CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

>>
Wind power project in Rajasthan
Version: 06
Date: 20/11/2012

A.2. Description of the project activity:

>>
Mytrah Energy (India) Limited (MEIL, formerly called Caparo Energy (India) Limited) has implemented a greenfield 42MW wind Power project in Jaisalmer District in the state of Rajasthan.

Purpose of the project activity:

The proposed project activity involves power generation using Wind Turbine Generator (WTG). Suzlon Energy Limited has been identified as the technology supplier for this project. The purpose of the project activity is to commission and operate 20WTGs of 2.1MW capacity each. The power generated by this project activity will be supplied to Amarsagar sub-station located in Jaisalmer district and further to Jodhpur Vidyut Vitran Nigam Limited which is located in North East West and North East (NEWNE) electricity grid, India. The grid is currently dominated with fossil fuel based power plants[1]. The project activity will help in contributing to the sustainable development by using wind energy as the source of power generation and also meet the electricity demand which is lower than supply in the state[2].

The activity is a zero emissions wind based power generation project connected to NEWNE grid. The project is expected to export 74173 MWh to NEWNE Grid every year. As the project involves grid connected generation of greenhouse gas (GHG) free power from a renewable source the approved baseline methodology ACM0002 "*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*" will be used for calculating the emission reductions. The project activity thereby leads to reduction in emissions associated with grid connected power plants and enables sustainable development.

Contribution to sustainable development:

As per the guideline provided by Ministry of Environment and Forests (MoEF), economic, social, Environment and technological well being have been identified as the four indicators of sustainable development[3]. The project contributes to sustainable development using the following ways.

[1] http://www.cea.nic.in/reports/monthly/executive_rep/jun11/8.pdf

[2] http://www.cea.nic.in/reports/yearly/lgbr_report.pdf, for year 2010-11

[3] http://www.cdmindia.in/approval_process.php

Social well being:

- The project would help in generating employment opportunities during the construction and operation phases.
- The project activity will lead to development in infrastructure in the region like development of roads and also may promote business with improved power generation.
- The project proponent will contribute 2% of net revenue realised from sale of CERs towards community development initiatives.

Economic Well Being:

- The project will improve livelihood of people in the region by generating employment opportunities in the region
- The project creates business opportunities of the suppliers, financial institutions and other stakeholder who are directly or indirectly associated with the project.
- The project is a clean technology investment in the region, which would not have been taken place in the absence of the CDM benefits
- The project activity will also help to reduce the electricity demand supply gap in the state.

Environmental Well Being:

- The project activity will generate power using zero emissions wind based power generation which helps to reduce GHG emissions and specific pollutants like SOx, NOx, and SPM associated with the conventional thermal power generation facilities.
- The project activity will conserve fossil fuel like coal, which can be used in other industrial applications. .

Technological Well Being:

- The successful operation of project activity would lead to promotion of Wind based power generation and would encourage other entrepreneurs to participate in similar projects.

A.3. Project participants:

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Name of party involved	Private and/or Public entity project participants	Kindly indicate if the party involved wishes to be considered as project participant (Yes/No)
India (Host country)	Mytrah Energy (India) Limited (MEIL)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

>>

India

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

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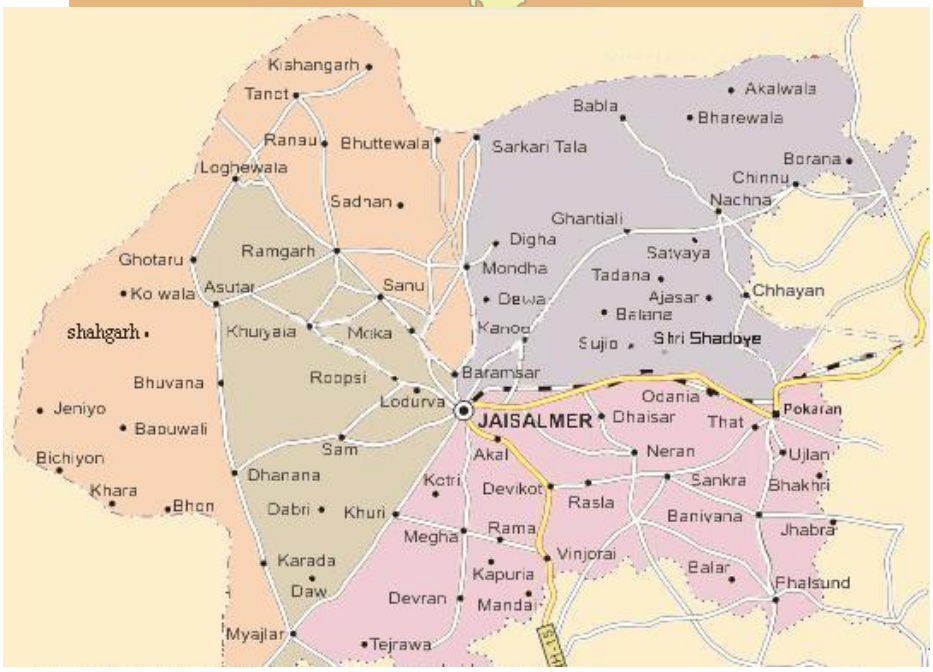
Rajasthan

A.4.1.3. City/Town/Community etc.:

Tejwa – Mokal village, Jaisalmer District.

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project activity is located in Tejwa – Mokal village, Jaisalmer District, Rajasthan State, India.



The locations of WTGs and the commissioning dates are as follows.

