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: Renewable Energy Wind Power Project in Karnataka

Version: 4.0

Date of completion of PDD: 26/05/2011

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

>>

The project activity is to install 6.4 MW wind energy project comprising eight Wind Energy Converters (WECs) of capacity 800 kw each in Karnataka 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 Karnataka state electricty grid which is part of the Southern grid of India. The project participant (PP) is Vish Wind Infrastructure LLP (VWLLP). This is 100% equity-based financed project and the first project activity by PP in the state of Karnataka. 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 Karnataka state electricty grid which is part of the Southern grid of India, thus displacing electricty produced in 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 Southern grid dominated by fossil fuels based power plants. Electricity generated will be supplied to Power Transmission Company Ltd (KPTCL)/Bangalore Electricity Supply Company Limited (BESCOM) under a long-term power purchase agreement (PPA). Operation and maintenance of the project activity will be carried out by Enercon.

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 up-liftment 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)	Vish Wind Infrastructure LLP	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 Karnataka in India.

A.4.1.3. City/Town/Community etc:

>>

The project is located in Village: Kalasapur, District: Gadag, State: Karnataka

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 15° 21' & 15° 22' North and longitude 75° 37' & 75° 38' East. The Project activity has eight 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 Harthi village.

The nearest major city is Hubli which is about 60 km from Gadag.

WEG S.No.	Capacity (MW)	Village Name	District	State	Latitude (hr, Min, Sec)			Longitude (hr, Min, Sec)		
1	0.8	Kalasapur	Gadag	Karnataka	15	22	22.2	75	38	21.2
2	0.8				15	21	50.8	75	37	52.1
3	0.8				15	21	59.8	75	37	52.4
4	0.8				15	21	43.6	75	38	31
5	0.8				15	21	50.3	75	38	27.3
6	0.8				15	21	42.6	75	37	54.4
7	0.8				15	21	59.2	75	38	31.3
8	0.8				15	21	32.9	75	37	57.8

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

Methodology Version: 16, EB 54

The project activity comprises of eight 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 height	75 m
Turbine Type	Gearless horizontal axis wind turbine with variable rotor speed
Power regulation	Independent electromechanical pitch system for each blade.

Cut in wind speed	2.5 *m/s*
Rated wind speed	12 *m/s*
Cut out Wind speed	28-34 m/s
Extreme Wind Speed	59.5 *m/s*
Rated rotational speed	32 rpm
Operating range rot. speed	12-29 rpm
Orientation	Upwind
No of Blades	3
Blade Material	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	**Estimation of annual emission reductions in tonnes of CO2e**
Year 1*	12,284
Year 2	12,284
Year 3	12,284
Year 4	12,284
Year 5	12,284
Year 6	12,284
Year 7	12,284
Year 8	12,284
Year 9	12,284
Year 10	12,284
Total estimated reductions (tonnes of CO_2e)	122840
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	12,284

**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 (AMS-I.D., Version 16, SC 01, EB 54)**

Reference:
http://cdm.unfccc.int/UserManagement/FileStorage/SJI52M6QXGKFNOZABTHDYPU789EV3C

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 that supply electricity to a national or a regional grid. Project activities that displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit shall apply AMS-I.F.	The project activity generates electricity using renewable energy source- wind power. Generated electricity is supplied to Southern Grid of India hence displaces the electricity which would have otherwise been generated from the fossil fuels based power plants connected to the grid. The project activity does not displace electricity from an electricity distribution system that was supplied by at least one fossil fuel fired generating unit so methodology AMS-I.F is not applicable.
2	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 eight new WEC have been installed. Total capacity of project is 6.4 MW.
3	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	Not applicable as project under consideration is wind based power project.

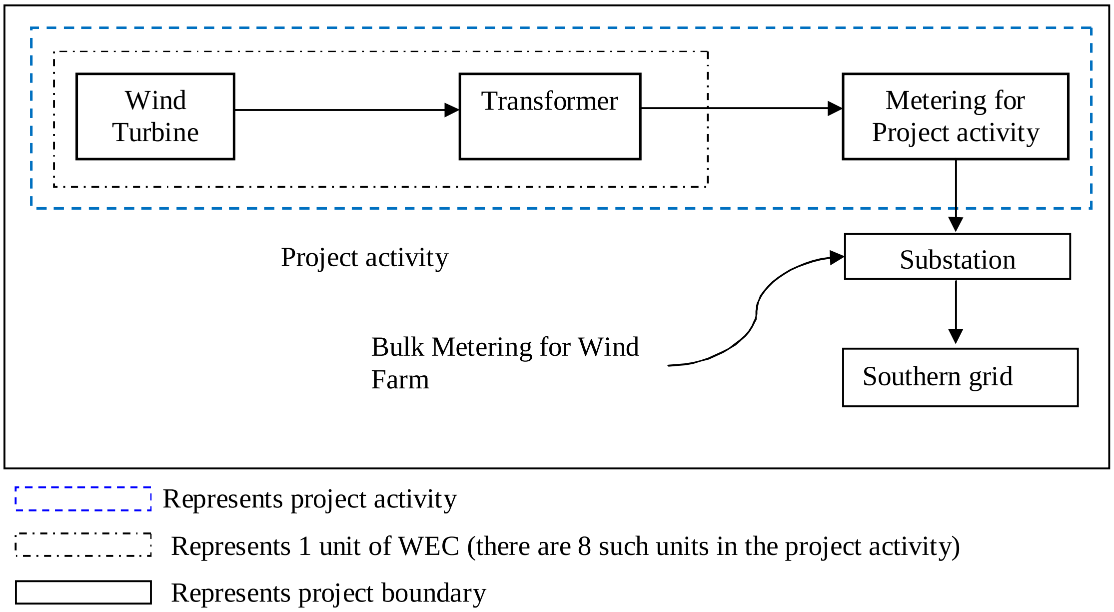
	in the Project Emissions section, is greater than 4 W/m2.	
4	In the case of biomass power plants, no other biomass types than renewable biomass is to be used in the project plant.	Not applicable as project under consideration is wind based power project.
5	If the new unit has both renewable and non-renewable 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 6.4 MW (eight 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 eight WEC, totaling to capacity of 6.4 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:

>>

According to para 9 of the methodology the project boundary includes the wind mill, transformer, Metering point, Substation (33/220 KV station constructed and maintained by Enercon at Harthi village) and Southern Grid of India (the physical extent of the electricity grid which includes all power plants connected physically to the electricity system)



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 16 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 16.

