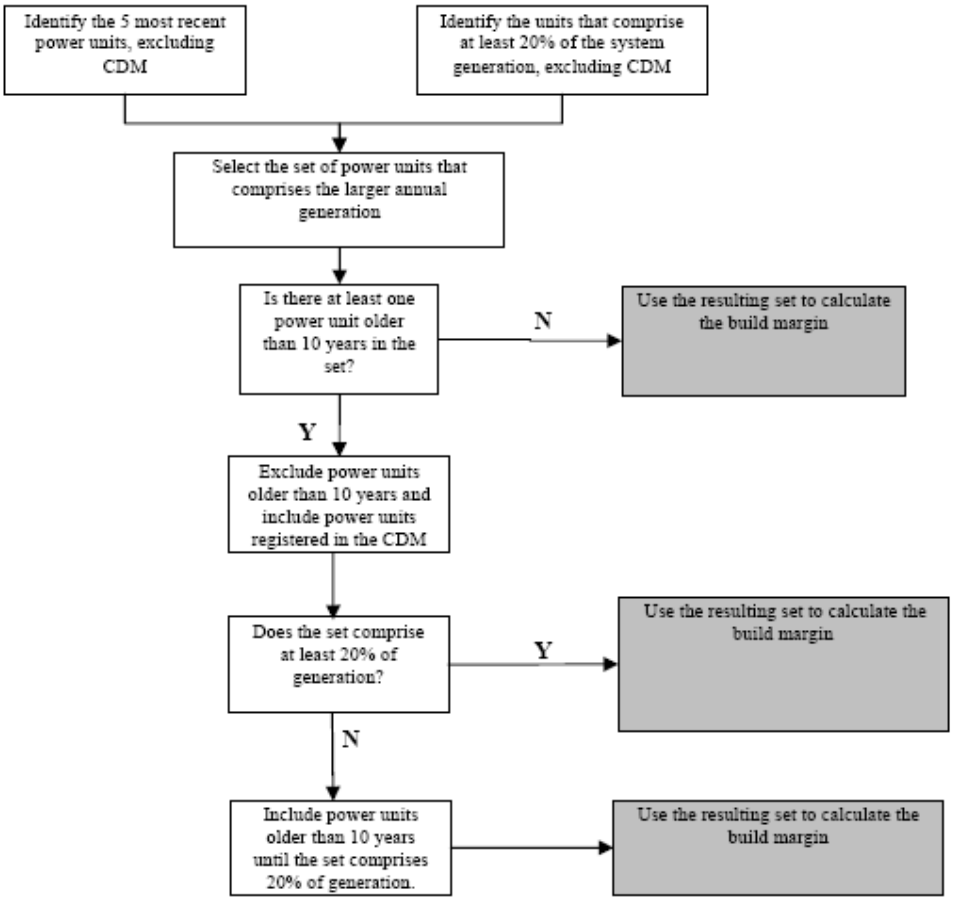
Simple Operating Margin = Generation Weighted average of the simple operating margin

=(0.9999* 401641585.97 +1.00655*421802632.89+0.97774*458043084.56)/(401641585.97 +421802632.89+458043084.56)

= 0.9941 (tCO_2/MWh)

STEP 5. Calculate the build margin emission factor:

The project participant has chosen option 1: For the first crediting period, calculate the build margin emission factor 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.
The sample group of power units *m* used to calculate the build margin should be determined as per the procedure presented below in chart.



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 electricity generation data is available, calculated as follows:
$\mathbf{EF_{grid,BM,y} = (\Sigma\ EG_{m,y}\ x\ EF_{EL,m,}) / \Sigma\ EG_{m,y}}$

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 electricity 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 electricity generation data is available, and using for *m* the power units included in the build margin.

The value of build margin (not adjusted for imports) has been taken from "CO_2 Baseline Database for the Indian Power Sector", Version 6.0, March, 2011; published by Central Electricity Authority (CEA), Government of India.

Year	2009-10
Build Margin CO_2Emission Factor (tCO_2e / MWh)	0.81231

STEP 6. Calculate the combined margin emissions factor:

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

$$\mathbf{EFy = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}}$$

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}	Weight of operating margin emissions factor (%)
w_{BM}	Weight of build margin emissions factor (%)

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

According to "**Tool to calculate the emission factor for an electricity system",** the weight 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 0.94865 tCO_2e/MWh.

Project Emissions:

As per para 20 of methodology, for most renewable energy project activities, $PEy = 0$

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

PE_y = 0..... (3)

Leakage:

Since no equipment is transferred from another project activity or that any existing equipment is transferred to another activity, leakage as per AMS ID is taken as zero.

LE_y = 0..... (4)

Details of Baseline data:

Data of Operating and Build Margin for the three financial years from 2007-08 to 2009-10 has been obtained from -

The CO_2 Baseline Database for the Indian Power Sector

Ministry of Power: Central Electricity Authority (CEA)

Version 6

Key baseline information is reproduced in annexure 3.

The detailed excel sheet is available at:

http://www.cea.nic.in

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

Data / Parameter:	$EF_{OM,y}$
Data unit:	tCO_2e/MWh
Description:	Operating Margin Emission Factor of NEWNE Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" 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:	0.99410
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated by using 3 years vintage (2007-2008, 2008-2009 and 2009-10) data obtained from "CO_2 Baseline Database for Indian Power Sector" version 6.0, 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:	$EF_{BM,y}$
Data unit:	tCO_2e/MWh
Description:	Build Margin Emission Factor of NEWNE Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" 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:	0.81231
Justification of the choice of data or description of measurement methods and procedures actually applied:	2009-10 data obtained from "CO_2 Baseline Database for Indian Power Sector" version 6.0, 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** $_{CO2, grid, y}$
Data unit:	tCO_2e/MWh
Description:	Combined Margin Emission Factor of NEWNE Electricity Grid
Source of data used:	Combined Margin Emission Factor ($EF_{CM,y}$) is calculated as the weighted average of Operating Margin Emission Factor ($EF_{OM,y}$) and Build Margin Emission Factor ($EF_{BM,y}$). The "CO_2 Baseline Database for Indian Power Sector" 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 $EF_{CO2,grid,y}$) : 0.94865 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:

>>

The baseline emissions are calculated as:

$\mathbf{BE_{y} = EG_{BL,y} * EF_{CO2,grid,y}}$

The annual electricity supplied to grid by the project activity is calculated as:

$EG_{BL,y}$ = 14.4 MW (Capacity) x 19.5 % (Effective PLF) x 8760 (hours)

= 24,601.86 MWh

Baseline emission factor (combined margin)

= 0.94865 tCO_2e/MWh

Hence baseline emissions are:

BE_y = 24,601.86 MWh * 0.94865 tCO_2e/MWh

= 23,338 tCO_2e

Project emissions and leakage emissions for the project activity are zero.

Hence emission reductions are calculated as:

$ER_y = BE_y – PE_y – LE_y$

= 23,338 - 0 - 0

= 23,338 tCO_2e/year

The annual emission reductions from the project activity are estimated to be 23,338 tCO2e/year.