Sr. No.	WTG ID	WTG Co-ordinate		Date of Commissioning
		Latitude	Longitude	
1	MK014	27.1631	70.6809	04 Aug 2011
2	MK015	27.1612	70.6858	19 Jul 2011
3	MK016	27.1594	70.6907	19 Jul 2011
4	MK017	27.1576	70.6956	19 Jul 2011
5	MK021	27.1466	70.7251	30 Sep 2011
6	MK039	27.1697	70.6926	12 Jul 2011
7	MK040	27.1715	70.6877	12 Jul 2011
8	MK042	27.1752	70.6779	19 Jul 2011
9	MK043	27.1771	70.6730	04 Aug 2011
10	MK066	27.1837	70.6848	12 Jul 2011
11	MK067	27.1812	70.6891	30 Jun 2011
12	MK068	27.1804	70.6949	30 Jun 2011
13	MK069	27.1782	70.6995	30 Jun 2011
14	MK092	27.1887	70.7016	19 Jun 2011
15	MK093	27.1905	70.6966	25 Jun 2011
16	MK094	27.1924	70.6917	30 Jun 2011
17	MK161	27.2195	70.6917	25 Jun 2011
18	MK163	27.2237	70.6833	25 Jun 2011
19	MK164	27.2255	70.6784	19 Jun 2011
20	MK165	27.2274	70.6735	19 Jun 2011

A.4.2. Category(ies) of project activity:

The project activity falls under the Category 1: Energy Industries (Renewable/Non-Renewable).
The project activity will generate power by using WTGs and will be exported to the Grid. Hence the methodology used for the project is **ACM0002** of **version 12.3.0**[4]**.**

A.4.3. Technology to be employed by the project activity:

The project activity is a greenfield project activity and does not have any project before this activity. The project activity implements 20 WTGs of Suzlon Energy Limited's 2.1MW S88 Model. The technical details are shown below.

OPERATING DATA

Rated power	2.1 MW
Cut-in wind speed	4 m/s

[4] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

Rated wind speed	14 m/s
Cut-out wind speed	25 m/s
50 years gust wind speed	59.5 m.s
Hub height	79 m (Foundation top equal to ground level)
Wind Class	IEC-IIA
Rotational Speed	15 to 17.6 rpm
ROTOR	
Pitch system	Pitch regulated, electrical
Diameter	88 m
Swept area	6082 m2
Blade material type	Epoxy bounded fibre glass
GENERATOR	
Type	Asynchronous slip ring type induction generator
Rated power	2100 kW
Rated voltage	690 / 600 V
Frequency	50 / 60 Hz
Protection	IP 54, IP23 for slip ring unit
Cooling system	Air cooled
Insulation Class	H
Slip control	Unique Flexi-Slip providing slip up to 16.67%
BRAKING SYSTEM	
Aerodynamic brake	3 independent systems with blade pitching mechanism
Mechanical brake	Hydraulic fail-safe disc brake system
GEARBOX	
Type	3 stages (One planetary & Two helical)
Ratio	1:98.8 / 1:118.1
Nominal load	2200 kW
YAW SYSTEM	
Type	Driven by 3 electrical driven planetary drives
Bearings	Polyamide slide
CERTIFICATIONS	
Design standards	GL 2003
Quality	ISO 9001:2000, ISO 9001:2008, ISO 14001:2004 & OHSAS 18001:2007
TOWER	
Type	Tubular Tower (4 sections)
Corrosion protection	Epoxy/PU coated

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

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The project uses fixed crediting period for 10 years from the date of registration. The project activity is expected to reduce 706,770 tonnes of CO_2 over ten years. The year on year expected emission reduction is shown below.

Year	Annual Estimate of emission reductions in tonnes of CO_2e
31/12/2012 – 30/12/2013[5]	70,677
31/12/2013 – 30/12/2014	70,677
31/12/2014 – 30/12/2015	70,677
31/12/2015 – 30/12/2016	70,677
31/12/2016 – 30/12/2017	70,677
31/12/2017 – 30/12/2018	70,677
31/12/2018 – 30/12/2019	70,677
31/12/2019 – 30/12/2020	70,677
31/12/2020 – 30/12/2021	70,677
31/12/2021 – 30/12/2022	70,677
Total estimated emission reduction (tonnes CO_2e)	**706,770**
Total number of crediting years	**10 years**
Annual Average over the crediting period of estimated reductions (tonnes of CO_2e)	**70,677**

A.4.5. Public funding of the project activity:

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No Public funding or ODA has been used for this project activity. An undertaking to this effect has been provided to the DOE for verification.

[5] Year 1 will start on 31/12/2012, which is the expected start date of crediting period period and the corresponding end of crediting period is on 30/12/2022

SECTION B. Application of a baseline and monitoring methodology

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

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Consolidated baseline methodology for grid-connected electricity generation from renewable sources.
Methodology: ACM0002 Version 12.3.0[6]
Other tool used in the PDD is
"Tool to calculate emission factor for an electricity system" – Version 02.2.1, Approved in EB 63[7].
"Tool for the demonstration and assessment of additionality" – Version 06.1.0 Approved in EB 69[8].

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The following steps will show the applicability of the project under this methodology.

Sl.No	Applicability criteria	Justification
1	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 project activity is a Greenfield plant and is connected to Rajasthan electricity grid which is part of NEWNE grid. Hence the project activity satisfies this applicability criterion.
2	The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: a) hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), b) wind power plant/unit, c) geothermal power plant/unit, d) solar power plant/unit, e) wave power plant/unit or tidal power plant/unit	The project activity is the installation of 42MW wind power plant and hence the project is applicable under these criteria.
3.	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 not 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	Not applicable as the project activity is development of Greenfield wind power generation project.

[6] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

[7] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

[8] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.1.0.pdf

	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 reference period and the implementation of the project activity;	
4.	In case of hydro power plants, at least one of the following conditions must apply: a) The project activity is implemented in an existing single or multiple reservoirs, with no changein the volume of any of the reservoirs; or b) The project activity is implemented in an existing single or multiple reservoir, where the volume of any of reservoir is increased and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m2 after the implementation of the project activity; or c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2 after the implementation of the project activity.	The project activity is wind based power project and hence this condition is not applicable.
5.	The methodology is not applicable to the following: a) 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; b) Biomass fired power plants; c) Hydro power plants1 that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m2.	The project activity does not involve fuel switch from fossil fuels, and is not a biomass or hydro based project. Hence the project activity satisfies the applicability criterion.

