CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Title: Grid Connected Wind Power Project by M/s. D. J. Malpani in Rajasthan
Version: 02.3
Date: 09/02/2012

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

The project activity is grid-connected wind power generation in District- Jaisalmer, State- Rajasthan in India. M/s. D. J. Malpani is the owner and developer of the project activity. The total capacity of the project activity is 7.5 MW (5 WTGs × 1.50 MW). The project activity employs Wind Turbine Generators (WTGs) of Class S-82 manufactured by M/s. Suzlon Energy Limited.

The project activity will supply the generated electricity to NEWNE Grid of India. The purpose of the project activity is generation of clean electricity by utilizing kinetic energy of wind. The project activity is estimated to generate 14,374 MWh of electricity annually; thus reducing GHGs to the tune of 13636 tCO_2e / annum for the entire crediting period of 7 years.

The project activity will contribute to sustainable development in various ways. These will be as follows:

Social well-being:

Social well-being focuses on the reflections of the project activity on the neighbouring community. The project promoter envisages following social benefits:

- Improved standard of living
- Availability of infrastructure like electricity, roads, medical facilities etc.
- Reduce migration from rural to urban area for the sake of employment
- Awareness about the global issues, their solutions & role of India in the same
- Awareness among local people regarding wind power & its effect on rain and ground water level

It will thus be responsible in bringing social well-being in the region.

Environmental well-being:

The project activity is a clean source of power generation. The environmental aspects in consideration are as follows:

- In comparison to other sources of power generation prevailing in the country, wind power is the cleanest technology.
- As compared to other power plants, less amount of land is required for a single wind turbo-generator.
- Wind power is renewable. It can be used continuously, whenever available. There is no danger of depletion of the raw material used for power generation.

- Wind power is a naturally available source of energy. There is no processing required to make it available for power generation.
- It does not result in biodiversity loss which occasionally occurs in some other power plants like hydro.

Thus, wind power technology goes hand-in-hand with the environmental well-being of the region.

Technological well-being:

The power generation technology used in this project activity is provided by M/s. Suzlon Energy Limited. The technological well-being envisaged by the project promoter is as follows:

- It will boost the use of such technology by other project developers.
- Successful implementation and operation of this project will give necessary impetus in implementation of similar technology in the region.
- The project activity will lead to transfer of environmentally safe and sound technologies that are comparable to best practices in order to assist in upgradation of the technological base in the local region.

Economic well-being:

Economic well being refers to additional investment consistent with the needs of the local community. The project in due course of time will draw additional investment to the region. In general, the project activity envisages following economic benefits:

- Employment opportunities
- Market facilities for local products
- Industrial development
- Increase in real income
- Increase in regional gross domestic product
- Capital formation
- Improvement of a rural economy
- Flow of goods and services

Although the realization of the above benefits would take a longer time needlessly, the economic development of the region would be attributed to the project operation. The project will contribute to the sustainable development of the region during its entire operational life.

A.3. Project participants:

Name of Party involved (*)((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host Party)	D. J. Malpani (Private Entity)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

CDM – Executive Board

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

India

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

State: Rajasthan

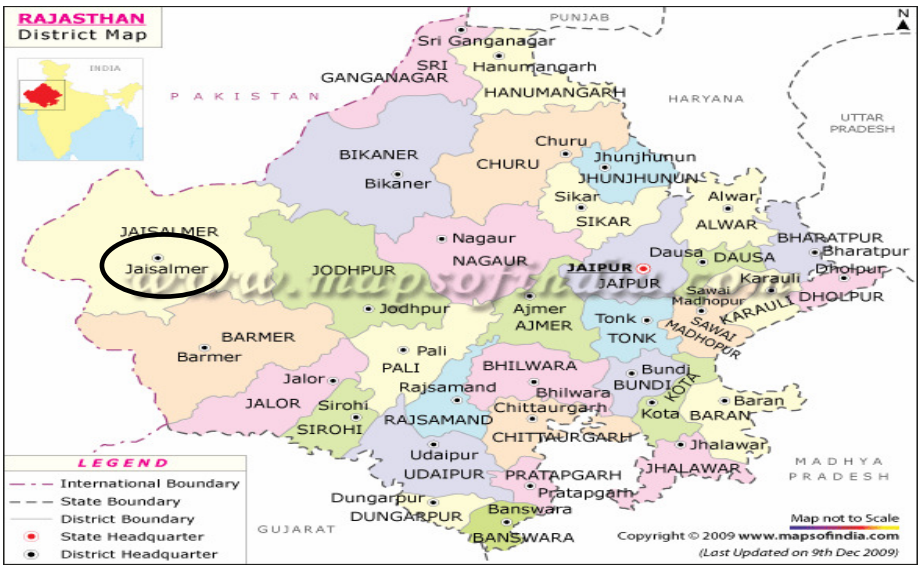
A.4.1.3. City/Town/Community etc:

Taluka: Fatehgarh & Jaisalmer
District: Jaisalmer

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project activity is located in District- Jaisalmer, State- Rajasthan in India. The details of project location are given below:

Sr. No.	Location No.	Khasra No.	Village	Taluka	Latitude	Longitude
1.	AK-278	83/P, 76/P	Sangana	Fatehgarh	N 26°47'48.7"	E 71°08'12.6"
2.	AK-283	147/P	Asayach	Jaisalmer	N 26°48'54.9"	E 71°07'04.6"
3.	AK-262	370/P	Chord	Fatehgarh	N 26°45'32.0"	E 71°09'49.3"
4.	AK-321	310/P	Chord	Fatehgarh	N 26°47'36.7"	E 71°10'15.8"
5.	AK-331	94/P	Asayach	Jaisalmer	N 26°49'45.3"	E 71°07'59.6"