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

Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of overall emission reductions (tCO2e)
Year 1*	0	23,338	0	23,338
Year 2	0	23,338	0	23,338
Year 3	0	23,338	0	23,338
Year 4	0	23,338	0	23,338
Year 5	0	23,338	0	23,338
Year 6	0	23,338	0	23,338
Year 7	0	23,338	0	23,338
Year 8	0	23,338	0	23,338
Year 9	0	23,338	0	23,338
Year 10	0	23,338	0	23,338

Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of overall emission reductions (tCO2e)
Total (tonnes of CO2e)	0	23,3380	0	23,3380

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

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

>>

B.7.1 Data and parameters monitored:

Data / Parameter:	**EGy**
Data unit:	MWh (Mega-Watt hour)
Description:	Net electricity supplied to the grid by the Project
Source of data to be used:	Electricity supplied to the grid as per the breakup sheet signed by DISCOM authorities and can also be verified with tariff invoices raised on State Utility . Further, to cross check; the net electricity supplied to the grid by the Project must be lesser than summation of electricity exported by WECs (Wind Energy Convertor) of project activity, as measured at the individual controller (LCS) of each WEC.
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 = 14.4 MW (Capacity) x 19.5% (PLF) x 8760 (hours) MWh = 24,601.86 MWh
Description of measurement methods and procedures to be applied:	The machines of the project activity and machines of other project developers are connected to Ratedi Hills Substation The common metering point comprises one main meter and check meter that is installed at 132 kV metering point at the Ratedi Hills substation. Consequently, the main meter reading reflects the aggregate electricity supplied by all these wind farms, including the project activity. The net electricity supplied by individual wind turbines is determined by a process of allocating the total electricity recorded at the main meter to the individual turbines in proportion of the electricity generation recorded by the LCS meters at the individual wind turbines. Allocation plan for calculating net electricity exported to the grid is given in section B.7.2. A breakup sheet is prepared mentioning the electricity export ($\sum_{Project} E_{WEC, Export}$), import ($\sum_{Project} E_{WEC, Import}$) and net electricity supplied by project activity. The net electricity supplied to grid by project activity is calculated as follows. $EG_y = \sum_{Project} E_{WEC, Export} - \sum_{Project} E_{WEC, Import}$ This breakup sheet is prepared by O&M service provider and endorsed by state utility.

	On receipt of breakup sheet, the PP raises the bill/invoice for the release of payment against net electricity supplied. The calculation of Break-up sheet is detailed in Section B.7.2. Main meter, Check meter and LCS meter continuously meters the electricity supply. Measuring and Recording frequency of electricity supply by these meters is monthly. Main and check meters will be calibrated annually. LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WECs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. Refer Annex – 4 for an illustration of the provisions for measurement methods.
QA/QC procedures to be applied:	Electricity supplied to the grid can be verified with tariff invoices raised on State Utility. Further, to cross check; the net electricity supplied to the grid by the Project must be lesser than summation of electricity exported by WECs (Wind Energy Convertor) of project activity, as measured at the individual controller (LCS) of each WEC.
Any comment:	The hard copies of Breakup sheet signed by DISCOM authority and tariff invoices raised on State Utility shall be kept for crediting period plus two years.

Data / Parameter:	$\sum E_{project, Controller, Export}$
Data unit:	MWh (Mega-Watt hour)
Description:	Summation of electricity exported by WECs (Wind Energy Convertor) of project activity, as measured at the individual controller (LCS) of each WEC. Every WEC has separate LCS. This Summation is carried out on WECs of project activity. The measured value of this parameter must always be more than net electricity supplied to the grid by the Project activity.
Source of data to be used:	This reading is monitored continuously by the online monitoring station at the project site.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will not be directly used for estimation of emission reduction.
Description of measurement methods and procedures to be applied:	The LCS readings of each WEC is monitored and recorded continuously by the online monitoring station. The reading from each LCS is also recorded as per billing cycle and summation is carried out on WECs of project activity This parameter is used by Enercon (India) Ltd.to prepare breakup sheet. Refer Section B.7.2 for detail procedure. LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WECs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.

QA/QC procedures to be applied:	Refer Annex-4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$E_{JMR, Export}$
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity exported by project activity and the turbines from other wind farm developers, as recorded by the main meter at the substation.
Source of data to be used:	The breakup sheet signed by state utility authorities
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will not be directly used for estimation of emission reduction.
Description of measurement methods and procedures to be applied:	The reading will be taken by the representatives of O&M service provider and the State utility at the meter(s) connecting WECs of project and non-project WECs at the project site. These meters are located at Ratedi Hills site substation. The main meter reading is considered for all calculations. The purpose of the check meter is to serve as a check on the accuracy of measurement and its reading is used when main meter is not working properly. Frequency of recording data: Monthly Refer section B.7.2 for the detail application of this parameter to calculate Net electricity supplied to the grid by the Project activity.
QA/QC procedures to be applied:	Main and check meters are under purview of state utility. The original document endorsed by the representatives of O&M service provider and the State utility shall not be under purview of project participant. Refer Annex-4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$E_{JMR, Import}$
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity imported by project activity and the turbines from other wind farm developers, as recorded by the main meter at the substation.
Source of data to be used:	The breakup sheet signed by state utility authorities
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will not be directly used for estimation of emission reduction.
Description of measurement methods and procedures to be applied:	The reading will be taken by the representatives of O&M service provider and the State utility at the meter(s) connecting WECs of project and non-project WECs at the project site. These meters are located at Ratedi Hills site substation. The main meter reading is considered for all calculations. The purpose of the

	check meter is to serve as a check on the accuracy of measurement and its reading is used when main meter is not working properly. Frequency of recording data: Monthly Refer section B.7.2 for the detail application of this parameter to calculate Net electricity supplied to the grid by the Project activity.
QA/QC procedures to be applied:	Main and check meters are under purview of state utility. The original document endorsed by the representatives of O&M service provider and the State utility shall not be under purview of project participant. Refer Annex-4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived for crediting period + 2 years.

B.7.2 Description of the monitoring plan:

>>

The applicable simplified baseline and monitoring methodology for selected small scale CDM project activities AMS I.D. version 17 requires monitoring of the following parameters:

- 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 18 turbines and the turbines from other wind farm developers at the project site. These meters are located at Ratedi Hills site substation. These reading become the basis of JMR (Joint Meter reading) report and are signed by the representatives of Enercon and State Utility. The net electricity export and import by project activity and other wind farms will be metered at this metering point.

The net electricity supplied by individual wind turbines is determined by allocating proportion of the total electricity recorded at the main meter at Ratedi Hills Substation. This allocation procedure comply with the power purchase agreement signed between CEPCO Industries Pvt. Ltd. and MP Power Trading Co. Ltd. The individual turbine electricity generation is recorded by the LCS meter (controller) at the individual wind turbine. The procedure for allocation is as follows:

$E_{JMR, Export}$ = Electricity exported by project activity and the turbines from other wind farm developers, as recorded by the main meter at the substation. Main and check meters are under purview of state utility.
$E_{JMR, Import}$= Electricity imported by project activity and the turbines from other wind farm developers, as recorded by the main meter at the substation. Main and check meters are under purview of state utility
$E_{Controller, Export}$ = Electricity exported by a Wind Energy Converter (WEC), as measured at the controller

$\sum E_{Controller, Export}$ = Electricity exported by all the WECs (by project activity and the turbines from other wind farm developers) connected to the main meter at the substation, measured at the controller of each WEC. Controller assigned to each WEC of project activity only is under purview of PP.

$\sum \mathbf{E}_{\mathbf{project, Controller, Export}}$ = Summation of electricity exported by WECs of project activity, as measured at the individual controller of each WEC. This Summation is carried out on WECs of project activity only.

