Voluntary Carbon Standard
Project Description Template

19 November 2007

11th November 2009
Version-02

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1 Description of Project:

1.1 Project title

12.55 MW Wind Power Project in India

This is a grouped project as the number of projects and their related methodologies are included in a single VCS project description.

Date: 11/08/2009
Version: 01

1.2 Type/Category of the project

The 12.55 MW wind power project falls under the following category:

Type : I- Renewable Energy Project (small scale)

Category: D-Grid Connected Renewable Energy Generation
(Version-14)

This project category is a part of Clean Development Mechanism that has been approved by VCS Board. The title of the VCS program approved CDM Methodology is Version 14 of small scale methodology, AMS-I.D "Grid Connected Renewable Electricity Generation1".

1.3 Estimated amount of emission reductions over the crediting period including project size:

The annual emission reductions achieved by the project activity are 4182tons of CO_2/annum in NEWNE grid and 25398 tons of CO_2/annum in southern grid. According to the VCS approved CDM methodology, the renewable energy project activities with a maximum output capacity up to 15 megawatts is considered a small scale project activity. Hence the 12.55 MW wind power project falls under the category of small scale projects.

Year	NEWNE Grid	Southern Grid
1	355	5246
2	4182	25398
3	4182	25398
4	4182	25398
5	4182	25398
6	4182	25398
7	4182	25398

1 http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PHPV5WESACMBTJ2YY54GAJYSIEI3HD

8	4182	25398
9	4182	25398
10	4182	25398
Total	41820	253980
Grand Total	271825	

1.4 A brief description of the project:

Purpose of project activity:

The main purpose of the project activity is to generate clean electricity using wind energy. The project activity consists of a group of wind turbine generators (WTGs) for a total installed capacity of 12.55 MW, installed by Walden Properties Pvt. Ltd. (WPPL), the contact details of which is provided in Annex 1. Approximately 27395 MWh of power generated from this clean energy source will be exported to the southern grid per annum and approximately 4615 MWh of power will be exported to NEWNE per annum. The electricity generated from the WTGs is connected to the state electricity grids of Tamil Nadu, Karnataka and Maharashtra.

The project activity comprises of the following machines:
1. Vestas V82 – 1.65 MW
2. Suzlon S82 - 1.5 MW & 1.25 MW and
3. Sriram EPC – 0.25 MW

The project consists of 12 numbers of WTGs of the following capacities:

1650 kW capacity - 2 Numbers
1500 kW capacity - 3 Numbers
1250 kW capacity - 3 Numbers and
250 kW capacity - 4 Numbers

The generated electricity will be transmitted through a 33 kV transmission line to the nearest substation. The turbines used are certified and manufactured according to International Standards.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

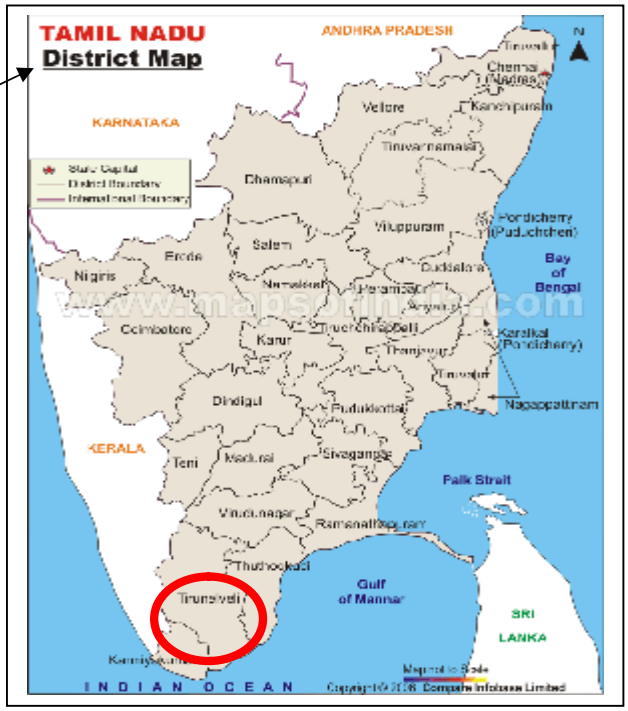
WPPL has established wind farms with the electricity generation capacity of 12.55 MW.

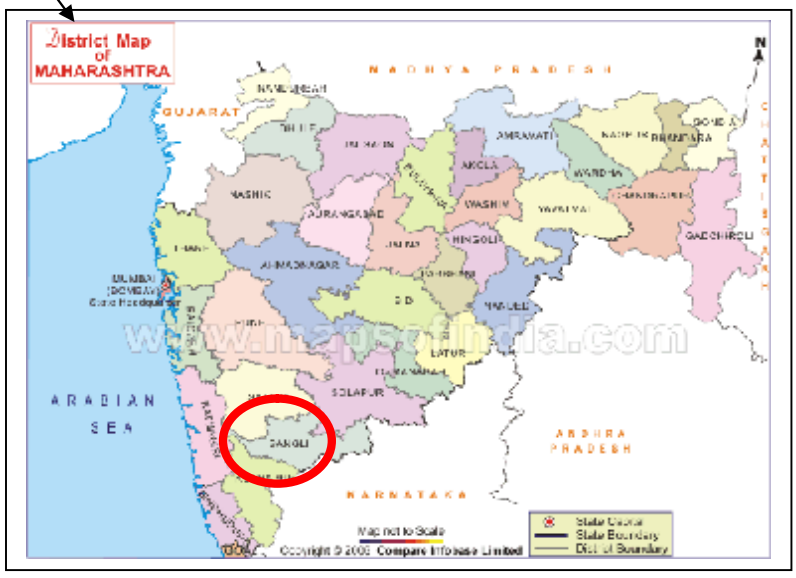
The location of each of the 12 WTGs installed under the project activity is given in the table below.

Details of WTGs in states of Tamil Nadu, Karnataka & Maharashtra

Capacity	Village	District	State	Latitude	Longitude	HT Sc. No.	Service provider
3.00 MW (1.5 x 2)	Udayathoor	Tirunelveli	Tamilnadu	8.44 N	77.44 E	2095 2108	Suzlon Energy Ltd
3.75 MW (1.25 x 3)	Devarakulam	Tirunelveli	Tamilnadu	8.44 N	77.44 E	2234 2235 2236	Suzlon Energy Ltd
1.00 MW (0.25 x 4)	Nettur	Tirunelveli	Tamilnadu	8.54 N	77.30 E	1988	Shriram EPC
1.50 MW	Rangapurakavalu	Hassan	Karnataka	12.51 N	76.13 E	HT/03	Suzlon Energy Ltd
1.65 MW	Thimmapanagutta	Belgaum	Karnataka	16.20 N	74.30 E	7022990	Vestas Wind technology (India) private Limited
1.65 MW	Gude Panchagani	Sangli	Maharashtra	17.07 N	73.59 E	46092	Vestas Wind technology (India) private Limited

The Details of Location are given below





1.6 Duration of the project activity/crediting period:

As per the VCS guidelines[2], the start date of the project activity is the date on which the project has begun reducing GHG emissions.

The project was commissioned in October 2006 and the lifetime of the project activity will be for 20 years. As per the VCS 2007.1 guidelines, the project is eligible to avail revenues from VCS from the latest date among the commissioning date and from 28th March 2006 as per the VCS-guidelines. The first two WTGs (1500 KW WTGs-2 in number) were commissioned in Udyathoor, Tamil Nadu on 25th October 2006.

The Purchase Order dates and commissioning dates of the WTGs forming a part of the project activity are mentioned below in the given table as follows:

State of Location	Place	HT Sc. No.	Capacity	Commissioning Dates	Purchase Order Dates
Tamil Nadu	Udyathoor	2095	1.5MW	25/9/2006	26/07/06
		2108	1.5MW	25/9/2006	26/07/06
Tamil Nadu	Devarakulam	2234	1.25 MW	31/03/2007	21/12/2006
		2235	1.25 MW	31/03/2007	21/12/2006
		2236	1.25 MW	31/03/2007	21/12/2006
Tamil Nadu	Keelaveranam	1988	1MW	30/6/2006	7/8/2006
Karnataka	Thimmapanagutta	HT/03	1.65 MW	30/6/2006	8/1/2007
Karnataka	Hassan	7022990	1.5MW	31/3/2007	21/12/2006
Maharasthra	Gude Panchagani	46092	1.65 MW	1/3/2007	22/12/2006

Hence the crediting period for the project activity would start from 25th October 2006 and end on 25th October 2016.

1.7 Conditions prior to project initiation:

The break-up of installed power generation capacity on 31/03/2006[3] as provided by CEA in the NEWNE grid & Southern grid is provided in Annex 3.

The CEA database (2005-06) shows that the share of wind power is 1293.2 MW & 3140.70 MW in NEWNE grid & southern grid compared to thermal power generation of 62044.22 MW & 20366 MW in the respective grids.

[2] http://www.v-c-s.org/docs/Voluntary%20Carbon%20Standard%202007_1.pdf
[3] http://cea.nic.in/about_us/Annual%20Report/2005-06/CEA%20AR%202006%20Final.pdf

From this it can be understood that the baseline grids i.e. (NEWNE grid & Southern grid) are dominated by fossil fuel fired power plants.

The project comprises of renewable wind energy generation units which supply electricity to the connected grids that are dominated by the fossil fuel fired power plants. The electricity generated from the windmills installed by WPPL thus replaces the electricity generated by fossil fuel. The baseline for the project activity will be usage of fossil fuels for generation of equivalent amount of electricity.

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

The project proponent has promoted the renewable wind power project as it is environment friendly and sustainable in nature. As the project is connected to the NEWNE Grid, it displaces an equivalent amount of power supplied to the grid by other GHG intensive sources and thus also causes mitigation of equivalent amount of greenhouse gas emissions.

1.9 Project technologies, products, services and the expected level of activity:

Project comprises of Vestas V82 – 1.65 MW, Suzlon S82 - 1.5 MW, Suzlon S66 - 1.25 MW and Shriram EPC – 0.25 MW Wind Turbine Generators (WTG). The project consists of 1650 kW (2 Nos), 1500 kW (3 Nos), 1250 kW (3 Nos) and 250 kW (4 Nos) capacity. The generated electricity will be transmitted through a transmission line to the nearest substation. The turbines used are certified and manufactured according to International Standards.