As per paragraph 10 of applied methodology-

If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

The project activity is a new grid connected power plant supplying electricity to southern 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.

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$$

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)

$EF_{CO2,grid,y}$ = 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 southern grid hence southern grid is considered as baseline grid and emission factor of southern 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' (version 02.1.0)OR

(b) The weighted average emissions (in kg CO_2e/kWh) 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, 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 southern grid multiplied by the emission factor of the southern grid calculated as the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors.

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 5
$EF_{BM,\ y}$ = Build Margin Emission Factor (tCO_2/MWh)	CEA Database for CO_2 emission factor, version 5
$EF_{CO2,\ grid,\ y}$ – Grid Emission Factor	Calculated as the weighted average of the operating margin and build margin

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

>>

The project activity has been conceived as a CDM project since its inception. The project start date is 10 July 2010 and the PP has intimated UNFCCC and DNA on 16 October 2010 about the project activity initiative that is within six months of the start date. The acknowledgement from UNFCCC was received on 26 October 2010. **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[2] document of “indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories”, project participants are required to 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

b) Technological barrier

c) Barrier due to prevailing practice

d) Other barriers

The additionality has been discussed based on the Annex 34[3] (EB 35). Some of the key barriers are discussed below:

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 guidance to investment analysis issued in EB 51 (Annex 58, 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 tool for demonstration and assessment of additionality version 5.2 [para-5, sub step 2(b)] states that in cases where the project has more than one potential developer, the benchmark shall be based on parameters that are standard in the market, considering the specific characteristics of the project type.

The project activity of Vish Wind Infrastructure LLP is financed through 100% equity (own funds) hence equity IRR is the appropriate financial indicator to assess the return on investment. The benchmark Cost

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

[2] http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf

[3] http://cdm.unfccc.int/EB/035/eb35_repan34.pdf

of equity for the project is **16.40 %** (The procedure to arrive at benchmark is described in Appendix-1 of this document and detail calculation of benchmark is presented in benchmark excel sheet)

The project participant used following assumptions for investment analysis as per the information available at the time of project decision making

Capacity of Machines in kW	800		Enercon Offer (Dated: 25 June 2010)
Number of Machines	8		Enercon Offer (Dated: 25 June 2010)
Project Capacity in MW	6.40		Enercon Offer (Dated: 25 June 2010)
Project Cost per MW (Rs. In Millions)	59.34		Enercon Offer (Dated: 25 June 2010)
Operations			
Plant Load Factor Base Case	23.9%		Enercon Offer (Dated: 25 June 2010)
Transformation loss and Transmission Loss up to metering point	3.0%		Enercon Offer (Dated: 25 June 2010)
Effective PLF	23.18%		Calculated
Insurance Charges @ % of capital cost	0.12%		Offer from Insurance provider dated 3-Mar-2010)
Operation & Maintanance Cost base year @ % of capital cost	1.30%		Enercon Offer (Dated: 25 June 2010)
% of escalation per annum on O & M Charges	6.0%		Enercon Offer (Dated: 25 June 2010)
Service Tax on O&M expenses	10.3%		Income Tax Act (Financial Year 2010-11)
Tariff			
Base year Tariff for 10 years (Rs./kwh)	3.70		KERC order date December 11, 2009
Tariff applicable after 10 years (Rs/kWh)	2.00		Tariff calculated based on guidelines from KERC order date December 11, 2009
Project Cost	**Rs Million**		
Total Project Cost	**379.76**		Enercon Offer (Dated: 25 June 2010)
Means of Finance		**Rs Million**	

Own Source	100%	379.76	VWLLP Partners resolution (Dated: 09 July 2010) & CA certificate
Term Loan	0%	-	
Total Source		379.76	
Income Tax Depreciation Rate (Written Down Value basis)			
on Wind Energy Generators	80%		Income Tax Act
Book Depreciation Rate (Straight Line Method basis)			
On all assets	4.5%		Straight Line Method
Book Depreciation up to (other than Land)	90%		Income Tax Act
Income Tax			
Income Tax rate	30.90%		Income Tax Act (Financial Year 2010-11)
Working capital			
Receivables (no of days)	30		Billing Cycle
O & M expenses (no of days)	90		Enercon Offer (Dated: 25 June 2010)

Debt Equity Ratio: The project is 100% equity financed; hence we have considered 100% equity 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 paragraph 6 of EB 51 annex 58. 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 as M/s Ravi Enteck Limited on 23 October 2010 to determine the plant load factor for the project activity under consideration.

The supplier offer mentions value of PLF as 23.9% and transmission losses as 3% giving effective PLF value as 23.18% whereas the third party assessment report gives the PLF value as 24% at the hub of WEC and transmission losses as 4% giving effective PLF value as 23.04%.

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 5.83 % 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 Guidance on the Assessment of Investment Analysis, version-03, Annex-58, EB 51.

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%) 341.78**	**(Base Value) 379.76**	**(+10%) 417.74**
Equity IRR	8.27%	5.83%	3.80%

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%) 20.86%**	**(Base Value) 23.18 %**	**(+10%) 25.5%**
Equity IRR	3.74%	5.83%	7.78%

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 hence it is subject to variation of +/-10%.

O&M (% of	**(-10%)**	**(Base Value)**	**(+10%)**

capital cost)	**(1.17% of Capital Cost)**	**(1.30% of Capital Cost)**	**(1.43% of Capital Cost)**
Equity IRR	6.24%	5.83%	5.40%

Tariff beyond the term of PPA

Karnataka state electricity commission has fixed the tariff for the period of 10 years. The tariff computed by the KERC order for the first year is INR 4.40/ Kwh and its decreases progressively to INR 3.04/Kwh in the 10th year. According to KERC order dated 11 December 2009 (source: http://www.kerc.org/nce%20tariff%202009/Order%20on%20NCE%20Tariff%20final%20dt11.12.2009.doc), the reduction in tariff year on year is on the account of repayment of debt and also there is no running cost other than O&M which increases only marginally.