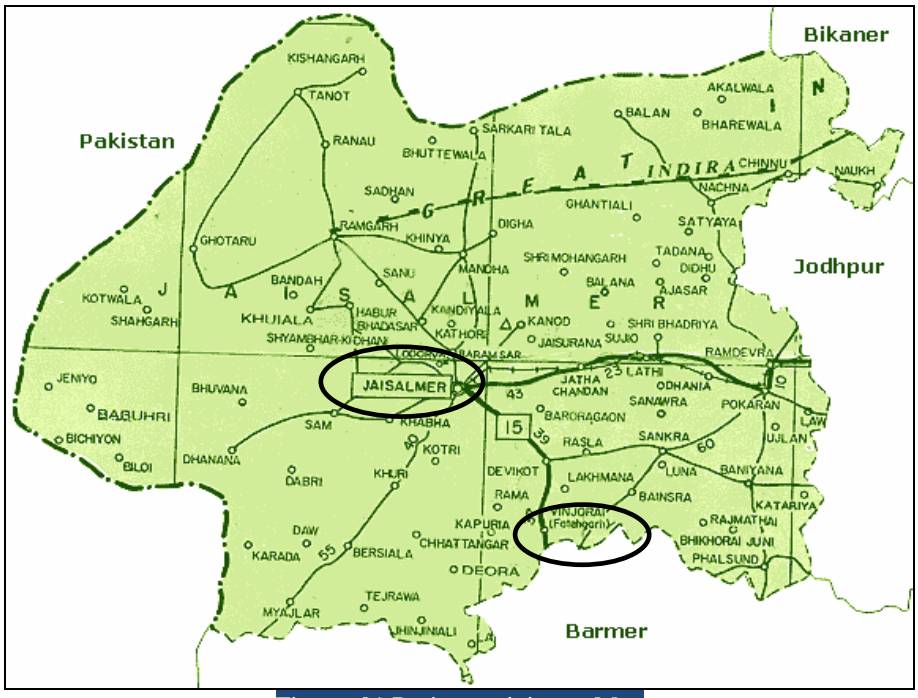


Figure: 01 Project activity on Map

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

Project Type	**:**	Type I – Renewable Energy Projects
Project Category[1]	**:**	*I.D. – Grid connected renewable electricity generation (Version- 16, EB- 54)*
Reference[2]	**:**	Appendix B Of The Simplified Modalities And Procedures For Small-Scale CDM Project Activities Indicative Simplified Baseline And Monitoring Methodologies For Selected Small-Scale CDM Project Activity Categories

Technology/Measure:

The wind power technology is considered as one of the most environmental friendly technologies available. The operation of the wind turbine does not emit any harmful GHGs or any other harmful gases like conventional power plants during their operation. The electricity generation is the result of the utilization of kinetic energy in wind to drive the wind turbine blades to generate electricity. Thus the operation of the wind power project is considered as environmentally safe.

Technical specifications for Class S-82[3]:

[1] http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X
[2] http://unfccc.int/resource/docs/2005/cmp1/eng/08a01.pdf#page=43
[3] Suzlon S-82 Brochure - http://www.suzlon.com/products/l2.aspx?l1=2&l2=8

1.	**Main Data**	
	Turbine type	Horizontal axis turbine
	Rated Power	1500 kW
	Rotor Diameter	82 m
	Hub height (including foundation)	Approximately 78.5 m
	Rotational Speed	15.6 to 18.4 rpm
2.	**Rotor**	
	Number of rotor blades	3
	Rotor Orientation	Upwind
	Material	Epoxy bonded fiber glass
3.	**Gear Box**	
	Type of Gear Box housing	One planetary stage / Two helical stages
	Ratio	1: 95.09
	Power	1650 kW
	Type of cooling	Forced oil cooling lubrication system
4.	**Generator System**	
	Generator type	Single speed induction generator with slip rings, variable rotor resistance via Suzlon Flexi slip system
	Rated power	1500 kW
	Speed at rated power	1511 rpm
	Rated voltage	690 V AC (phase to phase)
	Frequency	50 Hz
	Insulation Class	Class H
5.	**Tower**	
	Tower type	Tubular tower (corrosion proof painting on inner and outer surface) with welded steel plates
	Tower Height	76 m
6.	**Operational Parameters**	
	Cut-in wind speed	4 m/s
	Rated wind speed	14 m/s
	Cut-off wind speed	20 m/s
	Survival wind speed	52.5 m/s

The project technology is indigenous & no technology transfer is involved.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The chosen crediting period for the project activity is 7 years (renewable). It is estimated that the project activity would generate 13636 tonnes of CO_2 e/annum over the entire crediting period. Annual estimate of emission reductions by the project activity during the first crediting period are furnished below.

Years	Estimation of annual emission reductions in tonnes of CO_2 e
2012-13	13636
2013-14	13636
2014-15	13636
2015-16	13636
2016-17	13636

Years	Estimation of annual emission reductions in tonnes of CO_2 e
2017-18	13636
2018-19	13636
Total estimated reductions (tonnes of CO_2 e)	**95452**
Total number of crediting years	**7**
Annual average of the estimated reductions over the crediting period (tCO_2 e)	**13636**

A.4.4. Public funding of the small-scale project activity:

The project activity is not availing any public funding. Kindly refer Annex 2.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

As per "*Guidelines on Assessment of Debundling for SSC Project Activities*" (Version- 03, EB- 54, Annex- 13)[4]:

Debundling is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities. The full project activity or any component of the full project activity shall follow the regular CDM modalities and procedures.

This wind power project activity is a separate project activity having installed capacity of 7.5 MW (1.50 MW × 5 Nos.) and is not a debundled component of any large scale project activity.

Further, as per the guidelines,

A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- *With the same project participants;*
- *In the same project category and technology/measure; and*
- *Registered within the previous 2 years; and*
- *Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point*

This small-scale project activity cannot be deemed to be a debundled component of a large project activity as there is no registered[5] small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participant;
- In the same project category and technology/measure; and

[4] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf

[5] PP has two CDM registered projects (UNFCCC Ref. Nos.1778 & 3742). Nevertheless, these projects do not fulfill above debundling criteria.

- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

It therefore satisfies all conditions listed in '*Guidelines on Assessment of Debundling for SSC Project Activities*' (Version- 03, EB- 54, Annex- 13) regarding debundling. Thus, project proponent hereby confirms that the project activity is not a debundled component of another larger project activity.

SECTION B. Application of a baseline and monitoring methodology

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

The approved baseline and monitoring methodology for small scale project activity, AMS- I.D. (Version- 16, EB- 54), has been applied to this wind power project activity. The title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity is as below –

Title of Methodology : Grid connected renewable electricity generation (Version- 16, EB- 54)
Reference[6] : AMS- I.D.

Tools & guidelines referred to design project baseline & additionality:

- *Tool to calculate the emission factor for an electricity system (Version- 02.2.1 , EB- 63, Annex- 19)*[7]
- *Attachment A of Appendix B (Version 8, EB- 63, Annex- 24)*[8]
- *Guidelines on the Assessment of Investment Analysis (Version- 5, EB- 62, Annex- 5)*[9]
- *General Guidelines to SSC CDM methodologies (Version 17)*[10]

B.2 Justification of the choice of the project category:

Project Type : Type I – Renewable Energy Projects
Project Category : AMS *I.D. – Grid connected renewable electricity generation* (Version- 16, EB- 54)

The project activity having capacity 7.5 MW & is within the SSC limit of 15 MW. It will remain under the limits of small scale project activity types during every year of the crediting period.

The qualifying criteria for the chosen project category AMS- I.D. (Version- 16, EB- 54) and its subsequent justification are given in the table below:

[6] http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X
[7] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf
[8] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid05.pdf
[9] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf
[10] https://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf

Sr. No.	Criteria	Project Scenario
1.	*This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid. Project activities that displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit shall apply AMS I.F.*	The project activity comprises wind (renewable) energy generation units that supply electricity to NEWNE Grid of India.
2.	*This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).*	The project activity is a Greenfield plant (option a).
3.	*Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:* • *The project activity is implemented in an existing reservoir with no change in the volume of reservoir;* • *The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2;* • *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/m^2.*	As it is wind power project activity, the criteria is not applicable.
4.	*In the case of biomass power plants, no other biomass types than renewable biomass are to be used in the project plant.*	As it is wind power project activity, the criteria is not applicable.
5.	*If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.*	Project activity has only renewable component (wind), the capacity being 7.5 MW which does not exceed the eligibility limit for a small-scale CDM project activity.
6.	*Combined heat and power (co-generation) systems are not eligible under this category.*	As it is wind power project activity, the criteria is not applicable.
7.	*In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project*	Not applicable, as it is a Greenfield project activity.