B.3. Description of the sources and gases included in the project boundary:

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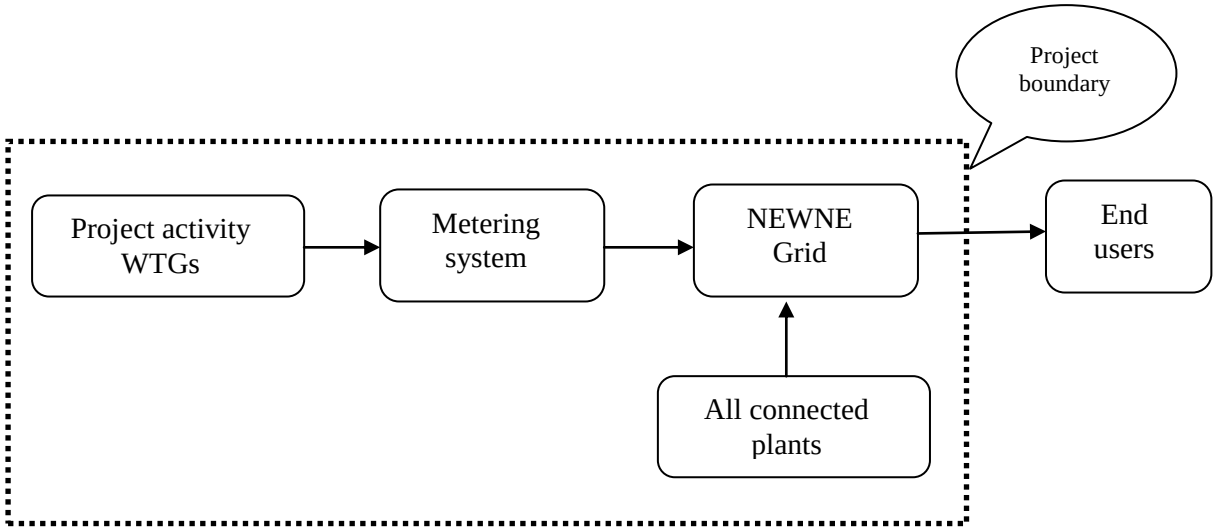
As per Table.1 of ACM0002 version 12.3.0, the selection of gases to be included and excluded within the project activity is as follows.

	Source	Gas	Included	Explanation
Baseline Activity	CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	Yes	Major emission source
		CH_4	No	Minor emission source
		NO_2	No	Minor emission source
Project Activity	Grid Connected wind power based electricity generation	CO_2	No	Electricity generation by using WTGs does not incur any emissions
		CH_4	No	
		NO_2	No	

This project activity is a wind power project and hence the project emission is zero.

According to ACM0002, version 12.3.0 for the baseline emission factor, *the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to:* the Project boundary defined as follows.



B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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As per ACM0002 version 12.3.0, 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".

As per methodology, "*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:

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)

Calculation of Combined Margin Emission Factor has shown in Annex-3.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

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As per the decision 17/cp.7 /para 43, a CDM project activity is additional if anthropogenic emissions of GHGs by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

Version 06.1.0 of "Tool for the demonstration and assessment of additionality" is used to demonstrate additionality for the project.

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

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

Alternative 1: The proposed project activity undertaken without being registered as a CDM project activity:

In this alternative, MEIL would have gone ahead with the implementation of project without CDM benefits. The project activity could have gone ahead with generation of electricity from wind and exported to the grid. However, as shown below, the project activity is not financially viable without CDM revenue. This is a credible alternative.

Alternative 2: Continuation of the current situation (No project activity)

The project is a greenfield activity. The project proponent would not have invested in wind power generation. In that scenario, the equivalent capacity additions in the grid would have been continued by fossil fuel based power generation mix and the equivalent amount of GHG would have been associated.

Outcome of Sub-step 1a: Alternative 1 and 2 are identified as most plausible and credible alternative to the proposed CDM project activity.

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

The above two alternatives are consistent with the mandatory laws and regulations.

Outcome of Sub-step 1b:

Generation of electricity from wind is not a legal requirement or a mandatory choice and there is no restriction to power generation by harnessing wind power. There is no legal restriction to fossil fuel based power generation[9].

[9] Electricity Act, 2003

Outcome of Step 1:
The alternative scenarios to the project activity are in compliance with the mandatory legislation and regulations taking in account the enforcement in the region and EB decisions on policies of region or sector.

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".

Step 2: Investment Analysis:

As per **"Tool for the demonstration and assessment of additionality",** the following steps has been used to conduct the investment analysis.

Sub-step 2a: Determine appropriate analysis method

The project activity will generate revenue by selling electricity to Jodhpur Vyapar Vitran Nigam Limited. Hence, Option-I of applying Simple Cost Analysis is not applicable. As the project is stand alone project, Option-II of applying Investment Comparison analysis is also not applicable

EB62, Version 05 of "Guidelines on the assessment of investment analysis" states that *"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."*

Since the alternative to the project is supply of electricity from a grid, benchmark analysis (Option-III) is used to conduct investment analysis.

The Post-tax 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

The baseline scenario for the project activity (as identified above) is generation of power in the GHG intensive grid. Thus, the baseline scenario does not require MEIL to make any investment. In such scenarios, as per the investment analysis guideline provided in Annex 5 of EB62, a benchmark analysis

should be conducted to assess the financial additionality of the project. Thus the project proponent has conducted a benchmark analysis to ascertain the financial viability of the project.

Selection of Benchmark

As per paragraph 19 of "Guidelines on the assessment of investment analysis" (Version 05, EB 62) which states that *"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." In addition guidance states that "in case of projects which could be developed by an entity other than the project participant the benchmark should be based on parameters that are standard in the market is suitable as the benchmark for the project activity."*

As per paragraph 15 of Guidance on investment analysis, *if the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A of the guidelines; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors.* The project proponent has chosen option (a) to estimate the cost of equity. As per Appendix A, 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%.

Further, as per the guidance in paragraph 7 *" In situations where an investment analysis is carried out in nominal terms, 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. If this information is not available, the target inflation rate if the central bank shall be used. If the information is also not available, then the average forecasted inflation rate for the host country published by the International Monetary Fund World Economic Outlook (IMF) or the World Bank for the next five years after the start of the project activity shall be use."*

The project participant has used the Mean WPI inflation forecast rate provided by the Reserve Bank of India[10] (i.e. the Central bank of the host country) in its 12th round forecast for Q1 of 2010 - 11 for the next ten years. This forecast was available prior to the decision making date of 13 Oct 2010. The same has been used to adjust the default value of ROE, which is given in real terms.

Cost of equity:

Using the inflation rate, the cost of equity has been calculated using the Fisher's equation as mentioned below:

$$\text{Cost of equity}_{\text{Nominal}} = (1+ \text{cost of equity}_{\text{Real}}) * (1+\text{Inflation rate}_{\text{Host country}}) - 1$$
$$= (1+11.75\%)*(1+5.10\%) - 1$$
$$= 17.45\%$$

[10] http://rbi.org.in/scripts/PublicationsView.aspx?id=12477

This is the benchmark considered for investment analysis. Cost of equity =17.45%

The parameters and assumptions used for Equity IRR calculations have been mentioned below.

