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

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Vajrakarur wind power project in Andhra Pradesh
Version number of the PDD	02.8
Completion date of the PDD	23/05/2013
Project participant(s)	Mytrah Vayu (Pennar) Private Limited
Host Party(ies)	India
Sectoral scope and selected methodology(ies)	Sectoral Scope: 1; Energy Industries (renewable -/ non- renewable) Selected methodology: ACM0002 ; Approved consolidated baseline methodology for grid connected electricity generation from renewable sources, Version 13.0.0
Estimated amount of annual average GHG emission reductions	124,363 tones Of CO_2 e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Electricity is an indispensable factor in development and growth. India faces peak electricity deficit leading to power shortages and power shut downs. As per the Central Electricity Authority[1], the Southern Grid has an installed capacity of 53,011.93 MW as on 31/03/2012 consisting of 28,784.6 MW thermal, 11,338.03 MW hydro, 1,320 MW nuclear and 11,569.3 MW from renewable energy sources. As per the Load Generation Balance Report[2] published by the Central Electricity Authority, the Southern grid faced a shortage of 5,388 MW.

In the above background, Mytrah Vayu (Pennar) Pvt Ltd is planning to set up 63MW wind power project at Vajrakarur village in Anathapur district in the state of Andhra Pradesh in India. The project activity comprises of 30 number Wind Turbine Generators (WTG's) with a capacity of 2.1 MW each. Thus the purpose of the project activity is to generate power from zero emissions wind based power project and thereby reduce the emissions associated with the grid. The project activity is expected to generate 138,632 MWh per annum and the same will be exported to southern grid. The electricity generated by the WTGs are monitored through energy meters connected to a set of WTGs of the PP at the project site. The electricity generated will be stepped up by 33 kV transmission lines and fed to the metering point which has main meter and check meter. The electricity is fed from this metering point to 33/220 kV pooling suzlon sub-station where the bulk meter (main meter and check meter) has been installed. Since WTGs of other project participants has also been connected to pooling substation, apportioning procedure is followed in arriving at net electricity exported by the project activity. The apportioning procedures have been detailed in section B.7.3 and annex 5.

The technology of electricity generation from wind power is environment friendly as it does not use any fossil fuel. It thereby reduces the greenhouse gas emissions associated with fossil fuel based electricity generation system.

The power (electricity) thus produced by the project activity would be transmitted to the Andhra Pradesh electricity grid. The project activity will therefore displace an equivalent amount of electricity which would have otherwise been generated in fossil fuel dominant electricity grid.

Therefore, baseline scenario (as stated in the methodology) will be power generation by fossil fuel based power plants connected to the grid. The annual average emission reduction by the project activity is expected to be 124,363 t CO_2e and the total emission reduction over the 10 year crediting period is 1,243,630 t CO_2e.

The project activity contributes to the sustainable development in the following manner:

- Social wellbeing
    - The project activity leads to direct and indirect employment throughout the life-cycle of the project.
    - Improvement of the local infrastructure like roads network.
    - The project activity provides business opportunities to the local population contributing to poverty alleviation of the local community
- Economic wellbeing

[1] http://www.cea.nic.in/reports/monthly/executive_rep/may12/8.pdf
[2] http://www.cea.nic.in/reports/yearly/lgbr_report.pdf

- Investment in a region, which would not have taken place in the absence of the project activity
- Infrastructural development of the region leading to overall development of the region

- Environmental wellbeing
  - The project activity uses natural resource (wind) for electricity generation
  - Project activity does not lead to any emissions or waste generation
  - Conservation of fossil fuel like coal, which can be used in other industrial applications
  - Contribute in bridging the demand-supply gap of electricity by producing green energy
- Technological wellbeing
  - The technology being implemented in the project activity is indigenous.
  - No technology transfer is taking place and the project activity proves the sustainable green power generation by indigenous technology

A.2. Location of project activity

A.2.1. Host Party(ies)

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India

A.2.2. Region/State/Province etc.

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Andhra Pradesh

A.2.3. City/Town/Community etc.

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Vajrakarur village, Anantapur district

A.2.4. Physical/Geographical location

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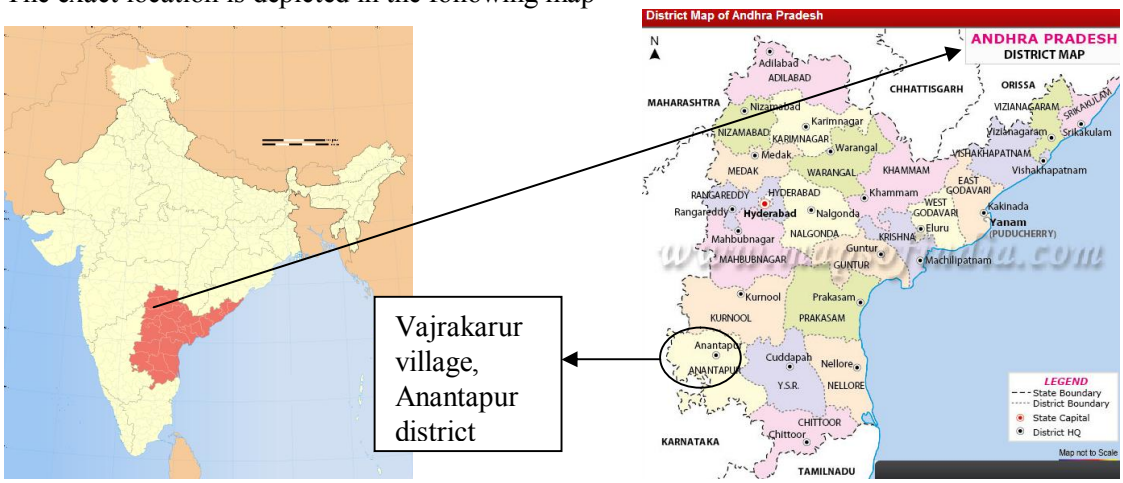
The project activity is located in Vajrakarur village, Anantapur district of Andhra Pradesh state, India. The location is about 360 km from Hyderabad city. As of March 2013, all 30 machines have been commissioned. The geo-coordinates of location of the project activity are as follows:

Sl No	Location	Zone	Latitude	Longitude
1	VAR 010	43 P	15^0 1’ 7.68”	77^0 14’ 37.18”
2	VAR 015	43 P	15^0 0’ 27.99”	77^0 15’ 14.58”
3	VAR 016	43 P	15^0 0’ 27.88”	77^0 16’ 1.56”
4	VAR 018	43 P	15^0 0’ 4.79”	77^0 15’ 44.45”
5	VAR 019	43 P	14^0 59’ 52.17”	77^0 16’ 1.02”
6	VAR 022	43 P	14^0 59’ 6.44”	77^0 15’ 44.64”
7	VAR 023	43 P	14^0 58’ 56.84”	77^0 15’ 55.01”
8	VAR 024	43 P	14^0 59’ 23.72”	77^0 16’ 35.89”
9	VAR 026	43 P	15^0 0’ 43.37”	77^0 16’ 46.07”
10	VAR 027	43 P	15^0 0’ 16.94”	77^0 17’ 36.85”
11	VAR 028	43 P	$15^0$0’ 4.62”	77^0 17’ 29.05”
12	VAR 029	43 P	14^0 59’ 42.71”	77^0 17’ 18.65”
13	VAR 030	43 P	14^0 59’ 30.30”	77^0 17’ 13.80”
14	VAR 037	43 P	14^0 58’ 42.71”	77^0 18’ 35.17”
15	VAR-038	43 P	14^0 58’ 21.07”	77^0 17’ 57.63”

16	VAR-039	43 P	14^0 58' 6.25"	77^0 17' 56.50"
17	VAR-040	43 P	14^0 57' 44.42"	77^0 18' 3.20"
18	VAR 050	43 P	14^0 59' 58.87"	77^0 19'4.90"
19	VAR 051	43 P	15^0 0' 10.25"	77^0 18' 55.68"
20	VAR 203	43 P	15^0 1' 6.13"	77^0 15' 21.67"
21	VAR 204	43 P	15^0 0' 48.04"	77^0 15' 22.42"
22	VAR 205	43P	15^0 0' 2.22"	77^0 15' 8.52"
23	VAR 208	43P	14^0 58' 13.90"	77^0 16' 27.42"
24	VAR 209	43P	14^0 58' 38.57"	77^0 17'34.36"
25	VAR 216	43P	15^0 1' 29.917"	77^0 16' 26.95"
26	VAR 217	43P	15^0 1' 16.78"	77^0 16' 42.34"
27	VAR 300	43P	15^0 1' 23.81"	77^0 15' 24.03"
28	VK 108	43P	15^0 2' 21.62"	77^0 16' 27.63"
29	VK 109	43P	15^0 2' 30.00"	77^0 16' 16.30"
30	VK 110	43P	15^0 2' 38.23"	77^0 16' 5.95"

The exact location is depicted in the following map



A.3. Technologies and/or measures

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The project activity comprises of 30 Wind Turbine Generators (WTG's) with a capacity of 2.1 MW each. The project activity proposes to use 2.1 MW WTG manufactured by Suzlon Ltd.