Therefore from 11th year to the 20th year, the tariff number cannot contain the element of debt service (principal repayment and interest payment) and even with the increased operating costs, the overall tariff number is lower in the 11th year. Therefore we have conducted sensitivity assuming a variation of 10% over the tariff computed of Rs. 2.00 /Kwh for the period beyond the term of PPA using the input values from the KERC order. Further, however not realistic, but still we have included the tariff of Rs. 3.70/Kwh for the period from 11th to 20th year in the sensitivity analysis.

Tariff beyond the term of PPA	10% decrease over base tariff	Base tariff (Rs. 2.00/Kwh beyond the term of PPA)	10% Increase over base tariff	Tariff of Rs. 3.70/Kwh for the period beyond 10th year
Post tax Equity IRR	5.33%	5.83%	6.29%	8.99%

Threshold limit of percentage variation in key parameters:

Name of Parameter	*Threshold limit (%)*	*Likelihood of variation*
Capital Cost	-32.31%	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 352 Million as per purchase order for Vish Wind Infrastructure LLP which is 7.9% 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 32.31% which is not relevant based on the purchase order.

Plant Load Factor	60.6%	PLF shall go up by 60.6% which is equivalent to effective PLF value of 37.23% which is unlikely to happen as third party assessment report provides a value of 24% with transmission losses as 4%.
O&M Charges	-378%	It is very unlikely that O&M cost shall reduce by 378% against the offer given by O&M contractor which gives a escalation of 6% per annum on O&M charges.
Tariff	517%	Karnataka state electricity commission has fixed the tariff for the period of 10 years. Tariff calculation beyond the 10th year has been calculated based on KERC order. The same has been considered for sensitivity analysis as well. An increase of 483% in Tariff beyond the 10th year is equivalent to 12.34 Rs/Kwh, which is very high value considering the KERC order and this scenario is unlikely to happen.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>

According to the approved methodology AMS I D (Version 16) Emission Reductions are calculated as:-

$$ER_y = BE_y – PE_y – LE_y \ldots\ldots\ldots\ldots (1)$$

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 kWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y} \ldots\ldots\ldots\ldots (2)$$

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 Karnataka which falls under southern 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 50, Annex 14, Version 02) for calculating the emission factor for an electricity system. The steps of calculation are as follows:

STEP 1. Identifying the relevant electricity systems:

The Indian electricity system is divided into two regional grids, viz. (1) Northern, Eastern, Western, North-Eastern and (2) Southern grid. Each grid covers several states. As the regional grids are interconnected, there is inter-state and inter-regional exchange. A small power exchange also takes place with neighbouring countries like Bhutan and Nepal.

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

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

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

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

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

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

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

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

	2004-05	**2005-06**	**2006-07**	**2007-08**	**2008-09**

	2004-05	2005-06	2006-07	2007-08	2008-09
NEWNE	16.84%	18.0%	18.5%	19.0%	17.3%
South	21.61%	27.0%	28.3%	27.1%	22.8%
India	18.01%	20.1%	20.9%	21.0%	18.6%

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 southern regional grid is less than 50 % of the total generation. Hence the Simple OM method can be used to calculate the Operating Margin Emission factor. The average operating margin method cannot be applied, as low cost/ must run resources in southern grid constitute less than 50% of total grid generation.

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

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

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

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

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

The CEA database 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:

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

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:

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

Where:

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

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

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

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

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

Project participants should use the set of power units that comprises the larger annual generation.

Accordingly, the CEA database calculates the build margin as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation.

The build margin emission factor has been calculated ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. This option does not require monitoring the emission factor during the crediting period.

STEP 6. Calculate the build margin emission factor:

The build margin emissions factor is the generation-weighted average emission factor of all power units m during the most recent year y for which power generation data is available, calculated as follows: $\mathbf{EF_{grid,BM,y} = (\Sigma\, EG_{m,y} \times EF_{EL,m,}) / \Sigma\, EG_{m,y}}$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh)

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

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

STEP 7. Calculate the combined margin emissions factor:

The emission factor *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:

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

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

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

According to "**Tool to calculate the emission factor for an electricity system"** (version 02.1.0)**,** the weights for OM and BM are 0.75 and 0.25 respectively.

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

Project Emissions:

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 2006-07 to 2008-09 has been obtained from -

The CO_2 Baseline Database for the Indian Power Sector

Ministry of Power: Central Electricity Authority (CEA)

Version 5

Key baseline information is reproduced in annexure 3.

The detailed excel sheet is available at:

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

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 Southern Regional 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:	0.98755
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated by using 3 years vintage (2006-2007, 2007-2008 and 2008-09) data obtained from "CO_2 Baseline Database for Indian Power Sector" version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system"..
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	***$EF_{BM,y}$***
Data unit:	tCO_2e/MWh
Description:	Build Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" 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:	0.81792
Justification of the choice of data or description of measurement methods and procedures actually applied:	2008-09 data obtained from "CO_2 Baseline Database for Indian Power Sector" version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system".
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	**$EF_{CO2, grid, y}$**
Data unit:	tCO_2e/MWh
Description:	Combined Margin Emission Factor of Southern Regional 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 $EF_{CM,y}$): 0.94515 Refer Annex – 3 for comprehensive calculation of Combined Margin Emission Factor.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System.
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

B.6.3 Ex-ante calculation of emission reductions:

>>

The baseline emissions are calculated as:

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$$

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

$EG_{BL,y}$ = 6.4 MW (Capacity) x 23.18% (Effective PLF) x 8760 (hours)

= 12,997.32 MWh

Baseline emission factor (combined margin)

= 0.94515 tCO_2e/MWh

Hence baseline emissions are:

BE_y = 12,997.32 MWh * 0.94515 tCO_2e/MWh

= 12,284 tCO_2e

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

Hence emission reductions are calculated as:

$ER_y = BE_y – PE_y – LE_y$

= 12,284 - 0 - 0

~ 12,284 tCO_2e/year

The annual emission reductions from the project activity are estimated to be 12,284 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	12,284	0	12,284
Year 2	0	12,284	0	12,284
Year 3	0	12,284	0	12,284
Year 4	0	12,284	0	12,284
Year 5	0	12,284	0	12,284
Year 6	0	12,284	0	12,284
Year 7	0	12,284	0	12,284
Year 8	0	12,284	0	12,284
Year 9	0	12,284	0	12,284
Year 10	0	12,284	0	12,284
Total (tonnes of CO2e)	0	122840	0	122840

*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 Form B
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. = 6.4 MW (Capacity) x 23.18% (Effective PLF) x 8760 (hours) = 12,997.32 MWh
Description of measurement methods and procedures to be applied:	Electricity supplied to grid for the project activity will be mentioned in Form-B. Form B also mentions the formula to calculate the same. Refer Annex – 4 for an illustration of the provisions for measurement methods. Frequency of Recording: Monthly
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The Form B shall be stored as hard copy.

Data / Parameter:	Gpe
Data unit:	MWh (Mega-watt hour)
Description:	Electricity Export is recorded at the meter(s) connecting 08 machines of the project activity.
Source of data to be used:	Electricity exported to the grid as per the Form B.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be taken from the Form B and will be applied directly.
Description of measurement methods and procedures to be applied:	Electricity exported to the grid will be recorded by the meter(s) connecting the 08 machines of the project activity feeding the substation of Enercon. Refer Annex – 4 for an illustration of the provisions for measurement methods. Metering will be continuous and recording will be done monthly as Form B.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The Form B shall be stored as hard copy.

Data / Parameter:	Gpi
Data unit:	MWh (Mega-watt hour)
Description:	Electricity Imported recorded at the meter(s) connecting 08 machines of the project activity.
Source of data to be used:	Electricity import from the grid as per the Form B.

Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be taken from the Form B and will be applied directly.
Description of measurement methods and procedures to be applied:	Electricity imported from the grid will be recorded by the meter(s) connectin the 08 machines of the project activity feeding the substation of Enercon. Refer Annex – 4 for an illustration of the provisions for measurement methods. Metering will be continuous and recording will be done monthly as Form B.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The Form B shall be stored as hard copy.

Data / Parameter:	Li
Data unit:	MWh (Mega-watt hour)
Description:	Transmission loss between the metering point for the project activity and the metering point at Substation where bulk metering is done.
Source of data to be used:	Transmission Loss will directly applied from the Form B for the project activity.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value is certified by the State utility in the Form B. This value will be directly applied from the Form B.
Description of measurement methods and procedures to be applied:	Transmission loss between metering point (feeder connecting 08 turbines of the project activity) and the metering point at the EB Substation/Switching Station is applied to the meter reading taken at the feeder connecting 08 turbines of the project activity. Switching station/EB Substation is connected to the machines of the project activity and the machines commissioned by the other project developers. The project proponent does not have control over the data of the other project developers. Therefore the project developer has to rely upon the transmission loss applied to the project activity by the state utility as reflected in the JMR (Form B). The JMR is signed by the representatives of Enercon and the state utility. Refer Annex – 4 for an illustration of the provisions for measurement methods. Metering will be continuous and recording will be done monthly as Form B.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The Form B shall be stored as hard copy.

The archive will be kept for the period up to two years after the completion of the crediting period.

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 16 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 08 turbines at the project site at 33kV and at the substation located at Harthi Village where bulk metering is done at 220kV. These readings become the basis of making Form B, which is signed by the representatives of Enercon and State Utility. Transmission loss between metering point for the project activity and the metering point at the Substation at Harthi Village is applied to the meter reading taken at the feeder connecting 08 turbines of the project activity.

Transmission losses are applied to the meter readings taken at the metering point of the project activity. Net Electricity exported to the grid is calculated by applying transmission loss to the meter reading taken at the metering point of the project activity connecting 08 turbines.

The Form B contains the following data:-

1. Electricity Export
2. Electricity Import
3. Transmission Loss (Between the metering point for project activity and at the substation where bulk metering is done)
4. Net Electricity exported to the Grid [Electricity Export-115%[4]*Electricity Import-Transmission Loss]

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

The Project is operated and managed by Vish Wind Infrastructure LLP. 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

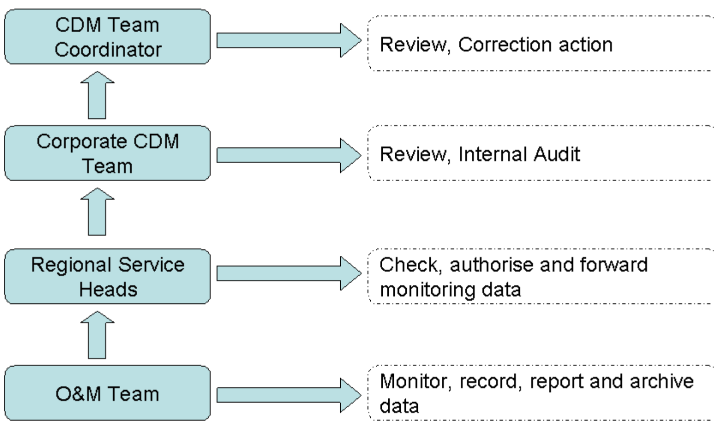
[4] The 115% value has been taken from the standard Form B approved by Hubli Electricity Supply Company Limited (HESCOM) which is one of responsible authority for electricity supply in state. This factor is multiplied with electricity imported by meter.

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: 23/12/2010

Name of responsible person/entity: Vish Wind Infrastructure LLP. 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:

>>

10/07/2010 (Date of purchase order issued to Enercon (India) Limited,)

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:

>>

20/08/2011 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 1533) dated 14th September 2006, a list of activities that require to undertake environmental impact assessment studies[5] 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:

---

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

>>

EIA is not required for project activity under consideration.

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 25/10/2010 to invite the stakeholders. The stakeholder meeting was conducted on 10/11/2010 in Hubli.