Sr. No.	Criteria	Project Scenario
	should be lower than 15 MW and should be physically distinct from the existing units.	
8.	*In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.*	Not applicable, as it is a Greenfield project activity.

Thus, the project activity is complying with requisite criteria for AMS- I.D. (Version-16, EB-54).

B.3. Description of the project boundary:

As per paragraph 9 of the chosen project category AMS- I.D. (Version- 16, EB- 54), '*The physical, geographical site of the renewable generation source delineates the project boundary.*'

The project activity is located in the State of Rajasthan and is supplying generated electricity to the NEWNE Grid of India. The project boundary consists of project activity, evacuation facility, common metering point and connectivity to the NEWNE Grid. The schematic diagram of project boundary is as follows:

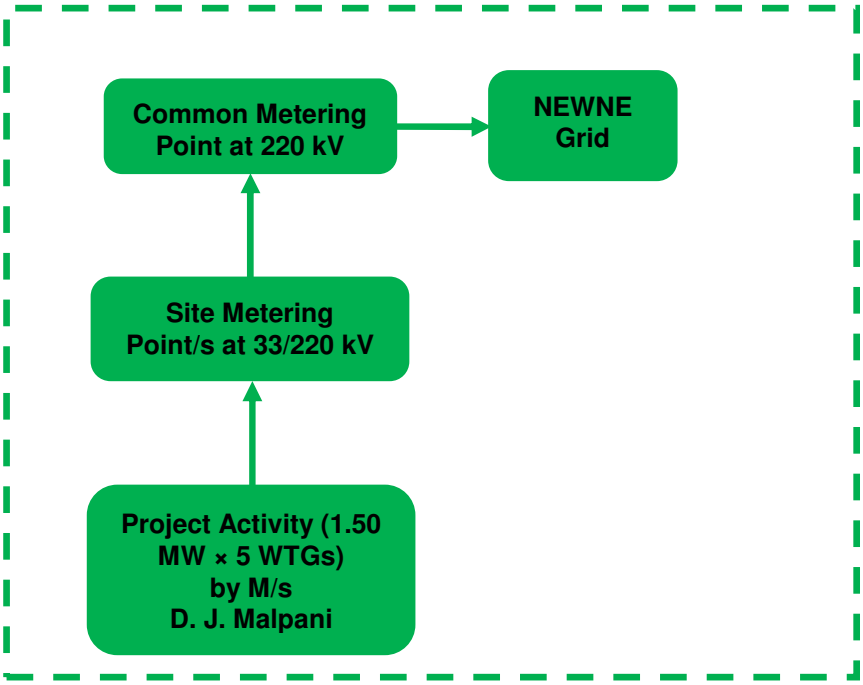


Figure 02: Project Boundary (Indicative)

B.4. Description of baseline and its development:

Baseline Estimation:

As per AMS- I.D. (Version- 16, EB- 54), paragraph 10,

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

Since the project activity is a new grid-connected power plant, the above stated baseline is applicable for the project. Further, as per paragraph 11,

'*The baseline emissions are the product of electrical energy baseline $EG_{BL,\ y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.*'

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

Where:

BE_y	=	Baseline emissions in year y; (t CO_2)
$EG_{BL,y}$	=	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$	=	CO_2 Emission Factor of the grid in year y; (t CO_2 / MWh)

As per paragraph 12 of AMS- I.D. (Version- 16, EB- 54), '*The emission factor can be calculated in a transparent and conservative manner as follows:*

a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system'.

OR

b) The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations must be based on data from an official source (where available) and made publicly available.

The emission factor has been calculated using option '*a*' above i.e. *combined margin* (as the data required to determined *weighted average emissions (in t CO_2/MWh) of the current generation mix* was not available at the time of submission of PDD for validation) by using "*Tool to calculate the emission factor for an electricity system" (Version- 02.2.1, EB- 63, Annex- 19).*
Following information is used for the calculation of baseline emissions:

1. Net electricity supplied by the project activity to the grid in year y taken from monthly *Break up of net export units* reports.

2. CO_2 Baseline Database (Version- 6.0, Date- March 2011) published by Central Electricity Authority (CEA), Government of India under *Baseline Carbon Dioxide Emissions From Power Sector*[11].

Sr. No.	Parameters	Unit	Value	Reference
1.	$EF_{grid,OM,y}$	tCO_2/ MWh	0.9942	Operating margin CO_2 emission factor for the project electricity system. The value is calculated for year 2007-08, 2008-09 & 2009-10.
2.	$EF_{grid, BM,y}$	tCO_2/ MWh	0.8123	Build margin CO_2 emission factor for the project electricity system. The value is calculated for year 2009-10.
3.	$EF_{grid,CM,y}$[12]	tCO_2/ MWh	0.9487	Combined margin CO_2 emission factor for the project electricity system.

The combined margin emissions factor is calculated as follows:

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

Where

$EF_{grid,OM,y}$ = Operating Margin CO_2 Emission Factor (tCO_2/MWh)
$EF_{grid,BM,y}$ = Build Margin CO_2 Emission Factor (tCO_2/MWh)
W_{OM} = Weighting of operating margin emission factor (%)
W_{BM} = Weighting of build margin emission factor (%)

The steps are detailed under section B.6.1

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

National policies and circumstances relevant to the baseline of the project activity:

The Electricity Act (EA), 2003 provides an enabling framework for accelerated and more efficient development of the power sector. The EA seeks to encourage competition with appropriate regulatory intervention. Competition is expected to yield efficiency gains and in turn result in availability of quality supply of electricity to consumers at competitive rates.

The Section 3 (1) of the Electricity Act 2003 requires the Central Government to formulate, inter alia, the National Electricity Policy in consultation with Central Electricity Authority (CEA) and State Governments. The provision is quoted below[13]:

"The Central Government shall, from time to time, prepare the National Electricity Policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy".

[11] http://www.cea.nic.in/reports/planning/cdm_co2/Database_publishing_ver6.zip
[12] Notation used for combined margin CO_2 emission factor by '*Tool to calculate emission factor for an electricity system*' is $EF_{grid,CM,y}$ but AMS I.D. (Version 16, EB 54) refers this parameter as $EF_{CO2,grid,y}$
[13] http://www.powermin.nic.in/acts_notification/electricity_act2003/pdf/The%20Electricity%20Act_2003.pdf , Pg 8

Further, as per section *5.2.12* of the National Electricity Plan[14]:

Even with full development of the feasible hydro potential in the country, coal would necessarily continue to remain the primary fuel for meeting future electricity demand.

