PROJECT DESIGN DOCUMENT FORM
FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)
Version 04.1

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Enercon Wind Farm (Hindustan) Ltd in Rajasthan
Version number of the PDD	12
Completion date of the PDD	14 /11/2013
Project participant(s)	Wind World (India) Limited.
Host Party(ies)	India
Sectoral scope and selected methodology(ies)	Scope Number 1, Sectoral Scope - Energy industries (renewable/ non-renewable sources). The approved consolidated baseline and monitoring methodology **ACM0002 Version 6.0** (19 May 2006) has been used. The titles of these baseline and monitoring methodologies are “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” and “Consolidated monitoring methodology for grid-connected electricity generation from renewable sources.
Estimated amount of annual average GHG emission reductions	101,047 tCO2e

Description of project activity
A.1. Purpose and general description of project activity
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Objective of the Project

The objective is development, design, engineering, procurement, finance, construction, operation and maintenance of Enercon Wind Farm (Hindustan) Ltd. (EWHPL) 60 MW wind power project ("Project") in the Indian state of Rajasthan to provide reliable, renewable power to the Rajasthan state electricity grid which is part of the Northern regional electricity grid. The Project will lead to reduced greenhouse gas emissions because it displaces electricity from fossil fuel based electricity generation plants.

Nature of Project

The Project harness renewable resources in the region, and thereby displacing non-renewable natural resources thereby ultimately leading to sustainable economic and environmental development. Wind World (India) Limited ("Wind World" or "WWIL") will be the equipment supplier and the operations and maintenance contractor for the Project. The generated electricity will be supplied to Rajasthan Rajya Vidyut Prasaran Nigam Ltd ("RRVPN")/ Jaipur Vidyut Vitran Nigam Limited ("Jaipur DISCOM) for 28.80 MW and Rajasthan Rajya Vidyut Prasaran Nigam Ltd ("RRVPN")/ Ajmer Electricity Distribution Company Ltd ("Ajmer DISCOM") for 31.20 MW under a long-term power purchase agreement (PPA). The Project company (EWHPL) is owned by Wind World (India) Limited and Enercon GmbH.

Contribution to sustainable development
The Project meets several sustainable development objectives including:

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

A.2. Location of project activity
A.2.1. Host Party(ies)
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The host party to the project activity is the Government of India.

A.2.2. Region/State/Province etc.
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The Project is located in the State of Rajasthan that forms part of the Northern regional electricity grid of India.

A.2.3. City/Town/Community etc.
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The Project is located at Kita and Pithodai Ki Dhani village, in Jaisalmer District of Rajasthan state in India.

A.2.4. Physical/Geographical location
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The project area extends between latitude 26^{o} 40' 47.5'' & 26^{o} 45' 48.3''North and longitude 70 ^{o} 58'19.3''& 71^{o}3'32.5''East. The Project is connected to 33/132/220kV Akal RRVPN substation. The sites are located at a distance of 25 km from Jaisalmer by road. The nearest railway station is at Jaisalmer. A location map is attached at Annex – 1. The Latitude and Longitude of each wind turbine is attached as Annex 10.

A.3. Technologies and/or measures
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The Project involves 75 wind energy converters (WECs) of WWIL make (800 kW E-48) with internal electrical lines connecting the Project with local evacuation facility. The WECs generates 3-phase power at 400V, which is stepped up to 33 KV. The Project can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The other salient features of the state-of-art-technology are:

- Gearless Construction - Rotor & Generator Mounted on same shaft eliminating the Gearbox.
- Variable speed function – has the speed range of 18 to 33 RPM thereby ensuring optimum efficiency at all times.
- Variable Pitch functions ensuring maximum energy capture.
- Near Unity Power Factor at all times.
- Minimum drawal (less than 1% of kWh generated) of Reactive Power from the grid.
- No voltage peaks at any time.
- Operating range of the WEC with voltage fluctuation of -20 to +20%.
- Less Wear & Tear since the system eliminates mechanical brake, which are not needed due to low speed generator which runs at maximum speed of 33 rpm and uses Air Brakes.
- Three Independent Braking System.
- Generator achieving rated output at only 33 rpm.
- Incorporates lightning protection system, which includes blades.
- Starts Generation of power at wind speed of 3 m/s.

Wind World (India) Limited has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH, has established a manufacturing plant at Daman in

India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured.

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A (host): Government of India (Host)	Private entity A: Wind World (India) Limited	No
…	…	

A.5. Public funding of project activity
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Not applicable.

SECTION B. Application of selected approved baseline and monitoring methodology
B.1. Reference of methodology
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The approved consolidated baseline and monitoring methodology **ACM0002 Version 6.0** (19 May 2006) has been used. The titles of these baseline and monitoring methodologies are "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" and "Consolidated monitoring methodology for grid-connected electricity generation from renewable sources.

B.2. Applicability of methodology
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The Project is wind based renewable energy source, zero emission power project connected to the Rajasthan state grid, which forms part of the Northern regional electricity grid. The Project will displace fossil fuel based electricity generation that would have otherwise been provided by the operation and expansion of the fossil fuel based power plants in Northern regional electricity grid.

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

- the Project is grid connected renewable power generation project activity
- the Project represents electricity capacity additions from wind sources
- the Project does not involve switching from fossil fuel to renewable energy at the site of project activity since the Project is green-field electricity generation capacities from wind sources at sites where there was no electricity generation source prior to the Project, and

the geographical and system boundaries of the Northern electricity grid can be clearly identified and information on the characteristics of the grid is available.

B.3. Project boundary

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

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

The project boundary encompasses the physical extent of the northern regional electricity grid, which includes the project site and all power plants connected physically to the electricity system.

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

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

B.4. Establishment and description of baseline scenario

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

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

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

B.5. Demonstration of additionality

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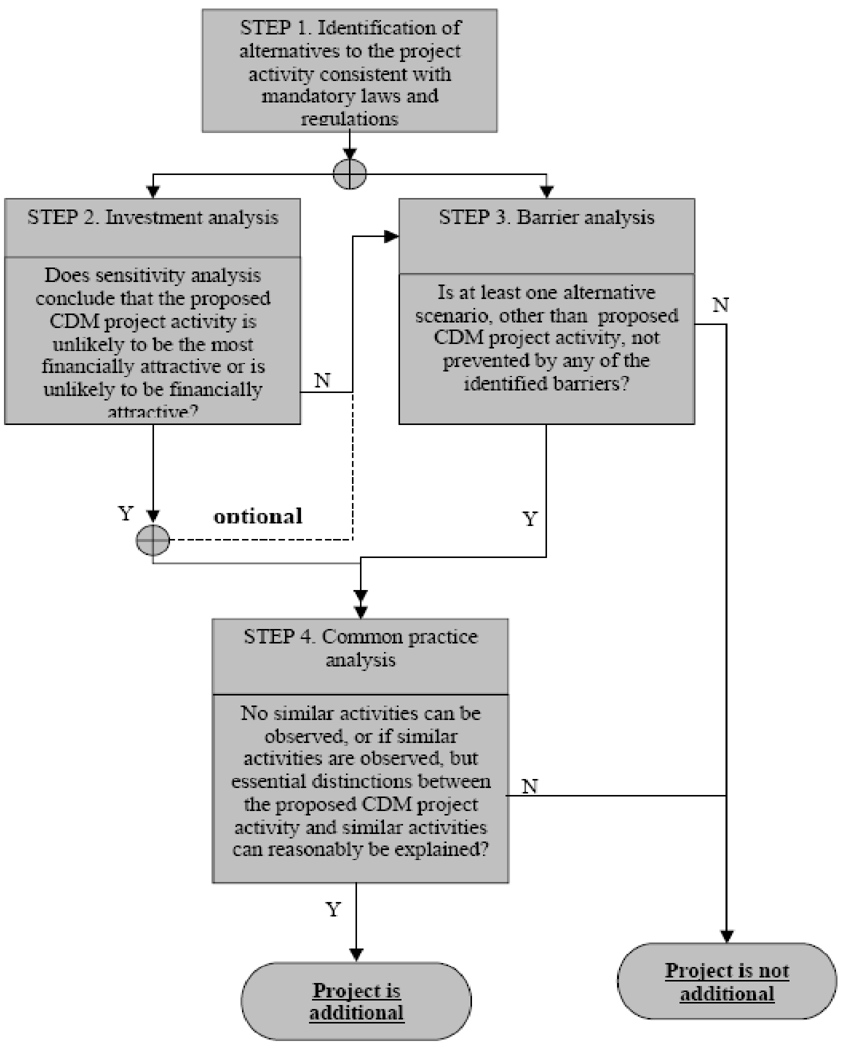
The latest additionality tool i.e. Tool for the demonstration and assessment of additionality version 3.0 approved by CDM Executive Board in its 29th meeting is used to demonstrate project additionality.



The Project start date is prior to the start date of validation of the PDD. WWIL entered into an Emission Reduction Purchase Agreement dated 7 December 2005 with a CER purchaser for purchase of emission reductions from the Project, which is prior to the start date of the Project.

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

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

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

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

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

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

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

Continuation of the current situation where no project activity or any of the above Alternatives are undertaken would not be applicable as Rajasthan had energy (MU) shortages of 3.5% and peak (MW) shortages of 13.7% in 2005-06 (Source: Northern Region Power Sector Profile, July 2006, Ministry of Power).

Outcome of step 1 a:

Alternatives a and b, as identified above are realistic and credible alternatives to the project activity.

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

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

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

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

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

Outcome of step 1 b

Both alternative a and alternative b are in compliance with mandatory laws and regulations taking into account the enforcement in the region or country and EB decision on national and sectoral policies. Hence Alternative a and b as identified in the step 1 a, are realistic and credible alternatives to the project activity.

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

Step 2: Investment Analysis

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

Sub-step 2a. - Determine appropriate analysis method

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

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

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

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

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

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

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

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

WWIL proposes to use **Option III – Benchmark Analysis** and the financial indicator that is identified is the post-tax return on equity or the equity IRR.

We would like to submit that we had initially considered the 16% post tax equity return benchmark that is used by various regulatory commissions for determining the tariff applicable for wind power projects. During the request for registration stage, the EB referred the project to “request for review” and sought clarifications from us. In response to the queries raised in request for review, we presented the clarifications in EB 36. The EB then instructed to register our project with corrections provided we submit a revised PDD and corresponding revised validation report which provide clarification regarding

suitability of the applied benchmark. Subsequently, the Executive Board in EB 40 meeting ruled that the 16% post tax return considered by regulatory commissions is not a suitable benchmark.

We also understand that as per Guidance to investment analysis issued in EB 41 (paragraph 11), the required return on equity can be considered as appropriate benchmark for Equity IRR. In light of this and keeping in mind the EB 40 ruling, we have considered the cost of equity[1] applicable to the project type i.e. electricity generation projects, as the suitable benchmark for the project. The cost of equity has been determined using the Capital Asset Pricing Model (CAPM) considering Beta values of all listed power generating companies in India. The CAPM economic model is widely used 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.

In line with the requirements of the Guidance to Investment Analysis (paragraph 12), data and parameters used in calculation of cost of equity i.e. beta values of power generating companies in India, risk free rate of return, market risk premium etc. have been derived from publicly available data sources. The detailed calculations of cost of equity along with an elaboration of the approach are provided in Annex 1.

As can be seen, the benchmark cost of equity works out to 18.7 %. To further substantiate the benchmark, we have also looked at registered Indian wind projects whose start date is around that of our project. In the last months, a total of 14 wind projects have been registered from India, of these two projects i.e. project reference no. 2265 and 1602 have start dates that are within three months of our project. The benchmarks used by these projects are presented below:

Project reference no.	Benchmark cost of equity based on Beta value	Average Beta value taken	Debt Equity ratio	Beta considered for benchmark computation	Reference
Project reference no. 1602	16.08%	1.46	Project is 100% equity financed	0.84, after adjusting the average Beta of 1.46 for 100% equity	http://cdm.unfccc.int/UserManagement/FileStorage/JTVSFO6ZPM0WLA53U2917XHD8BERNQ
Project reference no.	16.72%	N/A as	N/A	N/A	Benchmark

[1] In line with the Guidance to investment analysis (paragraph 13), we have not used company or project specific parameters for the calculation of the benchmark (such as company Beta etc.).

2265		Beta not used			computation approach not comparable

As can be seen, the beta value considered by us is comparable (even lower) than what has been considered by recently registered projects with similar start dates. The reason for a relatively lower benchmark of project 1602 is because of the project being 100% equity financed whereas our project has a 70% debt component.

The lowest benchmark used by comparable projects is 16.08% (that of project 1602), we would like to submit that even if this benchmark is considered our project remains additional.

Following a request for review, detailed explanations justifying the appropriateness of benchmark and parameters used for computing the benchmark were submitted to the honorable CDM Executive Board. The explanations were considered and deemed acceptable by the EB and the EB in its 52nd meeting agreed to register the project activity if the information submitted in the response was incorporated in the PDD and the corresponding validation report. We have accordingly, incorporated the question from EB and our responses below.

EB Query:

Further clarification from the DOE is required on the validation of the appropriateness of the 18.7% benchmark. In particular, a justification on each of the assumed parameters: risk free rate of 7.34%, risk premium of 8.52%, beta value of 1.34 considering that is higher than other similar CDM projects in India. In doing so, refer to VVM paragraph 110.

PP Response:

We have presented our response in two sections:

1. Section 1: Clarification to the queries
2. Section 2: Backup calculation to substantiate the response in Section 1

SECTION 1: Clarification to queries

We have analysed the Beta values taken by other similar projects mentioned in the review request i.e. PA1166, PA1602 and PA1762 and reviewed our benchmark. A summary of our analysis is presented below:

- All other things being equal Beta increases with increase in debt equity ratio. Therefore projects that are 100% equity financed use lower Beta as compared to projects that are financed through a combination of debt and equity such as ours. PA1602 and PA1762 are 100% equity financed hence their Betas are lower than our project which has a higher debt equity ratio of 70:30.
- When adjusted for difference in debt equity ratio, the Betas of PA1602 and PA1762 are in-fact higher than the Beta of 1.34 considered by us. Alternatively, when the beta of our project is

adjusted to the debt equity ratio of PA 1602 and PA1762, the resultant beta of our project is again found to be conservative.

- PA1166 has similar debt equity ratio as our project and hence is directly comparable. Beta of 1166 is 1.32 whereas our Beta is 1.34; the slight difference is due to change in timing of projects.
- Also, for comparison if 100% equity financing is assumed for our project (same as PA 1602 and PA 1762), the Beta, benchmark and equity IRR are lower than those of PA 1602 and PA 1762.
- We had earlier proposed a benchmark of 16%, it may be noted that at this benchmark also our project was additional.
- Further in our case, the beta values of comparable companies range from 0.95 to 1.63, even when the minimum beta of 0.95 is considered, the benchmark works out to 15.4%. At this benchmark also, the equity IRR of our project is lower and our project remains additional.