$E_{WEC, Export}$ = Apportioned value of electricity exported by a WEC (for all individual project and non-project WECs) to the grid, calculated

$E_{WEC, Import}$ = Apportioned value of electricity imported by a WEC (for all individual project and non-project WECs) from the grid, calculated

$\sum_{Project} E_{WEC, Export}$ = Summation of apportioned value of electricity exported by WECs of project activity

$\sum_{Project} E_{WEC, Import}$ = Summation of apportioned value of electricity imported by WECs of project activity

Electricity exported by each WEC is apportioned on the basis of electricity exported recorded at the controller of each WEC and the electricity exported at the main meter and mentioned in the Breakup sheet The export multiplication factor is calculated as follows-

Export Multiplication factor (Apportioning factor for Export) = $E_{JMR, Export} \div \sum E_{Controller, Export}$ ……(1)

Thus the energy exported by a WEC to the grid is given by the equation-

$E_{WEC, Export}$ = Export Multiplication factor * $E_{Controller, Export}$ ……..(2)

As the controller meter doesn't record import, the apportioning of energy imported by each WEC is also done on the basis of electricity exported recorded at the controller of each WEC and the electricity imported at the main meter and mentioned in the Breakup sheet The import multiplication factor is calculated as follows-

Import Multiplication factor (Apportioning factor for Import) = $E_{JMR, Import} \div \sum E_{Controller, Export}$ ……(3)

Thus the energy imported by a WEC to the grid is given by the equation-

$E_{WEC, Import}$ = Import Multiplication factor* $E_{Controller, Export}$ ……..(4)

The net electricity exported by the WECs of the project activity is given by the equation-

$EG_y = \sum_{Project} E_{WEC, Export} - \sum_{Project} E_{WEC, Import}$ ……..(5)

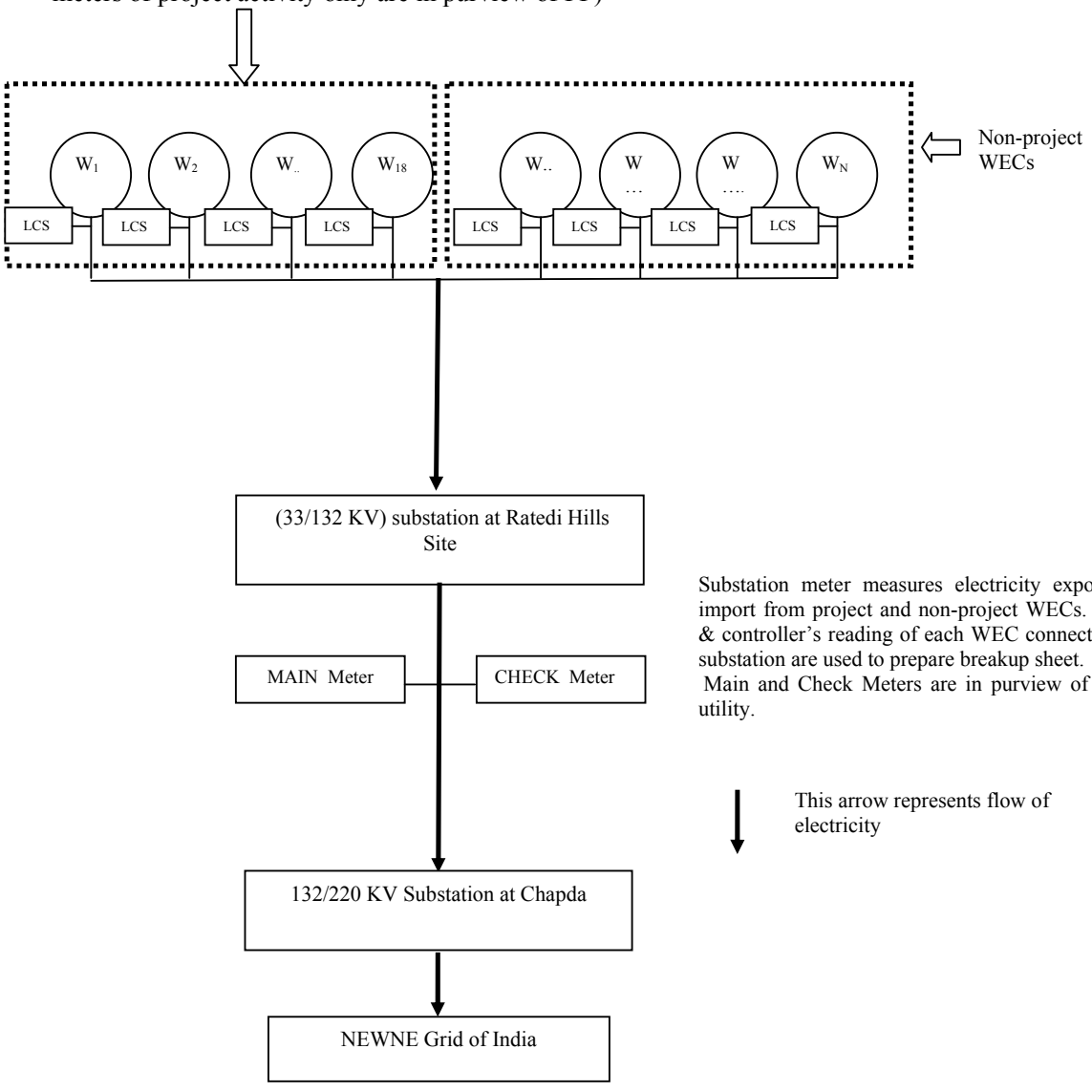
The summation is done on the WECs belonging to the project activity.

NOTE: The net electricity supplied to the grid by the project activity is a calculated value which is arrived by using the value of electricity generation by project WECs, non-project WECs at individual controller and the cumulative value of electricity import and export of the entire number of WECs connected to substation (i.e. including project and non-project WECs) as measured at the pooling substation. Since the measurement of electricity generation of non-project WECs at controller is not

feasible for PP, hence only parameters i.e. EG_y (sourced from breakup sheet) and $\Sigma E_{project, Controller, Export}$ (Summation of electricity exported by WECs of project activity, as measured at the individual controller of each WEC); have been included as the monitoring parameters in section B.7.1of PDD.

The monitoring arrangement, metering system under project boundary has been illustrated in schematic diagram below:

Project WECs (There are 18 WEC under project activity. Each machine has individual LCS meter. LCS meters of project activity only are in purview of PP)



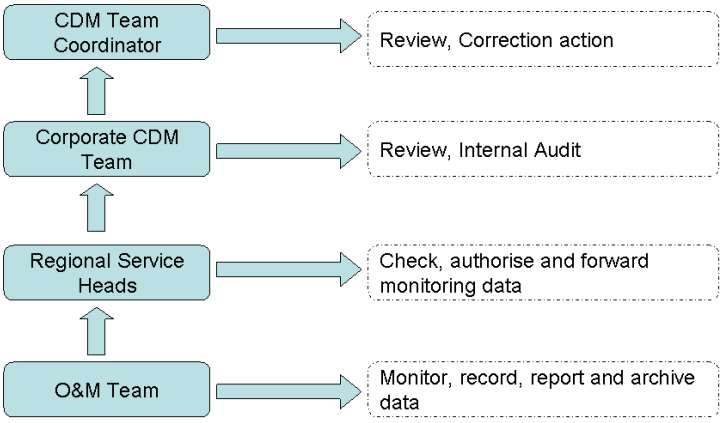
The operational and maintenance contract for the project is with Enercon. Enercon is an ISO 9001:2000 certified Quality Management system from Germanischer Lloyd. Enercon follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from 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 and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

Date of completion: 26/05/2011

Name of responsible person/entity: Enercon (India) Power Development Pvt. Ltd. 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:

>>

28/10/2010 (Date of purchase order)

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

>>

20 years

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

C.2.1. Renewable crediting period

>>

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

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>

02/12/2012 or the date of registration with the UNFCCC, whichever is later.

C.2.2.2. Length:

>>

10 years

SECTION D. Environmental impacts

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

>>

As per the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated January 27, 1994 and EIA Notification (S.O 3067) dated 1st December 2009, a list of activities that require to undertake environmental impact assessment studies[2] 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:

>>

EIA is not required for project activity under consideration.

[2] http://moef.nic.in/downloads/rules-and-regulations/3067.pdf

SECTION E. Stakeholders' comments

>>

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

>>

An advertisement was published in local newspaper in local language on 10/01/2011 to invite the stakeholders. The stakeholder meeting was conducted on 25/01/2011 in Dewas.