The National Electricity Plan also emphasizes the use of other fossil fuel like gas, LNG, Lignite, other imported fossil fuels in meeting the future electricity need.

It further emphasizes on the Renovation and Modernization (R&M) of the low performing thermal power stations in the country. This will enable to achieve improved PLF of the thermal power plant.

The implementation of the National Electricity Plan is clearly evident from the installed capacity in the project boundary i.e. the NEWNE Grid:

As per CEA Report, the installed capacity (in MW) of NEWNE Grid region as on 30/11/2010[15] is as follows:

Sr. No.	Power Sources	Installed Capacity, MW	Percentage, %
1	Thermal	83490.4	68.8
2	Nuclear	3460.0	2.9
3	Hydro	26068.4	21.5
4	RES	8263.3	6.8
5	**Total**	**121282.1**	**100.0**

The graphical representation of the above statistics is given below:

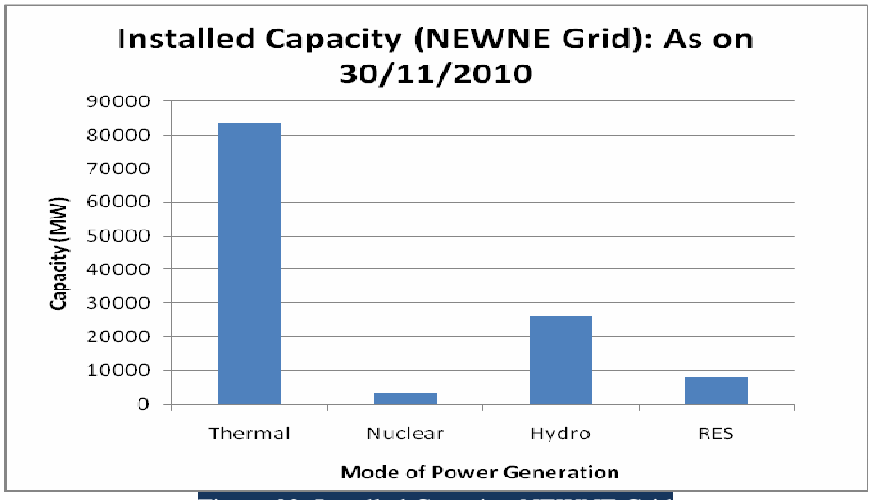


Figure 03: Installed Capacity, NEWNE Grid

[14] http://www.powermin.nic.in/indian_electricity_scenario/national_electricity_policy.htm

[15] http://cea.nic.in/ (Reference: Monthly Review of Power Sector Reports/November 2010/Sr. No. 06/Chapter: All India generating installed capacity- region wise/Page 8)

It can be observed from the above statistics that NEWNE Grid Region is dominated mostly by fossil fuel based thermal power plants. The share of thermal based power generation is 83490.4 MW (68.8%) as against the contribution of Renewable Energy Sources i.e. 8263.3 MW (6.8%). The percentage of hydro power is also substantial in the project boundary i.e. 21.5%.

Thus, the national policy clearly prefers the installation of the fossil fuel based power plants, which forms the basis of the project activity.

Project Additionality:

The additionality of this wind power project is proven by using the Investment barrier (option a) in accordance with *Attachment A of Appendix B (Version 08, EB- 63, Annex- 24)* & *Guidelines on the Assessment of Investment Analysis* (*Version- 5, EB- 62, Annex- 5*)

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

The investment analysis for this project activity is done as per the "Guidelines on the Assessment of Investment Analysis" (*Version- 5, EB- 62, Annex- 5*).

Project proponent is required to determine that the project activity is not:

- The most economically or financially attractive; or
- Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

As per paragraph 19 of "*Guidelines on the Assessment of Investment Analysis" (Version- 5, EB- 62, Annex- 5) – 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.* Hence, project promoter has considered Benchmark analysis to prove the additionality of the project.

PP has considered post tax project IRR as suitable financial indicator for the project.

Suitability of benchmark:

The *'Guidelines on the Assessment of Investment Analysis' (Paragraph- 12, Version- 5, EB- 62, Annex- 5)* states that, Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR, hence PP has selected Prime Lending Rate (PLR) applicable at the time of project conceptualization stage. PP has considered PLR of Bank of Baroda[16] as bench mark of the project. The PLR of the bank at the time of project conceptualization was 13.25%, which has been considered as benchmark of the project.

Calculation and comparison of financial indicators

PP has calculated project IRR of the project for entire life cycle. Key financial assumptions are as under:

[16] Bank of Baroda is a regular lender to the PP.

Sr. No.	Particulars	Unit	Value	Reference
1.	Capacity	kW	1500	Proposal from Supplier
2.	Machines	No.	05	Proposal from Supplier
3.	Total Capacity	kW	7500	Proposal from Supplier
4.	Net annual generation from project	Million kWh	15.14	PLF Assessment Report
5.	PLF[17]	%	23.04	PLF Assessment Report
6.	Deration in 6th, 10th, 14th and 18th year	%	1.25	Rajasthan Electricity Regulatory Commission order September 2006
7.	Tariff Rate	INR/kWh	3.87	Rajasthan Electricity Regulatory Commission Tariff order 06/08/2010
8.	O & M Cost per WTG	INR in Million	1.70	Proposal from Supplier
9.	O & M	INR in Million	8.50	Proposal from Supplier
10.	Service Tax (at 10.30%)	INR in Million	0.88	Service Tax Rule
11.	O & M including Service tax	INR in Million	9.38	Calculated
12.	Escalation in O & M Exp.	%	5.00	Proposal from Supplier
13.	O & M Free For	years	1st Year	Proposal from Supplier
14.	Insurance	INR in Million	0.66	Sheet no. 31 under Risk code 70 , Rate code 05 of http://iib.gov.in/IRDA/tac/tariffs/AIFT2001.pdf
15.	Cost of WTG	INR in Million	442.03	Proposal from Supplier
16.	Promoters contribution	INR in Million	442.03	Promoter Decision
17.	Depreciation as per Companies Act	%	4.50	Rajasthan Electricity Regulatory Commission order September 2006
18.	Income Tax	%	30.90	Section 143, Income Tax Act 1961

The Project IRR value for the project activity has been calculated for the life time of the project. The post tax Project IRR *without* CDM benefits comes to 8.91%, which is lower than the benchmark rate of 13.25[18]%.

Thus, we can conclude that successful CDM registration of this project activity is important to make it financially attractive.

[17] The PLF value arrived by the 3rd party PLF report is 23.04% whereas the PLF offered by Suzlon is. 21.88%. So, PP has considered PLF value of 23.04% for IRR working & PLF of 21.88% for baseline calculations as a conservative approach.