Further explanations on each of the above and our detailed analysis are presented below:

Framework for calculating β:

We have used the standard framework for calculation of Beta (**β**) from text books of corporate finance for calculating the Beta of our project, which is the same approach used in PA 1166 and PA 1602.

In brief, β is calculated **at a point in time** based on:

- Selecting comparable companies
- Covariance of each comparable company share returns with returns from a market index ($\beta_{observed}$)
- Un-levering the $\beta_{observed}$ for each comparable company with its debt-equity ($\beta_{un\text{-}levered}$)[2], calculating the average $\beta_{un\text{-}levered}$. The average $\beta_{un\text{-}levered}$ is then used for calculating the benchmark for 100% equity financed projects.
- In the event that the project has debt finance, levering the average $\beta_{un\text{-}levered}$ according to the project debt-equity ratio ($\beta_{levered}$)[3] for calculating the benchmark.

Thus, the appropriate β to be used will depend on the time of calculation and the debt-equity ratio of the project.

Evidence of this approach is available at:

- Page No. 21 and 22 of the PDD of PA 1602 - Annex 2
- Page No. 9,10, 34 and 35 of the PDD of PA 1166.
- Extracts from Text books on Corporate Finance attached as Annex 3

Analysis of project activities mentioned in the Context:

[2] Formula for Un-levering: $\beta_{un\text{-}levered} = \beta_{observed} / [1+(Debt_{company}/Equity_{company}) \times (1\text{-}Tax\ Rate_{Company})]$
[3] Formula for Re-levering: $\beta_{levered} = \beta_{un\text{-}levered} \times [1+(Debt_{project}/Equity_{project}) \times (1\text{-}Tax\ Rate_{project})]$

We have analysed the project activities referred into in the review request i.e. PA 1166, PA 1602 and PA 1762 to establish the appropriateness of β used for our project. The table below summarizes the analysis.

Project Activity Number	Average $\beta_{observed}$	Average $\beta_{un\text{-}levered}$	Project debt-equity ratio	$\beta_{levered}$	Appropriate β for use in calculating the benchmark
PA 1168	1.34	0.76	70:30	1.94	Taken same as Average $\beta_{observed}$ This is lower than Levered beta and hence conservative
PA 1166	1.32	0.77	70:30	1.97	Taken same as Average $\beta_{observed.}$ This is lower than Levered beta and hence conservative
PA 1602	1.46	0.84	0:100	0.84, as this is 100% equity financed	Only un-levered β is applicable since project is 100% equity finance.
PA 1762	Not carried out	0.23 (reverse calculated)	0:100	Not used	Not used, detailed explanation provided below

Beta Comparison with PA 1762:

PA 1762 has not followed the approach for calculating β and has instead reverse calculated β assuming a cost of equity benchmark of 14%. A detailed analysis of approach followed by PA 1762 is as follows:

- No comparable companies have been selected
- No calculation of covariance of stock returns with the returns from market index has been done
- No averaging of $\beta_{un\text{-}levered}$ has been carried out
- β is reverse calculated, from a cost of equity benchmark of 14% using the CAPM formula:

  Cost of Equity = Risk free rate + β x Equity Market Risk Premium (EMRP)
  PA 1762 has considered Risk free rate of 7.34% and EMRP of 28.65%, β is thus calculated as:
  β = [Benchmark (14%) – Risk free rate (7.34%)] / [EMRP (28.65%)] = 0.23
- A review of the parameters for reverse calculation show that, Equity Market Risk Premium (EMRP) is 28.65%, and is substantially higher than EMRP for all the projects under comparison. This is shown below:

Project	Equity Market Risk Premium	Source

Our project	8.52%	PDD
1166	7.43%	http://cdm.unfccc.int/UserManagement/FileStorage/FOB14QH0NZ2WCA8MRYDLVUPS5T9G6X
1602	11.82%	http://cdm.unfccc.int/UserManagement/FileStorage/MCZQ14BNOES8RWLK2T5706DIG3VPH9
1762	28.65%	Page 4 - PDD: Market return – risk free rate = 35.99%-7.34% http://cdm.unfccc.int/Projects/DB/RWTUV1207143768.84/ReviewInitialComments/EQ95C2B8AEAJWAY5OCUEIIX2YT2X5X

- The EMRP of PA 1762 is 28.65% whereas EMRP of our project is 8.52%, It is to be noted that the Market risk premium has an equal influence on benchmark calculation as the Beta, since the product of Market Risk Premium and Beta (EMRP x B) is considered.
- If an EMRP of 8.52% (same as PA 1168) is applied to the β calculation of PA 1762 then the β-reverse calculated works out to 0.78:
  - o β reverse calculated = [Benchmark (14%) – Risk free rate (7.34%)] / [EMRP (8.52%)] = 0.78 (instead of 0.23)
- This is for 100% equity financed project which is the case with PA 1762.
- $\beta_{levered} = \beta_{un\text{-}levered}$ x (1+ D/E x(1-Tax Rate)
- $\beta_{levered}$ at 70:30 (same as debt-equity ratio of PA1168) works out to 1.99. In comparison β used in Project 1168 is 1.34.

Appropriateness of β:

- Un-levered beta is applicable for 100% equity financed projects whereas levered beta is applicable for projects that use debt financing [Source: Corporate Finance Text Book extracts – Annex7]
- $\beta_{observed}$ of comparable companies for PA 1168 are presented in table 3 in the following section (Titled: Beta calculations for PA 1166, PA 1602 and PA 1168). These range from 0.95 to 1.63 with a median of 1.35. If one were to calculate the benchmark for these companies individually, the β value of 1.34 is quite appropriate.
- These comparable companies are primarily engaged in conventional power generation (large thermal and hydro); wind projects in comparison are more risky[4] and therefore should have a higher β.

[4] Our project gets a tariff of Rs. 3.25 per unit for the amount of electricity generated and supplied into the grid; this means that if there is no generation, the project does not earn any revenue. In comparison conventional power projects in India earn a two part tariff (fuel charge and investment charge) that allows guaranteed return on investment to projects irrespective of the level of generation. Clearly, the risk involved in wind business is significantly higher as compared conventional power generation projects.

- It can be seen, the β considered by us is based on well established principles of corporate finance and is also consistent with the referred projects. The reasons for differences in β values have been explained above.
- In order to draw a like to like comparison with PA 1602 and PA 1762, we assume a 100% equity financing for our project (same as PA 1602 and PA 1762). The project parameters in such a scenario would be:
  - Applicable β - 0.76, Benchmark - 13.81%, equity IRR (base) - 9.8% and equity IRR (sensitivity) - 11.3%
  - Benchmark for our project – 13.81%, benchmark for PA 1602 – 16.08%, benchmark for PA 1762 – 14%.
  - IRR 9.8% is lower than IRR of PA 1602 (10.02%) and PA 1762 (11.11%).
  - Under similar financing structure, the equity IRR as well as benchmark of our project is lower than those of PA 1602 and PA 1762.
- In light of the above, we feel the Beta of 1.34 considered by us is appropriate considering the project type, financing mix and timing of implementation of the project.

Benchmark using lower Beta values:

- In addition, we have also compared our IRR with the Cost of equity of comparable companies:

Company name	$\beta_{observed}$	Cost of equity assuming Rf = 7.34% EMRP = 8.52%
RELIANCE ENERGY	0.95	15.43%
GUJARAT INDS	1.36	18.93%
TATA POWER CO	1.35	18.84%
NEYVELI LIGNITE	1.16	17.22%
CESC LTD	1.63	21.23%
BF Utility	1.56	20.63%

The lowest cost of equity of comparable companies is 15.43%. This means that if any of these companies were to set up a project, the minimum benchmark equity IRR would be 15.43%. As can be seen this is well above the equity IRR of our project which is 11.9%

- Even when the lowest value of $\beta_{observed}$ of 0.95 (refer table above) is considered, the benchmark works out to 15.4% which is well above the equity IRR of the project.
- As can be seen our project remains additional even at the lowest beta value of 0.95. We therefore request the honourable EB to consider our request for registering the project.

Beta calculations for PA 1166, PA 1602 and PA 1168

Table 1: Project 1602:

COMPANY NAME	$B_{OBSERVED}$	DEBT:EQUITY RATIO	$B_{UNLEVERED}$
RELIANCE ENERGY	0.99	0.65	0.63

GUJARAT INDS	1.50	1.40	0.66
TATA POWER CO	1.40	0.57	0.97
NEYVELI LIGNITE	1.33	0.16	1.20
CESC LTD	2.10	1.92	0.76
	AVERAGE B $_{OBSERVED}$: 1.46		AVERAGE B $_{UNLEVERED}$: 0.84

- $\beta_{levered} = \beta_{un\text{-}levered}$ x (1+ D/E x(1-Tax Rate);
- Hence at 100% equity financing $\beta_{levered} = \beta_{un\text{-}levered}$
- Project 1602 debt-equity ratio = 0:100 (100% equity financed), therefore appropriate β for calculating benchmark in PA 1602 is the average $\beta_{un\text{-}levered}$ of 0.84.

Table 2: Project 1166:

COMPANY NAME	$B_{OBSERVED}$	DEBT:EQUITY RATIO	$B_{UN\text{-}LEVERED}$
RELIANCE ENERGY	1.00	0.65	0.64
GUJARAT INDS	1.32	1.40	0.58
TATA POWER CO	1.35	0.57	0.94
NEYVELI LIGNITE	1.44	0.16	1.30
CESC LTD	1.60	1.92	0.58
BF UTILITIES	1.22	0.98	0.62
	AVERAGE B $_{OBSERVED}$: 1.32		AVERAGE B $_{UNLEVERED}$: 0.77

- $\beta_{levered} = \beta_{un\text{-}levered}$ x (1+ D/E x(1-Tax Rate)
- Project debt-equity ratio = 70:30, therefore $\beta_{levered}$ = 1.97
- Average of $\beta_{observed}$ is 1.32. This is lower than $\beta_{levered}$ (1.97) and hence considering average of $\beta_{observed}$ is conservative

Table 3: Project 1168

COMPANY NAME	B $_{OBSERVED}$	DEBT:EQUITY RATIO	B $_{UNLEVERED}$
RELIANCE ENERGY	0.95	0.65	0.61
GUJARAT INDS	1.36	1.40	0.60
TATA POWER CO	1.35	0.57	0.94
NEYVELI LIGNITE	1.16	0.16	1.04
CESC LTD	1.63	1.92	0.59
BF UTILITY	1.56	0.98	0.79
	AVERAGE B $_{OBSERVED}$: 1.34		AVERAGE B $_{UNLEVERED}$: 0.76

- $\beta_{levered} = \beta_{un\text{-}levered}$ x (1+ D/E x(1-Tax Rate)
- Project debt-equity ratio = 70:30, therefore $\beta_{levered}$ = 1.94
- Average of $\beta_{observed}$ is 1.34. This is lower than $\beta_{levered}$ (1.94) and hence considering average of $\beta_{observed}$ is conservative.

SECTION 2: Backup calculation to Section 1

PA 1166

Company	Beta	Debt/Equity	Tax Rate	1-t	(1-t)*D/E	U Beta	Levered Beta
RELIANCE ENERGY	1.00	0.65	11.33%	88.7%	0.57	0.64	
GUJARAT INDS	1.32	1.40	8.84%	91.2%	1.28	0.58	
TATA POWER CO	1.35	0.57	23.58%	76.4%	0.44	0.94	
NEYVELI LIGNITE	1.44	0.16	30.84%	69.2%	0.11	1.30	
CESC LTD	1.60	1.92	8.03%	92.0%	1.77	0.58	
BF Utility	1.22	0.98	0.00%	100.0%	0.98	0.62	
Average Beta	**1.32**					**0.77**	**1.97**

PA 1168

Company	Beta	Debt/Equity	Tax Rate	1-t	(1-t)*D/E	U Beta	Levered Beta
RELIANCE ENERGY	0.95	0.65	11.33%	88.7%	0.57	0.61	
GUJARAT INDS	1.36	1.40	8.84%	91.2%	1.28	0.60	
TATA POWER CO	1.35	0.57	23.58%	76.4%	0.44	0.94	
NEYVELI LIGNITE	1.16	0.16	30.84%	69.2%	0.11	1.04	
CESC LTD	1.63	1.92	8.03%	92.0%	1.77	0.59	
BF Utility	1.56	0.98	0.00%	100.0%	0.98	0.79	
	1.34					**0.76**	**1.94**

PA 1602

Company	Beta	Debt/Equity	Tax Rate	1-t	(1-t)*D/E	U Beta	Levered Beta
RELIANCE ENERGY	0.99	0.65	11.33%	88.7%	0.57	0.63	
GUJARAT INDS	1.50	1.40	8.84%	91.2%	1.28	0.66	
TATA POWER CO	1.40	0.57	23.58%	76.4%	0.44	0.97	
NEYVELI LIGNITE	1.33	0.16	30.84%	69.2%	0.11	1.20	
CESC LTD	2.10	1.92	8.03%	92.0%	1.77	0.76	

	1.46					**0.84**	**2.15**

Source of Data:	
Beta: Registered / webhosted PDDs and financial models	
1602 PDD	http://cdm.unfccc.int/UserManagement/FileStorage/SQMO6RELVJ1GT872Z0I4A9HWY5N3FB
1602 excel sheet	http://cdm.unfccc.int/UserManagement/FileStorage/JTVSFO6ZPM0WLA53U2917XHD8BERNQ
1166 PDD	http://cdm.unfccc.int/UserManagement/FileStorage/ZN5YCPMU6BXIDHJ4GO7LF28RET1W0V
1166 excel calculations	http://cdm.unfccc.int/UserManagement/FileStorage/FOB14QH0NZ2WCA8MRYDLVUPS5T9G6X
Debt equity ratio and tax rate: www.moneycontrol.com and annual reports of companies	

PA 1762

Benchmark return on equity	14%
Market return	35.99%
Risk free rate	7.34%
Market risk premium	28.65%
Beta back calculation	**0.23**
Beta if the market risk premium is 8.52% (that of PA 1168)	**0.78**
Beta re-levered for 70:30 debt equity ratio (that of PA 1168)	**1.99**

Source of Data:	
Registered PDD of 1762 - http://cdm.unfccc.int/UserManagement/FileStorage/UME07SLCHIZ86NOAD19JX4FRTP3QG5	
Replies from 1762 PP for beta back calculation - http://cdm.unfccc.int/Projects/DB/RWTUV1207143768.84/ReviewInitialComments/EQ95C2B8AEAJWAY5OCUEIIX2YT2X5X	

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

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

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

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

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

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

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

The key assumptions used for calculating the benchmark (post-tax equity IRR) are set out below. These are the assumption on which the attached financial model based.