Item	**Value**	**Reference**
Location - State	Rajasthan	Quotation from technology supplier dated 02/06/2010
Place	Tejva-Moka	
No of WEGs	20 nos	
Capacity of each WTG	2.1 MW	
Project Size	42 MW	
Cost per WEG	114.83 INR million	
Cost of Project per MW	54.68 INR million	
Total Project Cost	2297 INR million	
Expected date of commissioning	30/09/2011	Quotation from technology supplier dated 02/06/2010
Cost per MW	54.7 INR million	Calculated
Means of Finance		
Debt	**1607.6 INR million**	Assumed 70:30 debt equity ratio
Equity	**689.0INR million**	
Opearating Parameters		
Plant Load Factor (net of Transmission charges)	20.16%	Calculated
Total Generation for the project at above PLF	74.17 million kWh p.a.	GLGH Wind Assessment Report. In conformance with Annex 11, EB 48 Guidelines on PLF
Grid Availability	100.00%	Assumed
Life of the Wind Turbine	20.00 years	Technical specification document of technology supplier
O & M cost		
O & M Cost (in Lacs) from 3rd Year of operation incl Ser. Tx	44.12 INR million for all the WTGs	Quotation from technology supplier dated 02/06/2010
Annual escalation from 3rd year	5%	
Financial Parameters		
Interest on Term Loan		
Rupee Loan	11.00[11]%	RBI Prime Lending rate. Conformance with guidance 6 of investment analysis guidelines.
Moratorium period	0 years	Rajasthan Electricity

[11] http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/0MMDJU260710_Full.pdf

Repayment	10 equal instalment	Regulatory Commission Order No 77, dated 16/07/2009
Tariff	3.83 INR per unit	Rajasthan Electricity Regulatory Commission Order No 9, dated 31/03/2010
GBI benefit	INR 0.50 per unit	IREDA/MNRE[12]
Depreciation Rate		
As per companies Act		
Plant and machinery – SLM	5.28%	Schedule XIV of Companies Act, 1956
As per Income Tax Act		
Depreciation rate- first year	15%	Income Tax Rule The Depreciation rates are defined in New Appendix - I (applicable from Assessment year 2006-07 onwards) As per Block III clause 1, the rate for general Plant & Machinery is 15% whereas as per Block III , clause 8(xiii) Reneawable Energy Devices being :- (l) Windmills are eligible for 80% depreciation. [PP has opted for GBI instead of 80% depreciation]
Taxation		
Corporate Tax	33.99%	Income Tax rate applicable FY 2010 - 11
MAT	18.54%	
Service tax	10.30%	Service Tax applicable[13]

All the input parameters used in computing the Equity IRR was available to the project proponent at the time of decision making. This is in conformance with paragraph 6 of the Investment analysis guidelines. The IRR has been calculated for a period of 20 years which is the expected operational lifetime of the project activity.

A fair value 10% of the project cost has been provided as per paragraph 4 of the Investment analysis guidelines.

[12] http://www.inwea.org/others/OPERATIONAL_GUIDELINES.pdf

[13] http://www.servicetax.gov.in/ovw/ovw3_existing-scheme.htm

The Ministry of New and Renewable Energy (MNRE) of India has announced the Generation Bases Incentives (GBI) for Grid Interactive Wind Power projects commissioned after 17/12/2009. Investors who wish to avail the GBI benefit will not be eligible to avail the Accelerated Depreciation benefit. The project proponent for the proposed project activity has chosen GBI and the same is considered in the Equity IRR computation.

A sensitivity analysis has also been done for the equity IRR with change in certain parameters, to show the robustness of the analysis.

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

The Equity IRR for the project found to be 7.79% which is lower than benchmark of 17.45%. The summary of the investment is as follows

Project	IRR without CDM	IRR with CDM
MEIL	7.79%	10.84%

Sensitivity Analysis:
Sensitivity analysis has been carried out, as per the guidelines laid out by the Executive Board, on parameters that can directly affect the income of the project. As per Paragraph 17 /Page 4/GUIDELINES ON THE ASSESSMENT OF INVESTMENT ANALYSIS/EB 62/Annex 5:

"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 (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets".

As per above guidelines, the parameters that have been considered for this project activity are PLF, project cost, O&M and power tariff. The results of the sensitivity analysis are provided in the table below.

Parameter	Variation in the parameter	IRR
PLF	+10%	10.10%
	-10%	5.51%
Project Cost	+10%	5.66%
	-10%	10.44%
Tariff	+10%	10.73%
	-10%	4.75%
O&M	+10%	7.48%
	-10%	8.10%

As per the Annex 58, EB 51 guidance no. 21, **"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, 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 40.90% (i.e. 28.41% PLF) in the PLF, the equity IRR crosses the benchmark. However, the probability of this is nil due to the following reasons:

- The PLF considered as per the independent third party report is 20.16%. The Rajasthan Electricity Regulatory Commission's order dated 16/07/2009[14] considers a PLF of 21% for determining the tariff. Even at this PLF of 21%, the equity IRR is 8.75%, which is below the benchmark. Therefore, it is very evident that the PLF assumed by the PP is in line with the tariff order. The probability of an increase in 40.90% (i.e. 28.41% PLF) is nil.

Power purchase tariff – With an increase in 34.30% (i.e. INR 5.14/kWh) in the tariff, the equity IRR crosses the benchmark. However, the probability of this is nil due to the following reasons:

- The Rajasthan Electricity Regulatory Commission's order dated 31/03/2010 fixes a tariff of INR 3.83 per unit. As per the actual PPA signed by the PP, the tariff of INR 4.22 per unit has been fixed for a period of 20 years. Even at this actual tariff, the equity IRR is 10.09% which is below the benchmark. Therefore The probability of an increase in tariff by 34.30% is nil

Project cost – With a decrease in 28.10% in the project cost, the equity IRR crosses the benchmark. However, the probability of this is nil due to the following reasons:

- The project activity is already commissioned and the actual project cost is only 8.56% (i.e. INR 2100 million) lesser than the quotation cost. Even at the actual cost, the equity IRR is 10.02% which is below the benchmark. Therefore the probability of any further reduction in project cost cannot be expected.