The technical specification of the WTGs is as follows:

Parameters	Vestas V82 – 1.65MW	Suzlon S82 – 1.5 MW	Suzlon S66 – 1.25 MW
Rotor Diameter (m)	82	82	66
Rotor Swept Area (m2)	5281	5281	3421
Rotor Speed (rpm)	14.4	15.6 – 18.4	13.8/20.7
Gear Type	Planetary / Helical gear	Planetary / Helical gear	Integrated 3 Stage 1 Planetary/2 Helical
Generator Type	Asynchronous	Single speed induction generator with slip rings, variable rotor resistance	Asynchronous 4/6

		via SUZLON-FLEXI-SLIP system	
Normal Voltage	690 V/ 50Hz	690 V/ 50Hz	690 V/ 50Hz
Normal Power	1650 kW	1500 kW	1250 kW

Project boundary of project activity is illustrated in the following diagram:

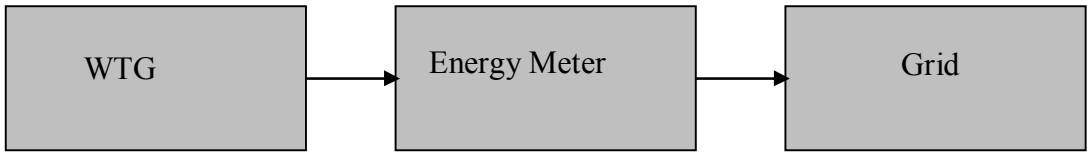


Figure: Project Boundary Diagram

1.10 Compliance with relevant local laws and regulations related to the project:

The project activity is compliant to the relevant local laws and regulations in the following ways:

It is not a prohibited activity, and permission to set up the same was obtained from the relevant local authorities like gram panchayat clearance etc.
The permission to commission the WTGs [4] was obtained from the concerned authorities, and an power purchase agreement was also signed with State Electricity Board (SEB), who is the sole buyer in the state as legally mandated for energy generated through renewable sources As per the latest notification[5] issued by the Ministry Environment and Forests (MoEF), Government of India, on projects requiring a mandatory Environmental Impact Assessment (EIA) to be conducted, wind energy projects are not included in the list. Hence, it does not require an EIA report for the same.

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

Technological Risk

The project activity faces significant income risks due to the fact that power generation from the project is heavily dependent on prevailing wind patterns, wind speed, etc. Any change in wind availability in the area can seriously affect the income from sale of power, thus seriously questioning the project's financial viability.

[4] Commissioning certificates of WTGs are provided to DOE
[5] http://envfor.nic.in/legis/eia/so1533.pdf

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The project is a Greenfield one and does not primarily create GHG emissions for the purpose of its subsequent removal. The project adds green power to the grid.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

The project does not possess any renewable energy certificates.

1.14 Project rejected under other GHG programs (if applicable):

The project has not been rejected under any other GHG trading program.

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

Operation & Maintenance Services: - The project proponent has signed an operation and maintenance agreement with the supplier of wind turbines i.e. M/s Suzlon Energy Limited, Vestas Wind Technology Private Limited & Shriram EPC. The performance of the turbines, safe operation and scheduled/breakdown maintenance is responsibility of M/s Suzlon Infrastructure Limited, Vestas Wind Technology Private Limited & Shriram EPC , and are organized and monitored by them.

Operation and maintenance labour work involves making available suitable manpower for operation and maintenance, cleaning and upkeep of the equipment including:-

1. Tower Torquing
2. Blade Cleaning
3. Nacelle Torquing & Cleaning
4. Transformer Oil Filtration
5. Site & Transformer Yard Maintenance

Management Services: - The responsibility for the tasks listed below is with Suzlon Energy, Vestas Wind Technology Private Limited & Shriram EPC.

1. Data logging in for power generation, grid availability, Machine availability.

2. Preparation & submission of monthly performance reports in agreed format.

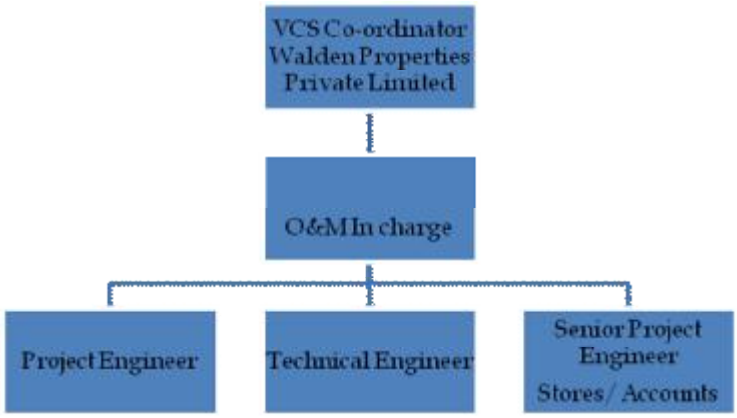
Technical Services: - The responsibility for the tasks listed below is with Suzlon Energy, Vestas Wind Technology Private Limited & Shriram EPC.

1. Visual inspection of WEGs and all parts.
2. Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services.

The VCS co-ordinator is responsible for following tasks:

1. Preparation of Project document.
2. Involvement in Validation & verification of project activity with the help of appointed consultant.
3. Preparation of Monitoring Report with the help of appointed consultant.
4. To pursue GHG emission reduction project.

The organizational hierarchy is shown below:-



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

Organization:	Walden Properties Pvt. Ltd.
Street/P.O.Box:	1009, Indu Fortune Fields, 13th Phase
Building:	KPHB
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500 072
Country:	India
Telephone:	+91-40-2378 0292
FAX:	+91-40-2378 0224
E-Mail:	
URL:	www.induprojects.com
Represented by:	
Title:	General Manager (Finance)
Salutation:	Mr.
Last Name:	Subash
Middle Name:	-
First Name:	B
Department:	-
Mobile:	+91-93467 46460
Direct FAX:	+91-40-2378 0224
Direct tel:	+91-40-2378 0292
Personal E-Mail:	Subash.b@induprojects.com

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

Project's contribution to sustainable development

The project has, since its inception, created an overall positive impact on the local area, contributing to its development in many ways:

1. As the project is located in the rural areas of the states, the project activity would lead to the development of the region either directly or indirectly. This project activity will result in infrastructural development of the region, leading to the rural development.

2. The project will create business opportunities for local stakeholders such as bankers, suppliers, manufacturers, contractors *etc.*

3. The project activity has provided employment opportunities for the local people during the construction and operation phase. Employment has also been generated by setting up of monitoring teams for the local skilled people simultaneously.

4. The project generates clean power. Consequently, no emissions result from the project, thus helping to protect the environment from harmful emissions (such as SO_2, NO_x etc.), as well as prevent greenhouse gas emissions altogether.

1.17 List of commercially sensitive information (if applicable):

None

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

The title of the VCS program approved CDM Methodology is Version 14 of small scale methodology, AMS-I.D "Grid Connected Renewable Electricity Generation[6]".

The aforementioned methodology has been utilized keeping in mind the fact that the project activity is a grid connected renewable energy generation effort.

The tool referenced in this methodology is titled "Tool to calculate the emission factor for an electricity system[7]" (Version 1.1).

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

As per the VCS program approved CDM methodology, the guidance for the approved small scale projects is given in Annex-II of "Simplified modalities and procedures for small scale clean development mechanism project activities" according to the decision 17/CP.7, paragraph 6(c).

The chosen small scale methodology AMS-I.D is applicable to the project activity as the project activity (12.55 MW) falls under Type I-Renewable Energy Projects as laid out in the Appendix B of the Simplified Modalities and Procedures (SMP) by the UNFCCC for small scale GHG abatement projects:

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6 http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PHPV5WESACMBTJ2YY54GAJYSIEI3HD

7 http://cdm.unfccc.int/Reference/tools/ls/meth_tool07_v01_1.pdf

As per Methodology	As per Project Activity
1. This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.	The project activity is a wind based power project of installed capacity of 12.55 MW that supplies electricity to the grid that would have been otherwise supplied by a fossil fuel fired generating unit.
2. If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.	The total capacity of the project activity is 12.55 MW.
3. Combined heat and power (co-generation) systems are not eligible under this category.	The project activity is not a cogeneration system. The project activity is a wind based power project with a generation capacity of 12.55 MW.
4. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	The project activity does not involve addition of renewable energy generation unit at an existing renewable power generation facility. The project activity is a wind based power project with generation capacity of 12.55 MW.
5. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.	The project activity does not seek to retrofit or modify an existing facility for renewable energy generation. The project activity is wind based power project with generation capacity of 12.55MW

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

	Source	Gas	Included?	Justification / Explanation
Baseline	Electricity generation, grid	CO_2	Included	Main Emission Source
		CH_4	Excluded	Excluded for Simplification. This is conservative
		N_2O	Excluded	Excluded for Simplification. This is conservative

	Source	Gas	Included?	Justification / Explanation
Project activity	Electricity generation, grid (for start ups)	CO_2	Excluded	Main Emission Source
		CH_4	Excluded	Excluded for Simplification. This is conservative
		N_2O	Excluded	Excluded for Simplification. This is conservative
	Electricity generation from burning of fuel	CO_2	Excluded	Main Emission Source
		CH_4	Excluded	Excluded for Simplification. This is conservative
		N_2O	Excluded	Excluded for Simplification. This is conservative

The project activity involves the utilization of wind energy for generating electricity. There is no usage of fossil fuels in the project activity and hence no GHG emissions. The electricity generated is exported to the Southern & NEWNE Grid, where, in the absence of the project, the electricity would have been generated in other fossil fuel based power plants.

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

In the absence of the project activity, existing power plants and new capacity additions connected to NEWNE grid & Southern Regional Grid generate an equivalent amount of electricity and contribute to GHG emissions.

Hence, generation of electricity by current power plant mix in Southern Regional Grid & NEWNE grid is identified as baseline scenario for the project activity. Annex 3 provides the power generation details in the Southern and NEWNE electricity grid which is used to determine the baseline scenario (refer section 1.7).

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

In accordance with the VCS 2007.1, title of the VCS program approved small scale CDM methodology is AMS-I.D "Grid Connected Renewable Electricity Generation[8]" (Version 14).