Capacity of Machines in kW	800
Number of Machines	75
Project Capacity in MW	60.00
Project Commissioning Date	1-Apr-07
Project Cost per MW (Rs. In Millions)	47.4

Operations	
Plant Load Factor	22.00%
Insurance Charges @ % of capital cost	0.18%
Operation & Maintenance Cost base year @ % of capital cost	1.25%
% of escalation per annum on O & M Charges	5.0%

Tariff	
Base year Tariff (2005-06) - Rs./kWh’	3.25
Annual Escalation (Rs./kWh per Year)	0.06
Tariff applicable from 2014-15 onwards (Rs/kWh)	3.79

Project Cost	Rs Million
Land and Infrastructure, Generator & Electrical Equipments, Mechanical Equipments, Civil Works, Instrumentation & Control, Other Project Cost, Pre operative Expenses, etc.	
Total Project Cost	2,845

Means of Finance		Rs Million
Own Source	30%	854
Term Loan	70%	1,992
Total Source		2,845
Terms of Loan		
Interest Rate	8.50%	

Tenure	10	Years
Moratorium	6	Months

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

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

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

CER Revenues	
CER Price in US$	-
Exchange rate Rs./US$*	43.59

* RBI reference rate as of 30 March 2007

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

Baseline Emission Factor for Northern Region (tCO2/GWh)	873.87

The equity IRR for the Project (without CDM revenues) is 11.9 %.

As explained under sub-step 2(b), the benchmark cost of equity for the project works out to 18.7 %, as can be seen the equity IRR is lower than the benchmark. The lowest benchmark used by comparable registered wind projects from India is 16.08%, we would like to submit that equity IRR remains lower than this benchmark. This analysis holds true even with the sensitivity[5].

Without CDM revenues, it was not possible for us to implement the project. Given the criticality of CDM revenues for our project, we even entered into an ERPA with a CER purchaser in December 2005, prior to the start of the project, to secure the CDM revenues. A copy of the ERPA has been submitted to the DOE during the validation process.

[5] The equity IRR in sensitivity is also lower than the target return of 16% that Enercon considers while making investment decision.

Clearly, the project activity would not have taken place in the absence of CDM.

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

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

Sensitivity analysis of the Equity IRR to the Plant Load Factor (the most critical assumption) has been carried out considering a plant load factor of 20% (plant load factor as observed in recent past for other WWIL projects) and 23.97% (highest plant load factor achieved according to RERC, in its Order dated 29 September 2006). Plant Load Factor is the key variable encompassing variation in wind profile, variation in off-take (including grid availability) including machine downtime. The post tax Equity IRRs at the stated PLFs are as follows:

Sensitivity	**PLF at 20%** (average of our project)	**PLF at 22 % (Base Case)**	**PLF at 23.97%**[6] (highest value observed by the state regulator)
Post tax Equity IRR without CER revenues	8.98%	11.9%	14.78%

Outcome of step 2

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

Step 4. Common practice analysis

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

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

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

[6] Though project additionality remains robust even in the upside case of 23.97% PLF, we consider this to be a remote possibility. Annual data from (2004 through 2007) and investors wise generation data, published and managed by RRECL (Rajasthan Renewable Energy Corporation Limited), reveals that the average PLF has been around 18%. The data has been provided to the validator.

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

We analyze the extent to which wind energy projects have diffused in the electricity sector in Rajasthan. In 2005 – 06, electricity generation from wind sources was 417 GWh which is expected to increase to 512 GWh in 2006 – 07. This works out to 1.35% of total generation available to the state of Rajasthan in 2005 – 06 and 1.66% of total expected generation available to the state of Rajasthan in 2006 – 07. Clearly, electricity generation from wind is not a common practice in Rajasthan.

We analyze the wind energy projects in Rajasthan that have come under different policy regimes and in different years. Briefly, the various policies have progressively decreased the electricity tariffs payable by the offtaker (RRVPN/Discoms) and have progressively passed on burden of providing or paying for transmission facilities. Below is the electricity tariff payable under different policies:

Electricity tariff (Rs/kWh)	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
1999 Policy	2.89	3.03	3.18	3.34	3.51	3.69	3.87	4.06	4.27
2000 Policy		3.03	3.18	3.34	3.51	3.68	3.87	4.06	4.26
2003 Policy					3.32	3.39	3.45	3.52	3.59
2004 Policy (Original)						2.91	2.96	3.01	3.06
2004 Policy (Amended)							3.25	3.31	3.37

Out of the 279 MW installed up to 31 March 2005, the wind power projects under various policies of Government of Rajasthan are set out below:
Policy 1999 (effective 11th March 1999): 4.25 MW
Policy 2000 (effective 4th Feb 2000): 82.23 MW
Policy 2003 (effective 30th April 2003): 174.29 MW
Policy 2004 (effective 25th October 2004): 18.85 MW

Currently, there are 134.71 MW of wind projects in Rajasthan (at various stages) that are in the CDM pipeline (on the cdm.unfccc.int website) out of 279 MW and more projects are expected to come into the CDM pipeline.

With the revision of Policy 2004 (effective February 2006), the capacity additions during the three years are expected to be around 297 MW:

2005–06: 74 MW
2006-07: 36 MW
2007-08: 187 MW

Out of the 297 MW that is estimated to be installed up to 2008, this Project constitutes 60 MW. WWIL is further developing a 100 MW wind power project and another 24.8 MW as CDM project activities under the 2004 policy (amended). It is expected that other wind power projects during this period will be undertaken as CDM projects.

Outcome of step 4
Clearly, wind power project development in Rajasthan is insignificant when compared to the power sector of Rajasthan. Further, wind power project development is substantially dependent on CDM mechanism and thus is not common practice.

Sub-steps 4a and 4b are satisfied. The project activity is additional.

B.6. Emission reductions
B.6.1. Explanation of methodological choices
>>
According to the approved baseline methodology ACM0002, the emission reductions ***ERy*** by the project activity during a given year "*y*[1]" is

ERy = BEy – PEy – Ly……………….(1)

where *BEy* is the baseline emissions
PEy is project activity emissions and;
Ly is the amount of emissions leakage resulting from the project activity.

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

BEy = EGy * EFy …………………….(2)

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

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

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

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

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

The Operating Margin emission factor

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

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

Generation in GWh	**2004-05**	**2003-04**	**2002-03**	**2001-02**	**2000-01**
Low cost/must run sources					
Hydro	36,128	38,279	30,335	29,129	29,020
Wind	332	15	25	19	6
Nuclear	7,503	7,380	8,800	8,158	6,669
Other sources					
Coal	106,156	103,232	100,362	96,882	92,417
Diesel	-	-	-	24	-
Gas	19,991	18,758	17,262	17,634	16,863
Total Generation	**170,109**	**167,663**	**156,785**	**151,845**	**144,975**
Low cost/must run sources	43,962	45,674	39,160	37,305	35,695
Low cost/must run sources	26%	27%	25%	25%	25%

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

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

Build Margin Emission Factor

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

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

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

The choice of method for the sample plant is the most recent 20% of the generating units built as this represents a significantly larger set of plants, for a large regional electricity grid have a large number of power plants connected to it, and is therefore appropriate.

The 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 CO2 Baseline Database provides information about the Operating Margin and Build Margin Emission Factors of all the regional electricity grids in India. The Operating Margin in the CEA database is calculated ex ante using the Simple OM approach and the Build Margin is calculated ex ante based on 20% most recent capacity additions in the grid based on net generation as described in ACM0002. We have, therefore, used the Operating Margin and Build Margin data published in the CEA database, for calculating the Baseline Emission Factor.

Combined Margin Emission Factor

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

Using the values for operating margin and build margin emission factors provided in the CEA database and their respective weights for calculation of combined margin emission factor, the baseline carbon emission factor (CM) is 873.87 tCO2e/GWh or 0.87387 tCO2e/MWh.

Project Emissions:

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

$PEy = 0$

Leakage:

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

$Ly = 0$

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EF_{OM,y}$
Unit	tCO_2e/MWh
Description	Operating Margin Emission Factor of Northern Regional Electricity Grid
Source of data	"CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value(s) applied	2002 – 03: 0.9993 2003 – 04: 0.9869 2004 – 05: 0.9756
Choice of data or Measurement methods and procedures	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002
Purpose of data	Baseline Emission Calculations
Additional comment	None

Data / Parameter	$EF_{BM,y}$
Unit	tCO_2e/MWh
Description	Build Margin Emission Factor of Northern Regional Electricity Grid
Source of data	"CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value(s) applied	2004 – 05: 0.5335
Choice of data or Measurement methods and procedures	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.
Purpose of data	Baseline Emission Calculations
Additional comment	None

Data / Parameter	$EF_{CM,y}$
Unit	tCO2e/MWh
Description	Combined Margin Emission Factor of Northern Regional Electricity Grid
Source of data	"CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value(s) applied	0.87387
Choice of data or Measurement methods and procedures	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.
Purpose of data	Baseline Emission Calculations
Additional comment	None

B.6.3. Ex ante calculation of emission reductions
>>
Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage are nil.

Baseline emission factor (combined margin)
= 873.87 tCO2e/GWh

Annual electricity supplied to the grid by the Project
= 60 MW (Capacity) x 22% (PLF) x 8760 (hours) / 1000 GWh
= 115.632 GWh

Annual baseline emissions
= 873.87 tCO2e/GWh x 115.632 GWh
= 101,047 tCO2e

B.6.4. Summary of ex ante estimates of emission reductions

>>

Year	Estimation of project activity emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of overall emission reductions (tonnes of CO2e)
15Aug2007-31Mar2008	0	63,154	0	63,154
01Apr2008-31Mar2009	0	101,047	0	101,047
01Apr2009-31Mar-2010	0	101,047	0	101,047
01Apr2010-31Mar2011	0	101,047	0	101,047
01Apr2011-31Mar2012	0	101,047	0	101,047
01Apr2012-31Mar2013	0	101,047	0	101,047
01Apr2013-31Mar2014	0	101,047	0	101,047
01Apr2014-31Mar2015	0	101,047	0	101,047
01Apr2015-31Mar2016	0	101,047	0	101,047
01Apr2016-31Mar2017	0	101,047	0	101,047
01Apr2017-14Aug2017	0	37,893	0	37,893
Total (tonnes of CO2e)	0	1,010,470	0	1,010,470

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored

Data / Parameter:	**EGy**
Unit:	MWh (Mega-Watt hour)
Description:	Net electricity supplied to the grid by the Project
Source of data	Electricity supplied to the grid as per monthly breakup sheet prepared by WWIL and the same will cross verified by the tariff invoices raised on RRVPNL/Ajmer & Jaipur DISCOM (State Utility).
Value(s) applied	Annual electricity supplied to the grid by the Project = 60 MW (Capacity) x 22% (PLF) x 8760 (hours) MWh = 115,632 MWh
Measurement methods and procedures	The WECs of the project activity and WECs of other power producers are connected to Bhu Substation which is further connected to Akal substation. In addition to the project activity, the WECs located at Kita, Jodha, Pithoda ki Dhani are also connected to Bhu substation which are further connected to the Akal substation. Net Electricity supplied by all these WECs is metered

	at a common metering/delivery point. The common metering/delivery point comprises one main meter & one back up meter that are installed at 220 kV metering/delivery point at the Akal substation. Consequently, the main meter reading reflects the aggregate electricity supplied by all these WECs, including the project activity. The net electricity supplied by individual WEC is determined by a process of allocating the total electricity recorded at the main meter to the individual WEC in proportion to the electricity generation recorded by the LCS meters at the individual WEC. Allocation plan for calculating net electricity supplied to the grid is given in section B.7.2. Refer Annex – 4 for an illustration of the provisions for measurement methods.
QA/QC procedures	QA/QC procedures will be as implemented by RRVPN/Ajmer & Jaipur DISCOM pursuant to the provisions of the power purchase agreement and the Metering Code of Rajasthan except or otherwise explicitly mentioned in Annex 4 and there will be no additional QA/QC procedures. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Purpose of data	Baseline Emission Calculations
Additional comment	The data will be archived in soft and hard format for crediting period + 2 years and will be provided to validator during verification

Data / Parameter	$E_{JMR-Export}$
Unit	MWh (Mega-Watt hour)
Description	Gross Electricity exported (at substation point), as recorded by the main meter & backup meter at the Akal substation. This data represents the total gross electricity exported by all the WECs (project and non project) at substation point.
Source of data	Export value from Joint meter reading taken at Substation in the presence of representatives of WWIL and state utility.
Value(s) applied	This value will not be directly used for estimation of emission reduction.
Measurement methods and procedures	The Export reading is jointly noted from the main meter & backup meter installed at the Akal Substation.
QA/QC procedures	The meters will be calibrated once each year by the state utility. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Purpose of data	Baseline Emission Calculations
Additional comment	The data will be archived is soft and hard format for crediting period + 2 years and will be provided to validator during verification

Data / Parameter	$E_{JMR,Import}$
Unit	MWh (Mega-Watt hour)
Description	Gross Electricity imported (at substation point), as recorded by the main meter & backup meter at the Akal Substation. This data represents the total gross electricity imported by all the WECs (project and non project) at substation point.
Source of data	Import value from Joint meter reading taken at Substation in the presence of representatives of WWIL and state utility
Value(s) applied	This value will not be directly used for estimation of emission reduction.
Measurement methods and procedures	The import reading is jointly noted from the main meter & backup meter installed at the Akal Substation.
QA/QC procedures	The meters will be calibrated once each year by the state utility. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Purpose of data	Baseline Emission Calculations
Additional comment	The data will be archived is soft and hard format for crediting period + 2 years and will be provided to validator during verification

Data / Parameter	$E_{Controller,Export,i}$
Unit	MWh (Mega-Watt hour)
Description	Gross Electricity export (at WEC point at the site) by a WEC (project or non project), as measured at the LCS meter. Each WEC has exclusive LCS meter that records gross electricity export from the WEC (project or non project). This represents gross electricity export by individual WEC (at WEC point at the site) where i is any WEC between 1 to j+k j is any WEC between 1 to 75 of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation. k is any WEC between 76 to 290[9] of the non project connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.
Source of data	This reading is monitored continuously by the online monitoring station (online monitoring station is located at the project site

[9] Please note that number of WECs that are connected to Akal substation and Bhu substation that share same main and backup meter as on date (29 November 2011) are 290. The number of WECs connected to Bhu substation and further connected to Akal substation may change in future. Additionally the connection point of the project activity to a particular substation is decided by state utility and hence, the same might change in future. However the procedure for allocation of apportioning of electricity generated will remain same.

	where all the data [historical and instantaneous] from the LCS meters of all WECs is retrieved) at the project site.
Value(s) applied	This value will not be directly used for estimation of emission reduction.
Measurement methods and procedures	The value is recorded continuously by the online monitoring station. This value can also be checked from the LCS meter installed inside the WEC tower.
QA/QC procedures	Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Purpose of data	Baseline Emission Calculations
Additional comment	The data will be archived in soft format at the online monitoring station at the project site for crediting period + 2 years.