[18] http://www.moneycontrol.com/stocks/stock_market/corp_notices.php?autono=391989

Sensitivity analysis

The "*Guidelines on the Assessment of Investment Analysis" (Paragraph 20, Version- 5, EB- 62, Annex-5),* states that 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 different parameters that affect the viability of a wind power project as per above clause are mentioned below –

Parameters	Comments
Annual Generation	*This is the most important and critical parameter for any Power Project & hence viability of the project will be affected by any fluctuation in this parameter. Sensitivity analysis has therefore been carried out for it.*
Project Cost	*This is other important and critical parameter for any Power Project & hence viability of the project will be affected by any fluctuation in this parameter. Sensitivity analysis has therefore been carried out for it.*
O & M Cost	*This does not add to 20% of either total project cost or total project revenues, even then sensitivity analysis is conducted out to show the effect on viability of the project.*
Tariff	*This is the most important and critical parameter for any Power Project & hence viability of the project will be affected by any fluctuation in this parameter. Sensitivity analysis has therefore been carried out for it.*

Outcome of Sensitivity analysis:

Sensitivity Analysis based on Annual Generation, Project Cost and O & M Cost			
Variation by….	-10%	0	10%
Annual Generation	6.90%	8.91%	10.79%
Project Cost.	10.59%	8.91%	7.48%
O & M Cost	9.30%	8.91%	8.50%
Tariff	6.90%	8.91%	10.79%

From the above table it seems that if the generation increased by 10%, project cost decreased by 10%, O & M decreased by 10% and tariff increased by 10%, the financial indicator will not cross the benchmark selected by the PP. The project activity is clearly unattractive in absence of CDM income. Hence the project activity is additional.

The successful registration of the project as CDM project is imperative in order to make it financially more attractive.

Prior CDM Consideration:

As per paragraph 02 of the *Guidelines On The Demonstration And Assessment Of Prior Consideration Of The CDM (Version: 04, EB: 62, Annex: 13),* the PP has intimated to both UNFCCC & DNA on 10/02/2011 regarding intentions to seek CDM benefits for the project activity. The start date of the project activity is considered as 03/01/2011 (Purchase Order date of Wind Turbine Generators).The intimation is within six months of the project start date.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline Emissions (BE_y):

Baseline methodology for project category *I.D* has been detailed in paragraphs 10-18 of the approved small scale methodology AMS- I.D. (Version- 16, EB- 54). As per paragraph 10,

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

Since the project activity is a new power plant, the above stated baseline is applicable for the project. Further, as per paragraph 11,

'*The baseline emissions are the product of electrical energy baseline $EG_{BL,\ y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.*'

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

Where:

BE_y	=	Baseline emissions in year y; (t CO_2)
$EG_{BL,y}$	=	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$	=	CO_2 Emission Factor of the grid in year y; (t CO_2 / MWh)

As per paragraph 12 of AMS- I.D. (Version- 16, EB- 54), '*The emission factor can be calculated in a transparent and conservative manner as follows:*

a) *A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system'.*

OR

b) *The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.*

The emission factor has been estimated using option (a) i.e. combined margin (as the data required to determined *weighted average emissions (in t CO_2/MWh) of the current generation mix* was not available at the time of submission of PDD for validation) above by using the following steps of "*Tool to calculate the emission factor for an electricity system" (Version- 02.2.1 , EB- 63, Annex- 19)*:

Step 1: Identify the relevant electricity systems

Central Electricity Authority, Ministry of Power, Government of India (Host Country) has given the delineations of the project electricity system and the connected electricity system in India. As per CEA, the Indian power system is divided into two regional grids, viz. NEWNE Grid & Southern Grid. Each grid covers several states as given in the following table. As the project activity is located in the State of Rajasthan, NEWNE Grid is the relevant electricity system.

Geographical Scope of Electricity Grid System:

NEWNE Grid				Southern Grid
Northern	**Eastern**	**Western**	**North-Eastern**	
Delhi	Jharkhand	Gujarat	Arunachal Pradesh	Andhra Pradesh
Haryana	Orissa	Daman & Diu	Assam	Karnataka
Himachal Pradesh	West Bengal	Dadra & Nagar Haveli	Manipur	Kerala
Jammu & Kashmir	Sikkim	Madhya Pradesh	Meghalaya	Tamil Nadu
Punjab	Andaman-Nicobar	Maharashtra	Mizoram	Pondicherry
Rajasthan	-	Goa	Nagaland	Lakshadweep
Uttar Pradesh	-	-	Tripura	-

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

Project participants have to choose between the following two options to calculate the operating margin and build margin emission factor:

- Option I: Only grid power plants are included in the calculation.
- Option II: Both grid power plants and off-grid power plants are included in the calculation.

The PP has chosen "*Option I: Only grid power plants are included in the calculation"* as the grid system in India is stable enough and off-grid generation is not significant.

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

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

Out of the above options, the simple OM method (option a) is used in India. The Dispatch data analysis OM is not used as off-grid generation is not significant in India as per step 2 above. Other methods cannot be applied in India due to lack of necessary data.

As per "*Tool to calculate the emission factor for an electricity system" (Version- 02.2.1 , EB- 63, Annex-19)*, 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.

As per option (1), in India as per available data (most recent five years) with CEA, the low-cost/must-run resources constitute 17.76% which is less than 50% of total grid generation.

NEWNE Grid: Share of low cost / Must- run (% of net generation)					
Year	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**
Share of low cost / Must-run (% of net generation)	17.95%	18.46%	19.04%	17.41%	15.94%
Average of most recent 5 years	17.76%				
Table reference- CEA CO_2 Baseline Database (Version- 6.0, Date- March 2011)					

For the simple OM, the emissions factor is calculated using the *ex ante* option. As per this option, the emission factor has been determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period is required.

As the project is a grid connected power plant, 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation has been used.

CEA has considered the CDM registered projects in the calculation of the operating margin (OM).

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

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated by one of the following two options:

Option A: Based on the net electricity generation and a CO2 emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:

(a) The necessary data for Option A is not available; and
(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

The simple OM is calculated as per Option B below.

Option B: Calculation based on total fuel consumption and electricity generation of the system

Under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$\mathbf{EF}_{\mathbf{grid,\,OMsimple,y}} = \frac{\sum_{i}(\mathbf{FC}_{\mathbf{i,y}} \times \mathbf{NCV}_{\mathbf{i,y}} \times \mathbf{EF}_{\mathbf{CO2,i,y}})}{\mathbf{EG_y}}$$

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)
$EF_{CO2,i,y}$	=	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 relevant year as per the data vintage chosen in Step 3

For this approach (simple OM) to calculate the operating margin, the subscript *m* refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports to the grid. Electricity imports should be treated as one power plant *m*.

OM values have been referred from CEA Database which has referred the "*Tool to calculate the emission factor for an electricity system"*. The value of operating margin emission factor is 0.9942 tCO_2/MWh.

OM calculation has been done *ex-ante* and hence OM value will remain fixed and need not be monitored during the crediting period.

Step 5: Calculate the build margin (BM) emission factor

As per the "*Tool to calculate the emission factor for an electricity system" (Version- 02.2.1, EB- 63, Annex- 19)*, project participant can choose between one of the following two options:

Option 1: *For the first 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. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.*

Option 2: *For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.*

The PP has opted for Option 1.