The project proponent demonstrates that the project is additional by using the CDM tool[9] to demonstrate and assessment of additionality of small scale project activity in the following section:

1. Regulatory Surplus
2. Implementation Barriers: The barriers shall face one or more distinct barriers compared with the barriers faced by alternative projects.
    - Investment Barrier
    - Technological Barrier
    - Institutional Barrier
3. Common Practice

Step1: Regulatory surplus

The project activity is not mandated by any enforced law, statute or any other regulatory framework. The project activity was taken up by the WPPL on a voluntary basis. The project was not implemented to create GHG emissions for the purpose of its subsequent removal or destruction.

As per the renewable purchase obligation (RPO) implemented through out the country for compulsory use of minimum quantity of renewable energy, the set targets are as follows:

State	Target as per (RPO)	Achieved as on (30th March 2006)*
Tamil Nadu	10	22.07
Karnataka	10	11.77
Maharashtra	3	4.7

* Source of data – CEA Database (2005-06)[10]

[8] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PHPV5WESACMBTJ2YY54GAJYSIEI3HD

[9] http://www.v-c-s.org/faq.html#question2

[10] http://cea.nic.in/about_us/Annual%20Report/2005-06/CEA%20AR%202006%20Final.pdf

The above set targets were already met by the respective states before the implementation of the 12.55 MW wind power project of WPPL. WPPL has voluntarily taken the initiative for setting up the project activity to protect the environment from the harmful emissions where the grid is dominated by the fossil fuel mix.

Step2: Implementation Barriers

As per the applied additionality, investment barrier has been demonstrated below to prove the additionality of the project activity.

Investment Barrier

The project activity is an initiative in grid-connected electricity generation from available renewable resources. The power generated is supplied to the state grid of Tamil Nadu, Karnataka and Maharashtra respectively. Due to this direct income influx, a simple cost analysis cannot be conducted to demonstrate the project additionality.

The financial viability of the project is a critical factor as the project's implementation and functioning relies heavily on it. A project proponent can assess the financial viability of a project using various parameters. Internal Rate of Return (IRR) is one of the several parameters used in assessing the financial viability of any project. In fact, it is a widely used parameter with respect to bankers and investors.

The project proponent has chosen the benchmark analysis to demonstrate additionality of the project. For this purpose, the equity IRR has been selected as the financial indicator. The cost of equity has been calculated using the Capital Asset Pricing Model (CAPM). The calculation procedure for cost of equity has been demonstrated below.

Capital Asset Pricing Model

The required return on equity investment is the return of a risk-free security plus suitable market risk premium. While considering a new project, CAPM can provide the required risk premium that the project needs to yield, taking into account the market premium and the volatility (risk) of the stock relative to the market (Beta). This required return on equity represents the cost of equity for the project.

Using the CAPM model and the following assumptions, the project proponent has computed the expected return on equity.

The formula used here is

Expected Return = Risk free rate of Return + Beta x (Market returns – Risk free rate of return) (or)
r = Rf + Beta x (RM - Rf)
Where:
- r is the expected return rate on a security
- R_f is the risk-free rate of return
- Beta is the Asset class volatility
- RM is the return rate of the appropriate asset class.

Risk free rate of return:

The interest rate offered on central government securities have been considered to represent the risk free rate of return as it is devoid of default risk. The weighted average annual interest rate offered on the Central Government Securities for the year 2004-05, was 7.057%[11].

Beta (ß)

The beta in the CAPM equation helps to account for the systematic risk by quantifying the sensitivity of the stocks of the companies representing a particular project type/sector with the market returns. Thus, it incorporates the risk of a specific sector in the calculation of the cost of equity. The beta values obtained for the suitable market, however, has to take into account the leverage of the various companies' activity in the market, and hence has to be suitably unlevered using the formula:

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ßunlevered = ßlevered / (1+ (1- tax rate)* Debt-equity ratio)

The beta values for the companies are given below (the values have been taken from Bloomberg[12]):

S. No	Name of the Company	Raw Beta Value
1.	Tata Power Company Ltd.	1.074
2.	Reliance Infrastructure	0.625
3.	BF Utilities	1.519
4	CESC Limited	1.056
5	Gujarat Industries	1.128
6	Neyveli lignite	1.203
7	NTPC Limited	1.225

The beta values of the companies chosen for beta analysis have been taken for a five year period (with respect to the start date of the proposed project activity). The weighted beta value thus estimated is 0.8520 and the same has been used for further analysis.

[11] http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=6087

[12] Screenshots from Bloomberg database for beta values have been submitted to the DOE (Annex-6)

Market Rate of Return (Rm)

The market rate of return is calculated using the formula given below:
Rm = [{(BSE index at the time of start of project) / (BSE index since 1999)} (1/N)] – 1
= [(2610.50/1015.70) (1/6.17)]-1
= 16.54%
Where,
N - Number of years from 1999 till the start of project activity

Rate of return on equity

Rate of return on equity or cost of equity benchmark is Ri= Rf + ß (Rm-Rf)

Ri = 7.057% + 0.8520 x (16.54 – 7.057) %
Ri = 15.14%

Hence the Cost of equity of companies engaged in similar business as that of the project which is calculated as 15.14%. The same is chosen as benchmark for comparing return on equity from the project activity.

Investment analysis

The equity IRR of the 12.55 MW wind power project was computed based on the following generation details:

	Tamil Nadu	Karnataka	Maharashtra
Total capacity of windmills (MW)	7.75	3.15	1.65
Plant Load Factor (%)	30	30% for 1.5 MW 34.3% for 1.65 MW	34.3
Machine Availability (%)	95	95	95
Grid availability (%)	100	100	100
Power export to grid (lakh KWh)	189.6	84.34	46.15

The 12.55 MW project activity exports a total of 320 lakh units of power to the state electricity board. A total number of 29580 VCUs are generated

from the project activity which are expected to be traded at 6$ (Exchange rate = INR 50/$).

The equity IRR of the wind power project was calculated taking the VCS revenue into consideration and otherwise as follows:

Project Proponent	CAPM benchmark (%)	Equity IRR without VCS revenue (%)	Equity IRR with VCS revenue (%)
WPPL	**15.14**	**7.60**	**9.63**

When the VCS revenues are considered for the 12.55 MW wind power project, the equity IRR of the project activity is 9.63%.

Sensitivity Analysis:

A sensitivity analysis was carried out to find out the robustness of the financial analysis.

PLF:

Wind speeds are variable leading to intermittent electricity generation. The variable nature of the wind speeds reduces the PLF and makes wind energy less attractive. The project proponent considered achieving an average 30.00 % PLF[13] during the planning stage for installing WTGs in Tamil Nadu and Karnataka locations. In case of Maharashtra, the project proponent was informed that the machine (1.65 MW) would generate power at a PLF of 34.3% at the proposed site in Maharashtra by the technology provider, though the same was not guaranteed. The project proponent therefore carried out a sensitivity analysis on the IRR with a range of PLF to understand the variation in the returns.

[13] As per TERI Report

PLF (%)	Equity IRR (%) without VCS revenue
+10%	10.55
+5%	8.87
0	7.6
-5%	7.06
-10%	5.65

The sensitivity analysis clearly indicates that the equity IRR would not cross the benchmark even if PLF is 10% higher. This however is difficult to achieve since the weighted average PLF at various locations in Tamil Nadu is only 27.46%[14] (Page 108 of TNERC Tariff Order) and that of Maharashtra is 25%, making the project financially not viable. Therefore, the VCU revenue generated after sale of the emission reductions is very crucial to sustain the project activity.

O&M Cost - Also, the PP considered the O&M cost as the major expenditure for the project activity. Therefore, a sensitivity analysis was carried out for O&M cost. The results are as follows:

Change in O&M cost (%)	Equity IRR (%) without VCS revenue
+10%	7.19
+5%	7.39
0	7.6
-5%	7.8
-10%	8.0

As can be seen from the table above, a 10% increase or decrease in the O&M cost can impact the IRR of the project activity and lower the O&M cost, higher is the IRR.

Step 3: Common practice

Common Practice has been discussed in the following section. In accordance with Chapter 7[15] of the GHG Protocol for project accounting which clearly states that Common practice refers to the predominant technologies or

[14] Based on the survey conducted by TNERC and published in their Tariff Order of 2006
[15] http://www.ghgprotocol.org/files/ghg_project_protocol.pdf

practices in a given market, as determined by the degree to which those technologies or practices have penetrated the market (defined by a specified geographic area).

Karnataka has total installed capacity of 7784.69 MW[16] as on 30th March 2006. The share of thermal power generation of the total installed capacity is 3303.09 MW, where as wind power generation is 487 MW. From the above data it is evident that the share of wind power is 6.25% of the total effective installed capacity in state which is less compared to the share of thermal power generation of 42.43%. It is understood that Karnataka is dominated by fossil fuel fired power plants. (Refer Annex-4)

Tamil Nadu had a total installed capacity of 12330.84 MW[17] as on 30th March 2006. The thermal power generation is equivalent to 6915.77 MW where as power generation based on wind is 2526 MW of total installed capacity in the state before commissioning of the project activity. It is evident that the share of wind power is 20.48% of the total effective installed capacity in the state which is less than the share of thermal power generation equal to 56.08%. From this it is understood that Tamil Nadu is dominated by fossil fuel fired power plants. (Refer Annex-4)

Maharashtra has total installed capacity of 16156.73 MW[18] as on 30th March 2006. The share of thermal power generation of the total installed capacity is 11643.33 MW, where as power generation based on wind is 654.60 MW. From the data it is evident that the share of wind power is 4.05% of the total effective installed capacity in the state which is less compared to share of thermal power generation in the total installed generation capacity is 72.06%. Maharashtra electricity grid is dominated by fossil fuel fired power plants. (Refer Annex-4).

This clearly illustrates that the contribution of wind power and other renewable plants are still far less as compared to thermal power plants. It is not a common practice in the respective states of project activity to generate power from wind.

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the

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

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

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

project activity and explanation of methodology choices:

The chosen small scale methodology is AMS-I.D "Grid Connected Renewable Electricity Generation" is applicable to the project activity as the project activity (12.55 MW) falls under Type I project activities: Grid connected renewable energy project activities with a maximum output capacity equivalent up to 15 megawatts (or an appropriate equivalent)

The justification for use of the methodology chosen has already been discussed in sections 2.1 and 2.2, which can be referred to for the same.