Data / Parameter	$\sum E_{Controller,Export,i}$
Unit:	MWh (Mega-Watt hour)
Description	Summation of gross electricity exported (at WEC point at the site) by all the WECs (project and non project) connected to the main meter at the substation, measured at the LCS meter of each WEC. This is summation of gross electricity exported by the WECs (at WEC point at the site) including WECs of the project and non project. where i is any WEC between 1 to j+k j is any WEC between 1 to 75 of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation. k is any WEC between 76 to 290[10] of the non project connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.
Source of data	This reading is monitored continuously by the online monitoring station (online monitoring station is located at the project site where all the data [historical and instantaneous] from the LCS meters of all WECs is retrieved) at the project site.
Value(s) applied	This value will not be directly used for estimation of emission reduction.
Measurement methods and procedures	The value is recorded continuously by the online monitoring station. This value can also be checked from the LCS meter installed inside the WEC tower.
QA/QC procedures	Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Purpose of data	Baseline Emission Calculations

[10] Please note that number of WECs that are connected to Akal substation and Bhu substation that share same main and backup meter as on date (29 November 2011) are 290. The number of WECs connected to Bhu substation and further connected to Akal substation may change in future. Additionally the connection point of the project activity to a particular substation is decided by state utility and hence, the same might change in future. However the procedure for allocation of apportioning of electricity generated will remain same.

Additional comment	The data will be archived in soft format at the online monitoring station at the project site for crediting period + 2 years.

Data / Parameter	$E_{WEC,Export,j}$
Unit	MWh (Mega-Watt hour)
Description	Gross Electricity exported (at substation point) by an individual WEC (j of the project activity) to the grid that is connected to main meter & backup meter at Akal substation. Where j is any WEC between 1 to 75 of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.
Source of data	Calculated using formula mentioned in B.7.2.
Value(s) applied	This value will not be directly used for estimation of emission reduction.
Measurement methods and procedures	$E_{WEC,Export,j}$ denotes the electricity exported by individual WEC of the project activity to the grid. The value is calculated based on the formula mentioned in section B.7.2.
QA/QC procedures	Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Purpose of data	Baseline Emission Calculations
Additional comment:	The data will be archived in soft format for crediting period + 2 years and will be provided to validator during verification.

Data / Parameter	$E_{WEC,Import,j}$
Unit	MWh (Mega-Watt hour)
Description	Gross Electricity imported (at substation point) by an individual WEC of the project activity to the grid that is connected to main meter & backup meter at Akal substation. Where j is any WEC between 1 to 75 of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.
Source of data	Calculated using formula mentioned in B.7.2.
Value(s) applied	This value will not be directly used for estimation of emission reduction.
Measurement methods and procedures	$E_{WEC,Import,j}$ denotes the gross electricity imported by individual WEC of the project activity from the grid. The value is calculated based on the formula mentioned in section B.7.2.
QA/QC procedures	Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Purpose of data	Baseline Emission Calculations
Additional comment:	The data will be archived in soft format for crediting period + 2 years and will be provided to validator during verification

Data / Parameter	$\sum_{Project} E_{WEC,Export,j}$
Unit	MWh (Mega-Watt hour)
Description	Summation of gross electricity exported (at substation point) by all the WECs of the project activity. Where j is any WEC between 1 to 75 of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.
Source of data	Calculated using formula mentioned in B.7.2. for $E_{WEC,Export}$
Value(s) applied	This value will be directly used for estimation of emission reduction.
Measurement methods and procedures	$\sum_{Project} E_{WEC,Export,j}$ denotes summation of the gross electricity exported (at substation point) to the grid by a WECs included in the project activity. The value is calculated based on the formula mentioned in section B.7.2.
QA/QC procedures	The value is calculated. Please refer B.7.2 for the formulas of $E_{WEC,Export}$.
Purpose of data	Baseline Emission Calculations
Additional comment:	The data will be archived in soft and hard format for crediting period + 2 years and will be provided to validator during verification

Data / Parameter	$\sum_{Project} E_{WEC,Import,j}$
Unit	MWh (Mega-Watt hour)
Description	Summation of electricity imported (at substation point) by all the WECs of the project activity. Where, j is any value between 1 to 75 representing WECs of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.
Source of data	Calculated using formula mentioned in B.7.2. for $E_{WEC,Import}$
Value(s) applied	This value will be directly used for estimation of emission reduction.
Measurement methods and procedures	$\sum_{Project} E_{WEC,Import,j}$ denotes the summation of gross electricity imported (at substation point) from the grid by a WECs included in the project activity. The value is calculated based on the formula mentioned in section B.7.2.
QA/QC procedures	The value is calculated. Please refer B.7.2 for the formulas of $E_{WEC,Import}$
Purpose of data	Baseline Emission Calculations
Additional comment:	The data will be archived in soft and hard format for crediting period + 2 years and will be provided to validator during

	verification

B.7.2. Sampling plan
>>
Not applicable

B.7.3. Other elements of monitoring plan
>>
Approved monitoring methodology ACM0002 / Version 06 Sectoral Scope: 1, "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

This approved monitoring methodology requires monitoring of the following:

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

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

The Project is operated and managed by WWIL.

EG_y for the project activity is derived as follows:-

The electricity generated from the project activity is transmitted to Bhu substation through 4 feeders. The WECs of the project activity and WECs of other power producers are connected to Bhu Substation which is further connected to Akal substation. In addition to the project activity, the WECs located at Kita, Jodha, Pithoda Ki Dhani are connected to Bhu substation which are further connected to the Akal substation. The detailed data of the customers that are connected to Bhu and Akal substation is given in the table below.

An Energy meter at 220 kV (accuracy Class-0.2) at Bhu Substation is termed secondary 'Back up meter' and Energy meters at 220 kV bay (accuracy Class-0.2) at Akal substation is termed as 'Main Meter' & 'Back up Meter'. Net Electricity supplied by the WECs is metered at a common metering/delivery point. The common metering/delivery point comprises of one main meter & one backup meter that are installed at 220 kV metering point at the Akal substation and one secondary backup meter installed at 220kV at Bhu substation. Consequently, the main meter reading reflects the aggregate electricity supplied by all these WECs, including the project activity. The net electricity supplied by individual WECs is determined by following a process of allocating the total electricity recorded at the main meter to the individual WECs in proportion of the electricity generation recorded by the LCS meters at the individual WECs. The apportioning for electricity export and import is done by WWIL based on which invoices are raised for individual customers.

The procedure for allocation is detailed below:

$E_{MR,Export}$ = Gross Electricity exported, as recorded by the main meter & backup meter at the substation. This data represents the total gross electricity exported by all the WECs (project and non project) at substation point.

$E_{MR,Import}$ = Gross Electricity imported, as recorded by the main meter & backup meter at the substation. This data represents the total gross electricity imported by all the WECs (project and non project) at substation point.

$E_{Controller,Export,i}$ = Gross Electricity exported (at WEC point at the site) by a WEC (project or non project), as measured at the LCS meter. Each WEC has exclusive LCS meter that records gross electricity export from the WEC (project or non project). This gross electricity exported by the WEC (at WEC point at the site)

$E_{Controller,Export,j}$ and $E_{Controller,Export,k}$ are subsets of $E_{Controller,Export,i}$

where i is any value between 1 to j+k

j represents WECs of the project activity (1 to 75) connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.

k represents WECs of the non project (76 to 290[11]) connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.

$\sum E_{Controller,Export,i}$ = Summation of gross electricity exported (at WEC point at the site) by all the WECs (project and non project) connected to the main meter at the substation, measured at the LCS meter of each WEC. This is summation of gross electricity exported by the WECs (at WEC point at the site) including WECs of the project and non project.

$E_{WEC,Export,j}$ = Gross Electricity exported (at substation point) by an individual WEC of the project to the grid that is connected to main meter & backup meter. Thus this data can be used to compute electricity export (at substation point) for individual WEC.

$E_{WEC,Import,j}$ = Gross Electricity imported (at substation point) by an individual WEC of the project from the grid that is connected to main meter & backup meter. Thus this data can be used to compute electricity import (at substation point) for individual WEC.

1. $\sum_{Project} E_{WEC}$ = Summation of gross electricity exported (at substation point) by all the WECs of the project activity.

[11] Please note that number of WECs that are connected to Akal substation and Bhu substation that share same main and backup meter as on date (29 November 2011) are 290. The number of WECs connected to Bhu substation and further connected to Akal substation may change in future. Additionally the connection point of the project activity to a particular substation is decided by state utility and hence, the same might change in future. However the procedure for allocation of apportioning of electricity generated will remain same.

$\sum_{Project} E_{WEC(import),j}$ = Summation of gross electricity imported (at substation point) by all the WECs of the project activity.

Gross Electricity exported by each WEC is apportioned on the basis of gross electricity export recorded at the LCS meter of each WEC and the gross electricity export recorded at the main meter & backup meter mentioned in the JMR. The export multiplication factor is calculated as follows-

1. $\text{Export Multiplication factor} = \frac{E_{JMR,Exp}}{\sum E_{Controller}}$ ………………………(1)

Thus the energy exported by an individual WEC of the project activity to the grid is given by the equation-

1. E_{WE} = Export Multiplication factor x 1. $E_{Controller}$ ………………………..(2)

As the LCS meter doesn't record import, the apportioning of energy import by each WEC is also done on the basis of electricity export recorded at the LCS meter of each WEC and the electricity import recorded at the main meter and mentioned in the JMR. The import multiplication factor is calculated as follows-

1. $\text{Import Multiplication factor} = \frac{E_{JMR,im}}{\sum E_{Controller}}$ …………………………………(3)

Thus the energy imported by an individual WEC of the project activity to the grid is given by the equation-

1. $E_{WEC(import),j} = \text{Import Multiplication factor} \times E_{Controlle}$…………………………..(4)

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

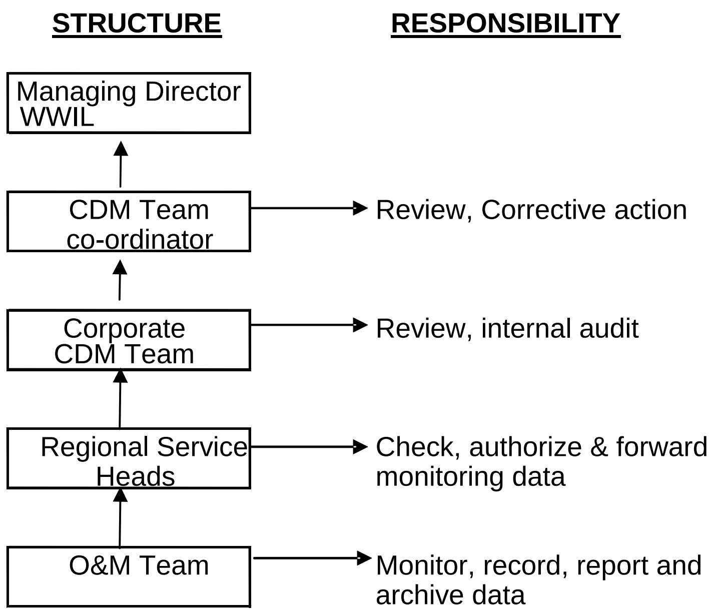
1. $EG_y = \sum_{Project} E_{WEC}$ - 1. $\sum_{Project} E_{WEC}$ ……………………………..(5)

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

The apportioning for electricity export and import is done by WWIL based on which invoices are raised for individual customers. These invoices can be cross verified by the cheque copies by the DOE.

Joint Meter Reading is generated on 1st day of every month. In case the crediting period does not match with the JMR date than the allocation of net electricity generation supplied to the grid by project activity for those days is difficult. Hence, the project proponent wishes to forego the generation for those days for the purpose of simplicity in the calculation of Emission reductions.

The operational and management structure implemented by WWIL is as follows:



Training and maintenance:

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 WECs and keep them in good health. In order to ensure, that WWIL'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 WWIL Training Academy provides need-based training to meet the training requirements of WWIL 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.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

10/03/2006 being the date of placement of purchase order for the wind energy generators.

C.1.2. Expected operational lifetime of project activity

>>

20 years

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

Fixed Crediting Period

C.2.2. Start date of crediting period

>>

01/11/2007, being the beginning of the month subsequent to the month in which the project is expected to be registered.

C.2.3. Length of crediting period

10 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

WWIL appointed Aditya Environmental Services Private Limited to conduct rapid environmental impact assessment study to assess the impact of the project on the local environment.

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

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

The study area represents part of Jaisalmer district, which is part of the Thar desert. The terrain is rough comprising sandy or stony wasteland & is very sparsely populated. The windfarm is located in the mist of the Indian ‘Thar’ Desert and does not come in the path of the migratory birds. There is no wild life or forestland near the project sites.

D.2. Environmental impact assessment
>>
EIA demonstrated that there is no major impact on the environment due to the installation and operation of the windmills. The desert ecology is not likely to get impacted by this type of project activity. The local population confirmed that there is no noise or dust nuisance due to windmills. The EIA also ruled out any adverse impacts due to the project activity.

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from local stakeholders
>>
The comments from local stakeholders were invited through a local stakeholder meeting conducted at Gorbandh Palace, Jaisalmer on 18 September 2006. A local newspaper advertisement was placed in *Rajasthan Patrica* on 5th September 2006 inviting the local stakeholders for the meeting.

The local stakeholder consultation meeting had representatives from the nearby villages, representatives of WWIL and representative of Aditya Environmental Services (consultant to WWIL). The minutes of the meeting are set out in Annex 5.

E.2. Summary of comments received
>>

The comments from local stakeholders covered the benefits the wind project activities have provided including employment opportunities to the local people, better transportation facilities to the near by towns, improved water availability, etc.

The local stakeholders did not find any negative impacts on account of the project activity on, inter alia, grazing by the cattle, affecting migratory patterns of the birds, noise levels, accidents, etc.

E.3. Report on consideration of comments received
>>
WWIL provided the following responses in relation to the comments received from the local stakeholders:
- The benefits to the local stakeholders will be through employment opportunities provided by the project in terms of small shops and construction workers. It will also lead to better connectivity to nearby towns.
- The project does not affect the grazing by the cattle. WWIL does not use any kind for boundary wall to protect their machines and hence the accessibility of cattle to areas for grazing and drinking water is not affected.
- The Project does not fall under migratory patterns of the birds.
- Project has improved the availability of water, which can also be accessed from project site. The tube wells are located at a distance of 3 Km from project site which the people daily access.
- WWIL has appropriate protocols are in place to take care of all the safety issues. No incidence of accident has occurred.
- No noise disturbances have been observed so far and local inhabitation is far away from the project site.

- A school was reconstructed by WWIL India Limited in police lane in Jaisalmer, Rajasthan in 2004 – 05. WWIL will bear in mind the requirement of school in the village and opportunities for women in the village when it undertakes further developmental work.

The local stakeholders were satisfied with the explanations provided during the meeting.