The meeting was presided over by Mr. M.B. Patil (Ex Chairman, Village Panchayat) and, other representatives were: Mr. Navin Kumar, (Enercon), Mr. S.V. Kulkarni (Member, PLD Bank, Harti), Mr. Chandra Mouli (Enercon-CDM), Mr. Ramesh Chauhan (Ex. President, PLD Bank, Kalsapur Village), and Mr. Prakash Bandi (village teacher)

Mr. Navin Kumar addressed the stakeholders in local language-Kannada- and explained the purpose of the meet. He said that this meet would help in creating awareness on the problem of Climate change and its impact on global community. He explained how the Clean Development Mechanism addresses the problem of climate change and sustainability. He mentioned that wind power project undertaken by Vish Wind Infrastructure LLP (VWLLP) at Kalasapura village in Gadag district of Karnataka 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 invited queries, suggestions and discussion related to project taken by VWLLP.

Mr. Chandra Mouli was invited to deliver the talk on global climate change and role of CDM to mitigate this problem. Mr. Ramesh Chauhan and Mr. S V Kulkarni explained the importance of project activity in improving socio-economic condition of local population.

Mr. Prakash Bandi explain the problem of global warming and the role of project activity to generate power from renewable sources.

Mr. M.B. Patil then delivered the vote of thanks and appreciated the villagers for their active participation. He appreciated that project activity will benefit the local public. He mentioned the importance of infrastructure built because of project and said that it will go a long way to improve the economical condition of village in future.

The attendants have been requested to provide their feedback on the project activity. The meeting was very cordial and ended on a positive note.

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
M.N. Biradar	How this project will help local community?	The project activity will result in generation of employment, during construction and operation phase.

Name of Person	Question/Comments	Project Proponent Response
		Also, the new infrastructure development will lead to economic prosperity of local population.
M.S.Kalyan	What is CDM?	Clean Development Mechanism allows industrialized (Annex 1) countries with a greenhouse gas reduction commitment to invest in emission reducing projects in a developing (non-Annex I) country as cost of emission reduction in developing country is considerably less when compared to developed countries. 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. One Certified Emission Reduction (CER) is issued to a project when it saves one tonne of CO_2 equivalent.
B.H. Laddi	Who is more responsible for climate change?	We all are responsible. At global level developed countries are consuming 80% of natural resources so their contribution to global warming is more than developing countries.
A.B. Sangaval	Will this project also cause pollution?	No, this project will not cause any kind of pollution as wind energy is natural and the conversion of this energy into electricity doesn't cause any form of pollution.
M.B. Patil	How project will affect air, soil and water quality in local area?	This project will not pollute air, water soil in anyway.
H.P. Shigli	Will the local people be employed for project work?	Local people will be hired during construction and operation of project.
S.S. Badiga	What are the green house gases?	There are six greenhouse gases - Carbon dioxide, Methane, Nitrous oxide, Sulfur hexafluoride, Hydro-fluoro carbons (HFCs), and Per-fluoro carbons (PFCs). There potential to global warming is different.

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:	Vish Wind Infrastructure LLP
Street/P.O.Box:	A-9, Veera Industrial Estate, Veera Desai Road, Andheri West
Building:	Enercon Tower
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400 053
Country:	India
Telephone:	+91-22-2671 7176
FAX:	+91 22 66921177
E-Mail:	yogesh.mehra@enerconindia.net
URL:	www.enerconindia.net
Represented by:	Yogesh Mehra
Title:	Designated Partner
Salutation:	Mr.
Last Name:	Mehra
Middle Name:	
First Name:	Yogesh
Department:	Corporate
Mobile:	+91-9820040301
Direct FAX:	+91-22-66921175
Direct tel:	+91-22-6692 4848 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 Southern Region Electricity Grid as published in the CEA database are as follows:

Simple Operating Margin

	Southern Grid (tCO_2e/MWh)
Simple Operating Margin – 2006-07	0.99912
Simple Operating Margin – 2007-08	0.99062
Simple Operating Margin – 2008-09	0.97292
Average Operating Margin of last three years	0.98755

Build Margin

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

Combined Margin Calculations

	Weights	**Southern Grid (tCO_2e/MWh)**
Operating Margin	0.75	0.98755
Build Margin	0.25	0.81792
Combined Margin		0.94515

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

Annex 4

MONITORING INFORMATION

- **Metering:** Electricity supplied to the grid is metered continuously at the metering point connecting 08 machines of the project activity. The meter reading is taken in the presence of representatives of Enercon (O&M Contractor for the project activity) and KPTCL.

- **Metering Equipment:** Metering system for the project activity consists of main and check meter. Both the meters are two-way trivector meters (accuracy class of 0.2%) capable of recording import and export of electricity. The metering equipment is calibrated annually.

- **Meter Readings:** The electricity exported 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 readings become the basis of making Form B. These certified readings are then used by the DISCOM officials to prepare the tariff invoices. Thus the monitoring parameters for the project activity are the electricity import and electricity export to the grid as mentioned in the JMR. The readings are then adjusted for the transmission loss in the Form B, which can be crosschecked with the value mentioned in the invoices.

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

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

  If during the meter test checking,

  - the main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the permissible limits, then the meter reading will be as per the main meter as usual. The check meter shall, however, be calibrated immediately.
  - the main meter is found to be beyond permissible limits of error, but the corresponding check meter is found to be within permissible limit of error, then the meter reading for the month up to the date and time of such test shall be as per the check meter.
  - If both the main meters and the corresponding check meters are found to be beyond the permissible limits of error, both the meters shall be immediately calibrated and the correction will

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

- If during any of the monthly meter readings, the variation between the main meter and the check meter is more than the permissible limit for meters of 0.2% accuracy class, all the meters shall be re-tested and calibrated immediately and the correction will be applied to the reading registered by the main meter to arrive the correct reading of energy supplied to the grid for the period up to last test.
- In case of the failures such as burning of the meter and the erratic display of the metered parameters and when the error found in testing the meters is beyond the permissible limit of error, the meter shall be calibrated immediately and the correction will be applied to the reading registered by the main meter to arrive the correct reading of energy supplied to the grid for the period up to last test.