3.2 Monitoring and calculation approaches:

Monitoring shall be done for the parameters that have been mentioned in section 3.3. The entire monitoring exercise shall be carried out to check the net electricity contribution to the regional grid and the subsequent emission reductions that are achieved due to this contribution, based on which VCUs shall be issued to the project proponent. Quality of the data generated shall be strictly monitored, more of which can again be ascertained in section 3.3.

CALICULATION APPROACH

Baseline Emissions

The combined emission factor is calculated as below:

$$EF_{Grid},CM,_y = EF_{Grid},CM,_y * w_{OM} * OM + EF_{Grid},BM,_y *w_{BM}$$

$$= 0.9984 * 0.75 + 0.7133 * 0.25$$

$$= 0.9271 \text{ } tCO_2/MWh \text{ (Southern Grid)}$$

$$EF_{Grid},CM,_y = EF_{Grid},CM,_y * w_{OM} * OM + EF_{Grid},BM,_y *w_{BM}$$

$$= 1.0089 * 0.75 + 0.59770 * 0.25$$

$$= 0.9061 \text{ } tCO_2/MWh \text{ (NEWNE Grid)}$$

Thus, the baseline emission factor, calculated as 0.9271 for Southern grid and 0.9061 for NEWNE grid is used for the calculation of the Emission Reductions.

The net electricity exported to the grid per annum by WPPL to southern grid is 27395 MWh and 4615 MWh for NEWNE grid. Hence the baseline emissions are calculated as below.

The baseline emissions would be calculated using the formula (as given in the applicable CDM methodology, AMS-I.D.).

Calculation for Southern grid:-

Total Electricity Generated (TEG_y) =27954 MWh
Plant load Factor=30% (for all machines in southern grid of project activty except 1.65MW of Karnataka)
Plant Load Factor=35.40% (1.65MW)
No of hours of operation of plant=8760
T&D losses considered on Exportable power= 2% of Number of units generated in year.
Electricity exported to the grid (EG_y) = (1-0.02) * 27954= 27395 MWh

$BE_y = (EG_y – EG_{baseline})* EF_y$
Where,
BE_y is the baseline emission in the year y.
EG_y is the amount of electricity exported to the grid in the year y.
$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.

Baseline Emissions = 27395 MWh x 0.9271
= 25398 tons of CO2

Calculation for NEWNE grid:-

Total Electricity Generated (TEG_y) = 4709 MWh
Plant load Factor= 34.30%
No of hours of operation of plant=8760
Generation Capacity, KWh = 1650
Number of units generated in year = 4709 MWh
T&D losses considered on Exportable power= 2% of Number of units generated in year.
Electricity exported to the grid (EG_y) = (1-0.02) * 4709= 4615 MWh

$BE_y = (EG_y – EG_{baseline}) EF_y$
Where,
BE_y is the baseline emission in the year y.
EG_y is the amount of electricity exported to the grid in the year y.

$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.

Baseline Emissions = 4615 MWh x 0.9061
= 4182 tons of CO2

Project Emissions

As per the methodology, there are no project related emissions for wind power projects. However emissions due to import of electricity from grid are attributed to the project activity and these emissions are accounted using the procedure explained in Section 4.3.

$PE_y = EG_{Imp,y} = 0$

Leakage

As per the methodology, no leakage is considered from the project activity.

Emission reduction

The emission reductions for the project activity are calculated as per the following equation:

Emission Reduction = Baseline emissions – Project emissions – Leakage

= 25398 – 0 – 0 = 25398(Southern grid)
= 4182 – 0 – 0 = 4182 (NEWNE grid)

Total emission reductions for the project activity = 25398 + 4182 = 29580 tons of CO2

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Power exported to the grid by the power plant during the crediting period.
Source of data to be used:	Monthly billing records of the State Electricity Board for the electricity supplied to the grid.
Value of data applied for the purpose of calculating expected emission reductions	27395 MWh (Southern grid) 4615 MWh (NEWNE grid)
Description of measurement methods and procedures to be applied:	The parameter is measured using a tri-vector energy meter available at WPPL
QA/QC procedures to be applied:	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency. The meters will be calibrated as per the standards
Any comment:	Data monitored is to be kept for two years after the end of the crediting period or the last issuance of VCUs for the project whichever occurs later

Data / Parameter:	$EG_{Imp,y}$
Data unit:	MWh
Description:	Power exported to the grid by the power plant during the crediting period
Source of data to be used:	Monthly billing records of the State Electricity Board for the electricity supplied to the grid.
Value of data applied for the purpose of calculating expected emission reductions	0 (Southern grid and NEWNE grid)
Description of measurement methods and procedures to be applied:	The parameter is measured using a tri-vector available at the sub-station.
QA/QC procedures to be applied:	The data will be directly measured and monitored at the project site. The meters will be calibrated as per the standards.
Any comment:	Data monitored is to be kept for two years after the end of the crediting period or the last issuance of VCUs for the project whichever occurs later. Any value recorded shall be subsequently considered for emission reduction calculation.

3.4 Description of the monitoring plan

The real time performance of the system is being monitored by the Operation and Maintenance team at the Central Monitoring Station. In the event of any discrepancies in the above, corrective action will be taken up comparing readings from the various measuring and monitoring equipments.

The monitoring plan for the different states of the project activity is given below:

Maharashtra:

Meter readings at the metering point shall be undertaken jointly by the representative of the state grid and the authorized representative of the seller on the first day of every month of the preceding month. The meter readings shall be jointly certified by both the representatives of state grid and the seller.

The electricity generated & exported is considered from the respective meters and the T&D loss is estimated as follows:

T&D loss = Power generation – Power export

The power generation is recorded from the LCS meter available within the WTG. The power export reading is taken jointly by representatives from the State Electricity Board and the technology / equipment provider at the substation. The substation has two meters (main meter and check meter) to measure the power exported to the grid.

The calibration is done once annually for energy meters.

The permissible limit of errors is 0.5%. In case the meter is found to be faulty during the joint meter readings taken by SEB and the technology / equipment provider, it is immediately corrected or replaced.

In case the meter readings of the main and check meter do not tally with each other, the representatives from SEB and the technology / equipment supplier will arrive at the final reading on "mutually agreeable basis". (As provided in the Power Purchase Agreement – Article 11 – Measuring & Metering).

Karnataka & Tamilnadu:

The meter reading for power export is taken jointly by representatives from the State Electricity Board (SEB) and the technology / equipment provider. The power generated from the windmills is connected to a feeder which receives power from other windmills (other than the ones owned by WPPL). The total T&D loss is computed by the SEB officials for a particular feeder. This loss is distributed amongst all power suppliers. The T&D loss is borne by WPPL.

The tri-vector meters are located at the respective substations to record the exported power. The Tamil Nadu substation has only the main meter under the control of SEB. In case of Karnataka, there are two tri-vector meters, the main meter and check meter. The main meter is controlled by WPPL and the check meter is controlled by the SEB.

The entire main and check meters shall be calibrated annually with reference to a portable standard meter, which shall be an accuracy class of 0.1.The portable standard meter shall be owned by SEB.

The main and check meters (export and import) shall be of 0.5 accuracy in Tamil Nadu and 0.2 accuracy in Karnataka. Each meter shall be jointly inspected and sealed on behalf of the parties and shall not be interfered with the either parties except in the presence of the other party or its accredited representatives.

The WTG controller readings for power generation are recorded on a daily basis. In case the meter at the substation seems to be faulty when compared with the WTG controller records, it is immediately replaced with a new meter. The SEB maintain 5-6 spares of such meters for this purpose.

In case the meter readings of the main and check meter do not tally with each other, the representatives from SEB and the technology / equipment supplier will arrive at the final reading on “mutually agreeable basis”. This basis has been defined in the respective Power Purchase Agreements (Karnataka – Article 7 – Metering & Communication). In case of Tamil Nadu, there is only one meter at the substation. In case it is found faulty, the power exported is computed from the WTG controller reading.

The following are the details of the energy meters at the WTG locations which are used for monitoring export and import from the Grid.

S. No.	Capacity of WTG (MW)	Location	Tag no OR equipment serial no of instrument	Service & Tech def. of instrument and measuring	Accuracy Class
1	1.50	Udayathoor, TN (R110)	04862793	Energy Meter	0.5
2	1.50	Udayathoor, TN (R118)	04863795	Energy Meter	0.5
3	1.25	Devarakulam, TN (L235)	04881081	Energy Meter	0.5
4	1.25	Devarakulam, TN (L247)	04865494	Energy Meter	0.5
5	1.25	Devarakulam, TN (L251)	04865497	Energy Meter	0.5
6	1.50	Hassan, KA	06760732	Energy Meter	0.2
7	1.65	Belgaum, KA	07022990	Energy Meter	0.2
8	1.65	Gude Panchagani, MH	AQ10192	Energy Meter	0.5
9	0.25	Nettur, TN	All four WTGs connected to one energy meter S. No. – TNB 01345	Energy Meter	0.5
10	0.25	Nettur, TN			
11	0.25	Nettur, TN			
12	0.25	Nettur, TN			

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

The GHG emission reduction has been calculated in accordance with the VCS program approved indicative simplified baseline and monitoring methodologies for selected small-scale projects AMS-I.D "Grid connected renewable electricity generation".

Version 1.1 of "Tool to calculate the emission factor of an electricity system" has been applied to calculate the emission factor for the NEWNE regional Grid.

Baseline Emissions:
Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants connected to the southern grid and NEWNE Grid that are displaced by the project activity.

The project is a renewable wind power plant supplying electricity to the southern grid and NEWNE Regional grid, thus displacing the electricity generated by fossil fuel fired power plants in the southern grid and NEWNE Grid.

As per the version 14 of AMS-1.D methodology for "Grid connected renewable electricity generation" the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner as:

A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor of an electricity system".

Calculation of CM according to the Tool

The Indian power system is divided into two independent regional grids, namely South and NEWNE Grid. The states of Karnataka and Tamil Nadu fall under the boundary of Southern Grid whereas Maharashtra falls under the boundary of NEWNE Grid.