SECTION F. Approval and authorization

>>

The letter of approval (Host Country Approval) has been submitted to the DOE.

- - - - -

Appendix 1: Contact information of project participants

Organization name	Wind World (India) Limited
Street/P.O. Box	A-9, Veera Industrial Estate, Veera Desai Road, Andheri West-400053
Building	Wind World Tower
City	Mumbai
State/Region	Maharashtra
Postcode	400 053
Country	India
Telephone	+91-22-66924848
Fax	+91-22-66921175
E-mail	yogesh.mehra@windworldindia.com
Website	www.windworldindia.com
Contact person	
Title	Managing Director
Salutation	Mr.
Last name	Mehra
Middle name	
First name	Yogesh
Department	Corporate
Mobile	+91-98200 40301
Direct fax	+91-22-6692 1177
Direct tel.	91-22-22-6702 2832 extn. 7111
Personal e-mail	yogesh.mehra@windworldindia.com

Appendix 2: Affirmation regarding public funding

No ODA financing has been used in the Project activity.

Appendix 3: Applicability of selected methodology

Please refer section B.2 of the PDD.

Appendix 4: Further background information on ex ante calculation of emission reductions

BASELINE INFORMATION

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

Simple Operating Margin

	tCO2e/GWh
Simple Operating Margin - 2002-03	999.35
Simple Operating Margin - 2003-04	986.94
Simple Operating Margin - 2004-05	975.68
Average Operating Margin of last three years	987.32

Build Margin

	tCO2e/GWh
Build Margin – 2004-05	533.52

Combined Margin calculations

	Weights	tCO2e/GWh
Operating Margin	0.75	987.32
Build Margin	0.25	533.52
Combined Margin		**873.87**

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

Appendix 5: Further background information on monitoring plan

MONITORING INFORMATION

- The electricity supplied to the grid will be metered at the 220 kV bay at the RRVPN substation at Akal. Representatives of RRVPN/Ajmer & Jaipur DISCOM and WWIL will jointly take the main reading & backup reading and sign the meter reading on the first day of every month. Simultaneously, the joint meter reading at the 220 kV level of the secondary backup metering system at Akal substation will also be taken by representatives of RRVPN/Ajmer & Jaipur DISCOM and WWIL. The line diagram is attached as annex 11. List of customers connected to Akal and Bhu substation sharing same main and backup meter as of 29 November 2011 is provided in annex 12.

  The meters will jointly inspected/tested once in a year as per the terms of the PPA.

  Metering Equipment and Arrangement Information

- The meters (main and backup meters) used are Trivectormeter. The meters are two way meter and measure the electricity import and export and give the net electricity.

- As per the Power Purchase Agreement entered into with the electricity distribution utility, there will be two meters, one main meter and one backup meter to assess the emission reductions from the period of last testing of the equipment. Both meters would be two-way export import meters that measure both export and import of electricity and provide net electricity supplied to the grid.

- In case the meters are found to operate outside the permissible limits during the calibration activity, the meters will be either replaced immediately or calibrated. Error correction will be applied to the meter reading. Whenever a main meter goes defective, the consumption recorded by the backup meter will be referred. The details of the malfunctioning along with date and time and snaps shot parameters along with load survey will be retrieved from the main meter. The exact nature of the malfunctioning will be determined after analyzing the data so retrieved and the consumption recorded by the main meter will be assessed accordingly.

- The main and the backup metering systems will be sealed in presence of representatives of WWIL and RRVPN/Jaipur & Ajmer DISCOM.

The 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.

Appendix 6: Summary of post registration changes

Changes to project design of registered project activity

a.) Notification with regards to change of village name and change of DISCOM name was sent to UNFCCC. The same was accepted on 3 Aug 2011 by UNFCCC. The same has been reflected in the revised PDD version 07 dated 16 Feb 2010.

b.) Notification with regard to the change in the substation from Amarsagar substation to Akal substation was sent to UNFCCC. The same has been accepted on 1 Mar 2012 by UNFCCC. The same has been reflected in the revised PDD version 09 dated 27 Jun 2011.

Permanent changes from registered monitoring plan or applied methodology

a.) Revision in the monitoring plan was requested. The same has been approved by UNFCCC on 3rd Aug 2011.

b.) The Location of backup meter as per the registered PDD has been changed. The backup meter is located in Akal substation. The same has been reflected in the revised PDD version 11 dated 17 Sep 2012. The same was approved on 14 Jan 2013 by UNFCCC.

Annex 1

COST OF EQUITY CALCULATION

Calculation of Cost of Equity:

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

Ke = Rf + B x (Rm – Rf)
where:
Ke = Rate of return on equity capital;
Rf = Risk-free rate of return;
B = Beta;
Rm – Rf = Market risk premium;

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 rate of interest on government bonds are considered as risk free rates. Page 191 of text book on "Corporate Finance Theory and Practice" by Dr. Aswath Damodaran[13] of Stern School of Business, New York University (attached as annex 8) describes that the long term government bond 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 long dated Indian government bond rates at the project start date (which is March 2006) which 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 government bond rates is published by Reserve Bank of India. (Web-link: http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/80303.pdf)

The applicable risk free rate is 7.34%.

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 average return on government securities over an extended period of history [page 190, Corporate Finance Theory and Practice, Dr. Aswath Damodaran. Attached as annex 7]. It is preferred to use long term premimums, i.e over a period of 25 years, since considering shorter time periods can lead to large standard errors because volatility in stock returns [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran. Attached as annex 3]. It is also preferred to calculate the risk premium based on geometric mean of the returns since arithmatic mean overstates the risk premium. Geometric mean is

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

[13] Dr. Damodaran is one of the foremost authorities in the world in the field of Investment Analysis

defined as the compounded annual return over the same period [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran. Attached as annex 3].

Therefore the risk premium has been calculated as the difference in compounded annual return bewteen the BSE-Sensex and the Government bond rates since the year of inception of BSE Sensex, i.e. 1979 – 80. The detailed calculations are presented in the attached excel sheet.

Source: BSE Stock Exchange (www.bseindia.com)

The applicable risk premium is 8.52%.

Beta:

Beta (B) indicates the sensitivity of the company to market risk factors. 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, there was only one wind energy or renewable energy power generation company (BF Utility) listed on any stock exchange in India (both BSE- Bombay Stock Exchange and NSE-National Stock Exchange) in year 2005[14]. 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. 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 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 available in annex 6.

The table below summarises the beta values:

Bloomberg Symbol	**Company Name**	**Beta**
RELE IN Equity	RELIANCE ENERGY	0.95
GIP IN Equity	GUJARAT INDS	1.36
TPWR IN Equity	TATA POWER CO	1.35
NLC IN Equity	NEYVELI LIGNITE	1.16
CESC IN Equity	CESC LTD	1.63
BFUT IN Equity	BF Utility	1.56
	Average Beta	**1.34**

[14] This can be verified from the database available at the web-link www.securities.com (This website is owned by a Euromoney Institutional Investor Company and It delivers hard-to-get information on more than 80 emerging markets through its award-winning online Emerging Markets Information Service.)

Source: Bloomberg[15]

Accordingly, the benchmark cost of equity works out to: Rf + B (Rm – Rf) = 7.34% + 1.34 x 8.52%
Cost of Equity = 18.7%

Annex 2: PDD extracts of PA 1602

[15] The beta value used, are the regression betas calculated by Bloomberg based on periodic stock returns. Bloomberg also provides an adjusted beta value after making the following adjustments:
Adjusted Beta=Regression Beta (denoted as Raw beta) *(0.67) +1.00*(0.33)
Bloomberg states that this is a default adjustment on the assumption that in future, over a period of time all betas may tend towards the average beta i.e. one. The approach outlined in corporate finance states: the conventional approach to estimate the beta of an investment is a regression of return on investment against returns on a market index (please see attached page no. 196 from "Corporate Finance Theory and Practice by Aswath Damodaran as annex 9). Accordingly, the regression beta (and not the adjusted beta) value has been considered.

Equity Beta (βe) = Covariance (r, rm) / Variance (rm)
Where:
r is the return from the equity investment in a single stock
rm is the return from the equity investment in the well-diversified market portfolio[5]

Conventionally, the asset beta which represents the power industry beta co-efficient is levered as per the capital structure of the concerned project activity with the help of the following formula:

$\beta\ ep = \beta a * \{1 + (1 - T)*(D / E)\}$

Where:
βa is the Asset beta or unlevered beta of the sector
βep is the Equity beta or levered beta of the project
T is the marginal tax-rate of the project
D / E is the debt-equity ratio of the project

However, since the present project has been financed entirely through promoter's equity, project parameters like the tax rate and the debt equity ratio will not affect the beta value. Therefore, the equity beta for the project would be equivalent to the asset beta i.e. 0.84 in this case ($\beta\ ep = \beta a$)[11].

On the basis of the values determined above, the equity risk premium was calculated as follows:

$E_p = (Er_m - r_f)\ ß_j = (17.93\% – 6.11\%)*0.84 = 9.97\%$

The cost of equity for the project was therefore, calculated as per the following:

$E\ (r_j) = 6.11\% + 9.97\% = 16.08\%$

Annex 3: Extracts from Text Book "Corporate Finance Theory & Practice" by Dr. Aswath Damodaran, New York University, Stern School of Business

204 CHAPTER SEVEN / ESTIMATING HURDLE RATES FOR FIRMS

Degree of Financial Leverage. Other things remaining equal, an increase in financial leverage will increase the beta of the equity in a firm. Intuitively, we would expect that the fixed interest payments on debt to result in high net income in good times and negative net income in bad times. Higher leverage increases the variance in net income and makes equity investment in the firm riskier. If all the firm's risk is borne by the stockholders (i e , the beta of debt is zero),[20] and debt has a tax benefit to the firm, then

$$\beta_L = \beta_u \left(1 + (1 - t)\left(\frac{D}{E}\right)\right)$$

where

β_L = Levered beta for equity in the firm

β_u = Unlevered beta of the firm (i e , the beta of the firm without any debt)

t = Corporate tax rate

$\frac{D}{E}$ = Debt/Equity Ratio

Intuitively, we expect that as leverage increases (as measured by the debt to equity ratio), equity investors bear increasing amounts of market risk in the firm, leading to higher betas. The tax factor in the equation captures the tax deductibility of interest payments.

The **unlevered beta** of a firm is determined by the types of businesses in which it operates and its operating leverage. It is often also called the **asset beta** because it is determined by the assets owned by the firm. Thus, the **levered beta,** which is also the beta for an equity investment in a firm, is determined both by the riskiness of the business it operates in and by the amount of financial leverage risk it has taken on.

Since financial leverage multiplies the underlying business risk, it stands to reason that firms that have high business risk should be reluctant to take on financial leverage. It is also expected that firms that operate in stable businesses should be much more willing to take on financial leverage. Utilities, for instance, have historically had high debt ratios but have not had high betas, mostly because their underlying businesses have been stable and fairly predictable.

In Practice 7.3: Effects of Leverage on Betas: Boeing

From the regression for the period from 1993 to 1998, Boeing had a historical beta of 0.96. Since this regression uses stock prices for Boeing over this period, we began by estimating the average debt/equity ratio between 1993 and 1998, using market values for debt and equity.

Average Debt/Equity Ratio between 1993 and 1998 = 17.88%

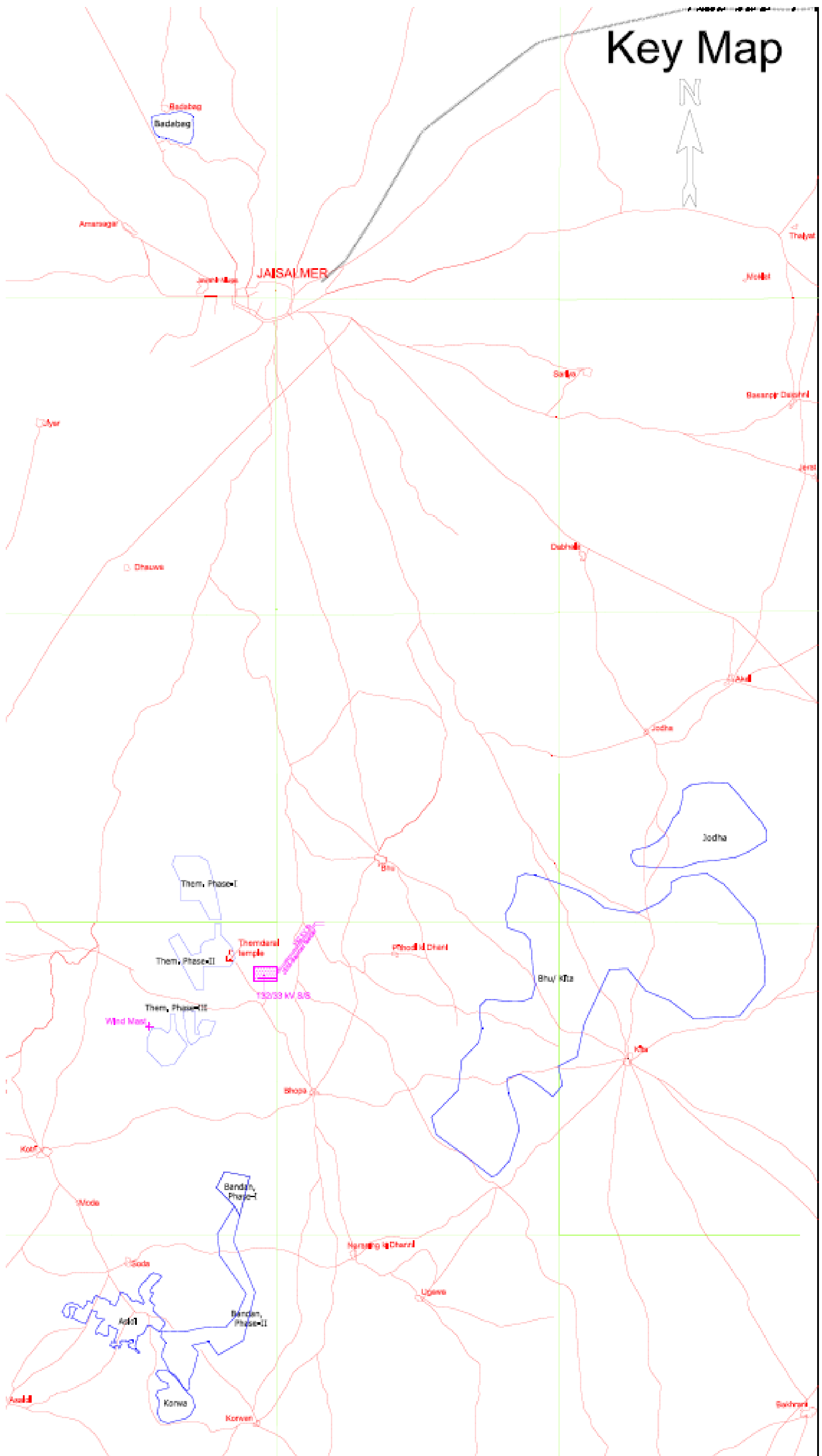
[20] This formula was originally developed by Hamada in 1972. One common modification is to ignore the tax effects and compute the levered beta as

$$\beta_L = \beta_u \left(1 + \frac{D}{E}\right)$$

If debt has market risk (i e , its beta is greater than zero), the original formula can be modified to take it into account. If the beta of debt is β_D, the beta of equity can be written as:

$$\beta_L = \beta_u \left[1 + (1 - t)\left(\frac{D}{E}\right)\right] - \beta_D (1 - t)\left(\frac{D}{E}\right)$$

Annex 4 – Location Map



ANNEX 5 – MINUTES OF STAKEHOLDER CONSULTATION MEETING

<table>
<tr><td></td><td colspan="2">Public Consultation Meeting for Wind Energy Projects at Clean Development Mechanism Project of WWIL. situated at Kita. Bhu, Sodabhandhan , Temderai(Phase I, PhaseII and PhaseIII), Asloi, Jodha, Korwa and Badabagh in Jaisalmer,Rajasthan
Jaisalmer, District Rajasthan, India
MINUTES OF THE MEETING</td></tr>
<tr><td></td><td>Venue: Gorbandh Palace, Jaisalmer</td><td>Date: 18 Sep 2006</td></tr>
<tr><td></td><td colspan="2">The people participated are the following:</td></tr>
<tr><td></td><td colspan="2">Representatives:</td></tr>
<tr><td></td><td colspan="2">Representatives from the Village:
Shri. Rahim Singh
Shri. Punam Singh
Shri Kishan Singh
The list of all other people from the villages is annexed.
Wind World (India) Limited:
Mr. Anupam Mathur
Mr. Rajendra Vyas
Mr. Rakesh Chhangani
Mr. Dilip Sharma
Mr. Neeraj Gupta
Aditya Environmental Services Pvt. Ltd.
Mr. Gurmeet Singh</td></tr>
<tr><td></td><td colspan="2">Mr. Anupam Mathur invited Mr. Punam Singh, Ex- Sarpanch to chair the meeting.