Capacity additions from retrofits of power plants are not included in the calculation of the build margin emission factor.

The sample group of power units *m* used to calculate the build margin is determined as per below procedure:

- Identify set of five power units that have been built most recently excluding CDM registered power units; or
- Identify set of power units that comprise 20% of the system generation excluding CDM registered projects and that have been built most recently.
- Project participant should use the set of power units that comprises the larger annual generation.
- If set do not comprises any power unit older than 10 years, then use this set for build margin calculation
- If set comprises any power unit older than 10 years, then replace this power unit/s with power unit registered as CDM till set comprises 20% generation & then use this set for build margin calculation
- In case the set do not comprise 20% generation then include power units older than 10 years unit the set comprises 20% generation. Use the resulting set for build margin calculation

As per CEA, 20% net generation (GWh) & Net Generation in Build Margin (GWh) for NEWNE Grid are as follows:

20% of Net Generation (GWh)

Year	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**
20% of Net Generation (GWh)	87,575	93,072	99,224	102,139	108,983
Table reference- CEA CO_2 Baseline Database (Version- 6.0, Date- March 2011)					

Net Generation in Build Margin (GWh)

Year	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**
Net Generation in Build Margin (GWh)	87, 764	93, 524	100, 707	102,589	109,064
Table reference- CEA CO_2 Baseline Database (Version- 6.0, Date- March 2011)					

The value of BM has been referred from CEA CO_2 Baseline Database (Version- 6.0, Date- March 2011) which has been calculated by "*Tool to calculate the emission factor for an electricity system" (Version- 02.2.1, EB- 63, Annex- 19).*

As per the "*Tool to calculate the emission factor for an electricity system" (Version- 02.2.1, EB- 63, Annex- 19)*, the build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which electricity generation data is available, calculated as follows:

$$\mathbf{EF}_{\mathbf{grid,BM,y}} = \frac{\sum_{m} \mathbf{EG}_{\mathbf{m,y}} \times \mathbf{EF}_{\mathbf{EL,m,y}}}{\sum_{m} \mathbf{EG}_{\mathbf{m,y}}}$$

Where,

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

The value of the BM has been calculated by CEA as 0.8123 tCO_2/MWh. BM calculations has been done *ex-ante* and hence BM value will remain fixed and need not be monitored during the crediting period.

Step 6: Calculate the combined margin (CM) emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option. The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered CDM projects at the starting date of validation; and

- The data requirements for the application of step 5 above cannot be met.

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

$$\mathbf{EF}_{\mathbf{grid,CM,y}} = \mathbf{EF}_{\mathbf{grid,OM,y}} \times \mathbf{W}_{\mathbf{OM}} + \mathbf{EF}_{\mathbf{grid,BM,y}} \times \mathbf{W}_{\mathbf{BM}}$$

Where

$EF_{grid,OM,y}$	=	Operating Margin CO_2 Emission Factor (tCO_2/MWh)
$EF_{grid,BM,y}$	=	Build Margin CO_2 Emission Factor (tCO_2/MWh)
W_{OM}	=	Weighting of operating margin emission factor (%)

W_{BM} = Weighting of build margin emission factor (%)

The following default values should be used for W_{OM} and W_{BM}:

- Wind and solar power generation project activities: W_{OM} = 0.75 and W_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

- All other projects: W_{OM} = 0.5 and W_{BM} = 0.5 for the first crediting period , and W_{OM} = 0.25 and W_{BM} = 0.75 for the second and third crediting period,6 unless otherwise specified in the approved methodology which refers to this tool.

Alternative weights can be proposed, as long as $W_{OM} + W_{BM} = 1$, for consideration by the Executive Board, taking into account the guidance as described below. The values for $W_{OM} + W_{BM}$ applied by project participants should be fixed for a crediting period and may be revised at the renewal of the crediting period.

The PP has opted for weighted average CM. Thus, the combined margin emissions factor is calculated as follows:

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

Where

$EF_{grid,OM,y}$ = Operating Margin CO_2 Emission Factor (tCO_2/MWh)
$EF_{grid,BM,y}$ = Build Margin CO_2 Emission Factor (tCO_2/MWh)
W_{OM} = Weighting of operating margin emission factor (%)
W_{BM} = Weighting of build margin emission factor (%)

Thus, the grid emission factor for NEWNE Grid is calculated *ex ante* as below:

$$EF_{grid,CM,y} = 0.75 \times EF_{grid,OM,y} + 0.25 \times EF_{grid,BM,y}$$
$$= 0.75 \times 0.9942 + 0.25 \times 0.8123$$
$$= 0.9487\ tCO_2/MWh$$

Baseline Emissions (BE_y):

The product of *Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y* in MWh with *CO_2 Emission Factor of the grid in year y* in tCO_2/MWh will give the estimated value of Baseline Emissions tCO_2 (BE_y).

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

Project Emissions (PE_y):

As per paragraph 19 of approved methodology AMS- I.D. (Version- 16, EB- 54), *For most renewable energy project activities, PE_y = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002.*

- *Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption)*
- *Emissions from water reservoirs of hydro power plants*

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

Leakage Emissions (LE_y):

As per paragraph 20 of the approved methodology AMS- I.D. (Version- 16, EB- 54), *If the energy generating equipment is transferred from another activity, leakage is to be considered.* The leakage emissions may be considered as zero tCO_2 as no such equipment shall be transferred from another project activity.

Emission Reductions (ER_y):

The emission reductions (ER_y) are calculated as per paragraph 21 of AMS- I.D. (Version- 16, EB- 54).

$$\mathbf{ER_y = BE_y - PE_y - LE_y}$$

Where

ER_y = Emission reductions in year y (tCO_2/y)
BE_y = Baseline Emission in year y (tCO_2/y)
PE_y = Project Emission in year y (tCO_2/y)
LE_y = Leakage Emission in year y (tCO_2/y)

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

Data / Parameter:	$EF_{CO2,grid,y}$
Data unit:	tCO_2 / MWh
Description:	Combined margin CO_2 emission factor for the project electricity system.
Source of data used:	CEA CO_2 Baseline Database (Version- 6.0, Date- March 2011). The value is calculated for year 2007-08, 2008-09 & 2009-10.
Value applied:	0.9487
Justification of the choice of data or description of	The *CO_2 Baseline Database* is the most authentic data available in India since it has been prepared & published by Central Electricity Authority, Government of India.

measurement methods and procedures actually applied :	The $EF_{grid, CM, y}$[19] calculation is based on equation 13 of the '*Tool to calculate the emission factor for an electricity system*' (Version- 02.2.1 , EB- 63, Annex- 19) which is given below as: $EF_{grid,CM,y} = 0.75 \times EF_{grid,OM,y} + 0.25 \times EF_{grid, BM,y}$
Any comment:	The calculation is done as *ex ante.*