The technical lifetime of the wind turbine is 20 years.
Some of the other salient features are as mentioned below:

MODEL	**S88- 2.1 MW[3]**
Operating Data	
Rated power	2.1MW
Cut-in wind speed	4 m/s
Rated wind speed	14m/s
Cut-out wind speed	25 m/s

[3] http://www.suzlon.com/products/l2.aspx?l1=2&l2=9

50 years gust wind speed	59.5 m/s
Wind Class	IEC-IIA
Rotor	
Diameter	88 m
Swept area	6082 m^2
Generator	
Type	Asynchronous slip ring type induction generator
Frequency	50/60 Hz
Braking System	
Aerodynamic brake	3 independent systems with blade pitching mechanism
Mechanical brake	Hydraulic fail safe disc brake system
Gearbox	
Type	3 stages
Yaw System	
Type	Driven by 3 electrical driven planetary drives
Bearings	Polyamide slide
Tower	
Type	Tubular Tower (4 Sections)

The technology is developed and manufactured by Suzlon Energy Ltd based in India. Therefore, there is no transfer of technology.

As stated in the earlier section, the southern grid is a fossil fuel intensive grid. In the absence of the project activity the current scenario will continue and conventional fossil fuel based power plants will generate equivalent quantity of power and feed the grid.

A.4. Part(ies) and project participant(s)

Name of Party involved (host) indicates a host Party	Name of private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	Mytrah Vayu (Pennar) Private Limited.	No

A.5. Public funding of project activity

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No public funding is available for the proposed project activity.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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Title: Consolidated baseline methodology for grid-connected electricity generation from renewable sources[4]

Reference: Approved consolidated baseline and monitoring methodology ACM0002, Version 13.0.0

Other tools referenced in this methodology are:

- Tool for the demonstration and assessment of additionality, Version 07.0.0 (EB70 Annex 08)[5]
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, Version 02 EB41[6]Annex 11.
- Tool to calculate the emission factor for an electricity system, Version 03.0.0 (EB70 Annex 22)[7]
- Combined tool to identify the baseline scenario and demonstrate additionality, Version 05 (EB70 Annex 09) [8].

B.2. Applicability of methodology

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The applicability of the methodology is as described below:

Applicability criteria	**Applicability status**
This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The proposed project activity is a Greenfield grid-connected renewable power plant. Therefore, confirms to the said criteria
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	The proposed project activity is the installation of wind power plant/unit. Therefore, confirms to the said criteria
In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is nor affected): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity addition or retrofit of the plant has been undertaken between the start of this minimum historical	The proposed project activity is the installation of a new wind power plant/unit. Therefore, the said criteria is not applicable

[4] http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT
[5] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf
[6] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf
[7] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v3.0.0.pdf
[8] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v5.0.0.pdf

reference period and the implementation of the project activity	
In case of hydro power plants, at least one of the following conditions must apply: • *The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or* • *The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity; or* • *The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m2.* *In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 after the implementation of the project activity all of the following conditions must apply:* • *The power density calculated for the entire project activity using equation 5 is greater than 4W/m2;* • *All reservoirs and hydro power plants are located at the same river and where are designed together to function as an integrated project1 that collectively constitutes the generation capacity of the combined power plant;* • *The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity;* • *The total installed capacity of the power units, which are driven using water from the reservoirs with a power density lower than 4 W/m2, is lower than 15MW;* • *The total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.*	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
The methodology is not applicable to the following: • *Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;* • *Biomass fired power plants;* • *A hydro power plant that result in the creation of a new single reservoir or in the increase in existing single reservoir where the power density of the*	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable

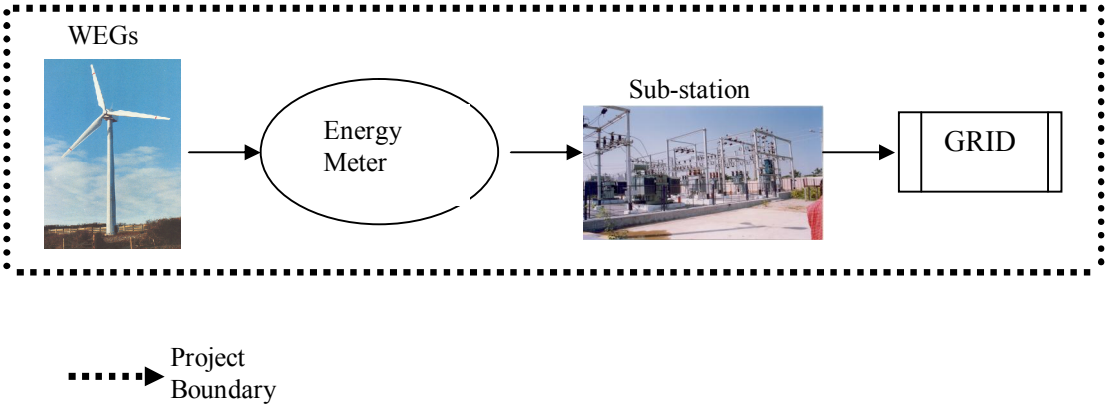
reservoir is less than 4 W/m^2.	

B.3. Project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Source 1: CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	Yes	In the baseline scenario, electricity would have been generated through emission intensive fossil fuel based power plants.
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project scenario	Source 1: Greenfield grid-connected wind power plant/unit	CO_2	No	The project activity does not have any emissions
		CH_4	No	
		N_2O	No	

As per the applied methodology, *"The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system[9] that the CDM project power plant is connected to".*

Therefore, the project boundary for the proposed project activity is:



B.4. Establishment and description of baseline scenario

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As per the applied methodology, the baseline scenario is "*Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the .Tool to calculate the emission factor for an electricity system".*

Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity

[9] As per Tool to calculate the emission factor for an electricity system, Version 03.0.0, *"**A grid/project electricity system** is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints".*

generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

*BEy = EGPJ,Y * EFgrid,CM,y*

Where:
BEy = Baseline emissions in year y (tCO2)
EGPJ,Y = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

EFgrid,CM,y = Combined margin CO2 emission factor for grid connected power generation in year y
calculated using the latest version of the .Tool to calculate the emission factor for an electricity system. (tCO2/MWh)