The agenda of the meeting is fixed as follows:
Welcome
Description of the project details
Queries and responses from the proponent and the stakeholders
Vote of thanks

Welcome Address
Mr. Dilip Sharma, Security and Liasoning person from WWIL welcomed all the people who came to take part in the meeting. There were more than 20 people from all the villages that fall in the vicinity of the project sites.

Description of the Project Details.
The present stakeholder consultation is for 60 MW of Enercon Wind Farm Hindustan Limited and for 82.74 MW of the customer projects out of which 47.01 MW has been finalized and the rest 35.73 MW is in the process to be considered. Some the projects will also come up in addition to the finalised projects for CDM.
The Knowledge of the wind farm was communicated to the local people in the local language. The wind farm projects falls in the category of the renewable energy. The meaning of the renewable energy was explained. The sites where the projects are located have no commercial activity and is a waste land.
The best use of land is made through the project which otherwise was barren. Improved supply</td></tr>
</table>

	of electricity to the grid, and employment opportunities to local people. He explained function advantages of the windmill to the people. Self reliance on using renewable energy sources is observed in Jaisalmer. The comparison between the wind farm projects and other alternatives is drawn in order to convey the advantages that wind power possess over other alternatives. The sites are located near Badabagh, Sodabandhan, Korwa, Asloi, Bhu, Temderai (Phase I, Phase II and Phase III) and Kita. In addition several other support services augmented by WWIL to local people in terms of transportation, mid –day meals to school children, renovation of Temedarai temple etc. as its social community initiatives. **Speech by Mr. Punam Singh** The chairperson of the meeting briefed the advantages of the wind farm. The project has provided the employment opportunities to the local people as the result of which the income of the people have increased. He also praised WWIL for investing in district of Jaisalmer. **Mr. Rahim Singh (BHU Sarpanch)** The villagers in this part of the state are very backward but the times are changing with coming up of the wind farm projects of the WWIL. The project has provided the employment opportunities to the people. Security, drivers and labour people are selected among the local villagers.
	Mr. Gurmeet Singh, Aditya Environmental Services briefed the environmental benefits of wind power generation as compared to that of thermal power generation based on coal. Similarly, a briefing on GHG and its role in global warming / increasing temperatures on the earth was given. The benefits in terms of pollution free environment and safeguard to human health were also communicated to the stakeholders while comparing coal-based generation to wind based generation. The Government of Rajasthan is also encouraging the development of renewable energy. Summary on Kyoto Protocol and CDM were made available.

	The concerns, suggestions, opinions of the stakeholders have been specially invited. The participants expressed the queries as given below. The representatives from WWIL clarified them as given below.	
	Queries	**Responses**
1.	What are the benefits of the wind power projects the stakeholders have observed?	The project has provided the people with the employment opportunities. The project has given jobs and economic opportunities in terms of small shops and construction workers. The transportation facilities has improved and has increased their accessibility to the near by town.
2.	Has the project affected the grazing of local cattle?	No, the project does not affect the grazing by the cattle. WWIL does not use any kind for boundary wall to protect their machines and hence the accessibility of cattle to areas for grazing and drinking water is not affected.
3.	Has the project affected any migratory	The project does not fall under migratory patterns

	patterns of birds or fauna?	of the birds. The major birds migrating in the region, but away from project site are *" Gatta"*, *Tilor*, and *Solan*, which usually take their path away from the project site.
4.	Has the project affected the water availability? How far are the tube wells located from the site?	The project has improved the availability of water, which can also be accessed from project site. The tube wells are located at a distance of 3 Km from project site which the people daily access.
5.	During construction and erection has any incident of accident or damage occurred?	As to date no incidence of accident has occurred.
6.	Do WWIL take care of safety issues?	The WWIL takes care about the safety issues. Appropriate protocols are in place to take care of all the safety issues.
7.	Have you observed any noise disturbances from the project during construction and operation of the project has occurred by the local people?	No noise disturbances have been so far. Local inhabitation is far away from the project site.

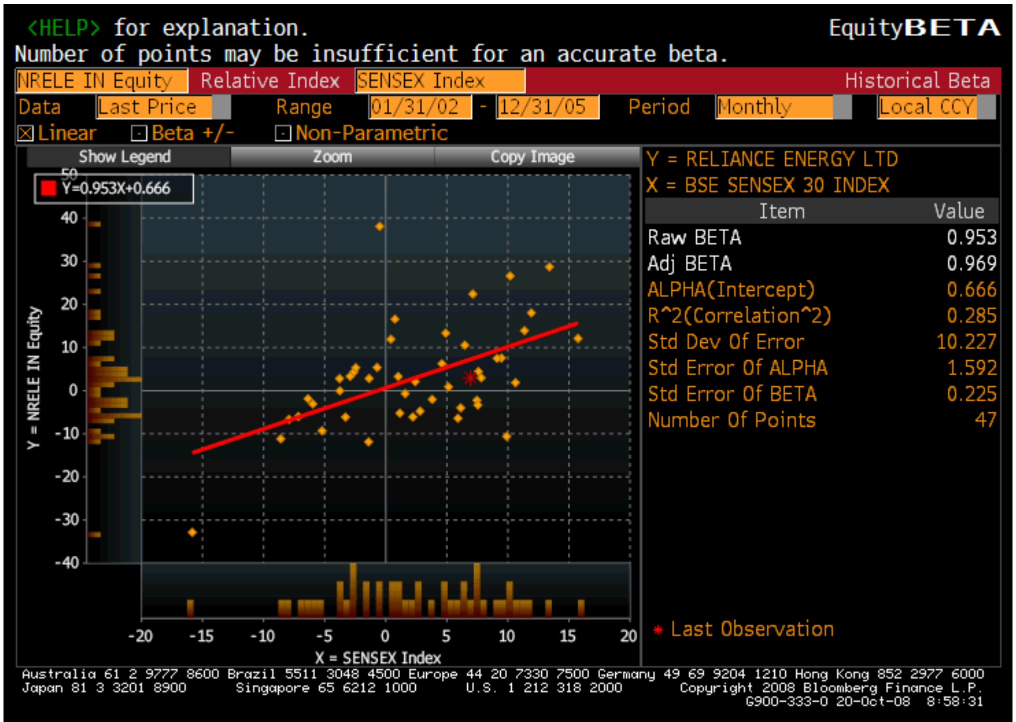
Women Representative

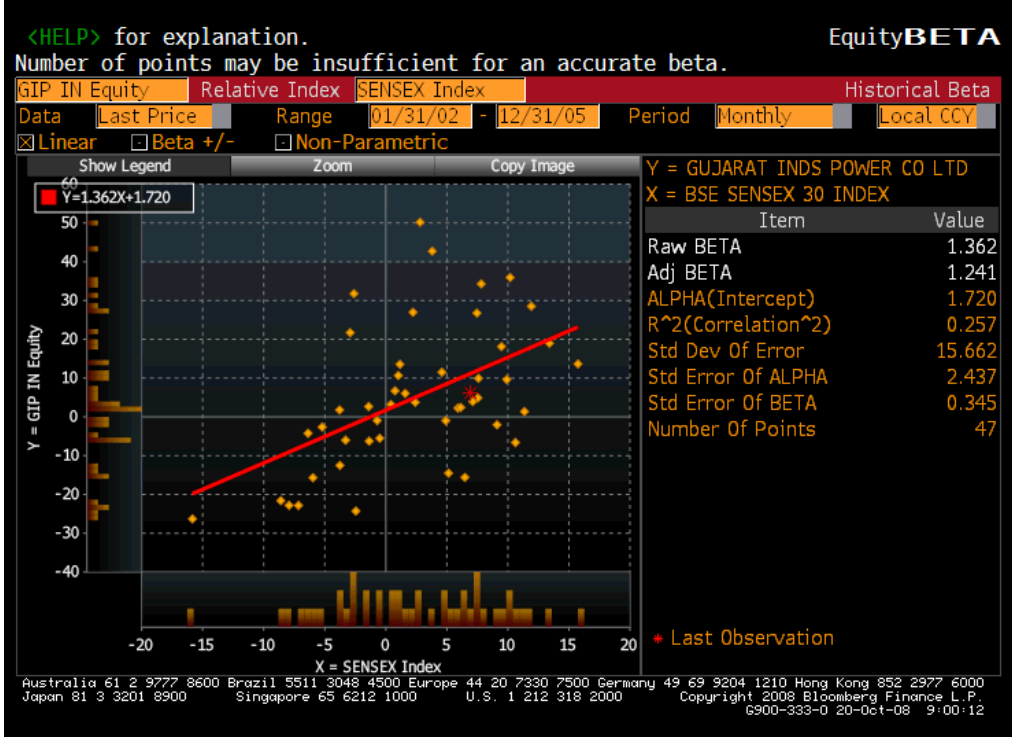
The women representative asked if school could be provided for the education of the children. The school can provide the much need education to the children. Also, women should be provided with the good opportunities.

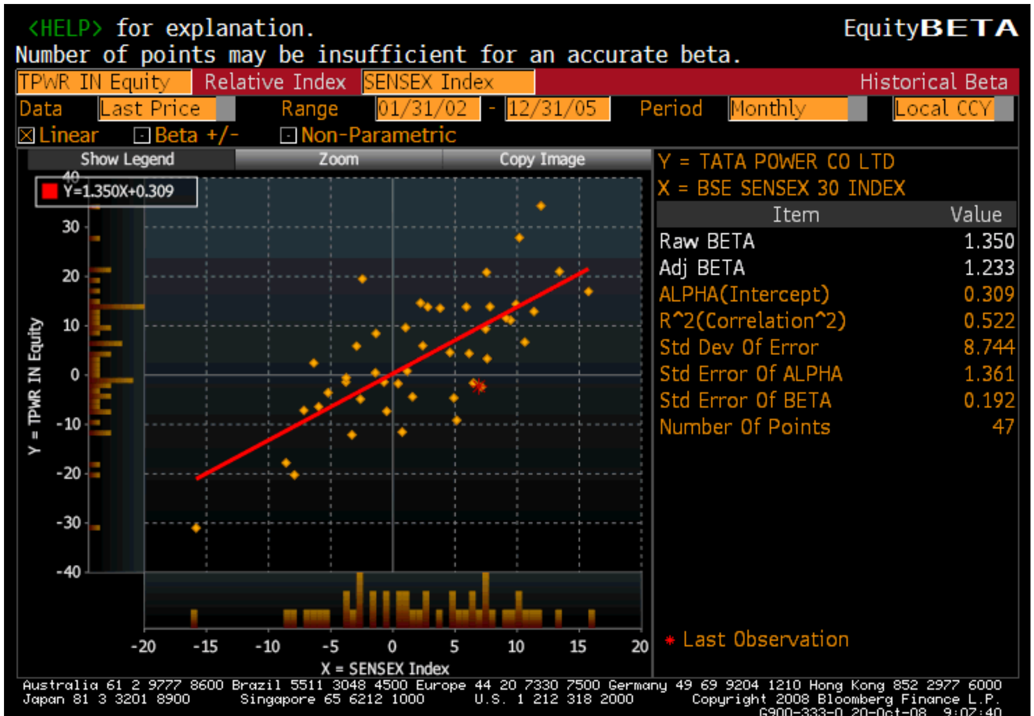
Vote of thanks

Mr. Dilip Sharma thanked all the people for sparing their time for this meeting and requested them to continue their support towards the projects of WWIL. The representatives of the villages and also the local population represented their happiness towards WWIL.