Version 4.0 of the Carbon dioxide Baseline database of Central Electricity Authority (CEA) is used for the estimation of the baseline emission factor. The procedure for estimation of the baseline emission factor is in line with version 1.1 of "Tool to calculate emission factor for an electricity system". The detailed procedure is given below.

Calculation Procedure:

Operating Margin Emission Factor

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the southern and NEWNE Grids, not including low-cost/must-run power plants/units. It has been calculated based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the southern and NEWNE Grids.

Simple operating margin approach has been adopted as per the guidelines stated in the "Tool to calculate the emission factor for an electricity system", which clearly states that the approach shall be used "if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production,"

Where low cost/must run resources have been identified to be "…power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants."

The formula applied for the calculation of Simple Operating Margin is

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

Where:

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

$FC_{i,m,y}$ = Amount of fossil fuel type i consumed by power plant / unit m in year y (mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)

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

$EG_{m,y}$ = Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)

m = All power plants / units serving the grid in year y except low-cost / must-run power plants / units
i = All fossil fuel types combusted in power plant / unit m in year y
y = The three most recent years for which data is available.

The average simple operating margin of the past three years[19] (2005-06 to 2007-08) thus calculated as 0.9984 for southern grid and 1.0089 for NEWNE grid and would be fixed for the entire crediting period.

$EF_{grid,OM,y}$ = 0.9984(Southern Grid)
$EF_{grid,OM,y}$ = 1.0089(NEWNE Grid)

Build Margin Emission Factor
The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available.

The build margin BM is calculated by CEA and is the generation weighted average emission factor of the most recent power plants consisting of the capacity additions that represent 20% of the system generation (in MWh) and that have been built most recently. This option is considered for calculation as it represents the larger sample. The data pertaining to the units thus identified are detailed in the Version 4.0 of the Baseline Carbon Dioxide Baseline database of the CEA.

The build margin emission factor is calculated as

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:
$EF_{grid,BM,y}$ = Build margin CO2 emission factor in year y (tCO2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (tCO2/MWh)
m = Power units included in the build margin

[19] "**Baseline Carbon Dioxide Emission Factor Database Version 4.0**" as put out by the Central Electricity Authority http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver4.zip

y	=	Most recent historical year for which power generation data is available

The Build Margin calculated is based on the most recent data available and the build margin thus calculated20 is 0.7133 for southern grid and 0.59770 for NEWNE grid.

Therefore,

$EF_{grid,BM,y}$ = 0.7133(Southern Grid)

$EF_{grid,BM,y}$ = 0.59770(NEWNE Grid)

Calculation of Combined Margin emission factor

The combined margin will be calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where,

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

As per the Version 1.1 of "Tool to calculate the emission factor for an electricity system", the default values to be used for Wind Power projects are

w_{OM}= 0.75
w_{BM}= 0.25

Hence, the Combined margin Co2 Emission Factor is calculated as below:

$EF_{Grid,CM}$ = $EF_{grid,OM,y}$*w_{OM} + $EF_{grid,BM,y}$*w_{BM}

= 0.9984 *0.75 + 0.7133*.25

= 0.9271 tCO2/MWh (Southern Grid)

[20] "**Baseline Carbon Dioxide Emission Factor Database Version 4.0**" as put out by the Central Electricity Authority http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver4.zip

$EF_{Grid,CM}$ = $EF_{grid,OM,y}$*w_{OM} + $EF_{grid,BM,y}$*w_{BM}

= 1.0089 *0.75 + 0.597700*.25

= 0.9061 tCO2/MWh (NEWNE Grid)

Project Emissions:

As per the methodology, there are no project related emissions for wind power projects. However emissions due to import of electricity from grid are attributed to the project activity and these emissions are accounted using the **procedure** explained in Section 4.3.

$EG_{Imp,y}$ = 0 (explained in section 4.3)

Leakage:

In accordance with the paragraph 14 of AMS ID – Version 14, leakage is considered in case the energy generation equipment is transferred from another activity. Since the project activity energy generation equipment is not transferred from other activity; hence leakage for the project activity is not considered.

LE_y = 0

Emission Reductions:

$ER_y = BE_y - PE_y - LE_y$
Where:
ER_y = Emission reductions in year y (t CO2e/yr).
BE_y = Baseline emissions in year y (t CO2e/yr).
PE_y = Project emissions in year y (t CO2/yr).
LE_y = Leakage emissions in year y (t CO2/yr).

ER_y= 25261-0-0 tCO_{2e}
= 25398 tCO_{2e} (Southern grid)

ER_y= 4182-0-0 tCO_{2e}
= 4182 tCO_{2e} (NEWNE grid)

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

Following table indicates the baseline emissions, project emissions and emission reductions of each year of the crediting period. The project activity accounts for 25261 tCO_2 of emission reductions from southern grid and 4182 tCO_2 of emission reductions from NEWNE grid over the renewable crediting period of 10 years.

Year	Electricity Exported (MWh)	Combined Margin Emission Factor (tCO2e/MWh)	Estimation of baseline emission reductions tCO_2e
Southern Grid			
2006-2007	5658	0.9271	5246
2007-2008	27395	0.9271	25398
2008-2009	27395	0.9271	25398
2009-2010	27395	0.9271	25398
2010-2011	27395	0.9271	25398
2011-2012	27395	0.9271	25398
2012-2013	27395	0.9271	25398
2013-2014	27395	0.9271	25398
2014-2015	27395	0.9271	25398
2015-2016	27395	0.9271	25398
NEWNE Grid			
2006-2007	392	0.9061	355
2007-2008	4615	0.9061	4182
2008-2009	4615	0.9061	4182
2009-2010	4615	0.9061	4182
2010-2011	4615	0.9061	4182
2011-2012	4615	0.9061	4182
2012-2013	4615	0.9061	4182
2013-2014	4615	0.9061	4182
2014-2015	4615	0.9061	4182
2015-2016	4615	0.9061	4182
Total (tonnes of CO_2)	271825		

4.3 Quantifying GHG emissions and/or removals for the project:

Project Emissions: The Project emissions are due to import of electricity from the grid. Hence, the formula applied is

$PE_y = EF_{grid,OM,y} * E_{import,grid}$
PE_y = Project Emisisons

$EF_{grid,CM,y}$ = Combined margin emission factor of grid
$E_{imp,grid}$ = Electricity import from grid.

Note: Ex-ante emissions of VCUs, the import of electricity are not considered however the aforementioned formula is applied during the actual verification and the project emissions would be deducted accordingly from the baseline.

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

Year	Estimation of Project activity Emissions (tCO_2)	Estimation of Baseline Emissions (tCO_2)	Estimation of leakage (tCO_2)	Estimation of overall Emission Reductions (tCO_2)
Southern Grid				
2006-2007	0	5246	0	5246
2007-2008	0	25398	0	25398
2008-2009	0	25398	0	25398
2009-2010	0	25398	0	25398
2010-2011	0	25398	0	25398
2011-2012	0	25398	0	25398
2012-2013	0	25398	0	25398
2013-2014	0	25398	0	25398
2014-2015	0	25398	0	25398
2015-2016	0	25398	0	25398
NEWNE Grid				
2006-2007	0	355	0	355
2007-2008	0	4182	0	4182
2008-2009	0	4182	0	4182
2009-2010	0	4182	0	4182
2010-2011	0	4182	0	4182
2011-2012	0	4182	0	4182
2012-2013	0	4182	0	4182
2013-2014	0	4182	0	4182
2014-2015	0	4182	0	4182
2015-2016	0	4182	0	4182
Total (tonnes of CO_2)	0	271825	0	271825

5 Environmental Impact:

In India, Ministry of Environment and Forest is the host party. As per the prevailing host party laws, (the Schedule 1 of Ministry of Environment and Forests, Government of India notification dated September 14, 2006), 38 activities are required to undertake environmental impact assessment studies. The details of these activities are available at http://envfor.nic.in/legis/eia/so1533.pdf. However the Environmental Impact Assessment study is not required for a wind mill project as there is no negative environmental impact due to the project activity and wind energy is one of the cleanest sources of energy.

6 Stakeholders comments:

WPPL identified the following local stakeholders to be associated with the project activities, directly or indirectly.

Process of Invitation of stakeholders:

The project proponents had conducted the stakeholder consultation process at project locations between 17th September 2007 and 16th October 2007. The project proponent had invited the stakeholders, through invitation letters describing the project activity and the benefits due to the operation of the wind power project and the purpose of the meeting. The stakeholders were requested to provide their general feedback on the project activity and specifically asked them to give information on how the project has helped them improve their livelihood. They were also asked whether there has been any improvement on the power conditions and business opportunities in the area. Among the people present were the village representative, local villagers, O & M contractors and other stakeholders.

Summary of the comments received

The Panchayat Office representatives (Member of locally elected body), local villagers expressed their happiness about the implementation of project in their villages. They said that many people sold their lands voluntarily to the project developers for setting up the project. The land prices have also gone up and are fetching them 3-4 times more than the market price. Many have been employed by the technology providers or project developers at the wind farms as security personnel or labourers and are also being paid good salaries. Some villagers said that they were travelling long distances to cities in search of jobs. Since the wind farms were developed, many of them returned and have been employed by the technology providers.

Some villagers also said that the electricity scenario has also improved in the nearby villages. Earlier there were complaints of low voltage and power cuts. After setting up of the project, the power scenario has

improved and villages are getting better voltage and electricity for longer duration.

In summary, stakeholders present at the meeting expressed that the project activity is helping the socio-economic development of the villages and nearby area without affecting the local environment adversely. There were no negative comments from the stakeholders at any location. The minutes of the meeting will be submitted to the DOE during validation process.

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

Not applicable. All positive comments received.

7 Schedule:

Chronology Consideration: Considering the above risks, the PP during the conceptualization of the project activity considered VCS revenue for the sustainability of the project. Given below is the chronology of the event which took place before and after the start of the project activity (i.e. March-April 2006 when the purchase order for the first WTG was issued by the PP).