O&M cost – With a decrease in over 376.00% in the O&M cost, the equity IRR crosses the benchmark. However, the probability of this is nil due to the following reasons:

- The project activity is already commissioned and the actual O&M cost is only 23% (i.e. INR 35.7 million) lesser than the quotation cost. Even at the actual cost, the equity IRR is 8.49% which is below the benchmark. Therefore the probability of any further reduction in project cost cannot be expected.

Therefore, the project activity proves to be additional at all the scenarios and hence the CDM revenue is critical to make the project financially viable.

[14] http://www.rerc.rajasthan.gov.in/TariffOrders/Order77.pdf

Step 3: Barrier analysis

Barrier analysis is not considered as Step-2 proves that the project is financially non-attractive.

Step 4: Common Practise analysis
For Common practice analysis, Version 02.0 of the GUIDELINES ON COMMON PRACTICE (EB 69)[15] has been used. As per the guideline the following steps have been suggested:

Step 1: calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity:
The proposed project activity is of 42 MW capacity. Considering +/- 50% of the project activity capacity, the output range to be considered for the common practice analysis is 21 MW to 63 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***

As per the tool, *Applicable geographical area should be the entire host country. If the project participants opt to limit the applicable geographical area to a specific geographical area (such as province, region, etc.) within the host country, then they shall provide justification on the essential distinction between the identified specific geographical area and rest of the host country*

Every state in India has its own State Electricity Regulatory Commission. The policy / regulations for each SERC are unique and different from the other. The proposed project activity is governed by the policy / regulations of Rajasthan Electricity Regulatory Commission. Wind projects in other states will follow their respective policy / regulations and will be different from that of the proposed project activity. In line with the aforesaid guidelines, the investment climate in the state of Rajasthan is different from that of other state in India. Therefore, the applicable geographical area for common practice analysis has been limited to the state of Rajasthan alone

[15] http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid44.pdf

All wind power plants in the applicable output range of 21 MW to 63 MW which started commercial operation before the start date of proposed project activity in the state of Rajasthan are as mentioned below.

Wind power project: The "Directory – Indian Wind power 2011", is an official compendium of wind power projects in India. The Wind Power Directory provides installation of wind turbines by a project owner along with information on WTG capacity, total installation, location & date of commissioning. As per Directory – Indian Wind power 2011. This has been consulted to provide a list of wind project activities in Rajasthan state and the same is as provided below:

Wind Power Plants:

Sl.N.	Project	Location, Rajasthan	Capacity MW	Year of Commissioning	CDM
1	Hindusthan Petroleum Corp Ltd	Akal	25.5	Sep-10	Yes[16]
2	IL& FS Energy Development	Pithodai ki Khani	38.4	Sep-10	Yes[17]
3	DLF Home Developers Ltd	Osiyan	33	Sep-08	Yes[18]
4	Enercon Wind Farms	Asloi	24	Sep-05	Yes[19]
5	Enercon Windfarms Hindusthan	Bhu/Kita	60	Mar-07	Yes[20]
6	Gujarat Fluorochemicals Ltd	Osiyan	30	Sep-09	Yes[21]
7	Hindusthan Petroleum Corp Ltd	Soda Mada	21.25	Mar-09	Yes[22]
8	Kohinoor Planet Construction Pvt Ltd	Kitta	24	Mar-10	Yes[23]
9	Rajasthan Renewable Energy Corporation	Soda Mada	25	Mar-05	Yes[24]
10	Rajasthan State Mines & Mineral Ltd	Tejuva	54	Sep-06	Yes[25]

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

[16] http://cdm.unfccc.int/Projects/Validation/index.html

[17] http://cdm.unfccc.int/Projects/Validation/index.html

[18] UNFCCC Project Ref 3642

[19] http://cdm.unfccc.int/Projects/Validation/index.html

[20] UNFCCC Project Ref 1168

[21] http://cdm.unfccc.int/Projects/Validation/index.html & http://cdm.unfccc.int/Projects/Validation/index.html

[22] http://cdm.unfccc.int/Projects/Validation/index.html

[23] http://cdm.unfccc.int/Projects/Validation/index.html

[24] http://cdm.unfccc.int/Projects/Validation/DB/RNNKAHLY2ZRXKKY7KS859PZOQL3XCJ/view.html and http://cdm.unfccc.int/Projects/Validation/DB/Y3O8IX2VXOH6L1WCZP48IC1UM74CU3/view.html

[25] http://cdm.unfccc.int/Projects/Validation/DB/Y8W0UMSG3DAI1VHPT2U3Y4IF9N7S4G/view.html

From the list of wind power plants mentioned in Step 2, it is evident that all the projects aretaken up as a CDM project activity.

Nall= 0

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 N_{diff}

Therefore,

$N_{diff} = 0$

Step 5: calculate factor $F=1-N_{diff}/N_{all}$ 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-(0/0)

Thus F= cannot be determined since it is division by zero

As per version 02 of the GUIDELINES ON COMMON PRACTICE , ***The proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3.***

As per the above calculations F cannot be determined as all projects in the estate of Rajasthan are under CDM route and $N_{all}-N_{diff} = 0$, which is less than 3. Therefore, the project activity is not a common practice.

Demonstration of Prior CDM Consideration:

Chronology of events:

S.No	Activity	Date
1.	Quotation received for the project	02 June 2010
2.	Prior CDM Consideration intimation sent to UNFCCC and Ministry of Environment and Forests (Host Country DNA)	16 Aug 2010
3.	Board Resolution considering CDM benefits	13 October 2010
4.	Placement of purchase orders	18 January 2011
5.	Local Stakeholder consultation meeting	31 March 2011
6.	Web-hosting for Global stakeholder comments	01 March 2012

From above table, it could be seen that the prior CDM consideration form has been submitted much before the start date (18/01/2011) and the validation process initiated within two years. Hence the project activity conforms to the "Guidelines on the demonstration and assessment of prior consideration of the CDM" Annex 13 of EB 62.
From the above investment analysis and chronology of events, it can be concluded that the project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>
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:

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)

Calculation of Combined margin emission factor has shown in Annex-3

Calculation of $EG_{PJ,y}$:

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{facility,y}$$

where:

$EG_{PJ,y}$ = 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), which is measured as the difference between the measured quantities of the grid electricity export, the import and line losses.
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in

year y (MWh)

Project Emissions:
The project activity involves in harnessing wind power. So the emissions from the project are zero.