B.5. Demonstration of additionality

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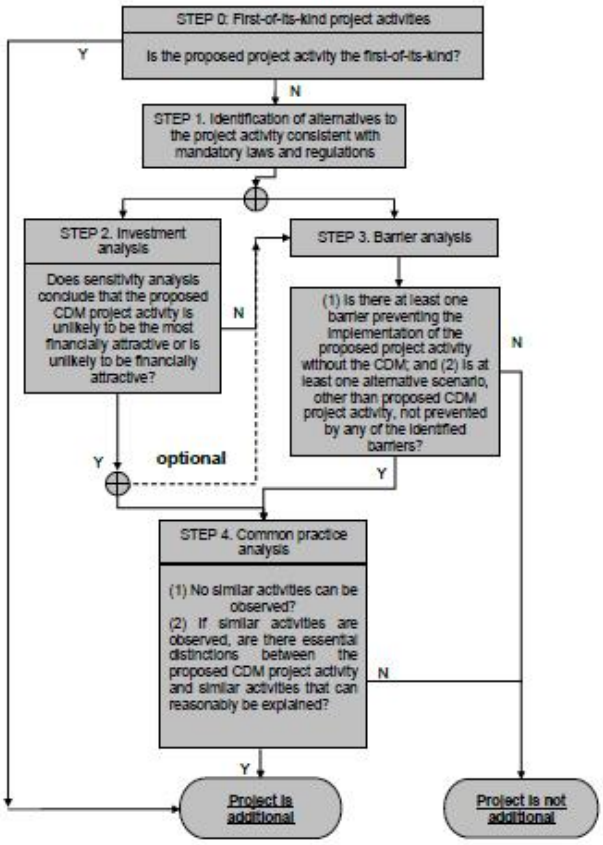
The project activity is said to be additional if the anthropogenic emissions of GHG by source are reduced below those that would have occurred in the absence of the registered CDM project activity. As per the applied methodology, "*the additionality of the project activity shall be demonstrated and assessed using the latest version of the Tool for the demonstration and assessment of additionality".*

The steps involved in demonstrating the additionality as per the latest version of the tool (Version 07.0.0) is as summarized below:



Sub Step 0: Demonstration whether the proposed project activity is the first-of-its-kind

The project activity is the establishment of 63 MW of wind power in the district of Anantapur in Andhra Pradesh. Establishment of wind power in the State of Andhra Pradesh is not first of it's kind since the state already has commissioned 248.52 MW of power.[10] *Step 1: Identification of alternatives to the project activity consistent with current laws and regulations*

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

The alternatives available to the proposed project activity are as follows:

a) The project activity being undertaken without taking in to consideration the CDM
In the absence of CDM, the project activity would have continued to generate electricity from wind and supply the same to the fossil fuel intensive regional grid. This is a realistic and credible alternative available to the project activity. However, without CDM revenues the project activity is not financially viable (explained in detail in step 2).

b) Project activity being setting up using other renewable energy and/or fossil fuel
Setting up of a fossil fuel based or other renewable energy (hydro, solar etc) based power plant is an alternative available to the project participant. As per the tool, "*a coal-fired power station or hydropower may not be an alternative for an independent power producer investing in wind energy"*. Therefore, this is not a realistic and credible alternative

c) Continuation of current scenario i.e., either no project activity or any other alternatives undertaken
As mentioned in the earlier section, the. The Southern Grid faced an energy shortage of 14.5% in the year 2011-12. Therefore, not having a project activity is not a realistic and credible option. Instead, the grid will continue to receive electricity from thermal power plants.

As per the applied methodology, "*If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:*

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the .Tool to calculate the emission factor for an electricity system".

Therefore, apart from continuation of the current scenario, the other alternative is the proposed project activity being undertaken without CDM

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

Undertaking the proposed project activity without CDM as well as the grid being fed with power plants is in compliance with all the laws and regulations.

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method
In addition to the CDM revenue, the project activity generates revenue from the sale of electricity to the grid. Therefore, Simple Cost analysis is not an appropriate analysis method.

[10] http://nedcap.gov.in/Wind_Energy_Projects_Commissioned.aspx

As per the Guidelines on the assessment of investment analysis[11], Version 05 guidance 19 states "*If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate".* The proposed project activity the baseline does not require investment, i.e., the project participant can chose to invest or not to. Also continuing of current scenario is the supply of electricity from a grid. Therefore, benchmark analysis is the appropriate method.

The equity Internal Rate of Return (Equity IRR) has been chosen as the financial indicator for the investment analysis. While computing the equity IRR, only the portion of investment costs which is financed by equity should be considered as the net cash outflow. This is in conformance with guidance 10 of the Guidelines on the assessment of investment analysis.

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

As per guidance 12 of Guidelines on the assessment of investment analysis, "*Required/expected returns on equity are appropriate benchmarks for an equity IRR".* Therefore, the project participant has chosen Cost of Equity as the benchmark to compare the equity IRR.

As per guidance 15 of Guidelines on the assessment of investment analysis, *"……. the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices……".*

The project participant has chosen option (a) to estimate the cost of equity. As per Appendix, the project activity falls under Group 1 category of projects. The default value for the expected return on equity calculated after taxes is 11.75%. As per guidance 7 of Appendix, *project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period.*

Reserve Bank of India (RBI), the central bank of India, provides the inflation forecast over the next ten years. The inflation expected over the next ten years (duration of crediting period) is 5.5[12]%.

The cost of equity is = 11.75%+5.50%
= 17.25%

Therefore, the benchmark computed for the project activity is 17.25%.

Sub-step 2c: Calculation and comparison of financial indicators

All the input values, along with their source, used for the computation of equity IRR is provided in the table below in a transparent manner. The equity IRR computation worksheet is provided to the DOE for verification.

Item	Value	Reference
No of WEGs	30nos	Quotation received on 01/11/2011 prior to decision making date of 21/12/2011. Conformance with
Capacity of each WTG	2.1 MW	

[11] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf
[12] http://rbi.org.in/scripts/PublicationsView.aspx?id=13360

Project Size	63 MW	guidance 6 of investment analysis guidelines.
Cost per WEG	129.36 Million INR	
Total Project Cost	3,881 Million INR	Calculated
Cost per MW	61.6 Million INR	Calculated
Means of Finance		
Debt	2,716.6	APERC Tariff Order Dated 01 May 2009 as 70.0%
Equity	1,164.2	APEREC Tariff Order Dated 01 May 2009 as 30.0%
Opearating Parameters		
Plant Load Factor (net of Transmission charges)	25.12%	GH Wind Assessment Report dated 17 May 2011
Total Generation for the project at above PLF	138.63 Million kWh per annum	Calculated
Life of the Wind Turbine	20.00 years	Manufacturer specification provided in Quotation received on 01/11/2011. In conformance with Annex 15, EB 50 Guidelines on Lifespan
O & M cost		
O & M Cost from 3rd Year of operation	45 Million INR	Quotation received on 01/11/2011 prior to decision making date of 21/12/2011. Conformance with guidance 6 of investment analysis guidelines.
Annual escalation from 4th year	5%	
Salvage Value	10%	APERC tariff order dated 01 May 2009[13]
Financial Parameters		
Interest on Term Loan		
Rupee Loan[14] (Interest Rate)	12.65%	Based on Prior experience, IREDA Loan letter (Reference No: 221/2680/WIND/IREDA) for the previous wind power projects dated 15/02/2011
Tariff	INR 3.50	APERC tariff order dated 01 May 2009[15]. Tariff rate fixed for 10 years. Beyond 10 years tariff will be agreed as per the mutual agreement between APERC and Mytrah Vaayu (Pennar) Pvt Ltd. However, tariff INR 3.5 has been considered for entire project lifetime conservatively.
Tariff escalation	0.00%	APERC tariff order dated 01 May 2009
Depreciation Rate		
As per companies Act		
Plant and machinery – SLM	5.28%	Companies Act Rates of depreciation under companies act - Schedule XIV[16]
As per Income Tax Act		

[13] http://www.aperc.gov.in/OtherOrders/2009/Final%20Wind%20Order%20dated%2001052009.pdf
[14] Ref: IREDA Loan letter dated 15/02/2011 and the same has been submitted to DOE
[15] http://www.aperc.gov.in/OtherOrders/2009/Final%20Wind%20Order%20dated%2001052009.pdf
[16] http://www.aadisol.in/aca/images/bullentins/bt_23.pdf

Depreciation rate- first year	15%	IT Act[17]
Taxation		
Corporate Tax	32.45%	IT Act (http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents /Tax/us_tax_Q4QuickReferenceGuide_012712.pdf) (page No.2)
MAT	20.01%	IT Act (http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents /Tax/us_tax_Q4QuickReferenceGuide_012712.pdf) (page No.2)

The equity IRR thus computed is 7.15%. Compared to the benchmark of 17.25%, it is evident that the project activity is not financially viable.