S. No.	Date	Description
1	5th April 2005	Letter to Consortium Advisory Services Pvt. Ltd., seeking information on wind energy
2	7th April 2005	Letter from Consortium Advisory Services Pvt. Ltd., providing WPPL general information on wind power and the Indian scenario. A note was issued to GM finance to seek further information on the project activity and also check the financials.
3	11th April 2005	An internal memo to the CEO was sent by GM-finance providing him the details of the return expected from the investment in wind power project and other details including Carbon revenue.
4	16th April 2005	An internal memo to the CEO was sent by GM-finance after carrying out a sensitivity analysis on the financials. The memo also stated that the returns are less

		then the returns obtained by other players in power generation and would cross the same only if carbon revenue is included in the cash flow. The entire analysis was done considering the investment for 1 MW of wind power project in Tamil Nadu, and though the project proponent had plans for installation of WTGs at other states, the PP started with the installation of the machines in the Tamil Nadu region as the financial analysis was carried out based on the conditions in Tamil Nadu. The same can be seen from the sequence of installations.
5	11th May 2005	The board of directors met and discussed on the proposal of setting up wind power project and based on the various information collected by the GM-finance and the financial analysis, it was decided to go ahead with the project activity considering the Carbon revenue which was making the project viable.
6	20th August 2005	Board minutes where it was informed that the GM-Finance is in contact with various technology provides for setting up wind project
7	15th December 2005	Discussions held during the board meeting regarding the site visits by GM-Finance to finalize locations for setting up wind power project
8	20th March 2006	Discussions held regarding the estimated returns due to the investment of INR 100 crores in wind power. The financial analysis carried out has been provided to the DOE during validation.
9	15th April 2006	Finalization of work order for installation of first set of WTGs at Tamil Nadu by Shriram EPC.
10	June 2006	Proposal from CDM consultant. (The same was submitted for CDM services for the machines installed in Tamil Nadu for a total capacity of only 4 MW.

		However, since the PP had issued purchase order for more WTGs, he had suggested waiting till the completion of the installation of all the machines. Copy of the same is submitted to DOE during validation)
11	July 2006	Order for 2 WTGs of 1.5 MW each at Tamil Nadu and approval to submit loan application to banks for financing of the project activity. (Board MOM – 31st July 2006)
12	December 2006	Selection of locations for 6 WTGs in Tamil Nadu, Karnataka and Maharashtra. The discussions were held during the board meeting (13th December 2006 – MOM). Interoffice memo regarding the PLF issue at Gude Panchagani in Maharashtra.
13	1st March 2007	Board decision to restrict the total investment on wind power project to INR 72 crores (720 million) against the proposed INR 100 crores (1000 million) and the project size to 12.55 MW. Considering that the PP decided not to add any more WTGs and restrict the project to 12.55MW, the PP immediately decided to appoint the consultant for CDM advisory for the project activity.
14	17th April 2007	Sanction of term loan of INR 38 crores towards wind power project.
15	May / June 2007	Invitation of proposals from various CDM/VCS consultants and negotiations
16	July 2007	Appointment of CDM/VCS consultant
17	November 2008	Appointment of DOE for validation of the project

8 Ownership:

8.1 Proof of Title:

The project activity's proof of title is substantiated by the following documents, which shall be provided by the project proponent:

1. Ownership of land that is proven by land purchase deeds
2. Purchase orders issued for acquiring the equipment
3. Power purchase agreements signed by the proponent with SEB(State Electricity Board)

All the aforementioned activities associated with the project have been undertaken in the name of WPPL, and proof for the same has been submitted to validator.

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

Not applicable

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Walden Properties Pvt. Ltd.
Street/P.O.Box:	1009, Indu Fortune Fields, 13th Phase
Building:	KPHB
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500 072
Country:	India
Telephone:	+91-40-2378 0292
FAX:	+91-40-2378 0224
E-Mail:	
URL:	www.induprojects.com
Represented by:	
Title:	General Manager (Finance)
Salutation:	Mr.
Last Name:	Subash
Middle Name:	-
First Name:	B
Department:	-
Mobile:	+91-93467 46460
Direct FAX:	+91-40-2378 0224
Direct tel:	+91-40-2378 0292
Personal E-Mail:	Subash.b@induprojects.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No Public Funding is available to the project.

Annex 3

Break-up of installed generation capacity as on 31/03/2006[21] in the NEWNE Grid is given below in MW.

Sector	Hydro	Thermal				Nuclear	R.E.S(MNRE)					Total	Grand Total
		Coal	Gas	Diesel	Total		SHP	Wind	B.G	B.P	U&I		
State	14335.3	30912.5	2763.9	242.09	33918.51	0	403.1	399.62	0	0	0	802.79	49056.6
Private	850.7	3731.38	2422.5	20.34	6174.22	0	0	893.58	40	211	9.7	1154.58	8179.5
Central	6172.00	17882.5	4068.9	0.0	21951.49	2480	0	0	0	0	0	0	30603.4
Grand Total	21358.0	52526.38	9255.4	262.43	62044.22	2480	403.1	1293.2	40	211	9.7	1957.37	87839.6

SHP=Small Hydro Project, B.G=Biomass Gasifier, B.P= Biomass Power, U&L= Urban &Industrial waste

RES=Renewable energy sources.

[21] http://cea.nic.in/about_us/Annual%20Report/2005-06/CEA%20AR%202006%20Final.pdf

Break-up of installed generation capacity as on 31/03/2006[22] in the Southern Grid is given below in MW.

Sector	Hydro	Thermal				Nuclear	R.E.S(MNRE)					Total
		Coal	Gas	Diesel	Total		SHP	Wind	B.G	B.P	U&I	
State	10912.26	7392.50	735.80	362.52	8490.82	0	374.31	1390.43	0	0	0	1764.74
Private	55.45	510.00	2348.70	576.80	3435.50	0	0	1750.27	37.00	656.23	25.25	2468.75
Central	0.0	8090.00	350.00	0.0	8440.00	880.00	0	0	0	0	0	0
Total	**10967.71**	**15992.50**	**3434.50**	**939.32**	**20366.32**	**880.00**	**374.31**	**3140.70**	**37.00**	**656.23**	**25.25**	**4233.49**
Grand Total	36447.52											

SHP=Small Hydro Project, B.G=Biomass Gasifier, B.P= Biomass Power, U&L= Urban &Industrial waste

RES=Renewable energy sources

[22] http://cea.nic.in/about_us/Annual%20Report/2005-06/CEA%20AR%202006%20Final.pdf

Annex 4

Break-up of installed generation capacity as on 31/03/2006[23] in the Maharashtra State Grid is given below in MW.

Sector	Hydro	Thermal				Nuclear	R.E.S(MNRE)					Total
		Coal	Gas	Diesel	Total		SHP	Wind	B.G	B.P	U&I	
State	2777.6	6425.0	912.0	0.0	7337.0	0	11.26	63.50	0	0	0	74.76
Private	447.0	1650.0	920.0	0.0	2570.0	0	0	591.10	3.82	36.0	1	631.92
Central	0.0	1339.0	397.28	0.0	1736.33	582.06	0	0	0	0	0	0
Total	3224.66	9414.05	2229.28	0.0	11643.33	582.06	11.26	654.60	3.82	36	1	706.68
Grand Total	16156.73											

SHP=Small Hydro Project, B.G=Biomass Gasifier, B.P= Biomass Power, U&L= Urban &Industrial waste

RES=Renewable energy sources

[23] http://cea.nic.in/about_us/Annual%20Report/2005-06/CEA%20AR%202006%20Final.pdf

Break-up of installed generation capacity as on 31/03/2006[24] in the Karnataka State Grid is given below in MW

State	Ownership Sector		Modewise breakup				Nuclear	RES						Grand Total
		Hydro	Thermal			Total Thermal		SHP	Wind	B.G	B . P	U & I	Total	
			Coal	Gas	Diesel									
Karnataka	State	3376.20	1470.00	0.00	127.92	1597.92	0.00	226.33	288.98	0.00	0.00	0.00	515.31	5489.43
	Private	51.70	260.00	220.00	106.50	586.50	0.00	0.00	198.02	**4.61**	**197.98**	**1.00**	401.61	1039.81
	Central	0.00	1118.67	0.00	0.00	1118.67	136.78	0.00	0.00	0.00	0.00	0.00	0.00	1255.45
	Sub-Total	**3427.90**	**2848.67**	**220.00**	**234.42**	**3303.09**	**136.78**	**226.33**	**487.00**	**4.61**	**197.98**	**1.00**	**916.92**	**7784.69**

State	Ownership Sector		Modewise breakup				Nuclear	RES						Grand Total
		Hydro	Thermal			Total Thermal		SHP	Wind	B.G	B . P	U & I	Total	
			Coal	Gas	Diesel									
Tamil Nadu	State	2145.85	2970.00	431.00	0.00	3401.00	0.00	3.80	1066.05	0.00	0.00	0.00	1069.85	6616.70
	Private	0.00	250.00	488.30	411.66	1149.96	0.00	0.00	1461.55	15.68	173.00	1.75	1651.98	2801.94
	Central	0.00	2364.81	0.00	0.00	2364.81	547.39	0.00	0.00	0.00	0.00	0.00	0.00	2912.20
	Sub-Total	**2145.85**	**5584.81**	**919.30**	**411.66**	**6915.77**	**547.39**	**3.80**	**2526.00**	**15.68**	**173.00**	**1.75**	**2721.83**	**12330.84**

[24] http://cea.nic.in/about_us/Annual%20Report/2005-06/CEA%20AR%202006%20Final.pdf

[25] http://cea.nic.in/about_us/Annual%20Report/2005-06/CEA%20AR%202006%20Final.pdf

Annex 5
BASELINE INFORMATION

Generation Data, Emission Data published by Central Electricity Authority, Government of India. (Version 04).
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

EMISSION FACTORS

Weighted Average Emission Rate (tCO2/MWh) (excl. Imports)

	2005-06	2006-07	2007-08
NEWNE	0.84	0.83	0.82
South	0.73	0.72	0.72
India	0.82	0.80	0.80

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

	2005-06	2006-07	2007-08
NEWNE	0.84	0.82	0.81
South	0.73	0.72	0.72
India	0.81	0.80	0.79

Simple Operating Margin (tCO2/MWh) (excl. Imports)

	2005-06	2006-07	2007-08
NEWNE	1.02	1.02	1.01
South	1.01	1.00	0.99
India	1.02	1.01	1.01

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

	2005-06	2006-07	2007-08
NEWNE	1.02	1.01	1.00
South	1.01	1.00	0.99
India	1.02	1.01	1.00

Build Margin (tCO2/MWh) (excl. Imports)