The meeting was presided over by Mr. Manohar Singh Mukhati (Ex-Sarpanch, Village Shukrawasa) and, other representatives were: Mr. Shanti Lal Yadav (President, Gram Van Samiti,Village Jhikhrakheda), Mr. Prabhu Lal Ji (President, Gram Van Samiti, Village Deharia Sahu), Mr. Rajendra Sharma (Forest Officer), Mr. Ashish Shukla (Chief Regulatory affair, EIL), Mr. Sunil Pandey (Legal, EIL), Mr. Bhupendra Verma – (CDM, Mumbai) and gathering of Villages:-Barotha, Jhanja gram, Dhanighati, Deharia Sahu, Jhikhrakheda, Shukrawasa, Arlawda, Ratedi, Mahu-kheda.

Mr. Sunil Pandey (Program presenter & Host for this meeting) addressed the stakeholders in local language-Hindi- and explained the purpose of the meet. He mentioned that wind power project undertaken by CEPCO Industries Pvt. Ltd. (CEPCO) at Ratedi Site in Dewas district of Madhya Pradesh state is one step to contribute to the mitigation of this problem of climate change. He elaborated that this project would not only help in addressing the problem of climate change but also would result in social, economical benefit for local societies and region as well. He said that this meet would help in creating awareness on the problem as Climate change and its impact on global community if it persists. He explained how the Clean Development Mechanism started to address the problem of climate change and sustainability.

Mr. Bhupendra Verma was invited to deliver the talk on global climate change and role of CDM to mitigate this problem. Mr. Ashish Shukla, Mr. Shanti Lal Yadav and Mr. Rajendra Sharma explained the importance of project activity in improving socio-economic and environmental condition at local and national level.

Mr. Manohar Singh Mukhati (Chairman of Stakeholder meeting) informed that such power projects are helpful for the development of the villages and in turn helps our nation in power crisis. He explained that the project has given local employment to many villagers and improved the socio-economic status of people. He mentioned that this project has helped us and will keep on helping us in future too. So we shall ensure the full support from the all the villages around this project. We shall avoid stealing any material and things related to project. He thanked all people to spare their valuable time for this stakeholder meet.

Mr Sunil Pandey thanked all villagers and prominent dignitaries and requested all stake-holders to ask questions related to project under consideration and raise any concerns if any.

E.2. Summary of the comments received:

>>

The comments received from various stakeholders are detailed below. The clarifications were addressed by the representatives of Enercon.

Name of Person	Question/Comments	Project Proponent Response
Mr. Rajendra Sharma	What are the sustainable development criteria of CDM project?	The Sustainable Development criteria defined by "Ministry of Environment and Forest" of Government of India falls under following four categories. • Social well being • Economic well being • Environmental well being • Technological well being
Mr. Kamil Khan	What is the role of western countries in CDM?	Under Clean Development Mechanism industrialized countries can invest in emission reducing projects in a developing country by providing finance or clean technology. This is financially attractive to both parties as developed countries achieve emission reduction at a lower cost while developing country gets money by selling the CERs and also gets cleaner technology.
Mr. Mukesh	How common people around the project can contribute to the project?	People can support such activities whether this project or any other activity to save the environment by active participation. People around the area shall assure that project is developed in safely and they don't allow unsocial element to harm the project.

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

>>

No negative comments were received from the stakeholders. Their queries were resolved during stakeholder meeting.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Cepco Industries Private Limited
Street/P.O.Box:	8, Balaji Estate, Guru Ravi Dass Marg, Kalka Ji
Building:	
City:	New Delhi
State/Region:	Delhi
Postfix/ZIP:	110019
Country:	India
Telephone:	+91-260-2220624, 2220628
FAX:	+91-264-69371
E-Mail:	cepco@vsnl.com
URL:	
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Aggarwal
Middle Name:	
First Name:	Rohit
Department:	Corporate
Mobile:	+91-9810514822
Direct FAX:	+91-264-69371
Direct tel:	+91-264-40702
Personal E-Mail:	cepco@vsnl.com

Organization:	Enercon (India) Power Development Private Limited
Street/P.O.Box:	Enercon Tower, A-9, Veera Industrial Estate, Veera Desai Road,
Building:	
City:	Andheri (W),
State/Region:	Mumbai
Postfix/ZIP:	400053
Country:	India
Telephone:	+91-22-66924848
FAX:	+91-22-66921175
E-Mail:	yogesh.mehra@enerconindia.net
URL:	
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Mehra
Middle Name:	
First Name:	Yogesh
Department:	Corporate

Mobile:	+91-98200 40301
Direct FAX:	+91-22-66921175
Direct tel:	+91-22-66924848 extn. 7111
Personal E-Mail:	yogesh.mehra@enerconindia.net

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No ODA financing has been used in the project activity.

Annex 3

BASELINE INFORMATION

The Operating Margin data for the most recent three years and the Build Margin data for the NEWNE Grid as published in the CEA database version 6.0 are as follows:

Simple Operating Margin

	NEWNE Grid (tCO2e/MWh)
Simple Operating Margin – 2007-08	0.99990
Simple Operating Margin – 2008-09	1.00655
Simple Operating Margin – 2009-10	0.97774

Net Generation in Operating Margin (MWh)			
	2007-08	2008-09	2009-10
NEWNE	401641585.97	421802632.89	458043084.56

Simple Operating Margin	0.99410

Build Margin

	NEWNE Grid (tCO_2e/MWh)
Build Margin- 2009-10	0.81231

Combined Margin Calculations

	Weights	NEWNE Grid (tCO2e/MWh)
Operating Margin (Weightage Average of Simple Operating Margin of last three years)	0.75	0.99410
Build Margin (Year 2009-10)	0.25	0.81231
Combined Margin (Calculated)		0.94865

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 continuously and recorded monthly at the metering point connecting 18 machines of the project activity along with other wind farm developers at Ratedi Hills site. The meter reading is taken in the presence of representatives of Enercon (O&M Contractor for the project activity) and MPPTCL.

- **Metering Equipment:** Metering system for the project activity consists of main meter, check meter and LCS meters. Main and check meters are two-way trivector meters capable of recording import and export of electricity. Main and check meters will be calibrated annually. LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WECs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.

- **Meter Readings:** The electricity supplied to the grid is recorded monthly 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 Enercon officials to prepare the breakup sheet for individual customers and then breakup sheet is approved by DISCOM authorities. The breakup sheet is used by project developer to raise 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 MPPTCL's testing Division. The MPPTCL will carry out the calibration, periodical testing, sealing and maintenance of meters. The MPPTCL 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 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.

Appendix-1: Calculation of cost of equity benchmark using paragraph 15 option (b) of "Guidelines on the Assessment of Investment Analysis" version 5.0.

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 guidelines on the assessment of investment analysis issued in EB 62, Annex-5 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 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.

Calculation of Cost of Equity:

The expected return on equity has been determined using the Capital Asset Pricing Model (CAPM). 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.

$Ke = Rf + B \times (Rm - Rf)$

where:

Ke = Rate of return on equity capital;

Rf = Risk-free rate of return;

B = Beta;

Rm – Rf = Market risk premium;

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[3], 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.

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

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.(Source: http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/26CT_SEP090910.pdf , RBI Monthly Bulletin September 2010)

The average applicable risk free rate has been found as 8.27%.

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 premiums; i.e over a period of 25 years, since considering shorter time periods can lead to large standard errors because volatility in stock returns. 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. Therefore the risk premium has been calculated as the difference in compounded annual return between the BSE-200 index and the yield rate since the year of inception of BSE-200 index. The detailed calculations are presented in the attached excel sheet.

Hence the applicable risk premium was calculated as:

Risk Premium= Market return- Risk free rate

= 16.21%-8.27%.

= 7.933 %

Beta:

Beta 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. However, in the absence of adequate data on companies which are exclusively into the 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 activity (power generation business).

Therefore, we have considered beta values of all electricity generating companies which are part of the BSE-200 index (used for calculating the market risk premium) with data available for the last 3 years (from investment decision date). 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.