Sensitivity Analysis

As per guidance 20 of Guidelines on the assessment of investment analysis, "*Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation".* The parameters therefore subjected to sensitivity analysis are:

- Project cost
- O&M cost
- PLF
- Power tariff rate

The results of sensitivity analysis are presented in the table below:

Parameter	Sensitivity applied	Equity IRR	Benchmark
Project Cost	10%	4.64%	17.25%
	-10%	10.31%	
O&M Cost	10%	6.79%	
	-10%	7.50%	
PLF	10%	9.85%	
	-10%	4.39%	
Power tariff	10%	9.81%	
	-10%	4.43%	

From above, it is evident that in no event the equity IRR crosses the benchmark.

As per the Annex 5, EB 62[18] , GUIDELINES ON THE ASSESSMENT OF INVESTMENT ANALYSIS "In cases where a scenario will result in the project activity passing the benchmark or becoming the most financially attractive alternative the DOE shall provide an assessment of the probability of the occurrence of this scenario in comparison to the likelihood of the assumptions in the presented investment analysis,

[17] http://law.incometaxindia.gov.in/DITTaxmann/Notifications/IncomeTaxAct/2010/Notification15_2012.htm; and http://law.incometaxindia.gov.in/DitTaxmann/IncomeTaxActs/2001ITAct/rules2001/appI.htm

[18] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

taking into consideration correlations between the variables as well as the specific socio-economic and policy context of the project activity"

From the above mentioned results of sensitivity analysis, it is evident that the equity IRR does not cross the benchmark within the chosen range. However, the sensitivity at which the equity IRR crosses the benchmark is provided below along with the justification of the probability of these scenarios not occurring.

PLF – With an increase in 35.75% in the PLF, the equity IRR crosses the benchmark. However, the probability of this is nil due to the following reasons:

- The PLF is considered as per the third part assessment report at 25.12%. The Andhra Pradesh State Electricity Board considers a PLF of 24.5%. Since the PLF considered at 25.12% is as per the third party assessment and greater than the PLF provided in the tariff order the occurrence of equity IRR crossing the benchmark is NIL.

Power purchase tariff – With an increase in 36.8% in the tariff, the equity IRR crosses the benchmark. However, the probability of this is nil due to the following reasons:

- The Andhra Pradesh State Electricity Tariff dated 01/05/2009 fixes the preferential tariff of INR 3.5 per unit for wind power projects. PP has entered into PPA for the 30 commissioned machines at INR 3.5/kWh Hence the probability of increase in tariff by 36.8% is nil

Project cost – With a decrease in 25% in the project cost, the equity IRR crosses the benchmark. As per the Purchase Order placed by PP, the actual project cost incurred for the project is INR 3880 million which is lesser than offer price by the technology supplier. Hence the probability of decrease in project cost by 25% is nil.

O&M cost –The equity IRR does not crosses the benchmark, if O&M cost decreases by 100% .It is also confirmed that equity IRR crosses the benchmark if O&M cost decreases by 381% but this is not a likely scenario because the PP has entered into O&M agreement with the technology supplier and the actual O&M cost is 1.867 million per annum which is higher than the O&M cost considered at the time of decision making. It is worthwhile to note that an annual escalation of 5% in O&M cost from 4th year of operation till end of lifetime of project activity is also considered. Hence the probability of any further reduction in O&M cost is ruled out.

Step 4: Common practice analysis:

Since the project activity comes under option b (ii) of para 13 of the tool to demonstrate additionality, version 7, PP has used Sub-step 4(a) to demonstrate common practice analysis.

The project activity is a power generation based on renewable energy, which falls under measures listaed in definition section of "Tool for the demonstration and assessment of additionality". Hence, substep 4a is been followed and latest version of Guidelines on Common Practice Version 02 approved in EB 69 Annex 08 is been used.

Step 1: Applicable output range
The proposed project activity is of 63 MW capacity. Considering +/- 50% of the project activity capacity the output range to be considered for the common practice analysis is 31.5 MW to 94.5 MW

Step 2: *Identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:*

(a) The projects are located in the applicable geographical area;
(b) The projects apply the same measure as the proposed project activity;
(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity

a) The host country India has been chosen as the applicable geographical area. Hence, projects in the host country India have been chosen for analysis.
b) The proposed project is a wind power project supplying electricity to the grid. Hence, similar projects in the capacity range which use the same source of energy and apply the same measure have been selected.
c) The energy source used by the project activity is wind. Hence, only wind energy projects have been considered for analysis.
d) The plants which produce goods or services with comparable quality, properties and applications have been considered.
e) The projects within the applicable capacity range have been considered.
f) The projects which started commercial operations before the start date of the project activity have been considered as the project start date is before the date of global stakeholder consultation.

Thus, all power plants which supply electricity to the grid in the applicable capacity range and commissioned before the project start date have been considered

The list of similar projects as per the Steps 2(a) to 2(f) and their CDM status is presented below:

Wind Power Projects:

Sources:
Indian Wind Power Directory 2011 (http://www.indiacore.com/bookstore-ic/details/de-ipdi/ipdi134.html)

Name	Capacity	Commissioning date	State
DLF Home developers Limited	33 MW	Sep-08	TAMIL NADU
Enercon windfarms Hindustan P Ltd	44.8 MW	Sep-06	KARNATAKA
Enercon windfarms Hindustan P Ltd	60 MW	Mar-07	RAJASTHAN
GACL	39 MW	Mar-09	GUJARAT
GSPC	52.5 MW	Sep-09	GUJARAT
Gujarat NRE Coke Limited	39 MW	Sep-08	GUJARAT
HZL	88.8MW	Mar-08	GUJARAT
Madras Cement Ltd	36 MW	Mar-08	TAMIL NADU

ONGC	46.5 MW	Sep-08	GUJARAT
Reliance Innoventures Pvt Ltd	37.5 MW	Mar-08	MAHARASTHRA
Tata Power company	36 MW	Mar-09	KARNATAKA
Tata Power Company	37.6 MW	Mar-07	MAHARASTHRA
BP Energy India Pvt Ltd	40 MW	Sep-07	MAHARASTHRA
Rajasthan State Mines & Mineral Ltd.	31.5 MW	Mar-10	RAJASTHAN
Bajaj Auto Limited	45.2	Jan-00	Maharshtra
Grace Infrastructure Limited	31	Oct-04	Tamil Nadu

Thus, 16 projects are identified as per the Steps 2(a) to 2(f).

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number Nall

From the list of power plants mentioned in Step 2 the list of power plants which are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation is given below:
The list of power plants that are under CDM and their CDM reference is provided in the below table.