Leakage Emissions:
No leakage emissions have been considered and hence the leakage emission is zero.

So the emission reductions is equal to baseline emissions $ER_y = BE_y$.

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

Data / Parameter:	$EF_{grid,OMsimple,y}$
Data unit:	tCO_2
Description:	operating margin CO_2 emission factor of NEWNE grid
Source of data used:	Central Electricity Authority:CO_2 Emission Database CEA CO_2 Baseline database Version 07[26]
Value applied:	0.9842
Justification of the choice of data or description of measurement methods and procedures actually applied :	The operating margin emission factor data has been deduced from CO_2 Database.
Any 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:	$EF_{grid,BM,y}$
Data unit:	tCO_2
Description:	Build margin CO_2 emission factor of NEWNE grid
Source of data used:	Central Electricity Authority:CO_2 Emission Database CEA CO_2 Baseline database Version 07
Value applied:	0.8588
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Build margin emission factor data has been deduced from CO_2 Database.
Any 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 0.8588

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

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2
Description:	Combined margin CO_2 emission factor of NEWNE grid
Source of data used:	Central Electricity Authority:CO_2 Emission Database CEA CO_2 Baseline database Version 07
Value applied:	0.9529
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated as per the procedures in "Tool to calculate the emission factor for an electricity system" with data deduced from CEA
Any comment:	The Combined Margin would be calculated ex ante and fixed during the crediting period.

B.6.3. Ex-ante calculation of emission reductions:

>>

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

$$ER_y = BE_y - PE_y$$

As the project activity is wind power project, project emissions are zero and the resulting emission reduction is as follows.

$$ER_y = BE_y$$

Baseline emission factor (Combined Margin) is found to be 0.9529 tCO_2e.

Annual net electricity supplied to the grid by the project activity
= Generation * PLF * 8760/1000
= 42 * 20.16% * 8760/1000
= 74173MWh

So the baseline emission = Emission reductions = 74173 * 0.9529 = 70,677 tCO_2e

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

>>

Year	Estimation of baseline emissions (tonnes of CO_2)	Estimation of project activity emissions (tonnes of CO_2)	Estimation of leakage (tonnes of CO_2)	Estimation of overall emission reductions (tonnes of CO_2)
31/12/2012 – 30/12/2013[27]	70,677	0	0	70,677
31/12/2013 – 30/12/2014	70,677	0	0	70,677
31/12/2014 – 30/12/2015	70,677	0	0	70,677
31/12/2015 – 30/12/2016	70,677	0	0	70,677
31/12/2016 – 30/12/2017	70,677	0	0	70,677
31/12/2017 – 30/12/2018	70,677	0	0	70,677
31/12/2018 – 30/12/2019	70,677	0	0	70,677
31/12/2019 – 30/12/2020	70,677	0	0	70,677
31/12/2020 – 30/12/2021	70,677	0	0	70,677
31/12/2021 – 30/12/2022	70,677	0	0	70,677
Total (tonnes of CO_2)	**706,770**	**0**	**0**	**706,770**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh
Description:	Quantity of Net Electricity exported to the grid during the year y.
Source of data to be used:	Calculated value based on Measured electricity export and import values
Value of data applied for the purpose of calculating expected emission reductions in section B.5	74173
Description of measurement methods and procedures to be applied:	Net electricity supplied will be calculated based on the difference between calculated values of "export" and calculated value "import" on the JVVNL energy meter at the common evacuation point and the percentage transmission loss as prescribed in the PPA for metering at 220 kV. Refer to Annex 4 of the PDD for more details on the calculation procedure. All the data items monitored under the monitoring plan will be archived for entire crediting period or till the last issuance of CERs for this project activity whichever occurs later. Calibration Frequency: All Energy meters will be tested for accuracy at least

[27] Year 1 will start on 31/12/2012, which is the expected start date of crediting period and the corresponding end of crediting period is on 30/12/2022

	once in a years. The accuracy class of the energy meter is 0.2s
QA/QC procedures to be applied:	Net electricity supplied to the grid by the project activity will be cross checked with invoices submitted to JVVNL.
Any comment:	-

Data / Parameter:	$E_{WTG,i,y}$
Data unit:	MWh
Description:	Quantity of Electricity generated by the individual WTGs of the PP in year y
Source of data to be used:	WTG Controller meter reading
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3708
Description of measurement methods and procedures to be applied:	Electricity generated by the WTG will be continuously monitored by the controller meter installed within the WTG. These reading are recorded online by the technology supplier. Refer to Annex 4 of the PDD for more details on the calculation procedure. All the data items monitored under the monitoring plan will be archived for entire crediting period or till the last issuance of CERs for this project activity whichever occurs later. Calibration Frequency: The WTG controller meter does not require calibration as per the specification provided by the technology supplier[28]
QA/QC procedures to be applied:	The quantity of electricity generated by the individual WTG will be cross-checkd with the online tracking system provided by the technology supplier
Any comment:	-

B.7.2. Description of the monitoring plan:

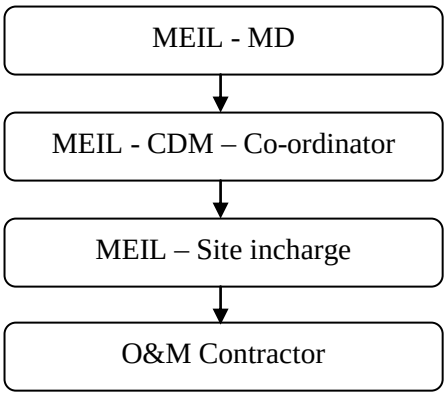
>>The electricity exported to the grid through the project activity and the electricity imported from the JVVNL grid will be monitored. The electricity export and import is through a common evacuation system having common metering equipments. Suzlon Energy Limited has been identified as the common agency responsible for joint metering. net electricity exported by the project proponent is calculated as mentioned below.

$$EJ_{PJ,y} = (Export - Import)\ X\ (1 + \%\ transmission\ loss)$$

Refer to Annex 4 to this document for further details on monitoring.