Data / Parameter:	$EF_{grid, OM, y}$
Data unit:	tCO_2/MWh
Description:	Operating margin CO_2 emission factor for the project electricity system.
Source of data used:	CEA CO_2 Baseline Database (Version- 6.0, Date- March 2011). The value is calculated for year 2007-08, 2008-09 & 2009-10.
Value applied:	0.9942
Justification of the choice of data or description of measurement methods and procedures actually applied :	The *CO_2 Baseline Database* is the most authentic data available in India since it has been prepared & published by Central Electricity Authority, Government of India. The $EF_{grid, CM, y}$ calculation is based on the guidelines in '*Tool to calculate the emission factor for an electricity system*' (Version- 02.2.1 , EB- 63, Annex- 19)
Any comment:	The calculation is done as *ex ante.*

Data / Parameter:	$EF_{grid, BM, y}$
Data unit:	tCO_2/MWh
Description:	Build margin CO_2 emission factor for the project electricity system.
Source of data used:	CEA CO_2 Baseline Database (Version- 6.0, Date- March 2011). The value is calculated for year 2009-10.
Value applied:	0.8123
Justification of the choice of data or description of measurement methods and procedures actually applied :	The *CO_2 Baseline Database* is the most authentic data available in India since it has been prepared & published by Central Electricity Authority, Government of India. The $EF_{grid, CM, y}$ calculation is based on the guidelines in '*Tool to calculate the emission factor for an electricity system*' (Version- 02.2.1 , EB- 63, Annex- 19)
Any comment:	The calculation is done as *ex ante.*

[19] Refers to $EF_{grid,CO2,y}$

B.6.3 Ex-ante calculation of emission reductions:

The Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh) is calculated using the following parameters:

Sr. No.	Project Parameters	Details
1.	Location	Akal, Jaisalmer district, Rajasthan
2.	Grid	NEWNE Grid
3.	Capacity per WTG	1.50 MW
4.	Total no. of WTGs	5
5.	Total Capacity	7.5 MW
6.	*Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y*	14,374[20] MWh

Baseline Emissions (BE_y), tCO_2:

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

$= 14,374 \times 0.9487$

$= 13636\ tCO_2$

The project emissions (PE_y) & leakage emissions (LE_y) are zero as explained in Section B.6.1. Thus,

$ER_y = BE_y$

$= 13636\ tCO_2$

Thus, the project activity is estimated to achieve emission reductions of 13636 tCO_2e per annum over the entire crediting period of 7 years.

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

Year	Estimation of project activity emissions (tCO_2 e)	Estimation of baseline emissions (tCO_2 e)	Estimation of leakage (tCO_2 e)	Estimation of overall emission reductions (tCO_2 e)
2012-13	0	13636	0	13636
2013-14	0	13636	0	13636
2014-15	0	13636	0	13636
2015-16	0	13636	0	13636
2016-17	0	13636	0	13636
2017-18	0	13636	0	13636
2018-19	0	13636	0	13636
Total (tonnes of CO2 e)	**0**	**95452**	**0**	**95452**

[20] It is as per generation/PLF offered by Suzlon (conservative). The PLF value arrived by the 3rd party PLF report is 23.04% whereas the PLF offered by Suzlon is. 21.88%. So, PP has considered PLF value of 23.04% for IRR working & PLF of 21.88% for baseline calculations as a conservative approach.

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh/y
Description:	*Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y*
Source of data to be used:	Monthly *Break up of net export units* report
Value of data	14,374
Description of measurement methods and procedures to be applied:	**Metering at 33 kV/220 kV level:** The electricity generated by the project activity WTG/s is evacuated to the pooling station at 33 kV/220 kV level. The project activity WTG/s along with other WTGs, are connected to the feeder-wise metering point/s, where each metering point consists of both main & check meters. These tri vector energy meters are having accuracy class of 0.2s. The joint meter reading is taken on monthly basis at these metering point/s by the representatives of PP & State Utility, which records parameters like export, import. The electricity (export and import) for the connected WTG/s is apportioned on monthly basis by the State Utility at 33 kV/220 kV level on the basis of generation ratio at the applicable metering point (ratio of controller reading of connected WTG to the controller reading for all WTGs connected to the applicable metering point) and the electricity (export, import etc) recorded by the energy meters at 33 kV/220 kV GSS on monthly basis. It will give export kWh & import kWh for connected WTG. The net export obtained at 33 kV/220 kV level for any given month for the connected WTG is then obtained by: Net Export = Export kWh – Import kWh All these metering points are further connected to the common delivery point at the 220 kV level. **Metering at 220 kV level:** The common metering point at 220 kV GSS *concurrently* records total electricity (total export and total import) receiving from all connected metering points. The common metering point consist of both main & check meters. These energy meters are having accuracy class of 0.2s. The monthly JMR is taken by the representative of PP & State Utility. Billing of the energy will be done based on the energy break up available at the metering at 220 kV level.

	Transmission loss: The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of exports for all metering points at 33/220 kV level and the total reading of exports for same metering points recorded at the 220 kV level. Similarly, transmission loss occurred during import of the electricity is also calculated. The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the *Generation Ratio at common delivery point* (ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point). The values of transmission loss during export & import for the given WTG are subtracting from $EG_{Export,\ metering\ point}$ & $EG_{Import,\ metering\ point}$ respectively to get the values of export and import respectively for the given month. **Net electricity delivered to the Grid:** The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export. The values of the net electricity delivered to the Grid are aggregated annually to get $EG_{BL,y}$. The value of net electricity delivered to the Grid ($EG_{BL,y}$) by the project activity per annum is converted to MWh before the calculation of emission reductions (*ex ante* determined in tCO_2/MWh unit).
QA/QC procedures to be applied:	The meters are approved, tested & sealed by the State Utility. The meters are in the custody of State Utility. The calibration of the meters will be carried out by State Utility. The calibration of the meters will be carried out at least once in three years (as per paragraph 17 (c) of *General Guidelines to SSC CDM methodologies, Version 17*). In the absence of the meter calibration—*Guidelines For Assessing Compliance With The Calibration Frequency Requirements* will be applied appropriately to confirm the conservativeness of metering and emission reductions.
Any comment:	Data will be archived in electronic form for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.