Wind Power Plants:

Name	Capacity	Commissioning date	State	CDM Status
DLF Home developers Limited	33 MW	Sep-08	TAMIL NADU	Validation[19]
Enercon windfarms Hindustan P Ltd	44.8 MW	Sep-06	KARNATAKA	Registered[20]
Enercon windfarms Hindustan P Ltd	60 MW	Mar-07	RAJASTHAN	Registered[21]
GACL	39 MW	Mar-09	GUJARAT	Validation[22]
GSPC	52.5 MW	Sep-09	GUJARAT	Validation[23]

[19] http://cdm.unfccc.int/Projects/DB/BVQI1270985563.08/view

[20] UNFCCC Project Registered: 1295
[21] UNFCCC Project Registered: 1168
[22] http://cdm.unfccc.int/Projects/Validation/DB/CBEZRP9HZI993GZEUKGZF6JOGZJB45/view.html
[23] http://cdm.unfccc.int/Projects/Validation/DB/B86YECV7ZMPDMHIKTX0S9VXVUMR6CG/view.html

Gujarat NRE Coke Limited	39 MW	Sep-08	GUJARAT	Validation[24]
HZL	50.4 MW	Mar-08	GUJARAT	Validation[25]
Madras Cement Ltd	36 MW	Mar-08	TAMIL NADU	Validation[26]
ONGC	46.5 MW	Sep-08	GUJARAT	Validation[27]
Reliance Innoventures Pvt Ltd	37.5 MW	Mar-08	MAHARASTHRA	Validation[28]
Tata Power company	36 MW	Mar-09	KARNATAKA	Validation[29]
Tata Power Company	37.6 MW	Mar-07	MAHARASTHRA	Validation[30]
BP Energy India Pvt Ltd	40 MW	Sep-07	MAHARASTHRA	Validation[31]
Rajasthan State Mines & Mineral Ltd.	31.5 MW	Mar-10	RAJASTHAN	Validation[32]
Bajaj Auto Limited	45.2	Jan-00	Maharashtra	Rejected under CDM[33]
Grace Infrastructure Limited	31	Oct-04	Tamil Nadu	Rejected under CDM[34]

Hence only two projects are rejected under CDM and hence considered for calculation of Nall

Hence Nall= 2

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number Ndiff

[24] http://cdm.unfccc.int/Projects/Validation/DB/3XJDEJWIXD7AE8K5O7RYT5HU1CV2HB/view.html

[25] http://cdm.unfccc.int/Projects/Validation/DB/GBNPPPY3L5ZQHW62FBTOV0IERYTZYJ/view.html

[26] http://cdm.unfccc.int/Projects/Validation/DB/OB98HGOB9W6DUNN60IUBED9VHZRTUQ/view.html

[27] http://cdm.unfccc.int/Projects/Validation/DB/R5BD015ZJ7LASJ7O6UH5I5031VOG1F/view.html

[28] http://cdm.unfccc.int/Projects/DB/RWTUV1218537127.82/view

[29] http://cdm.unfccc.int/Projects/Validation/DB/JKN7E7WJGVFV54ESYJAM6ONJZFU86D/view.html
[30] http://cdm.unfccc.int/Projects/Validation/DB/E28ZL3NPWVJM6PRE5Y8CX36320II6R/view.html
[31] https://cdm.unfccc.int/Projects/Validation/DB/6EMUL2Q30KIARSY3QVTBUR9QB50GC1/view.html
[32] http://2.imimg.com/data2/EW/LW/HTT-370/370_2010-01-19_56.pdf
[33] http://cdm.unfccc.int/Projects/DB/BVQI1135775559.33/view
[34] http://cdm.unfccc.int/Projects/DB/RWTUV1248957594.87/view

As per paragraph 4 of guideline on common practice, "*Different technologies are technologies that deliver the same output and differ by at least one of the following (as appropriate in the context of the measure applied in the proposed clean development mechanism (CDM) project activity and applicable geographical area):*"

a. Energy source/fuel
b. Feed stock
c. Size of installation (power capacity)/energy savings:
d. Investment climate on the date of the investment decision,
e. Nature of the investment

Based on investment climate considering the fact that in host country each state has its own regulatory guidelines, projects falling in other state than Andhra Pradesh are considered as different project. Also, as a part of legal regulations and policy requirement under host country regarding electricity act came in force in 2003. Major reforms were initiated in power sector in India in the year 2003 when Electricity Act 2003, came into force. State Regulatory Commissions (APERC) started formulating Tariff Orders for Wind Power projects in their respective states. As verified from the various state regulatory commission tariff orders, it is confirmed that the tariff rates, Potential for generation, other expenditure are different for different states. Hence projects commissioned prior to 2003 and commissioned in other state than Andhra Pradesh are considered as different projects.

Hence Ndiff= 2

Step 5: calculate factor F=1-Ndiff/Nall representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity

F = 1-(2/2)
Thus F = 0

And, $N_{all} - N_{diff} = 0$

As per paragraph 4 of guideline on common practice, the proposed project activity is a common practice within a sector in the applicable geographical area if both the following conditions are fulfilled:

(a) The factor F is greater than 0.2, and
(b) $N_{all} - N_{diff}$ is greater than 3.

Since the factor F is zero i.e., less than 0.2 and $N_{all} - N_{diff}$ is less than 3, the project activity cannot be considered as a common practice within the applicable geographical area.

This proves that similar activities are not widely observed or commonly carried out. Therefore the project activity is not a common practice.

The above discussions show that wind power development is not a common practice and the project activity is not financially attractive; hence the project activity is additional.

Serious CDM consideration

Mytrah Vaayu (Pennar) Pvt limited is in the business of generating wind power. PP has prior experience in availing CDM benefits and the earlier CDM projects are in validation[35]. Hence PP was completely aware of CDM benefits and considered the CER revenue for this project as the project activity is not financially viable**.**

The chronology of events mentioned below highlights the various steps taken up by PP to secure the CDM revenue:

Project implementation	Date	CDM activity	Date
Offer received from technology supplier	01/11/2011	Board Resolution	21/12/2011
Purchase Order (start date)	21/12/2011		
		Prior Consideration to UNFCCC and NCDMA[36]	09/01/2012
		Stakeholder Consultation	12/04/2012
		PDD webhosted for Global Stakeholder Consultation	30/08/2012

From above table, it could be seen that the prior CDM consideration form has been submitted within six months from the start date and hence the project activity conforms to the "Guidelines on the demonstration and assessment of prior consideration of the CDM" Annex 13 of EB 62.

Hence from the above analysis it can be concluded that the project activity is additional and the financial viability and sustainable operation is possible only with the benefits of CDM.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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According to the methodology, Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year y (tCO_{2e})
BE_y = Baseline emissions in year y ($t CO_2$)
PE_y = Project emissions in year y ($t CO_{2e}$)

Baseline Emissions:

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows

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

Where:

[35] http://cdm.unfccc.int/Projects/Validation/DB/51ZY4MG9TEBV9RBFH5JNQTB13XTIWL/view.html
http://cdm.unfccc.int/Projects/Validation/DB/71IYU4T80UMYUCMEOX5YFKSMWJ01YD/view.html
[36] http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

BE_y = Baseline emissions in year y (tCO_2)
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

As per the "Tool to calculate the emission factor for an electricity system", Version 03 **Calculation of the Baseline Emission Factor**[37]

Step 1: Identify relevant electricity systems:

The Indian electricity system is divided into two regional grids, viz. (1) Northern, Eastern, Western, North-Eastern and (2) Southern grid. Each grid covers several states. As the regional grids are interconnected, there is inter-state and inter-regional exchange.

Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state in a regional grid meets its demand with its own generation facilities and also with allocation from power plants owned by the Central Sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the Central Sector power plants.

Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus, represents the "project electricity system" for the project activity. As the project activity is connected to the southern regional electricity grid, the Southern grid is the "project electricity system".

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)
As the above step is optional, only grid power plants have been included in the calculation of the operating margin and build margin emission factor.

Step 3: Select a method to determine the operating margin (OM).
$EF_{grid,OM,y}$ will be calculated based on one of the four following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

Any of the four methods can be used, however, the simple OM method (option a) can only be used if low cost/ must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The below table shows the share of low cost/must run resource in the generation profile of two grids in India for the last five years.

	2006-07	2007-08	2008-09	2009-10	2010-11
NEWNE	18.5%	19.0%	17.4%	15.9%	17.6%
South	28.3%	27.1%	22.8%	20.6%	21.0%

[37] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v3.0.0.pdf

India	20.9%	21.0%	18.7%	17.1%	18.4%

From the above table, the use of the Simple OM method is justified as the share of the low cost/ must run resources constitute less than 50% of the total grid generation. The Ex ante option has been chosen where in a three year generation weighted average based on the most recent data would be calculated and the same would be fixed for the crediting period.