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

[28] Reference document provided to DOE for verification



The project proponent has entered into agreement with the WTG- Supplier – Suzlon Energy Limited 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 wind data, generation data, major breakdown events and machine availability, which forms the basis for invoicing and emission reduction computation. 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 MEIL.All data will be archived for a period two years after crediting period.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

>>

Date of completion of the application of baseline study and monitoring methodology: 21/09/2011.

Name of the responsible entity: Mytrah Energy (India) Limited
The responsible entity is same as participant mentioned in Annex I to this document.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

As per Glossary of CDM terms[29], *"the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity".* Complying with the above norms the start date considered for the project activity is 18/01/2011 i.e., the date on which purchase orders has been placed with Suzlon Energy Limited.

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

>>

The project activity is expected to be operational for 20 years.

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

C.2.1. Renewable crediting period:

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

>>

Not applicable

C.2.1.2. Length of the first crediting period:

>>

Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

31/12/2012

C.2.2.2. Length:

>>

10 years, 0 months

[29] http://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf

SECTION D. Environmental impacts

>>

D.1. Documentation on the analysis of the environmental impacts, including transboundary 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. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

The project activity is a renewable energy project. There will be no negative impact result out of the project.

SECTION E. Stakeholders' comments

>>

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

>>

The stakeholders identified for the project were: the usual occupants of the villages around and the local communities, NGOs, governmental agencies, employees, contractors. Local population is considered to be a major stakeholder with respect to the project activity. Comments were received from the village people. News paper advertisement[30] was placed in newspaper on 16/03/2011. The stakeholder meeting was organised at the project site on 31/03/2011.

The meeting started with the welcome address by the representative of MEIL. He further explained about the wind project taken up by the company.

Representative of the project proponent explained the purpose of the meeting and detailed each questions in the questionnaire. He further explained about the advantages of the wind energy generation and explained how the project would help in reducing demand supply gap in environment friendly manner.

The villagers wished to know the impact of WTGs on the environment in the region. Further to the discussion, Representative of Suzlon Energy Limited, explained its a eco-friendly technology which will have no harmful effect on the environment. Finally the comments were received from the stakeholder, which has been briefed in section E-2.

E.2. Summary of the 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 likes roads.

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

>>

All comments were positive. No negative comments were received from stakeholders.

[30] "Dainikbhaskar" newspaper

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Mytrah Energy (India) Limited
Street/P.O.Box:	8001
Building:	Q-City, S.No: 109, Nanakramguda, Gachibowli
City:	Hyderabad
State/Region:	Andhra Pradesh
Postcode/ZIP:	500032
Country:	India
Telephone:	+91 40 4396 0000
FAX:	+91-40- 43960001
E-Mail:	
URL:	
Represented by:	
Title:	Managing Director
Salutation:	Mr
Last name:	Kailas
Middle name:	
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Department:	
Mobile:	
Direct FAX:	+91 40 4396 0000
Direct tel:	+91-40- 43960001
Personal e-mail:	Vikram.Kailas@mytrah.com

Annex 2
INFORMATION REGARDING PUBLIC FUNDING

No public funding is available for the project.

Annex 3
BASELINE INFORMATION

The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the Build Margin and the Simple Operating Margin for the NEWNE grid, the details of which are presented below:

The Net Generation (GWh) is shown in the below table.

	2008-09	**2009-10**	**2010–11**
NEWNE	510,693	544,915	579,181

The Simple Operating Margin (tCO_2/MWh) (incl. Imports) is shown in the table.

	2008-09	**2009-10**	**2010–11**
NEWNE	1.01	0.98	0.97

The Build Margin in tCO_2/MWh (incl. Imports) is shown in the table below

	2008-09	**2009-10**	**2010–11**
NEWNE	0.68	0.81	0.86

Calculation of the Baseline Emission Factor

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 NEWNE regional electricity grid, the NEWNE 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%
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 CO_2 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)
$EFCO2_{,i,y}$ = CO_2 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 CO_2 emission factor for the recent years (2008-09, 2009-10, 2010-11) is 0.9842 tCO_2/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 6.0 of the Baseline Carbon Dioxide Emissions database of the CEA[31].

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 (tCO_2/MWh) of all power units m during the year y for which power generation data is available and will be calculated as follows.

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

Where

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EFEL_{,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available
The build Margin would be calculated ex ante during the crediting period.

For ex ante calculation the most recent data (2010 -11) available has been used and the build margin thus calculated is 0.8588

Therefore $EF_{grid,BM,y}$ = 0.8588 tCO_2/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 CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
W_{OM} = Weighting of operating margin emissions factor (%)
W_{BM} = Weighting of build margin emissions factor (%)

For wind and solar powered projects the defaults weights are as follows: W_{OM} = 0.75 and W_{BM} = 0.25

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

Hence the baseline emission factor is calculated as follows.

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

=0.9842*0.75+0.8588*0.25
=0.9529 tCO_2/MWh

Thus the resulting combined emission factor is 0.9529 tCO_2/MWh

Annex 4

MONITORING INFORMATION

The Operation & Maintenance of the project will be done by Suzlon Energy Limited. As per the monitoring plan, the electricity exported to the grid through the project activity and the electricity imported from the JVVNL grid will be monitored.

Measurement of Energy and Metering[32]:

- Since there are power producers other that the project proponent injecting electricity produced by them using the common evacuation / injection system and through the common metering equipment, Suzlon Energy Limited has been identified as the common agency responsible for joint metering.
- The joint meter reading taken at the common evacuation / injection system is supported by controller readings of individual power producers using the common evacuation / injection system. Based on this breakup, limited to the total energy injection, net electricity exported by the project proponent is calculated as mentioned below.