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

Calculation of Data:

EG_y = $G_{pe} - 115\% * G_{pi} - L_i$

EG_y : Net Electricity supplied to grid by the project activity

Gpe : Electricity Export is recorded at the meter(s) connecting 08 machines of the project activity

Gpi : Electricity Import is recorded at the meter(s) connecting 08 machines of the project activity

L_i : Transmission loss

Transmission loss is certified by the state utility in JMR:

L : $\sum_j G_j - N$

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

N : Electricity generation data measured at Substation at Harthi Village from the feeders emanating from the pooling station

L : Total transmission loss

Li : $G_{pe} * (L / \sum_j G_j)$

Appendix-1: Calculation of financial benchmark (Cost of Equity)

Selection of Appropriate Benchmark:

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

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

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

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 x (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[6], Stern School of Business, New York University, describes that the yield rates are suitable indicators of risk free rates when the time horizon for the investment is long term.

Accordingly the risk free rate has been taken from yield rates available at the decision making date. This has been considered as it was in the year of investment (i.e in that year, the company had the alternative

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

of this long term risk free investment). The data on yield rates is published by Reserve Bank of India.(Source:http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx/scripts/BS_ViewBulletin.aspx?Id=11317, RBI Monthly Bulletin June 2010)

The applicable risk free rate has been found as 8.38%.

Risk Premium:

The most common approach for estimating the risk premium is to base it on historical data, in the CAPM, the premium is estimated by looking at the difference between average return on stocks and risk free return. It is preferred to use long term premimums, i.e over a period of 25 years, since considering shorter time periods can lead to large standard errors because volatility in stock returns. 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 bewteen the BSE-Sensex and the yield rate since the year of inception of BSE Sensex. The detailed calculations are presented in the attached excel sheet.

Hence the applicable risk premium was calculated as:

Risk Premium= Market return- Risk free rate

= 15.77%-8.38%.

= 7.39%

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. Therefore, in the absence of adequate data on companies which are exclusively into the exactly same type of business (i.e wind power projects), the next best option for assessing the risk of these projects is to consider the data available on companies which are involved in similar businesses.

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

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

Since the project is 100% equity financed Unlevered Beta values have been calculated. The Unlevered Beta removes the impact of its debt obligations. Unlevered beta removes the effects of the use of leverage on the capital structure of a firm, since the use of debt can result in tax rate adjustments that benefit a company. Removing the debt component allows the comparison of Unlevered Beta values of companies under consideration with the project activity which is totally equity based project. Unlevered Beta is calculated by dividing the Levered Beta or raw Beta by [1 + (1 - tax rate) x (D / E)],
Where D/E is the debt/equity ratio of the companies.

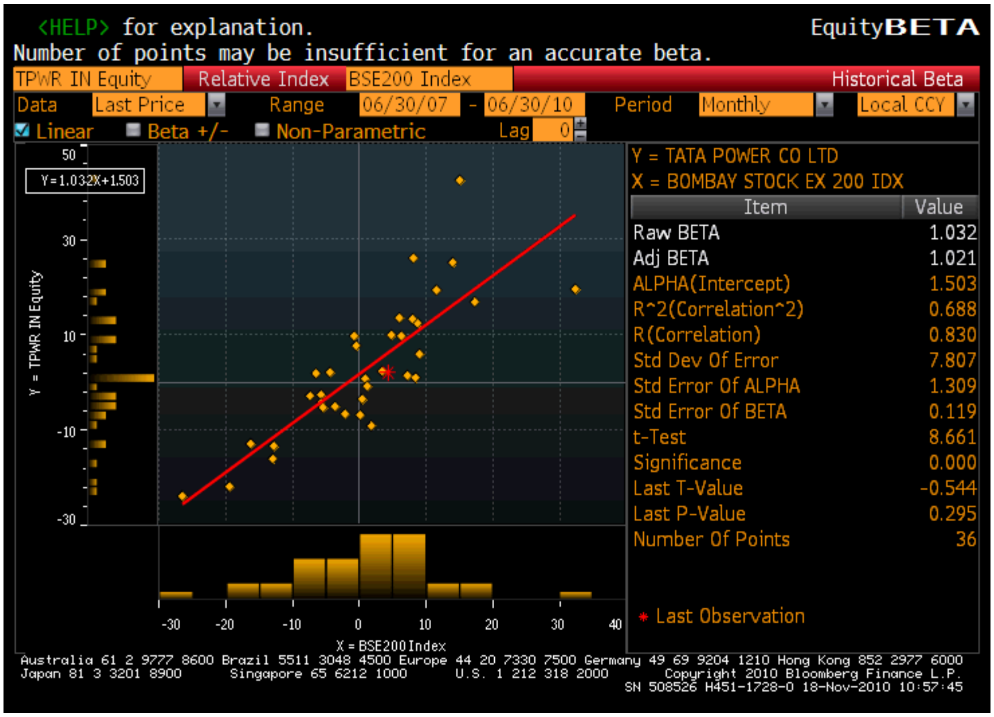
The table below lists the Beta values:

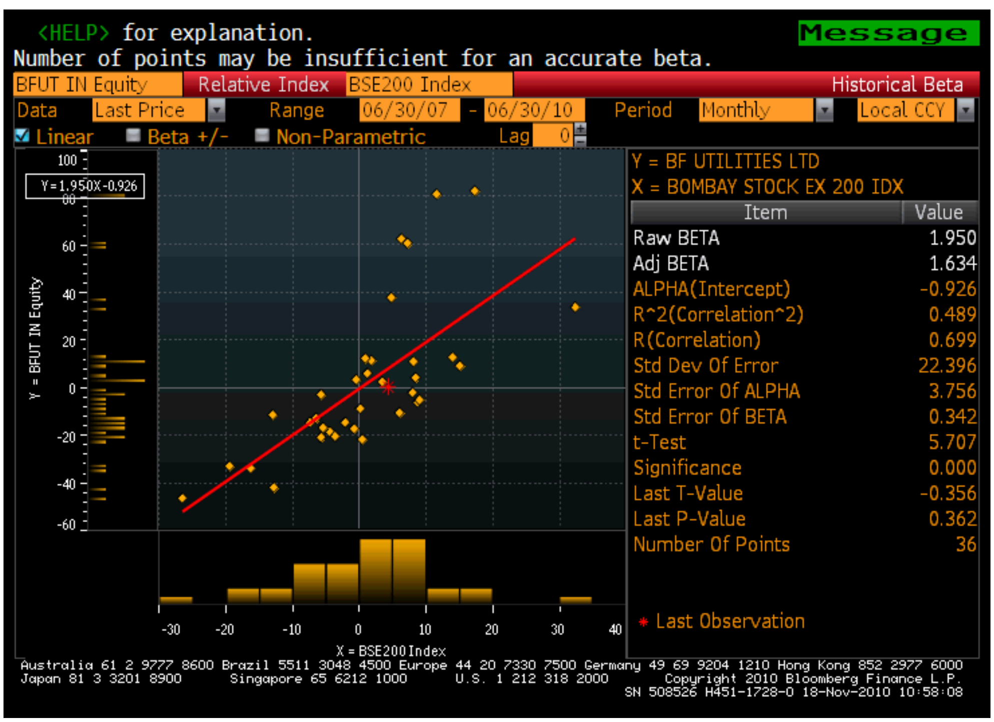
Company Name	Bloomberg Symbol	Unlevered Beta
Tata Power Co Ltd	TPWR IN Equity	0.73
BF Utilities Ltd	BFUT IN Equity	1.07
Neyveli Lignite Corporation	NLC IN Equity	1.24
Reliance Infrastructure Ltd	RELE IN Equity	1.60
Gujarat Inds Power Co Ltd	GIP IN Equity	0.79
	Average Unlevered Beta	**1.09**

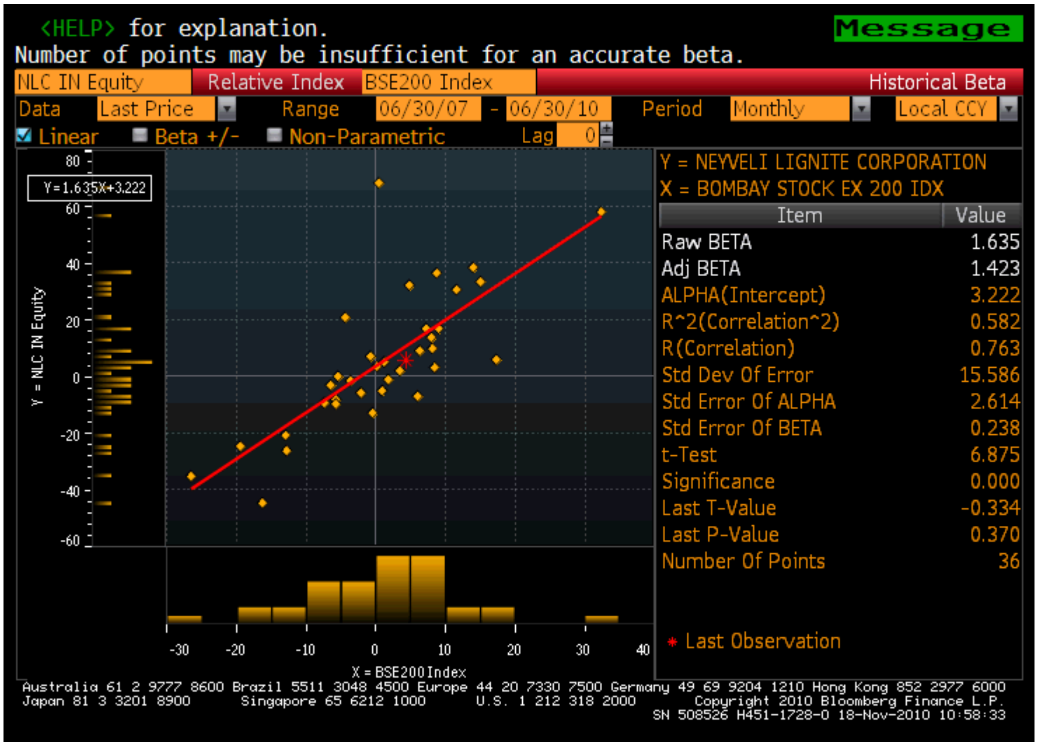
Calculation of Cost of Equity (benchmark for the project activity):

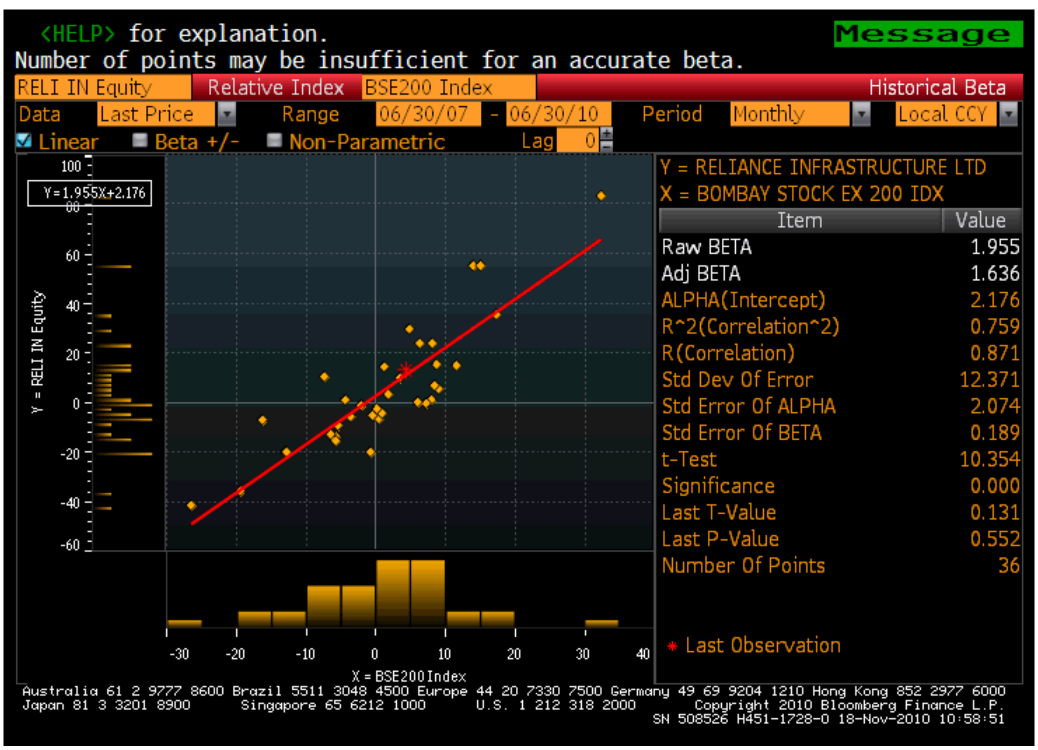
Cost of Equity = Risk free rate + Unlevered beta * Market risk premium
= 8.38% +1.09* 7.39%
= **16.40%**