Step 4: Calculate the operating margin emission factor according to the selected method.
According to the, the Simple OM emission factor, the simple OM emission factor is calculated based on the electricity generation of each power unit and an emission factor for each power unit, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}\right)}{EG_y}$$

Where:
$EF_{grid,OMsimple,y}$ = Simple operating margin CO2 emission factor in year y (tCO_2/MWh)
$FC_{i,y}$ = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
$EFCO2_{,i,y}$ = CO2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)
i = All fossil fuel types combusted in power sources in the project electricity system in year y
y = The three-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD

Thus the simple operating margin CO2 emission factor for the recent years (2008-09, 2009-10, 2010-11) is **0.9515 tCO2/MWh**

Step 5: Identify the group of power units to be included in the build margin (BM)

For the calculation of the build margin, the sample group of power unit m must consist of either:

1. The set of five power units that have been built most recently, or
2. The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Option 2 has been used for calculating the build margin. The data pertaining to the units thus identified are detailed in the Version 7.0 of the Baseline Carbon Dioxide Emissions database of the CEA[38].

With regards to data vintage, the project participant wishes to use Option 1 viz., for the crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation

Step 6:Calculate the build margin emission factor:

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

[38] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

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

Where

$EF_{grid,BM,y}$ = Build margin CO2 emission factor in year y (tCO2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EFEL_{,m,y}$ = CO2 emission factor of power unit m in year y (tCO2/MWh)
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available
The build Margin would be calculated ex ante during the crediting period.

For ex ante calculation the most recent data (2009-10) available has been used and the build margin thus calculated is **0.7339 tCO2/MWh.**

Step 7: Calculate the combined margin (CM) emissions factor.

The combined emissions factor is calculated as follows.
$EF_{grid,CM,y}$ = $EFgrid_{,OM,y}$ x W_{OM} + $EF_{grid,BM,y}$ x 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 (%)

For wind and solar powered projects the defaults weights are as follows: W_{OM} = 0.75 and W_{BM} = 0.25
Hence the baseline emission factor is calculated as follows.

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

=0.9515*0.75+0.7339*0.25
=0.8971 tCO2/MWh

Thus the resulting combined emission factor is **0.8971 tCO2/MWh**

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EF_{grid,OMsimple,y}$
Unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor of Southern grid
Source of data	Central Electricity Authority:CO_2 Emission Database CEA CO_2 Baseline database Version 07[39]
Value(s) applied	0.9515
Choice of data or Measurement methods and procedures	The operating margin emission factor data has been deduced from CO_2 Database.
Purpose of data	Used to compute combined emission factor of grid
Additional comment	The operating margin emission factor is a 3-year generation-weighted average data, based on the most recent data available on CEA database at the time of submission of the CDM-PDD to the DOE for validation

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO_2/MWh
Description	Build margin CO_2 emission factor of Southern grid
Source of data	Central Electricity Authority:CO_2 Emission Database CEA CO_2 Baseline database Version 07
Value(s) applied	0.7339
Choice of data or Measurement methods and procedures	The build margin emission factor data has been deduced from CO_2 Database.
Purpose of data	Used to compute combined emission factor of grid
Additional comment	The build Margin would be calculated ex ante and fixed during the crediting period. For ex ante calculation the most recent data available has been used and the build margin thus calculated is 0.7339

[39] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor of Southern grid
Source of data	Central Electricity Authority:CO_2 Emission Database CEA CO_2 Baseline database Version 07
Value(s) applied	0.8971
Choice of data or Measurement methods and procedures	Calculated as per the procedures in "Tool to calculate the emission factor for an electricity system" with data deduced from CEA
Purpose of data	Used to compute the baseline emissions
Additional comment	The Combined Margin would be calculated ex ante and fixed during the crediting period.

B.6.3. Ex ante calculation of emission reductions

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Baseline Emissions:

$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$
$= 138,632 * 0.8971$
$= 124,363\ tCO_2e$

As the project activity is wind power project, project emissions are zero .

Therefore, Emission reductions are:

$ER_y = BE_y - PE_y$
$= 124,363 - 0$
$= 124,363\ tCO_2e$

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

Year*	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1	124,363	**0**	**0**	124,363
Year 2	124,363	**0**	**0**	124,363
Year 3	124,363	**0**	**0**	124,363
Year 4	124,363	**0**	**0**	124,363
Year 5	124,363	**0**	**0**	124,363
Year 6	124,363	**0**	**0**	124,363
Year 7	124,363	**0**	**0**	124,363
Year 8	124,363	**0**	**0**	124,363
Year 9	124,363	**0**	**0**	124,363
Year 10	124,363	**0**	**0**	124,363
Total	1,243,630	**0**	**0**	1,243,630
Total number of crediting years	10			
Annual average over the crediting period	124,363	**0**	**0**	124,363

* Begins from the start date of crediting period and each year extends for 12 months.

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{PJ,y}$
Unit	MWh (Mega- Watt hour) /year
Description	Net Electricity Supplied to the grid by the project activity.
Source of data	Calculated
Value(s) applied	Annual electricity supplied to the grid by the Project = 63 MW (Capacity) x 25.12%(PLF) x 8,760 (hours) MWh =138,632 MWh
Measurement methods and procedures	• Metering system for the project activity consists of cluster metering system at 33kV. Each Cluster point will have one main and one check meter (33kV metering point) All the clusters of the project activity will be exclusively be connected to WEGs of the project activity i.e. there will be no WEGs of other project owners that are connected to these clusters. Summation of meter reading for all the clusters (connecting 30 machines) will provide total electricity generated by the project activity. • In addition to cluster meters there is one set of main & check meter at Suzlon pooling sub-station (220kV metering point/Bulk metering point) where all the WEGs of project activity and non-project activity are connected. All main and check meters are two way tri-vector meters capable of recording import and export of electricity under the control of state electricity utility. • All main and check meters are of 0.2% of accuracy class • The procedures for metering and meter reading will be as per the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD • Monthly Joint Meter Reading will be recorded at all the meters will be done by Discom utility in the presence of PP's representative (Suzlon) • Joint meter reading recorded at cluster metering point indicates the values of export & import by the WEGs of project activity connected to 33 kV metering point. There will be individual Joint meter reading for individual cluster metering point. • Joint meter reading recorded at 220kV metering point at Suzlon pooling sub-station indicates the values of export and import by all the WTG's of the project activity and WTG's of non-project activity connected to 220kV metering point • Net electricity supplied to the grid is used in calculation of emission reduction of the project activity Refer Appendix 5 for an illustration of the provisions for measurement methods
Monitoring frequency	Recording : Monthly Monitoring :Not Applicable since it is a calculated parameter

QA/QC procedures	QA/QC procedures will be as implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Net electricity supplied ($EG_{PJ,y}$) to the grid by the project activity will be cross checked with invoices submitted by the PP to.the state utility. All the main meter and check meters are calibrated by state utility once a year and records are available with PP.
Purpose of data	Baseline emissions calculation
Additional comment	-

Data / Parameter	$EG_{export, y}$
Unit	MWh (Mega-Watt hour) /year
Description	Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (cluster meter) and 220kV metering point(Bulk metering point)
Source of data	Electricity exported by project activity will be calculated using the formula better described in Appendix V
Value(s) applied	-
Measurement methods and procedures	Refer Appendix V for an illustration of the provisions for measurement methods.
Monitoring frequency	Not Applicable since it is a calculated parameter
QA/QC procedures	Value of $EG_{export,y}$can be cross checked from certified statement given by state utility showing cost of export and import. It may be noted that energy export by the project activity will be import by the grid from the project activity and therefore electricity export by the project activity is denoted as import by the grid in the certified statement by the state utility. QA/QC procedures will be as implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters are calibrated by state utility once a year and records are available with PP.
Purpose of data	Baseline emissions calculation
Additional comment	-

Data / Parameter	EGpe
Unit	MWh/year
Description	Electricity Export recorded at 33kV(JMR at 33kV metering point) cluster points connecting total 30 machines of the project activity.
Source of data	Electricity export to the grid as per the joint meter reading recorded at cluster metering points
Value(s) applied	-
Measurement methods and procedures	Electricity export to the grid will be recorded by the cluster meters (main and check) connecting 30 turbines at 33kV level.
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	The value of (EGpe) transmission loss can be cross checked from the transmission loss calculation sheet of Suzlon and Discom. QA/QC procedures will be implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.
Purpose of data	Baseline emissions calculation
Additional comment	All the data items monitored under the monitoring plan will be archived for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later