Beta values of individual companies have been sourced from Bloomberg and screenshots are attached herewith.

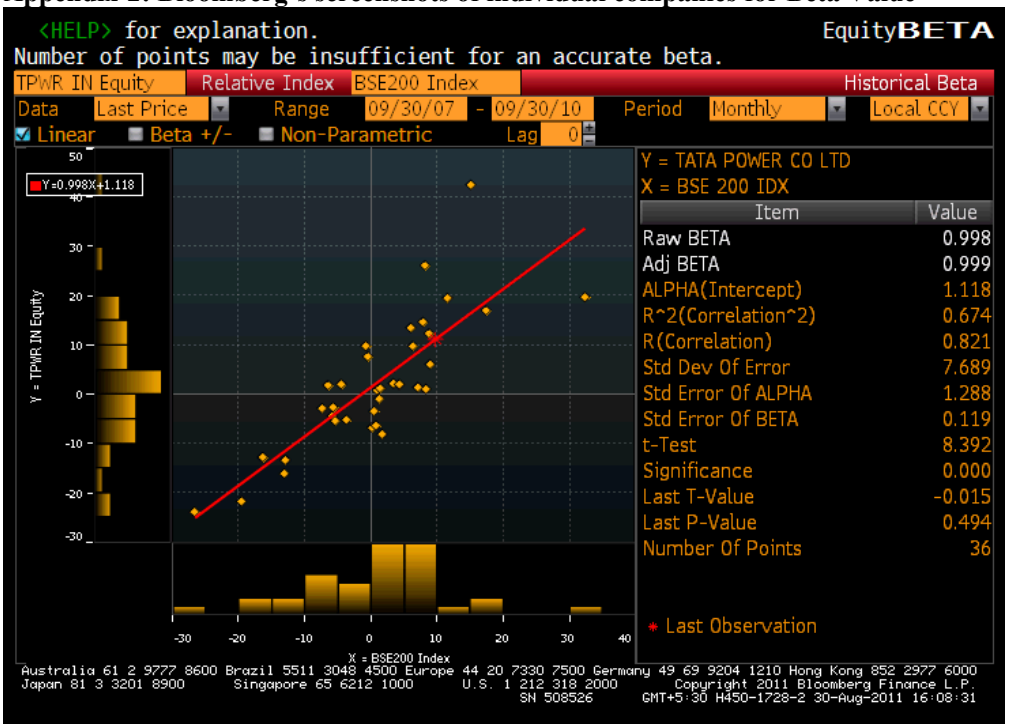
The table below lists the Beta values:

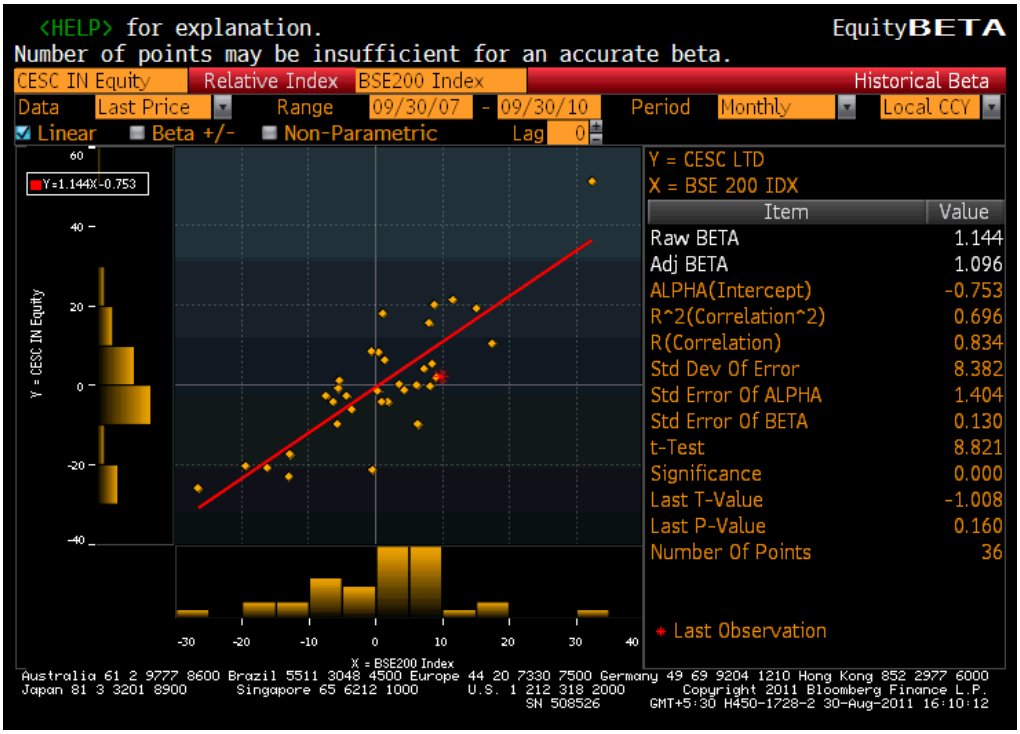
Company Name	Bloomberg Symbol	Beta value
Tata Power Co Ltd	TPWR IN Equity	0.999
CESC in equity	CESC IN Equity	1.096
Neyveli Lignite Corporation	NLC IN Equity	1.358
Reliance Infrastructure Ltd	RELI IN Equity	1.553
GMR Infrastructure Limited	GMRI IN Equity	1.245
GVK Power & Infrastructure Ltd	GVKP IN Equity	1.296
NTPC LTD	NTPC IN Equity	0.724
TORRENT POWER LIMITED	TPW IN Equity	1.293
Reliance Power Limited	RPWR IN Equity	1.227
LANCO INFRATECH LTD.	LANCI IN Equity	1.741
	Average Beta	**1.253**

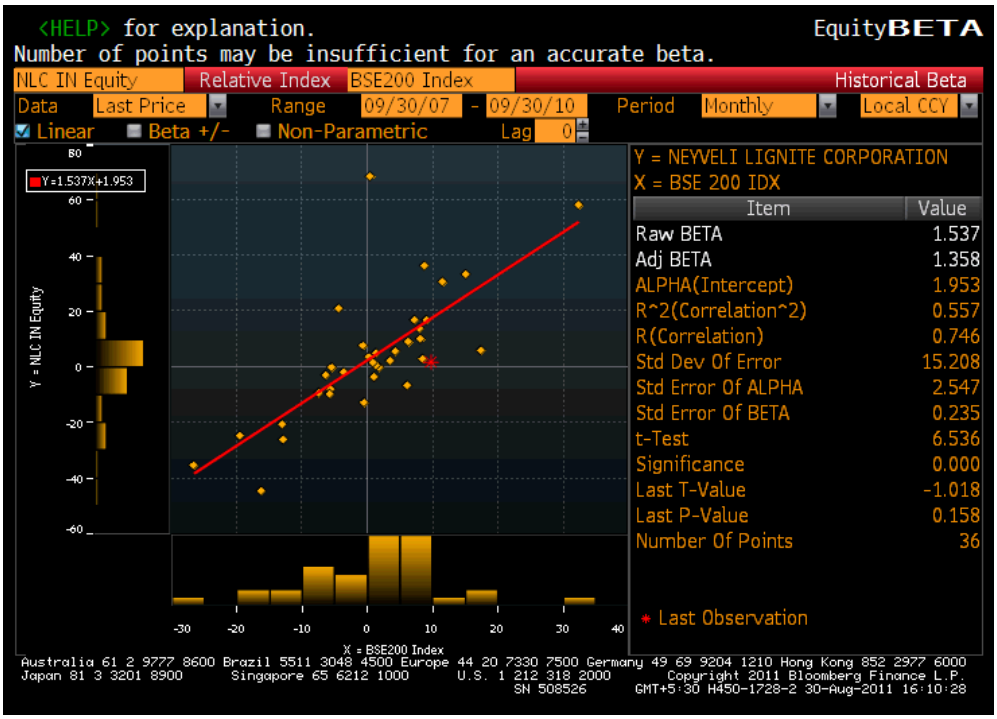
Calculation of Cost of Equity (benchmark for the project activity):