Annex 6: Bloomberg's Screenshots of Individual Companies for Beta Value






<HELP> for explanation.
EquityBETA
Number of points may be insufficient for an accurate beta.
TPWR IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
01/31/02
12/31/05
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Show Legend
Zoom
Copy Image
Y=1.350X+0.309
Y = TPWR IN Equity
X = SENSEX Index
Y = TATA POWER CO LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 1.350
Adj BETA 1.233
ALPHA(Intercept) 0.309
R^2(Correlation^2) 0.522
Std Dev Of Error 8.744
Std Error Of ALPHA 1.361
Std Error Of BETA 0.192
Number Of Points 47
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 2008 Bloomberg Finance L.P.
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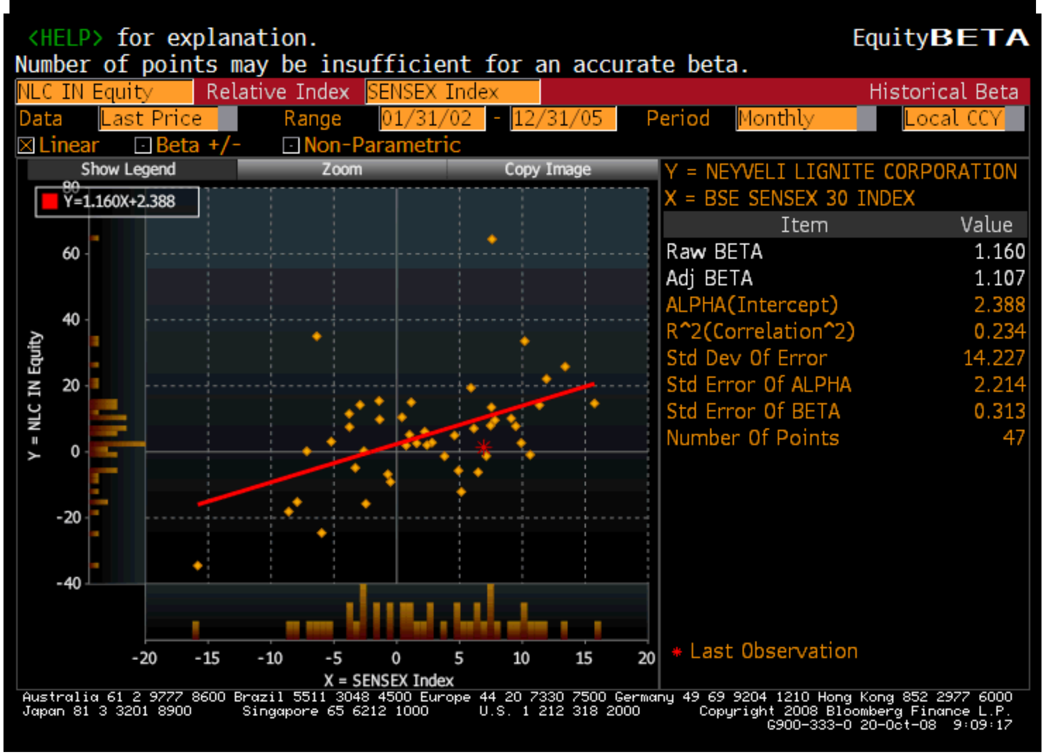
<HELP> for explanation.
EquityBETA
Number of points may be insufficient for an accurate beta.
NLC IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
01/31/02
12/31/05
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Show Legend
Zoom
Copy Image
Y=1.160X+2.388
Y = NLC IN Equity
X = SENSEX Index
Y = NEYVELI LIGNITE CORPORATION
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 1.160
Adj BETA 1.107
ALPHA(Intercept) 2.388
R^2(Correlation^2) 0.234
Std Dev Of Error 14.227
Std Error Of ALPHA 2.214
Std Error Of BETA 0.313
Number Of Points 47
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 2008 Bloomberg Finance L.P.
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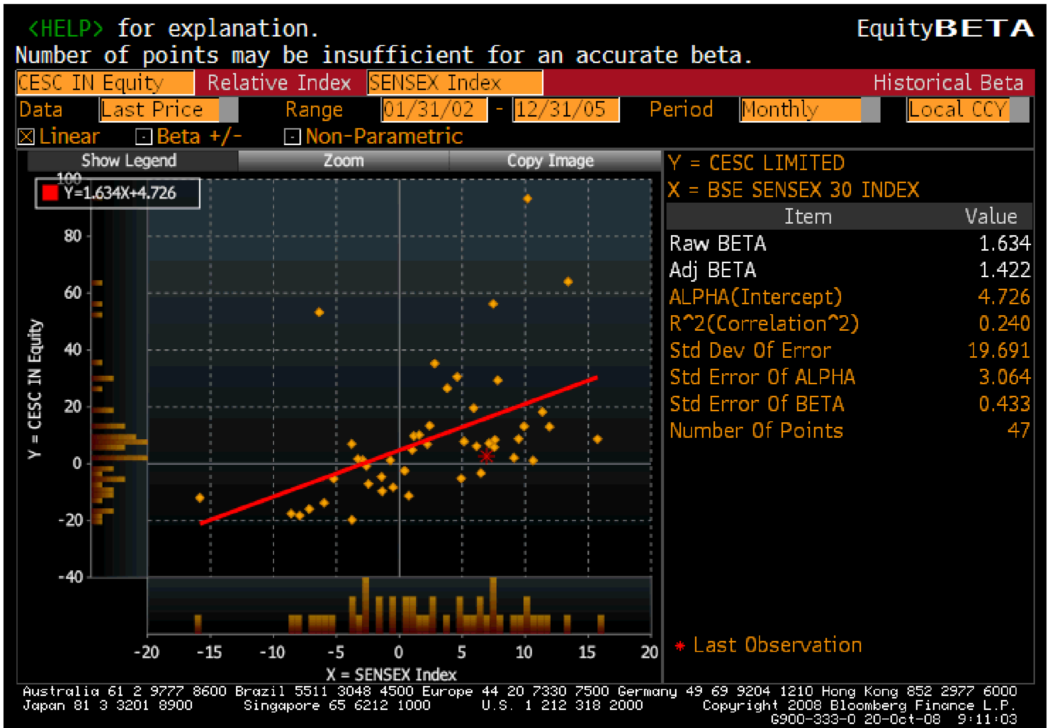
<HELP> for explanation.
EquityBETA
Number of points may be insufficient for an accurate beta.
CESC IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
01/31/02 - 12/31/05
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Show Legend
Zoom
Copy Image
Y=1.634X+4.726
Y = CESC IN Equity
X = SENSEX Index
Y = CESC LIMITED
X = BSE SENSEX 30 INDEX
Item Value
Raw BETA 1.634
Adj BETA 1.422
ALPHA(Intercept) 4.726
R^2(Correlation^2) 0.240
Std Dev Of Error 19.691
Std Error Of ALPHA 3.064
Std Error Of BETA 0.433
Number Of Points 47
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 2008 Bloomberg Finance L.P.
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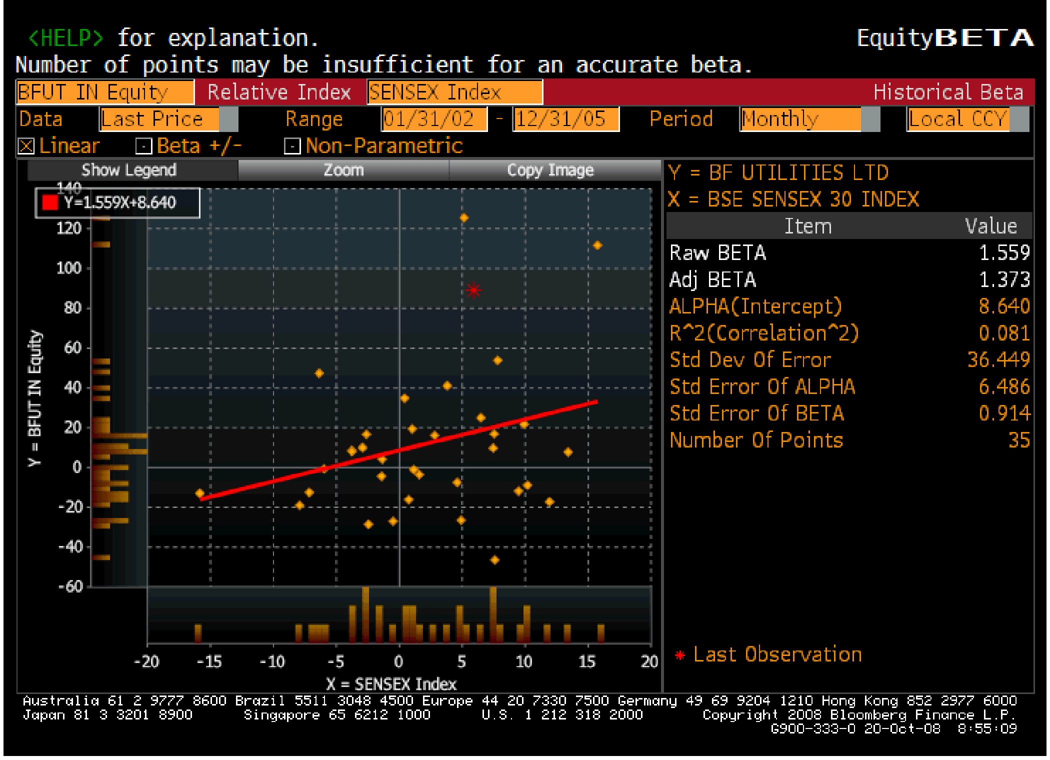

<HELP> for explanation.
EquityBETA
Number of points may be insufficient for an accurate beta.
BFUT IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
01/31/02 - 12/31/05
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Show Legend
Zoom
Copy Image
Y=1.559X+8.640
Y = BFUT IN Equity
X = SENSEX Index
Y = BF UTILITIES LTD
X = BSE SENSEX 30 INDEX
Item Value
Raw BETA 1.559
Adj BETA 1.373
ALPHA(Intercept) 8.640
R^2(Correlation^2) 0.081
Std Dev Of Error 36.449
Std Error Of ALPHA 6.486
Std Error Of BETA 0.914
Number Of Points 35
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 2008 Bloomberg Finance L.P.
G900-333-0 20-Oct-08 8:55:09

Annex 7: Page 190 of text book on "Corporate Finance Theory and Practice"

- If no such securities exist in the market in which you are attempting to estimate a real riskless rate, it can be approximated by the long-term real growth rate of the economy. Thus, the real riskless rate in China may be set equal to 6% because that is what you expect the long-term real growth rate in the Chinese economy to be. It will be much lower (2–3%) for more mature, slower growth economies.

Risk Premium

The risk premium is a significant input in all the asset pricing models. In the following section, we begin by examining the fundamental determinants of risk premiums and then look at practical approaches to estimating these premiums.

What Is the Risk Premium Supposed to Measure? The risk premium measures the "extra return" that would be demanded by investors for shifting their money from a riskless investment to an average risk investment. It should be a function of how risk-averse investors are and how risky they perceive stocks (and other risky investments) to be, relative to a riskless investment. Because each investor in a market is likely to have a different assessment of an acceptable premium, the premium will be a weighted average of these individual premiums, where the weights will be based on the wealth the investor brings to the market. Investors with more wealth, like Warren Buffett, will therefore have their risk premiums weighted more than investors with less wealth.

✔ *CQ 7.1:* **Assume that stocks are the only risky assets and that you are offered two investment options. One is a riskless investment on which you can make 6.7%, and the other is a stock mutual fund. How much more than 6.7% would you need to be offered, on an expected basis, to pick the latter? Would you ever settle for less than 6.7%?**

Estimating Risk Premiums We look now at two ways to estimate the risk premium in the capital asset pricing model. One is to look at the past and estimate the premium earned by risky investments (stocks) over riskless investments (government bonds); this is called the **historical premium.** The other is to use the premium extracted by looking at how markets price risky assets today; this is called an **implied premium.**

Historical Risk Premiums. The most common approach to estimating the risk premium is to base it on historical data. In the arbitrage pricing model and multifactor models, the raw data on which the premiums are based are historical data on asset prices over very long time periods. In the CAPM, the premium is estimated by looking at the difference between average returns on stocks and average returns on riskless securities over an extended period of history.

In most cases, we follow these steps to find historical risk premiums. First, we define a time period for the estimation, which can range as far back as 1926 for U.S. data.[4] Then, we calculate the average returns on stocks and average returns on a riskless security over the period. Finally, we calculate the difference between the returns

[4] The most widely used database, from Ibbotson Associates, has returns going back to 1926. Jeremy Siegel at Wharton recently presented data going back to the early 1800s.

Annex 8: Page 191 of text book on "Corporate Finance Theory and Practice"

on stocks and the riskless return and use it as a risk premium to predict future returns. When we use historical premiums, we implicitly assume that the risk aversion of investors has not changed across time and that the relative riskiness of the risky portfolio (stocks) has not changed over time either.

In calculating the average returns over past periods, a measurement question arises: Should we use arithmetic or geometric averages to compute the risk premium? The arithmetic mean is the average of the annual returns for the period under consideration, whereas the geometric mean is the compounded annual return over the same period. The following example demonstrates the difference.

Year	*Price*	*Return*
0	$50	
1	100	100%
2	60	–40%

The arithmetic average return over the two years is 30%, while the geometric average is only 9.54% ($1.2^{0.5} - 1 = 1.0954$). Those who use the arithmetic average premium argue that it is much more consistent with the framework[5] of the CAPM and a better predictor of the risk premium in the next period. The geometric mean is justified on the grounds that it takes into account compounding and that it is a better predictor of the average premium in the long term. There can be substantial differences in risk premiums based on the choices made at this stage, as illustrated in Table 7.1. The data in the table are based on historical data on stock, treasury bill, and treasury bond returns and provide estimates of historical risk premiums. As you can see, the historical premiums can vary widely depending on whether we go back to 1926, 1962, or 1981, whether we use T. Bills or T. Bonds as the riskless rate, and whether we use arithmetic or geometric average premiums.[6] Although it is impossible to prove one premium right and the others wrong, we are biased toward

- *Longer term premiums,* since stock returns are volatile and shorter time periods can provide premiums with large standard errors. For instance, the premium extracted from 25 years of data will have a standard error[7] of about 4 to 5%.
- *Long-term bond rates as riskless rates,* since our time horizons in corporate financial analysis tend to be long term, and we use the treasury bond rate as our riskless rate.
- *Geometric average premiums,* since arithmetic average premiums overstate the expected returns over long periods.[8] The geometric mean yields lower premium

---

[5] The CAPM is built on the premise of expected returns being averages and risk being measured with variance. Since the variance is estimated around the arithmetic average, and not the geometric average, it may seem logical to stay with arithmetic averages to estimate risk premiums.

[6] Booth (1999) examines both nominal and real equity risk premiums from 1871 to 1997. Although the nominal equity returns have changed over time, he concludes that the real equity return has been about 9% over this period. He suggests adding the expected inflation rate to this number to estimate the expected return on equity.

[7] Assuming that returns in individual years are independent, the standard error of a 25-year estimate can be calculated by dividing the annual standard deviation in stock prices in the United States (about 25%) by the square root of the number of years ($\sqrt{25} = 5$), yielding a standard error of 5% (25%/5) in the estimate.

[8] When we look at markets like the United States that have survived for 70 years without significant breaks, we are looking at the exception. To provide a contrast, consider the other stock markets in which one could have invested in 1926; many of these markets did not survive, and an investor would have lost much of his or her wealth.

Annex 9: Page 196 of text book on "Corporate Finance Theory and Practice"

Betas

The second set of inputs that we need to put risk and return models into practice are the betas for investments. In the CAPM, the beta of an investment is the risk that the investment adds to a market portfolio. In the APM and multifactor model, the betas of the investment relative to each factor have to be measured. Three approaches are available for estimating these parameters. One is to use historical data on market prices for individual investments; the second is to estimate the betas from the fundamental characteristics of the investment; and the third is to use accounting data. We describe all three approaches in this section.