Data / Parameter	EG_{imp}
Unit	MWh/year
Description	Electricity imported recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting a total of 30 machines of the project activity.
Source of data	Electricity import from grid as per the joint meter reading recorded at cluster metering points.
Value(s) applied	-
Measurement methods and procedures	Electricity import form grid will be recorded by cluster meters (main and check) connecting 30 turbines at 33kV level.
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	Value of E_{imp} can be cross checked from certified statement given by state utility showing cost of export and import. It may be noted that energy import by the project activity will be export by the grid from the project activity and therefore electricity import by the project activity is denoted as export by the grid in the certified statement by the state utility. QA/QC procedures will be as implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.
Purpose of data	Baseline emissions calculation
Additional comment	All the data items monitored under the monitoring plan will be archived for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later

Data / Parameter	EG*e*
Unit	MWh
Description	Electricity export recorded at 220kV meters (main and check) at Suzlon pooling station connecting machines of the project activity and the machines commissioned by other project developers
Source of data	Electricity export to the grid as per joint Meter Readings recorded at 220kV of Suzlon pooling sub -station.
Value(s) applied	-
Measurement methods and procedures	Electricity export to the grid will be recorded by the 220 kV (main and check) at Suzlon pooling sub- station connecting machines of the project activity and machines of other project developers. Refer Appendix V for illustration of the methods.
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	The value of EG*e* can be cross checked from the transmission loss calculation sheet signed by the representatives of suzlon and discom. QA/QC procedures will be implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. The energy meters (main & check) will be calibrated by state utility annually.
Purpose of data	Baseline emissions calculation
Additional comment	All the data items monitored under the monitoring plan will be archived for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later

Data / Parameter	L*ep*
Unit	MWh/year
Description	Total percentage of transmission loss for export between the metering point at 33kV (sum of all the WEGs connected to Bulk metering point including non-project activity as well as project activity WTG's) metering points and the metering point at 220kV at Suzlon pooling substation.
Source of data	Transmission Loss will directly applied from the monthly generation report for the project activity.
Value(s) applied	-
Measurement methods and procedures	Transmission loss between metering point at 33kV and at metering point of 220kV at Suzlon Sub-station is applied to meter reading taken at meters connected at 33kV for the project activity. Suzlon pooling sub-station is connected to the machines of the project activity and the machines commissioned by the other project owners. Therefore transmission loss is applied to the project activity by the state utility as reflected in the JMR taken at 33kV level. The JMR is signed by the representatives of Suzlon and the state utility.
Monitoring frequency	Recording : Monthly Monitoring: Not Applicable since it is calculated parameter
QA/QC procedures	QA/QC procedures will be implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.
Purpose of data	Baseline emissions calculation
Additional comment	All the data items monitored under the monitoring plan will be archived for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later

B.7.2. Sampling plan

>>

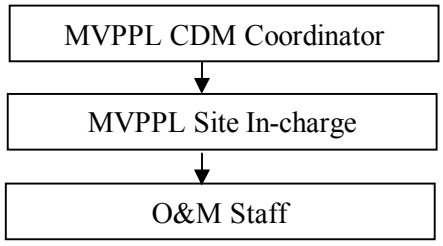
Data and parameter monitored in section B.7.1 above does not require sampling.

B.7.3. Other elements of monitoring plan

>>

The project participant will enter into agreement with the WTG- Supplier for the operation and maintenance of WTGs. The WTG supplier has dedicated and technically well equipped O&M team for day to day Operation and maintenance of each WTG. O&M contractor will provide a monthly report, which includes generation data, major breakdown events and machine availability. Project Manager is responsible for recording of monthly Joint Meter Readings of export and import. Monthly power export and import data will be sent regularly to CDM coordinator of MVPPL

The organisational structure of this CDM project activity is as follows.



SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

21/12/2011 (Date when Purchase Order was placed with technology provider)

C.1.2. Expected operational lifetime of project activity

>>

20 years 0 month

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

Fixed

C.2.2. Start date of crediting period

>>

01/06/2013

C.2.3. Length of crediting period

10 years 0 month

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

As per the prevailing Ministry of Environment and Forest laws, (the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated January 19, 2009), 38 activities are required to undertake environmental impact assessment studies. Environmental Impact Assessment study is not required for 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

D.2. Environmental impact assessment

>>

There are no significant environmental impacts due to project activity

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

The opinion of the institutional stakeholder is reflected in the form of approvals and clearances granted for the project activity. The project promoters have sought and obtained the necessary regulatory clearances for setting up of the project activity. The residents of neighbouring villages, the contractors and the employees were identified as the important local stake holders for the project activity.

In order to gauge the expectations of the stakeholders about the project activity and for providing them with a platform for expressing their opinions, the project promoters organized a stakeholder meeting at the project site on the 12 April 2012. Invitation letters were sent on 02 April 2012 intimating the stakeholders about the day, time, venue and purpose of the meeting and were requested to attend the meeting.

In the meeting, the stakeholders[40] were briefed about the project activity in the local language and were informed as to how power is generated using wind energy. They were then informed about global warming and its causes and the effects. Subsequently, they were introduced to the concept of CDM and how it is helping the world in mitigating Green House gas emissions. The stakeholders were then invited to provide their comments on how the project activity had affected their lives and about their expectations from the project activity.

E.2. Summary of comments received

>> According to the feedback received from the stakeholders, due to the erection of wind farms the socio-economic situation in the area and the village people's living standard has been improved. It has not only provided employment but also significantly contributed to the infrastructure development like roads

E.3. Report on consideration of comments received

>>

The stakeholder's comments have been considered while preparing the PDD. No negative comments were received from any of the stakeholders which mandated an action on the part of the project promoters.

SECTION F. Approval and authorization

>>

The Host Country approval (HCA) for the project activity (Ref No: 4/1/2013-CCC) is received and the same has been submitted to DOE..

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[40] Annex 2 to this document provides the attendance sheet

Appendix 1: Contact information of project participants

Organization name	Mytrah Vayu (Pennar) Private Limited
Street/P.O. Box	8001 Floor, Q-City, S.No: 109
Building	-
City	Nanakramguda, Gachibowli, Hyderabad
State/Region	Andhra Pradesh
Postcode	500 032
Country	India
Telephone	+91-40- 3376 01000
Fax	+91-40- 3376 0101
E-mail	-
Website	-
Contact person	-
Title	The Managing Director
Salutation	Mr.
Last name	Kailas
Middle name	-
First name	Vikram
Department	-
Mobile	-
Direct fax	+91-40- 3376 0101
Direct tel.	+91-40- 3376 0100
Personal e-mail	vikram.kailas@mytrah.com

Appendix 2: Affirmation regarding public funding

No public funding is availed by the project participant for the project activity

Appendix 3: Applicability of selected methodology

The same has been justified in Section B.2 of this PDD.

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

BASELINE INFORMATION

Gross Generation Total (GWh)

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	161897	167379	167587	180638	185257

Net Generation Total (GWh)

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	152205	157247	157336	169765	173925

20% of Net Generation (GWh)

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	30,441	31,449	31,467	33,953	34,785

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

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	28.3%	27.1%	22.8%	20.6%	21.0%

Net Generation in Operating Margin (GWh)

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	109116	114633	121471	134716	137387

Net Generation in Build Margin (GWh)

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	30441	31613	31606	36099	35267

Emission Data

Absolute Emissions Total (tCO_2)

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	109020455	113586133	117880640	126786214	129093635

Absolute Emissions OM (tCO_2)

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	109020455	113586133	117880640	126786214	129093635

Absolute Emissions BM (tCO_2)

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	21348181	22550310	25851338	27558554	25882886

Emission Factor

Simple Operating Margin (tCO_2/MWh) (incl. Imports)

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	1.00	0.99	0.97	0.94	0.94

Build Margin (tCO_2/MWh) (not adjusted for imports)

	2006-07	2007-08	2008-09	2009-10	2010-11
Southern Grid	0.70	0.71	0.82	0.76	0.73

Appendix 5: Further background information on monitoring plan

Metering and Monitoring Plan details: The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication shall be applicable as per the PPA (Power purchase agreement) with the State electricity board except or otherwise explicitly mentioned in the PDD.