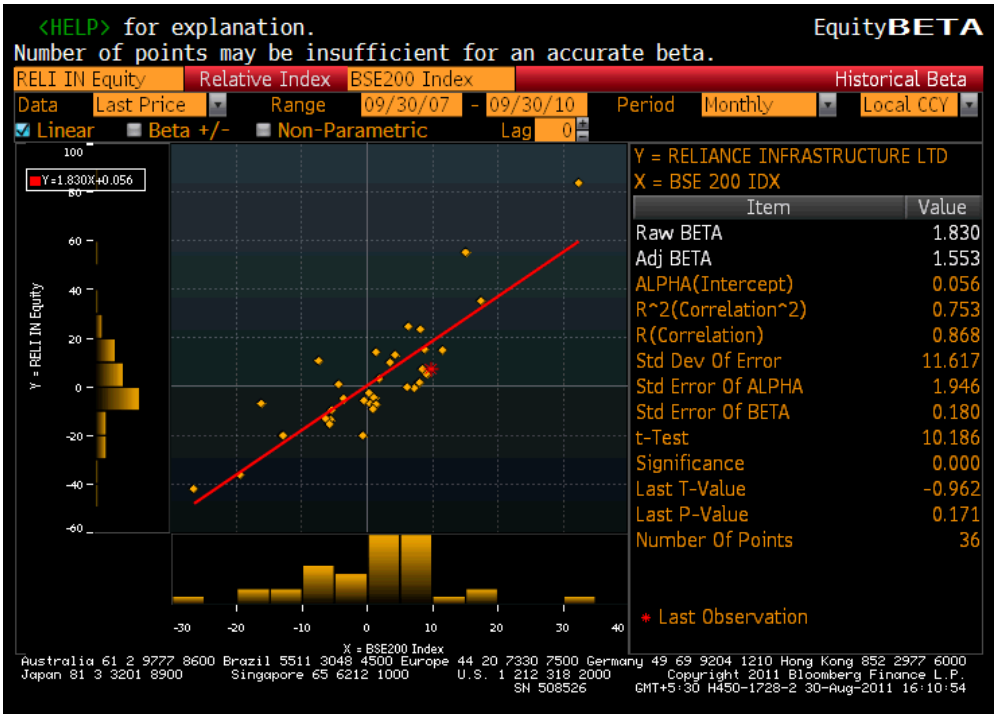
Cost of Equity = Risk free rate + Levered beta * Market risk premium
= 8.27% +1.253* 7.933%
= **18.21%**

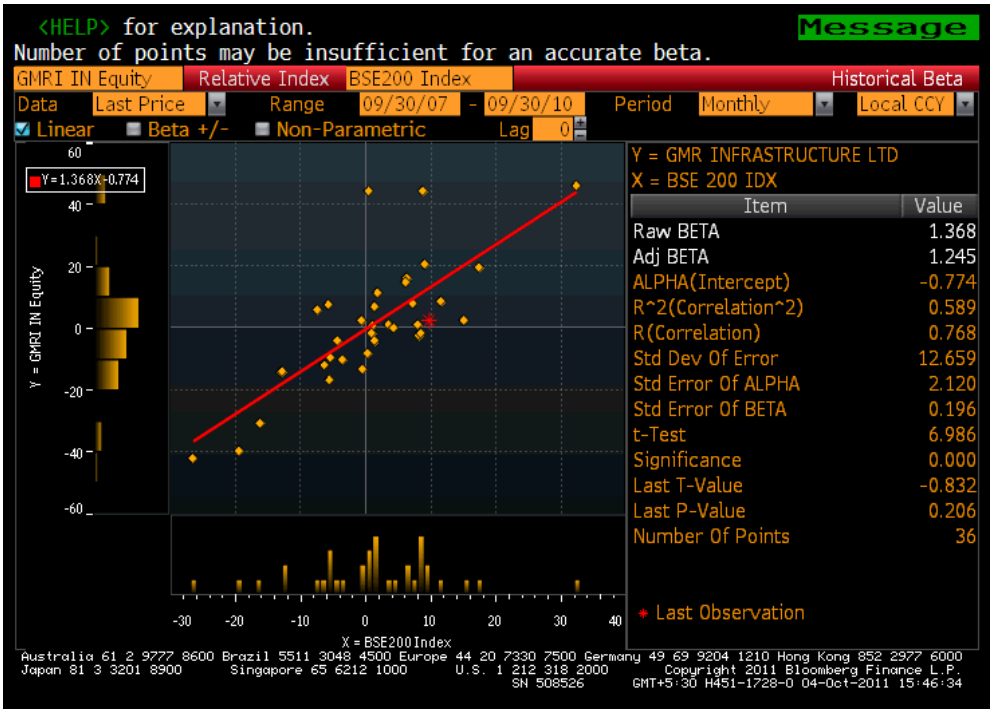
Appendix-2: Bloomberg's screenshots of individual companies for Beta Value