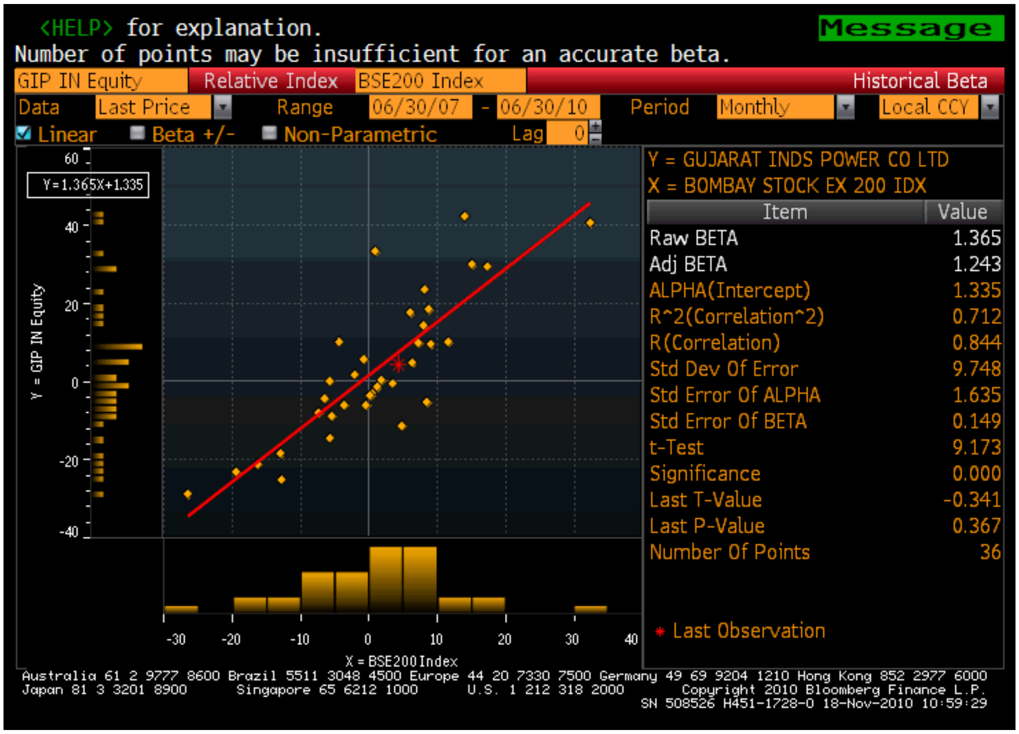
Appendix-2: Bloomberg's screenshots of individual companies for Beta Value






<HELP> for explanation.
Message
Number of points may be insufficient for an accurate beta.
NLC IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
06/30/07
06/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.635X+3.222
Y = NLC IN Equity
X = BSE200 Index
Y = NEYVELI LIGNITE CORPORATION
X = BOMBAY STOCK EX 200 IDX
Item
Value
Raw BETA 1.635
Adj BETA 1.423
ALPHA(Intercept) 3.222
R^2(Correlation^2) 0.582
R(Correlation) 0.763
Std Dev Of Error 15.586
Std Error Of ALPHA 2.614
Std Error Of BETA 0.238
t-Test 6.875
Significance 0.000
Last T-Value -0.334
Last P-Value 0.370
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 2010 Bloomberg Finance L.P.
SN 508526 H451-1728-0 18-Nov-2010 10:58:33


<HELP> for explanation.
Message
Number of points may be insufficient for an accurate beta.
RELI IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
06/30/07
06/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.955X+2.176
Y = RELI IN Equity
X = BSE200 Index
Y = RELIANCE INFRASTRUCTURE LTD
X = BOMBAY STOCK EX 200 IDX
Item
Value
Raw BETA 1.955
Adj BETA 1.636
ALPHA(Intercept) 2.176
R^2(Correlation^2) 0.759
R(Correlation) 0.871
Std Dev Of Error 12.371
Std Error Of ALPHA 2.074
Std Error Of BETA 0.189
t-Test 10.354
Significance 0.000
Last T-Value 0.131
Last P-Value 0.552
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 2010 Bloomberg Finance L.P.
SN 508526 H451-1728-0 18-Nov-2010 10:58:51


<HELP> for explanation.
Message
Number of points may be insufficient for an accurate beta.
GIP IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
06/30/07
06/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.365X+1.335
Y = GIP IN Equity
X = BSE200 Index
Y = GUJARAT INDS POWER CO LTD
X = BOMBAY STOCK EX 200 IDX
Item
Value
Raw BETA 1.365
Adj BETA 1.243
ALPHA(Intercept) 1.335
R^2(Correlation^2) 0.712
R(Correlation) 0.844
Std Dev Of Error 9.748
Std Error Of ALPHA 1.635
Std Error Of BETA 0.149
t-Test 9.173
Significance 0.000
Last T-Value -0.341
Last P-Value 0.367
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 2010 Bloomberg Finance L.P.
SN 508526 H451-1728-0 18-Nov-2010 10:59:29

- - - - -