$$EJ_{PJ,y} = (Export - Import)\, X\, (1 + \%\, transmission\, loss)$$

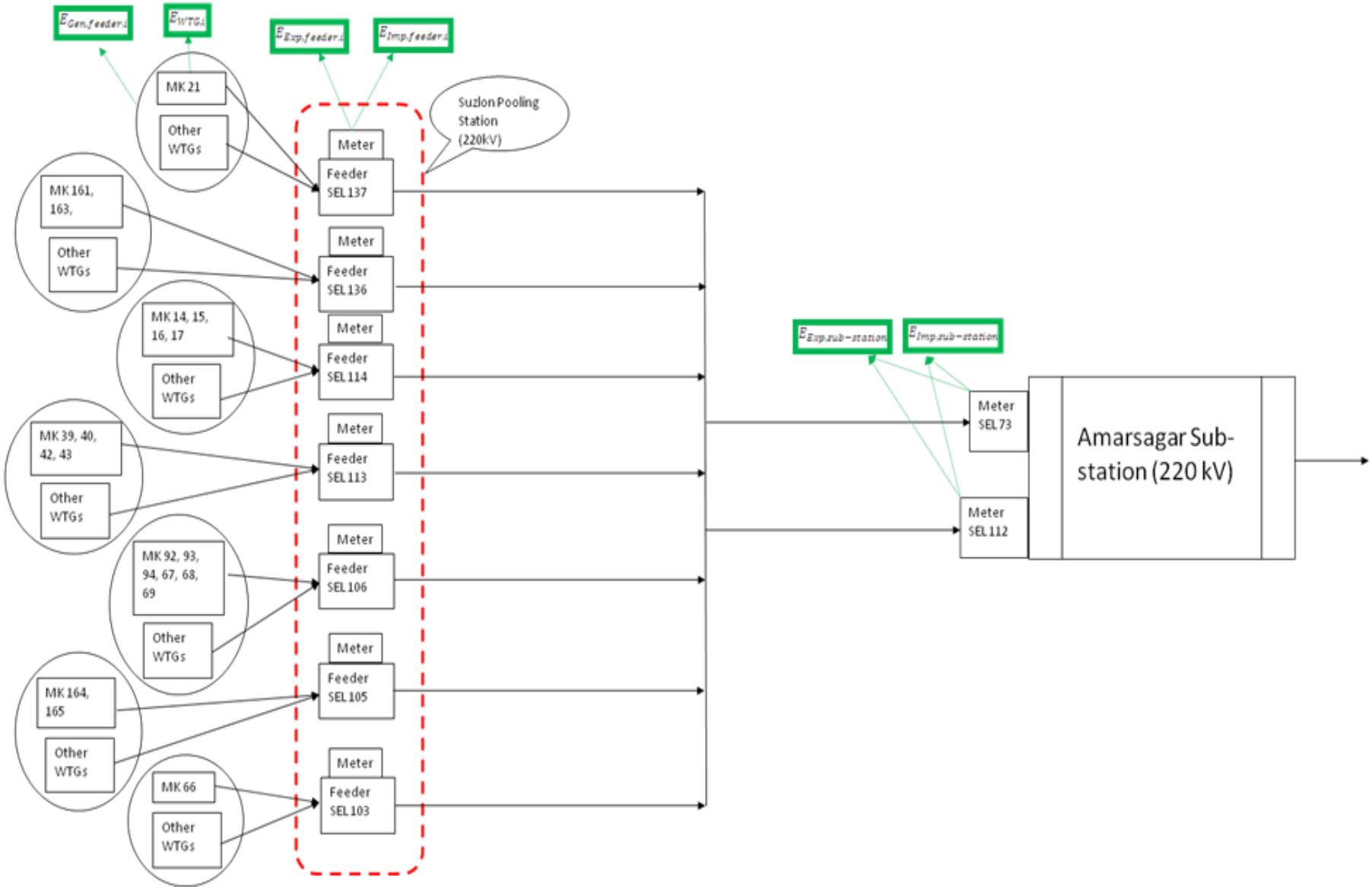
Where,

$$Export = \left(\frac{E_{Exp,feeder,i}}{E_{Gen,feeder,i}}\, X\, E_{WTG,i}\right) - \left(\left(\left(\sum E_{Exp,feeder,i}\right) - E_{Exp,sub-station}\right) \div \sum E_{Gen,feeder,i}\right) \times E_{WTG,i}$$

$$Import = \left(\frac{E_{Imp,feeder,i}}{E_{Gen,feeder,i}}\, X\, E_{WTG,i}\right) - \left(\left(\left(\sum E_{Imp,feeder,i}\right) - E_{Imp,sub-station}\right) \div \sum E_{Gen,feeder,i}\right) \times E_{WTG,i}$$

A schematic diagram indicating the metering system is provided below.

[32] Refer section 4.2 of PPA


$E_{Gen,feeder,i}$
$E_{WTG,i}$
$E_{Exp,feeder,i}$
$E_{Imp,feeder,i}$
MK 21
Other WTGs
Suzlon Pooling Station (220kV)
Meter
Feeder SEL137
MK 161, 163,
Other WTGs
Feeder SEL136
MK 14, 15, 16, 17
Other WTGs
Feeder SEL114
MK 39, 40, 42, 43
Other WTGs
Feeder SEL113
MK 92, 93, 94, 67, 68, 69
Other WTGs
Feeder SEL106
MK 164, 165
Other WTGs
Feeder SEL105
MK 66
Other WTGs
Feeder SEL103
$E_{Exp,sub-station}$
$E_{Imp,sub-station}$
Meter SEL73
Meter SEL112
Amarsagar Sub-station (220 kV)

Monitoring plan for 2% CER revenues:

The project proponent will contribute 2% of net revenue realised from sale of CERs towards sustainable development initiatives. The details of such expenditure made would be included in the monitoring report for the period following the transaction and the format is as follows:

Action Plan for expenditure incurred through 2% of CER revenues									
Financial Year (A)	**Activity (B)**	**Issued CERs (C)**	**CER Price (D)**	**Total CDM Amount (E=CxD)**	**Expenditure in Current year (F)**	**Expenditure Carried forward (G)**	**Net Expenditure for Current Year (H = F+G)**	**Expenditure as % of CDM amount for current year (I = H/E)**	**Reference Documentation (J)**
Indicates the year for which the assessment is being provided	*Provides details of the social/ community activities on which the expenditure has been incurred*	*Quantity of CERs issued for the assessment year*	*CER price at which the transaction has happened*	*Total amount CDM amount received*	*Expenditure made on the social/ community development activity in the current assessment year*	*Additional expenditure incurred on capital goods in the previous assessment years being carried forward to the current assessment yea*	*Net Expenditure on social/ community development activity for the current year*	*Indicates the % of the total CDM amount spent on social/community development activity*	*Indicates the documentation to be provided to the DOE during the verification to evidence the amount spent on social/community development activity*

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