Historical Market Betas The conventional approach to estimating the beta of an investment is a regression of returns on the investment against returns on a market index. For firms that have been publicly traded for a length of time, it is relatively straightforward to estimate returns that an investor would have made by investing in the firm's stock each interval (such as a week or a month) over that period. In theory, these stock returns on the assets should be related to returns on a market portfolio, that is, a portfolio that includes all traded assets, to estimate the betas of the assets. In practice, we tend to use a stock index, such as the S&P 500, as a proxy for the market portfolio, and we estimate betas for stocks against the index.

The standard procedure for estimating betas is to regress stock returns (R_j) against market returns (R_m).

$$R_j = a + bR_m$$

where

a = Intercept from the regression

$$b = \text{Slope of the regression} = \frac{\text{Covariance}\ (R_j, R_m)}{\sigma^2_m}$$

The *slope* of the regression corresponds to the beta of the stock and measures the riskiness of the stock.

The *intercept* of the regression provides a simple measure of performance of the investment during the period of the regression, when returns are measured against the expected returns from the capital asset pricing model. To see why, consider the following rearrangement of the capital asset pricing model:

$$R_j = R_f + \beta\ (R_m - R_f)$$
$$= R_f\ (1 - \beta) + \beta\ R_m$$

Compare this formulation of the return on an investment to the return equation from the regression:

$$R_j = a + bR_m$$

Thus, a comparison of the intercept (a) to $R_f\ (1 - \beta)$ should provide a measure of the stock's performance, at least relative to the capital asset pricing model.[14] In summary, then:

[14] The regression is sometimes calculated using returns in excess of the riskless rate, for both the stock and the market. In that case, the intercept of the regression should be zero if the actual returns equal the expected returns from the CAPM, greater than zero if the stock does better than expected, and less than zero if it does worse than expected.

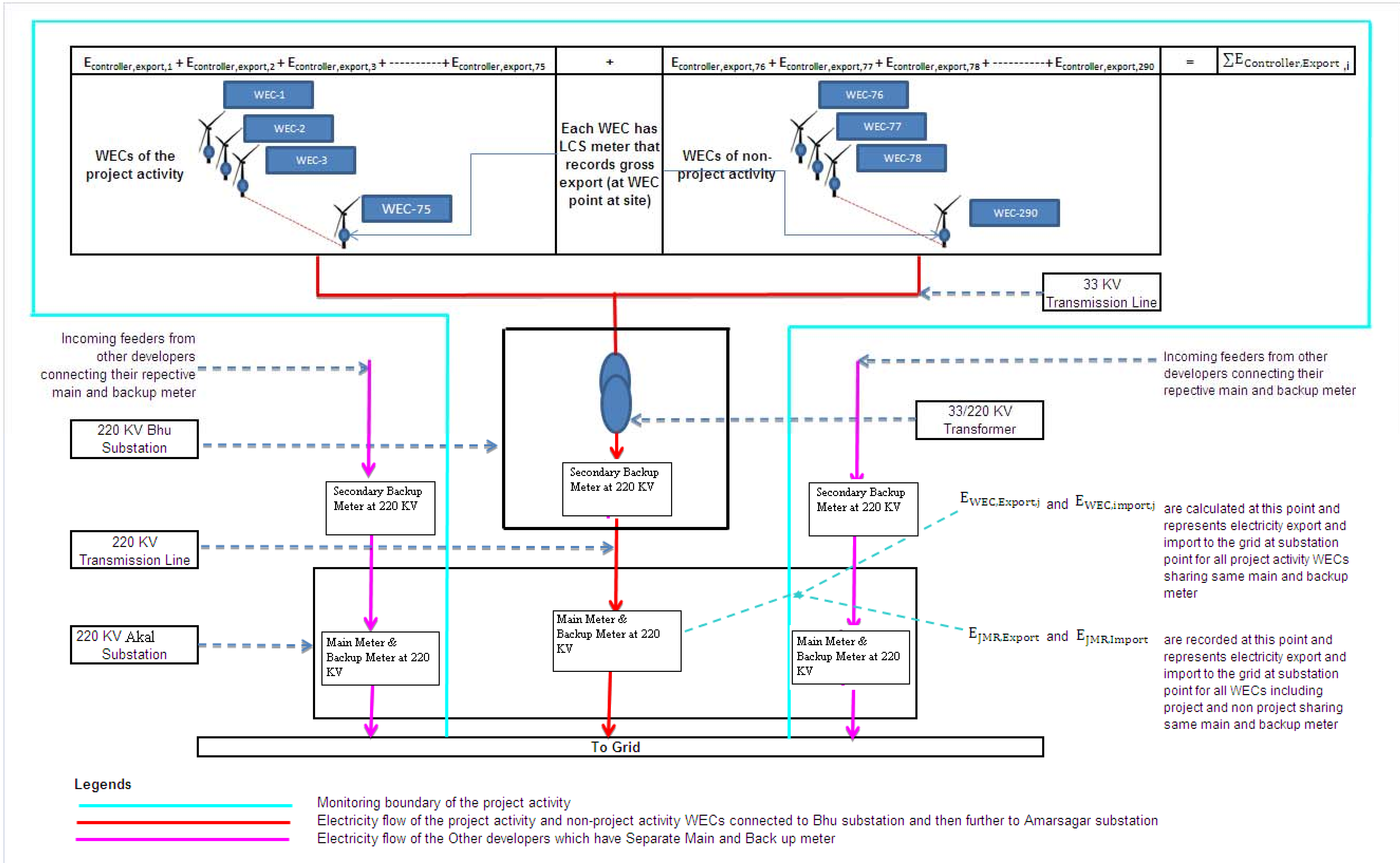
Annex 10

S. No	EWHPL UNIQUE ID	Loc No	Latitude			Longitude		
			Deg.	Minute	Second	Deg.	Minute	Second
1	EWHPL 01	322	26	40	47.5	70	58	58.2
2	EWHPL 02	323	26	40	55.3	70	58	54.6
3	EWHPL 03	145	26	41	2.5	70	58	49.5
4	EWHPL 04	146	26	41	7.7	70	58	43.9
5	EWHPL 05	147	26	41	12.8	70	58	38.4
6	EWHPL 06	148	26	41	18	70	58	32.8
7	EWHPL 07	150	26	41	27	70	58	48.3
8	EWHPL 08	151	26	41	32.1	70	58	42.7
9	EWHPL 09	152	26	41	37.3	70	58	37.2
10	EWHPL 10	153	26	41	38.5	70	59	8.6
11	EWHPL 11	154	26	41	43.6	70	59	3.1
12	EWHPL 12	155	26	41	48	70	58	57.5
13	EWHPL 13	156	26	41	54.1	70	58	52.1
14	EWHPL 14	157	26	41	56.6	70	58	41.5
15	EWHPL 15	307	26	42	12	70	58	24.8
16	EWHPL16	306	26	42	17.2	70	58	19.3
17	EWHPL 17	300	26	42	47.4	70	58	24.4
18	EWHPL 18	301	26	42	43.9	70	58	30.7
19	EWHPL 19	304	26	42	26.8	70	58	46.6
20	EWHPL 20	305	26	42	21.7	70	58	52.2
21	EWHPL 21	161	26	42	16.5	70	58	57.7
22	EWHPL 22	160	26	42	9	70	59	2.2
23	EWHPL 23	159	26	42	1.3	70	59	6.7
24	EWHPL 24	324	26	42	5.7	70	59	23.9
25	EWHPL 25	167	26	42	38.3	70	59	0.2
26	EWHPL 26	168	26	42	42.9	70	58	56.3
27	EWHPL 27	169	26	42	49.6	70	58	54.4
28	EWHPL 28	170	26	42	56.5	70	58	52.7
29	EWHPL 29	326	26	43	22.4	70	58	50.2
30	EWHPL 30	177	26	42	54.5	70	59	29.3
31	EWHPL 31	178	26	42	49.4	70	59	34.9
32	EWHPL 32	179	26	42	44.2	70	59	40.5

33	EWHPL 33	181	26	42	32.2	70	59	50.9
34	EWHPL 34	183	26	42	59	70	59	50.6
35	EWHPL 35	184	26	43	5.8	70	59	45.8
36	EWHPL 36	186	26	43	17.8	70	59	35.4
37	EWHPL 37	190	26	43	25.1	70	59	50.1
38	EWHPL 38	191	26	43	18.3	70	59	54.9
39	EWHPL 39	192	26	43	13.2	71	0	0.5
40	EWHPL 40	193	26	43	8	71	0	6.1
41	EWHPL 41	194	26	43	2.9	71	0	11.6
42	EWHPL 43	218	26	45	31.3	71	0	32
43	EWHPL 42	219	26	45	17.2	71	0	23.1
44	EWHPL 44	220	26	44	52.6	71	0	38.2
45	EWHPL 45	221	26	44	52.5	71	0	47.2
46	EWHPL 46	222	26	44	45.9	71	0	55.9
47	EWHPL 47	223	26	44	56.1	71	1	5.4
48	EWHPL 48	224	26	45	1.9	71	1	16.3
49	EWHPL 49	225	26	44	43.9	71	1	23
50	EWHPL 50	226	26	44	38.8	71	1	35.9
51	EWHPL 51	230	26	44	24.9	71	1	55.5
52	EWHPL 52	232	26	44	19.9	71	2	1.7
53	EWHPL 53	233	26	44	14.1	71	2	7.3
54	EWHPL 54	329	26	44	30.1	71	2	16
55	EWHPL 55	234	26	44	20.5	71	2	27.9
56	EWHPL 56	236	26	43	57.4	71	2	22.2
57	EWHPL 57	237	26	43	55.8	71	2	30.9
58	EWHPL 58	238	26	43	56.9	71	2	39.7
59	EWHPL 59	328	26	44	8.9	71	2	56.5
60	EWHPL 60	241	26	43	58.7	71	2	59.9
61	EWHPL 61	242	26	43	51.8	71	3	5.1
62	EWHPL 62	245	26	44	30.5	71	3	32.5
63	EWHPL 63	246	26	44	32.5	71	3	22.5
64	EWHPL 64	249	26	45	9.4	71	3	14.1
65	EWHP 65	302	26	44	51.4	71	2	56.1
66	EWHPL 66	250	26	44	58.1	71	2	52.3
67	EWHPL 67	251	26	45	0.4	71	2	44.6
68	EWHPL 68	252	26	45	0.8	71	2	32.4

69	EWHPL 69	253	26	45	4.3	71	2	25.6
70	EWHPL 70	254	26	45	14.2	71	2	15.9
71	EWHPL 71	256	26	45	23.8	71	2	25.8
72	EWHPL 72	257	26	45	39.3	71	2	47.5
73	EWHPL 73	258	26	45	42.8	71	2	37.2
74	EWHPL 74	259	26	45	46.6	71	2	26.5
75	EWHPL 75	260	26	45	48.3	71	2	18.7

Annex 11: Flow diagram representing WECs connection to Akal and Bhu substation sharing same main and backup meter as on date (29 November **2011)**



Annex 12: List of customers connected to Akal and Bhu substation sharing same main and backup meter as on date (29 November 2011)

Investors Name	Capacity (Mw)	No. Of Machines
Mahanagar developers	4	5
Enercon wind farms (hindustan) pvt. Ltd.	28.8	36
Enercon wind farms (hindustan) pvt. Ltd.	31.2	39
signet overseas ltd.	1.6	2
Wires and fabriks	0.8	1
Gemscab industries ltd.	0.8	1
Param capital research pvt. Ltd.	2.4	3
Texonic instruments	0.8	1
Manjeet cotton pvt. Ltd.	1.6	2
Bharat timber & construction company	0.8	1
Om horizon infrastructure	0.8	1
Jsons foundry pvt. Ltd.	0.8	1
Western precicast pvt. Ltd.	0.8	1
Suttatti enterprises ltd.	0.8	1
Shalimar hotel pvt. Ltd	0.8	1
Agro solvent products pvt. Ltd.	3.2	4
Consolidated energy consultants ltd.	0.8	1
Darshana industries pvt. Ltd.	0.8	1
Kshetrapal enterprises	0.8	1
Agarwal packaging pvt. Ltd.	0.8	1
Sahyadri industries ltd.	3.2	4
Sanjana power (division of sanjana cryogenic storages ltd.)	2.4	3
Purushottam lohia	0.8	1
Prachar energy (a unit of prachar communications ltd.)	1.6	2
Rahul dravid	0.8	1
Sabarmati construction co.	0.8	1
Swaraj p.v.c. pipes pvt. Ltd.	0.8	1
Kohinoor planet constructions pvt. Ltd.	24	30
Gangadhar narsinghdas agrawal	4	5
Il&fs energy development company limited	9.6	12
Il&fs energy development company limited	12.8	16
Agarwal coal corporation	1.6	2

Param capital research pvt. Ltd.	1.6	2
Cepco industries pvt. Ltd.	2.4	3
Cepco industries pvt. Ltd.	4	5
Emkay taps & cutting tools pvt. Ltd.	1.6	2
Pravin masalewale	0.8	1
Agarwal enterprises	0.8	1
Kandoi eco energy	0.8	1
Nakoda machinery pvt. Ltd.	1.6	2
Bothara agro equipments pvt. Ltd.	0.8	1
Zenith press pvt. Ltd.	0.8	1
F. C. Properties & developers pvt. Ltd.	0.8	1
Sankalp international	0.8	1
Panama business centre	0.8	1
Rahul dravid	0.8	1
Kishco ltd.	0.8	1
Vishal nirmiti pvt. Ltd.	2.4	3
Cepco industries pvt. Ltd.	6.4	8
Ferromar shipping private limited	0.8	1
Il&fs energy development company limited	16	20
Vish wind infrastructure llp	4	5
Diamonds 'r' us	2.4	3
Neeshal merchandising pvt. Ltd.	2.4	3
Stellar diamond	2.4	3
Solar exports	2.4	3
G. Amphray laboratories	1.6	2
Kshetrapal enterprises	0.8	1
Cepco industries ltd.	4	5
Vivek pharmachem (india) limited	0.8	1
Suttatti enterprises ltd.	0.8	1
Balaji industrial products ltd.	0.8	1
Green lifestyles developers pvt. Ltd.	0.8	1
Eminence equipments pvt. Ltd.	0.8	1
Specialise instruments marketing company	0.8	1
Harinagar sugar mills limited	0.8	1
Suboneyo chemicals & pharmaceuticals pvt. Ltd.	0.8	1
Dr. Santosh prabhu	0.8	1

Mr. Vinod g. Vora	0.8	1
Shree chlorates (prop : zenith electrochem pvt. Ltd.)	0.8	1
Mr. Kanti n. Gada	0.8	1
Gee cee ventures ltd.	1.6	2
Cepco industries pvt. Ltd.	0.8	1
Vish wind infrastructure llp - i	4.8	6
Vish wind infrastructure llp - ii	4.8	6
Total	**232**	**290**

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03	EB 25, Annex 15 26 July 2006	
02	EB 14, Annex 06b 14 June 2004	
01	EB 05, Paragraph 12 03 August 2002	Initial adoption.
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