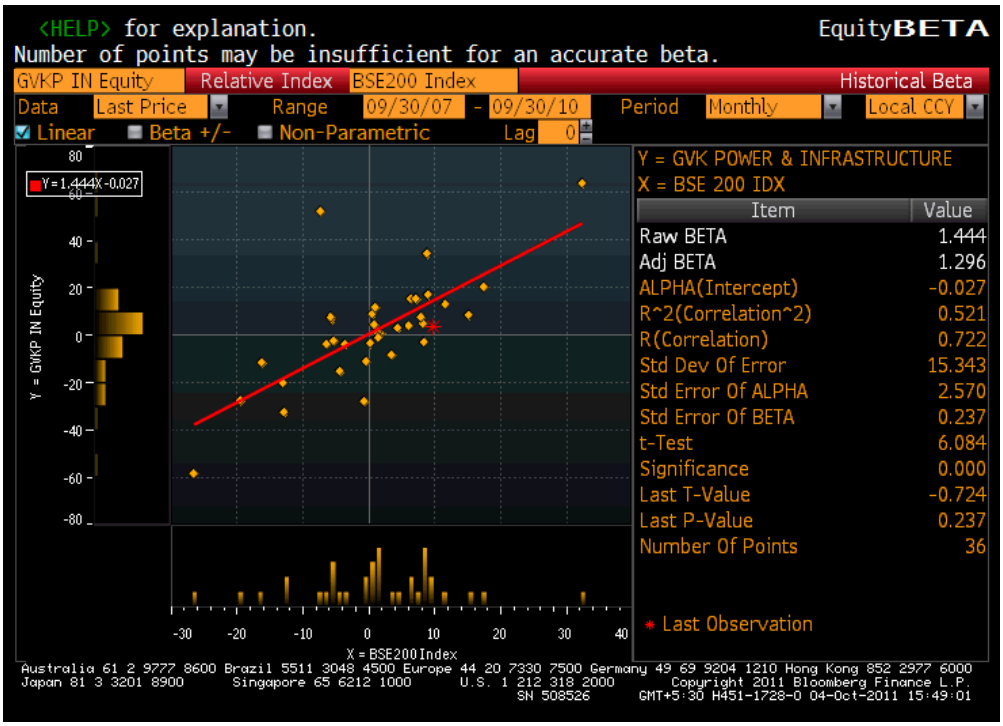


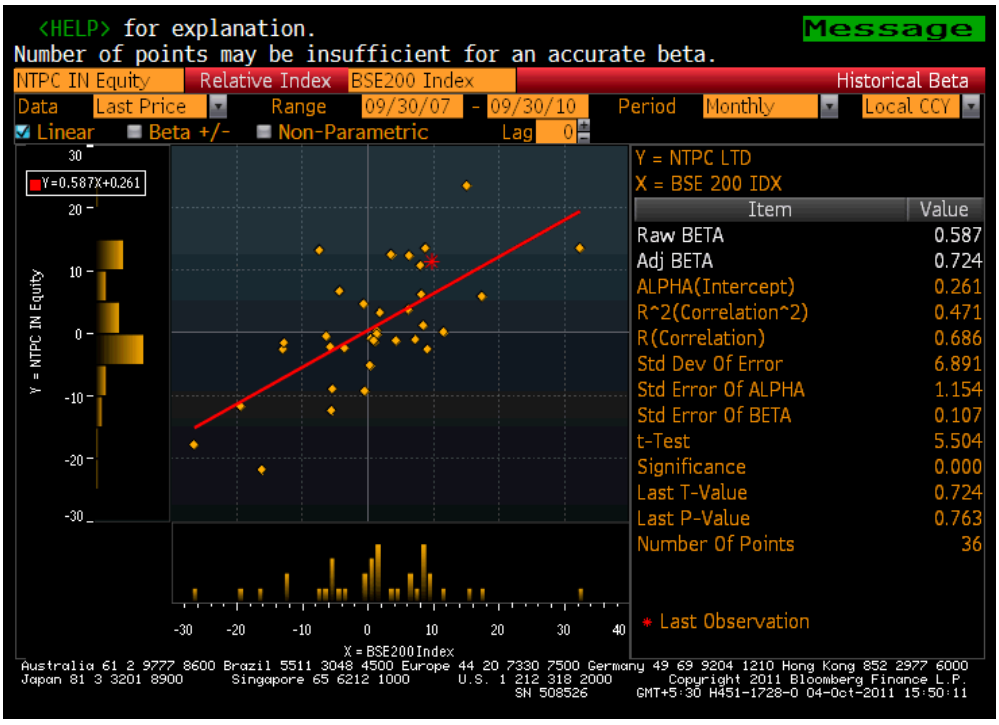


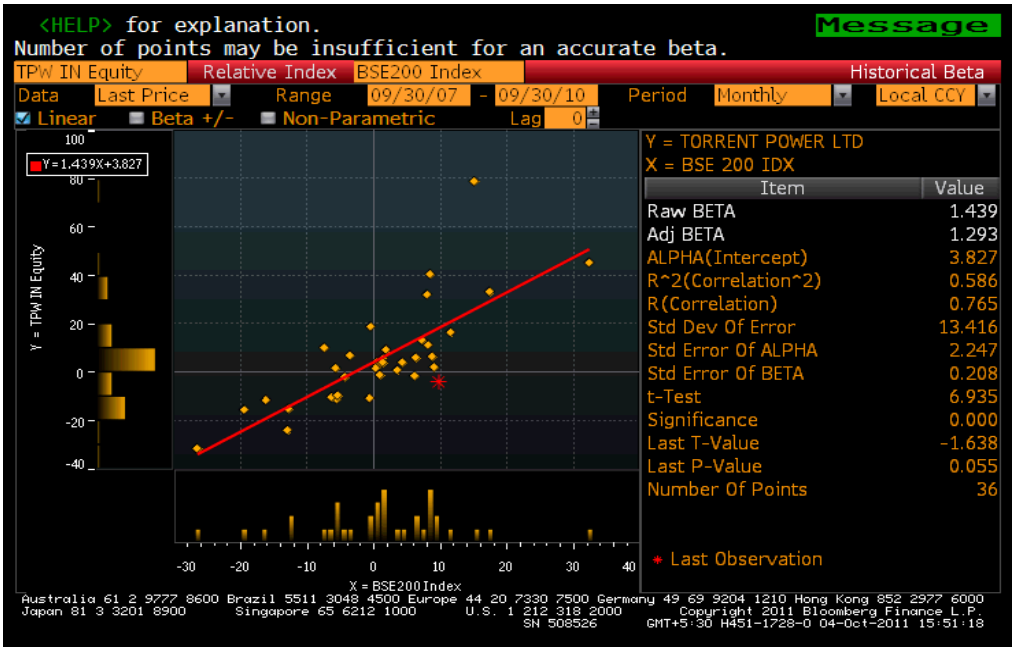

<HELP> for explanation.
EquityBETA
Number of points may be insufficient for an accurate beta.
NLC IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
09/30/07
09/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.537X+1.953
Y = NLC IN Equity
X = BSE200 Index
Y = NEYVELI LIGNITE CORPORATION
X = BSE 200 IDX
Item
Value
Raw BETA 1.537
Adj BETA 1.358
ALPHA(Intercept) 1.953
R^2(Correlation^2) 0.557
R(Correlation) 0.746
Std Dev Of Error 15.208
Std Error Of ALPHA 2.547
Std Error Of BETA 0.235
t-Test 6.536
Significance 0.000
Last T-Value -1.018
Last P-Value 0.158
Number Of Points 36
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
Copyright 2011 Bloomberg Finance L.P.
SN 508526
GMT+5:30 H450-1728-2 30-Aug-2011 16:10:28

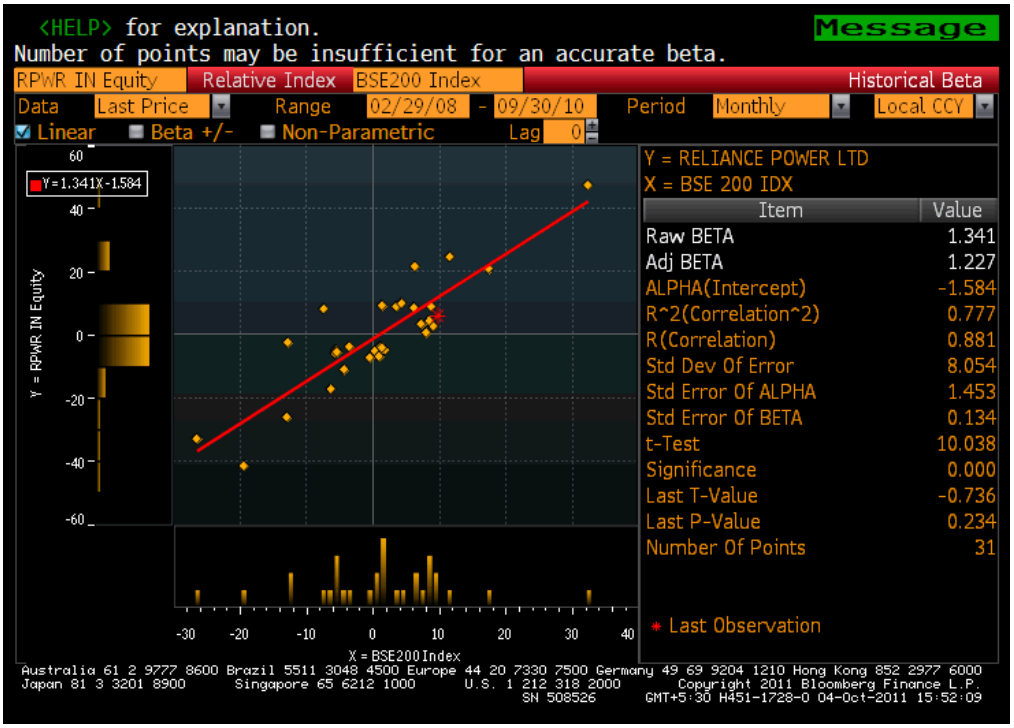

<HELP> for explanation.
EquityBETA
Number of points may be insufficient for an accurate beta.
RELI IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
09/30/07
09/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.830X+0.056
Y = RELI IN Equity
X = BSE200 Index
Y = RELIANCE INFRASTRUCTURE LTD
X = BSE 200 IDX
Item
Value
Raw BETA 1.830
Adj BETA 1.553
ALPHA(Intercept) 0.056
R^2(Correlation^2) 0.753
R(Correlation) 0.868
Std Dev Of Error 11.617
Std Error Of ALPHA 1.946
Std Error Of BETA 0.180
t-Test 10.186
Significance 0.000
Last T-Value -0.962
Last P-Value 0.171
Number Of Points 36
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
Copyright 2011 Bloomberg Finance L.P.
SN 508526
GMT+5:30 H450-1728-2 30-Aug-2011 16:10:54