Metering: The electricity generated by the WTGs are monitored through energy meters connected to a set of WTGs of the PP at the project site. The electricity generated will be stepped up by 33 kV transmission lines and fed to the metering point which has main meter and check meter. The electricity is fed from this metering point to 33/220 kV pooling sub-station where the bulk meter (main meter and check meter) has been installed and the same has been presented in the diagram below. The bulk meter at the sub-station measures total electricity exported by the different project participants located at the site.

Layout of metering arrangement for the project activity is as follows:

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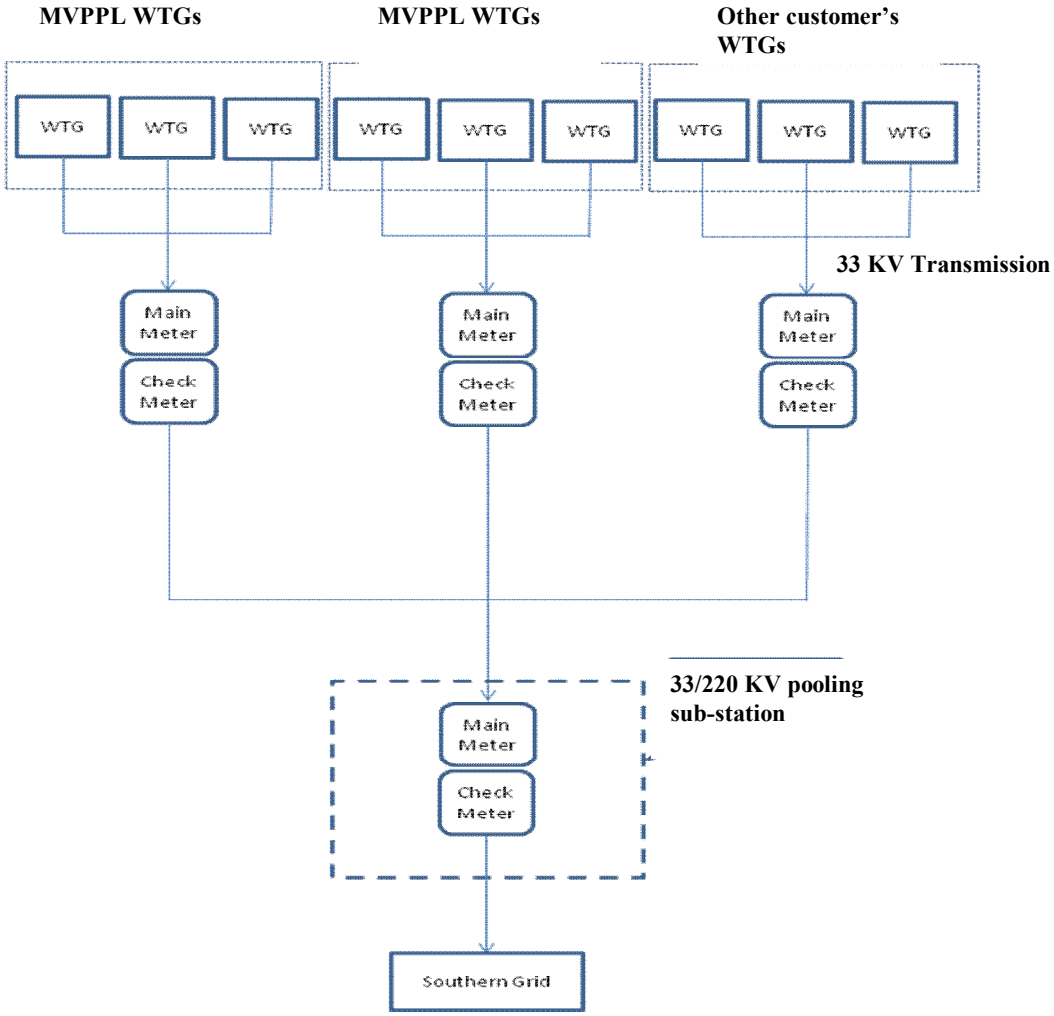

The PP will make clusters of WTGs at the project site for the purpose of metering. Each cluster will have a main and the check meter. All the clusters of the project activity will exclusively be connected to WTGs of the project activity i.e. there will be no WTGs of other project owners that are connected to these clusters.

It is clear that the clusters meters (dedicated meters/ individual meters) of project activity and other customers are connected to the Suzlon pooling sub- station at bulk metering point at 220 kV. Since the main and check meters at 220 kV metering point at the Suzlon Pooling station is connected to the machines of the project activity and the machines commissioned by other project developers, therefore in order to determine the net electricity supplied to the grid at 220kV at Suzlon sub-station, the state utility apply the apportioning of transmission loss to the meter reading recorded at 33kV. The total % of transmission loss for the export between 220kV metering point at Suzlon sub-station and all the WTGs connected to the sub-station is calculated by the state utility is endorsed / confirmed jointly by the representatives of Suzlon and the state utility. The transmission the state utility is reflected in transmission loss calculation sheet signed by the representatives of Suzlon and Discom. Net Electricity exported to the grid is calculated by applying transmission loss to the meter readings taken at 33 kV metering point of the project activity.

Metering Equipment: Metering equipment is electronic trivector meter of 0.2% accuracy class.

Meter Readings: The monthly meter reading is taken jointly by the parties (Suzlon personal and personals of State utility) for every last month. At the conclusion of each meter reading an appointed representative of State Utility and Enercon sign a document indicating the number of Kilowatt (kWh) indicated by the meter

The procedure for calculation of Transmission loss is as follows:

Each project developer has dedicated individual metering system at 33kV. Energy export ($X_{Export,N}$) and energy import ($X_{Import,\ N}$) is recorded for the individual developers at 33 KV metering point; Where N is number of project developers connected to 220kV metering point of Suzlon substation.
Total % of transmission losses for export (Lep) are calculated as using the following formula:

$$Lep\ (\%) = \frac{\{(XExport,1 + XExport,2 + \ldots\ldots\ XExport,N) - EGe\ *100}{\{(XExport,1 + XExport,2 + \ldots\ldots\ XExport,N)}$$

Where, EGe = Electricity export to the grid recorded at Suzlon substation.
Value of Lep is calculated by state utility and would be sourced directly from the transmission loss calculation sheet.

Hence,

Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (Cluster meter) & 220kV metering point (Bulk meter)
$EG_{export,\ y} = EGpe\ *\ (\ 1 - Lep(\%))$
The Joint meter reading noted at 33 KV metering location contains the following data:
1. Electricity Export
2. Electricity Import
The net electricity supplied to the grid is calculated as follows.

$$EG_{PJ,y} = EG_{export,\ y} - EG_{imp}$$

Electricity exported by the project activity ($EG_{PJ,y}$)will be used for CER computation.

QA/QC Procedure: All the meters are calibrated/ tested once in a year. In case of the failure of the main meter, readings will be obtained from the check meter, in case of the check meter failure also, there is a standby meter that is operational from which readings will be taken.

The calibration is done by the officials of the state utility. Copy of calibration/testing certificate will be kept as record by the PP and will be presented to the DoE during verification exercise.

The project participant is Mytrah Vaayu (Pennar) India Private Limited will be keeping and monitoring the data for electricity generation and calibration reports post project implementation.
Suzlon India will be the O&M contractor who will be having the responsibility of activities such as maintaining electricity generation records, calibration records and maintenance of the WEGs (Wind Energy Generators).

Appendix 6: Summary of post registration changes

Not Applicable

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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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