	2005-06	2006-07	2007-08
NEWNE	0.67	0.63	0.60
South	0.71	0.70	0.71
India	0.68	0.65	0.63

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

	2005-06	2006-07	2007-08
NEWNE	0.67	0.63	0.60
South	0.71	0.70	0.71
India	0.68	0.65	0.63

Combined Margin (tCO2/MWh) (excl. Imports)

	2005-06	2006-07	2007-08
NEWNE	0.85	0.82	0.80
South	0.86	0.85	0.85
India	0.85	0.83	0.82

Combined Margin in tCO2/MWh (incl. Imports)

	2005-06	2006-07	2007-08
NEWNE	0.85	0.82	0.80
South	0.86	0.85	0.85
India	0.85	0.83	0.81

GENERATION DATA

Gross Generation Total (GWh)

	2005-06	2006-07	2007-08
NEWNE	470,037	499,380	531,539
South	147,355	161,897	167,379
India	617,392	661,277	698,918

Net Generation Total (GWh)

	2005-06	2006-07	2007-08
NEWNE	437,877	465,361	496,119
South	138,329	152,206	157,315
India	576,206	617,567	653,434

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2005-06	2006-07	2007-08
NEWNE	18.0%	18.5%	19.0%

EMISSION DATA

Absolute Emissions Total (tCO2)

	2005-06	2006-07	2007-08
NEWNE	368,114,047	385,643,080	406,563,416
South	101,551,293	109,020,456	113,626,240
India	469,665,340	494,663,536	520,189,656

Absolute Emissions OM (tCO2)

	2005-06	2006-07	2007-08
NEWNE	368,114,047	385,643,080	406,563,416
South	101,551,293	109,020,456	113,626,240
India	469,665,340	494,663,536	520,189,656

Absolute Emissions BM (tCO2)

	2005-06	2006-07	2007-08
NEWNE	59,023,283	59,042,467	60,193,616

South	27.0%	28.3%	27.1%
India	20.1%	20.9%	21.0%

Net Generation in Operating Margin (GWh)

	2005-06	2006-07	2007-08
NEWNE	359,271	379,471	401,642
South	100,978	109,116	114,702
India	460,249	488,587	516,343

20% of Net Generation (GWh)

	2005-06	2006-07	2007-08
NEWNE	87,575	93,072	99,224
South	27,666	30,441	31,463
India	115,241	123,513	130,687

Net Generation in Build Margin (GWh)

	2005-06	2006-07	2007-08
NEWNE	87,764	93,524	100,707
South	28,228	30,442	31,613
India	115,991	123,965	132,320

South	19,947,081	21,348,182	22,550,310
India	78,970,364	80,390,649	82,743,926

IMPORT DATA

Net Imports (GWh) - Net exporting grids are set to zero

	2005-06	2006-07	2007-08
NEWNE	4,853	5,126	8,193
South	0	0	0

Share of Net Imports (% of Net Generation)

	2005-06	2006-07	2007-08
NEWNE	1.1%	1.1%	1.7%
South	0.0%	0.0%	0.0%

Annex 6
MONITORING INFORMATION

Please refer to the section 3.4

Appendix – A

Calculation of Baseline Emission reductions for 12.55MW of WPPL

Southern Grid										
Fiscal year	2006 - 07	2007 - 08	2008 - 09	2009 - 10	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16
Tamil Nadu	_	_	_	_	_	_	_	_	_	_
Net Export for Entire Plant (MWh)	5622.31	18961.68	18961.68	18961.68	18961.68	18961.68	18961.68	18961.68	18961.68	18961.68
Emission Factor For Regional Grid	0.9271	0.9271	0.9271	0.9271	0.9271	0.9271	0.9271	0.9271	0.9271	0.9271
Net Emission Reductions Achieved	5212	17579	17579	17579	17579	17579	17579	17579	17579	17579
Karnataka										
Net Export for Entire Plant (MWh)	36	8434	8434	8434	8434	8434	8434	8434	8434	8434
Emission Factor For Regional Grid	0.9271	0.9271	0.9271	0.9271	0.9271	0.9271	0.9271	0.9271	0.9271	0.9271
Net Emission Reductions Achieved	34	7819	7819	7819	7819	7819	7819	7819	7819	7819
Sub-total	5246	25398	25398	25398	25398	25398	25398	25398	25398	25398
NEWNE Grid										
Fiscal year	2006 - 07	2007 - 08	2008 - 09	2009 - 10	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16
Net Export for Entire Plant (MWh)	392.01	4615.64	4615.64	4615.64	4615.64	4615.64	4615.64	4615.64	4615.64	4615.64
Emission Factor For Regional Grid	0.9061	0.9061	0.9061	0.9061	0.9061	0.9061	0.9061	0.9061	0.9061	0.9061
Net Emission Reductions Achieved	355	4182	4182	4182	4182	4182	4182	4182	4182	4182
Total Net Emission Reductions Achieved	5601	29580	29580	29580	29580	29580	29580	29580	29580	29580
Grand Total	271825									

Appendix - B

Assumption for IRR Calculation

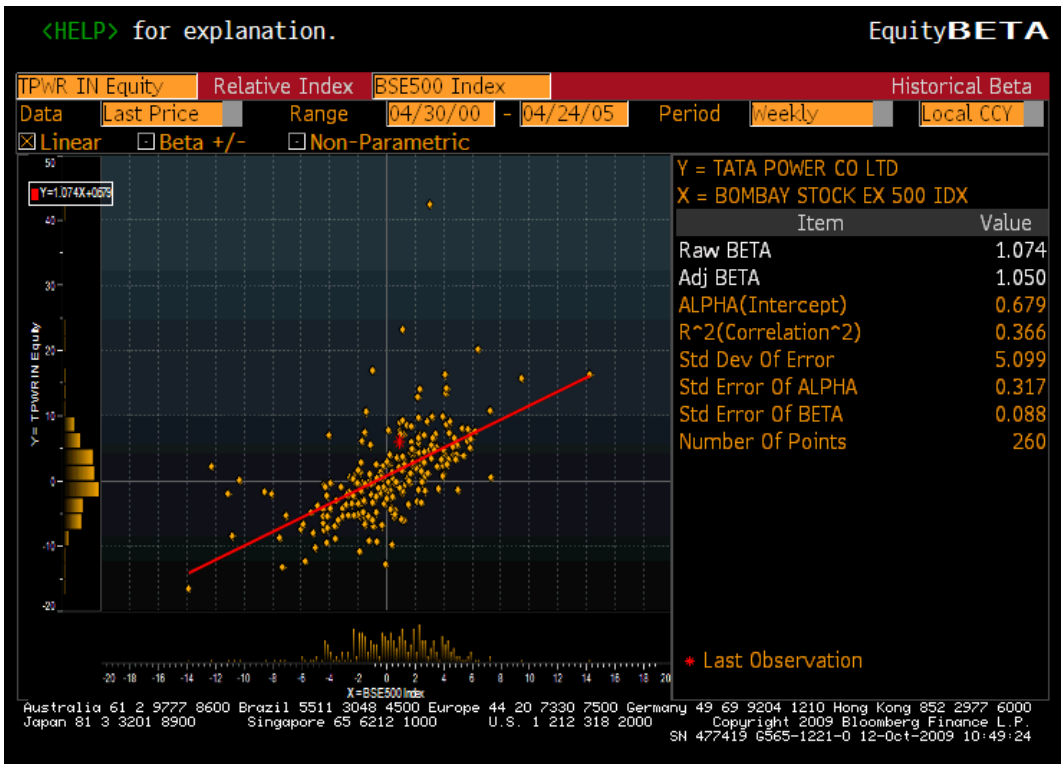
Assumptions:		
Project Size	12.55	MW
No of WEGs (1650, 1500, 1250 and 250 kWh capacities)	12	nos
Total Project Cost	7206.00	Lacs
Means of Finance		INR lakhs
Debt (as per loan agreements)	**70%**	**5060.00**
Equity	**30%**	**2146.00**
Total Project Cost		**7206.00**
Operating Parameters		
Total Generation for the project at 100% PLF	1099.38	Lacs KWH p.a.
Plant Load Factor (net of Transmission charges)	30.00%	Tamilnadu and Karnataka as per TERI report
	35.40%	1.65 MW machine in Karnataka
	34.30%	Maharashtra, as provided by technology provider
O&M cost		
Tamil Nadu	INR lakhs	
2nd year	43.00	
3rd year	75.15	
4th year	78.91	
Escalation with 5% for year on year upto 10th year	82.85	
Grid Availability	100%	
Machine availability	95%	
Karnataka - 1.5 MW		
3rd year	7.50	
4th year	15.35	
Escalation with 5% for year on year upto 10th year	16.12	
Grid Availability	100%	
Machine availability	95%	
Maharashtra & Karnataka-1.65 MW		
From 2nd year	9.50	
Escalation with 7.5% for year on year upto fifth year	10.21	
Grid Availability	100%	
Machine availability	95%	
Financial Parameters		

Interest on Term Loan		
Rupee Loan	10.50%	IDBI Bank
	14.00%	BOI
Repayment		
Installements	28	Quarters
Moratorium	4	Quarters
Working Capital		
Receivables	2.00	Months
O&M	3.00	Months
Working Capital Interest	11.00%	
Margin Money on WC	25%	
Upfront Fees on term loan	0.1%	
Tariff (INR)		
Maharashtra	3.50	Increase of 15 Paise for 13 years
Karnataka	3.40	No Escalation
Tamilnadu	2.70	No Escalation
Depreciation Rate		
As per Electricity Act		
Asset to be written off	100%	
Depreciation rate(SLM)	5.28%	
As per Income Tax Act		
Depreciation for the first year	80%	
Tax Rate		
Income Tax Rate	33.66%	
MAT	11.22%	