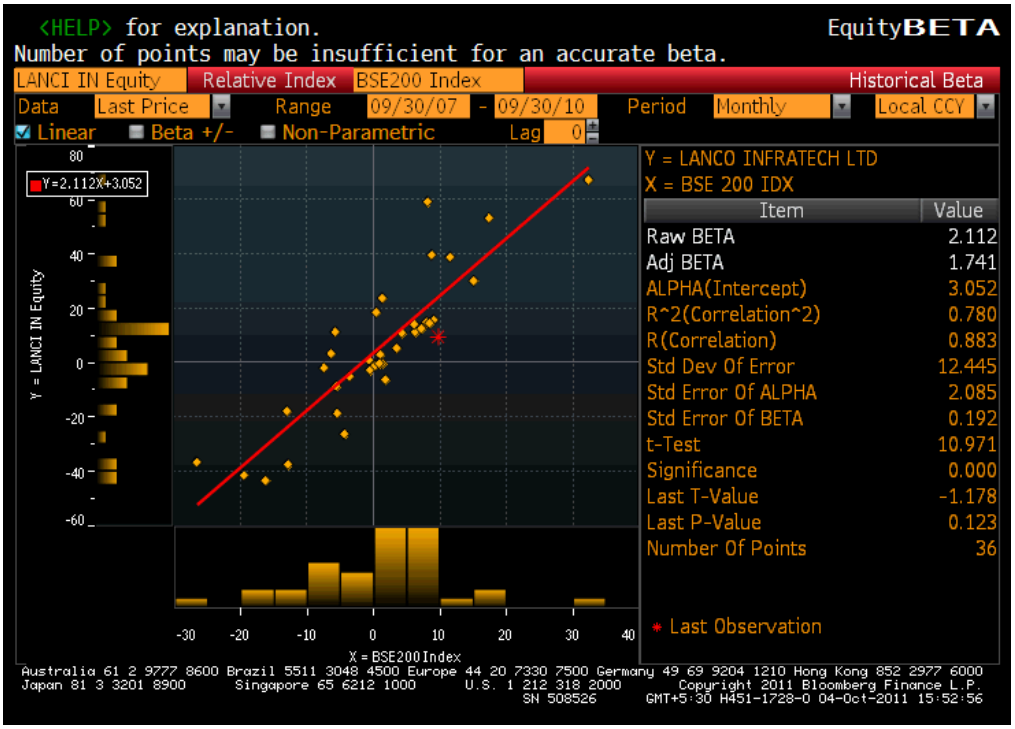

<HELP> for explanation.
Message
Number of points may be insufficient for an accurate beta.
GMRI IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
09/30/07
09/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.368X+0.774
Y = GMRI IN Equity
X = BSE200Index
Y = GMR INFRASTRUCTURE LTD
X = BSE 200 IDX
Item
Value
Raw BETA 1.368
Adj BETA 1.245
ALPHA(Intercept) -0.774
R^2(Correlation^2) 0.589
R(Correlation) 0.768
Std Dev Of Error 12.659
Std Error Of ALPHA 2.120
Std Error Of BETA 0.196
t-Test 6.986
Significance 0.000
Last T-Value -0.832
Last P-Value 0.206
Number Of Points 36
Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2011 Bloomberg Finance L.P.
SN 508526 GMT+5:30 H451-1728-0 04-Oct-2011 15:46:34


<HELP> for explanation.
EquityBETA
Number of points may be insufficient for an accurate beta.
GVKP IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
09/30/07
09/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.444X-0.027
Y = GVKP IN Equity
X = BSE200Index
Y = GVK POWER & INFRASTRUCTURE
X = BSE 200 IDX
Item
Value
Raw BETA 1.444
Adj BETA 1.296
ALPHA(Intercept) -0.027
R^2(Correlation^2) 0.521
R(Correlation) 0.722
Std Dev Of Error 15.343
Std Error Of ALPHA 2.570
Std Error Of BETA 0.237
t-Test 6.084
Significance 0.000
Last T-Value -0.724
Last P-Value 0.237
Number Of Points 36
Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2011 Bloomberg Finance L.P.
SN 508526 GMT+5:30 H451-1728-0 04-Oct-2011 15:49:01


<HELP> for explanation.
Message
Number of points may be insufficient for an accurate beta.
NTPC IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
09/30/07
09/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=0.587X+0.261
Y = NTPC IN Equity
X = BSE200Index
Y = NTPC LTD
X = BSE 200 IDX
Item
Value
Raw BETA 0.587
Adj BETA 0.724
ALPHA(Intercept) 0.261
R^2(Correlation^2) 0.471
R(Correlation) 0.686
Std Dev Of Error 6.891
Std Error Of ALPHA 1.154
Std Error Of BETA 0.107
t-Test 5.504
Significance 0.000
Last T-Value 0.724
Last P-Value 0.763
Number Of Points 36
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
Copyright 2011 Bloomberg Finance L.P.
SN 508526 GMT+5:30 H451-1728-0 04-Oct-2011 15:50:11


<HELP> for explanation.
Message
Number of points may be insufficient for an accurate beta.
TPW IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
09/30/07
09/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.439X+3.827
Y = TPW IN Equity
X = BSE200Index
Y = TORRENT POWER LTD
X = BSE 200 IDX
Item
Value
Raw BETA 1.439
Adj BETA 1.293
ALPHA(Intercept) 3.827
R^2(Correlation^2) 0.586
R(Correlation) 0.765
Std Dev Of Error 13.416
Std Error Of ALPHA 2.247
Std Error Of BETA 0.208
t-Test 6.935
Significance 0.000
Last T-Value -1.638
Last P-Value 0.055
Number Of Points 36
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
Copyright 2011 Bloomberg Finance L.P.
SN 508526 GMT+5:30 H451-1728-0 04-Oct-2011 15:51:18


<HELP> for explanation.
Message
Number of points may be insufficient for an accurate beta.
RPWR IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
02/29/08
09/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.341X-1.584
Y = RPWR IN Equity
X = BSE200 Index
Y = RELIANCE POWER LTD
X = BSE 200 IDX
Item
Value
Raw BETA 1.341
Adj BETA 1.227
ALPHA(Intercept) -1.584
R^2(Correlation^2) 0.777
R(Correlation) 0.881
Std Dev Of Error 8.054
Std Error Of ALPHA 1.453
Std Error Of BETA 0.134
t-Test 10.038
Significance 0.000
Last T-Value -0.736
Last P-Value 0.234
Number Of Points 31
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
Copyright 2011 Bloomberg Finance L.P.
SN 508526
GMT+5:30 H451-1728-0 04-Oct-2011 15:52:09


<HELP> for explanation.
EquityBETA
Number of points may be insufficient for an accurate beta.
LANCI IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
09/30/07
09/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=2.112X+3.052
Y = LANCI IN Equity
X = BSE200 Index
Y = LANCO INFRATECH LTD
X = BSE 200 IDX
Item
Value
Raw BETA 2.112
Adj BETA 1.741
ALPHA(Intercept) 3.052
R^2(Correlation^2) 0.780
R(Correlation) 0.883
Std Dev Of Error 12.445
Std Error Of ALPHA 2.085
Std Error Of BETA 0.192
t-Test 10.971
Significance 0.000
Last T-Value -1.178
Last P-Value 0.123
Number Of Points 36
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
Copyright 2011 Bloomberg Finance L.P.
SN 508526
GMT+5:30 H451-1728-0 04-Oct-2011 15:52:56