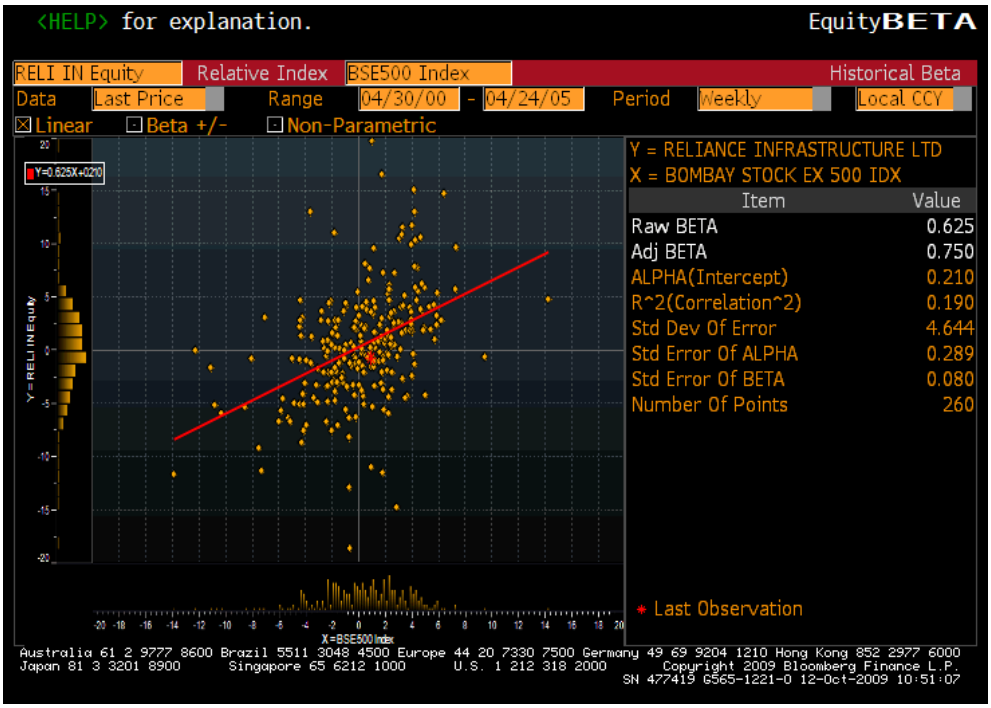
Annex 7

Source: Bloomberg Database

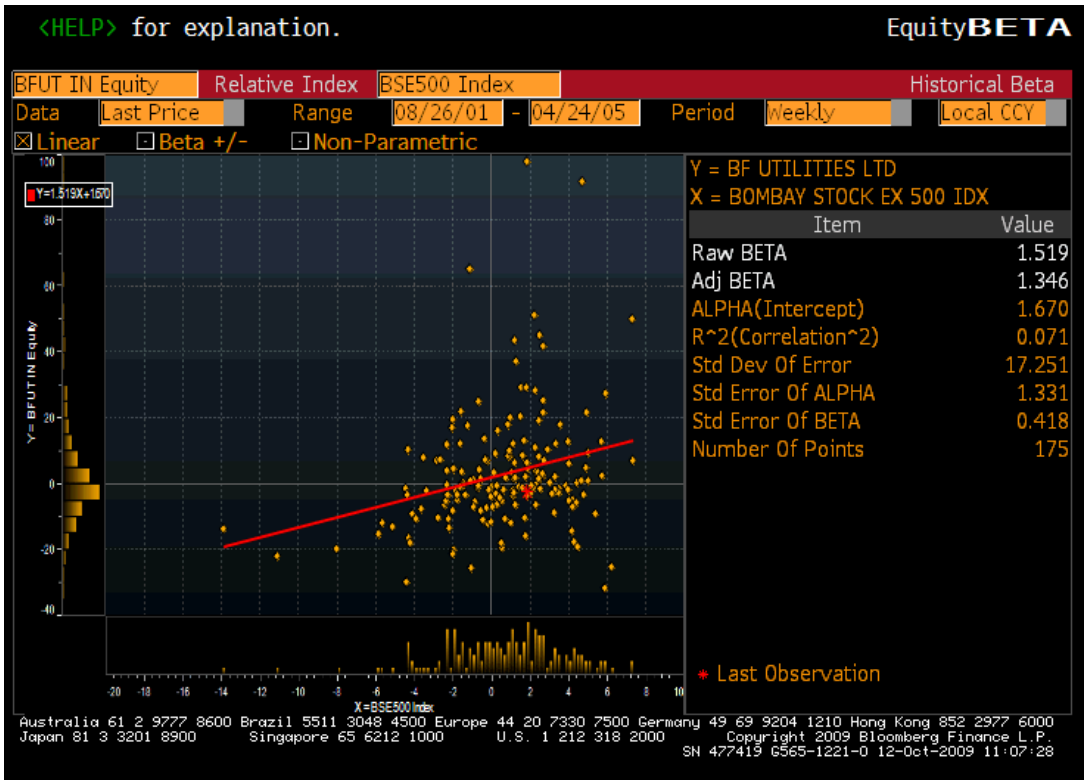
Tata Power



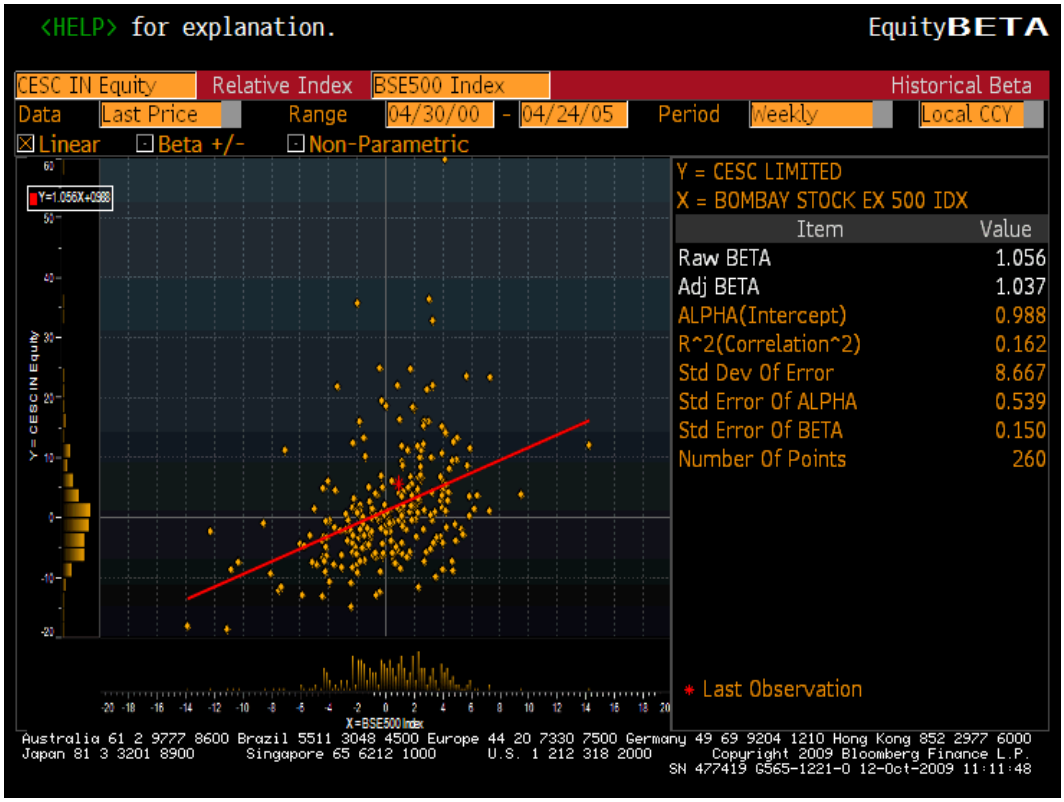
RELIANCE INFRASTRUCTURE LTD



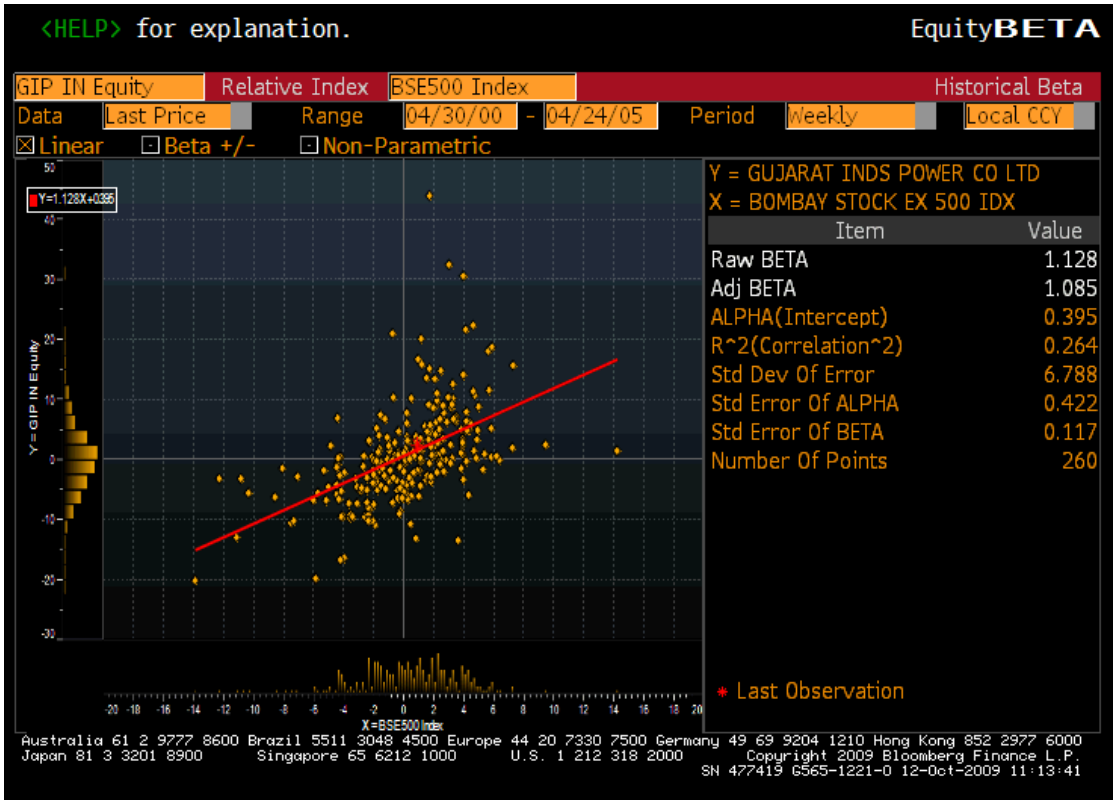
BF UTILITIES LTD



CESC LIMITED



GUJARAT INDS POWER CO LTD



NEYVELI LIGNITE CORPORATION