B.7.2 Description of the monitoring plan:

Monitoring of the project activity:

The monitoring of the project activity is given as below:

- The electricity generated by the project activity WTGs is evacuated to the pooling station at 33 kV/220 kV level. The project activity WTGs along with other WTGs, are connected to the feeder-wise metering point/s, where each metering point consists of both main & check meters. These tri vector energy meters are having accuracy class of 0.2s.
- The joint meter reading is taken on monthly basis at these metering point/s by the representatives of PP & State Utility, which records parameters like export, import.
- All these metering points are further connected to the common delivery point at the 220 kV level.
- The common metering point at 220 kV GSS concurrently records total electricity (total export and total import) received from all connected metering points. The common metering point consist of both main & check meters. These energy meters are having accuracy class of 0.2s. The monthly JMR is taken by the representative of PP & State Utility.
- Billing of the energy will be done based on the energy break up available at the metering at 220 kV level.
- The monitoring & measurement of electricity will be done on continuous basis; while recording will be done on monthly basis as *Joint Meter Reading* by the representatives of State Utility & PP.
- The value of monthly export by the project activity along with import and net export will be recorded in the monthly *Break up of net export units* report.
- The values of monthly export & import by the project activity recorded in the monthly *Break up of net export units* report is calculated based on the apportioning method by the state utility.
- The meters shall be approved, tested & sealed by the State Utility. The meters are in the custody of State Utility. The calibration of the meters will be carried out by State Utility.
- The calibration of the meters will be carried out at least once in three years (as per paragraph 17 (c) of *General Guidelines to SSC CDM methodologies, Version 17*). In the absence of the meter calibration— *Guidelines For Assessing Compliance With The Calibration Frequency Requirements* will be applied appropriately to confirm the conservativeness of metering and emission reductions.
- The net electricity supplied to the grid will be converted to MWh for calculation of emission reductions.
- Data will be archived in electronic form for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.
- The PP is responsible for data collection & archiving.

Sample Apportioning Procedure:

The apportioning of the electricity is the responsibility of the State Utility. The sample apportioning procedure adopted for any given WTG for any given month is given below:

Generation Ratio at metering point (33 kV/220 kV level GSS):

The generation ratio is the ratio of electricity generated by installed WTG of PP to the total generation by all the connected WTGs to the applicable metering point.

$$G_{R,\ metering\ point} = EG_{Controller,\ WTG} / EG_{Controller,\ metering\ point} \quad (a)$$

Where:

$G_{R,\ metering\ point}$: Generation Ratio at metering point

$EG_{Controller, WTG}$: Electricity generated by installed WTG of PP connected to the applicable metering point

$EG_{Controller, metering\ point}$: Total generation by all the connected WTGs to the applicable metering point

Calculation of net electricity exported at applicable metering point:

The Main and Check meters at the applicable metering point measures number of parameters including export and import for all the connected WTGs.

The import, kWh by the WTG at the metering point is calculated in the following manner:

$$\mathbf{EG_{Import, metering\ point} = G_{R, metering\ point} \times EG_{Total\ Import, metering\ point}} \quad (b)$$

Where:

$EG_{Import, metering\ point}$: Import, kWh by the WTG at the metering point
$G_{R, metering\ point}$: Generation Ratio at metering point
$EG_{Total\ Import, metering\ point}$: Total Import, kWh by all the WTGs at the metering point

The export, kWh by the WTG at the metering point is calculated in the following manner:

$$\mathbf{EG_{Export, metering\ point} = G_{R, metering\ point} \times EG_{Total\ Export, metering\ point}} \quad (c)$$

Where:

$EG_{Export, metering\ point}$: Export, kWh by the WTG at the metering point
$G_{R, metering\ point}$: Generation Ratio at metering point
$EG_{Total\ Export, metering\ point}$: Total Export, kWh by all the WTGs at the metering point

The net electricity exported by the WTG at the 33 kV/220 kV level metering point is calculated by subtracting equation (b) from (c).

Thus, the net electricity exported at 33 kV/220 kV level metering point

$$= \mathbf{EG_{Export, metering\ point} - EG_{Import, metering\ point}} \quad (d)$$

Transmission Loss Calculation:

The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of export for all metering points at 33/220 kV level and the total reading of export for same metering points recorded at the 220 kV level. Similarly transmission loss occurred during import of the electricity is also calculated.

The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the *Generation Ratio at common delivery point.*

Generation Ratio at common delivery point:

It is the ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point.

$$G_{R,\ Common\ Delivery\ Point} = EG_{Controller,\ WTG} / EG_{Controller,\ Common\ Delivery\ Point} \quad (e)$$

Where:

$G_{R,\ Common\ Delivery\ Point}$: Generation Ratio at common delivery point
$EG_{Controller,\ WTG}$: Electricity generated by installed WTG
$EG_{Controller,\ Common\ Delivery\ Point}$: Total generation by all the connected WTGs/ or connected metering points under common delivery point

Calculation of net electricity delivered to the Grid:

The values of transmission loss during export & import for the given WTG are subtracting from $EG_{Export,\ metering\ point}$ & $EG_{Import,\ metering\ point}$ respectively to get the values of export and import respectively for the given month.

The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export. Thus,

$$= \textbf{Export} - \textbf{Import} \quad (f)$$

These apportioned values viz import, export and net export kWh can be referred from the *Monthly Break up of net export units report.*

Operation & Maintenance of the Project:

Suzlon Infrastructure Services Ltd. is providing O & M services to the project promoter. Following services are provided by Suzlon Infrastructure Services Ltd.:

Routine Maintenance Services:

Routine maintenance labour work involves making available suitable manpower for operation and maintenance of the equipment and covers periodic preventive maintenance, cleaning and upkeep of the equipment including –

- Tower torquing
- Blade cleaning
- Nacelle torquing and cleaning
- Transformer oil filtration
- Control panel & LT panel maintenance
- Site and transformer yard maintenance

Security Services:

This service includes watch and ward and security of the wind turbines and the equipment.

Management Services:

- Data logging for power generation, grid availability, machine availability.
- Preparation and submission of monthly performance report in agreed format.
- Taking monthly meter reading jointly with utility of power generated at promoter's wind turbines and supplied to grid from the meter/s maintained by utility for the purpose and co-ordinate to obtain necessary power credit report/ certificate**.**

Technical Services:

- Visual inspection of the WTGs and all parts thereof.
- Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services

Operational & Management Structure:

Sr. No.	Monitoring Team	Responsibility
1	Project Head	• Overall project management • Project execution • Review of project operations • Review of generation & achieved emission reductions by project • Liaisoning with Consultant/Suzlon
2	Project Coordinator	• Data Archival (electronic) • Site visit for actual project monitoring Storage of data • Coordination with O & M Contractor for day to-day operations • Coordination with Suzlon for regular calibration of meters • Reporting to Project Head • Online project monitoring • Feedback and corrective action wherever necessary
3	O & M Contractor (Suzlon)	• Compliance as per O & M Agreement with the PP

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

Date of completion of the application of the baseline and monitoring methodology: 26/03/2011

Name of person/entity determining the baseline:

M/s. D. J. Malpani[21]

Prafulla Khinvasara
Head- Wind Power Projects
M/s. D. J. Malpani

[21] Project participant listed in Annex 1.

Malpani Estate | Kasara Dumala | Sangamner – 422 605 | Maharashtra | India
Ph: +91-2425-225 035 | Fax: +91-2425-225035 | Mob. +91 98223 22145
Email: prafulla@malpani.com | Homepage: http://www.malpani.com/

MITCON Consultancy & Engineering Services Ltd.[22]

Kishor Deshmukh
Chief Consultant
Energy & Carbon Services
M/s. MITCON Consultancy & Engineering Services Ltd.
Kubera Chambers | Shivajinagar | Pune - 411 005 | Maharashtra | India
Ph.: +91-20-6628 9113 | Fax: +91-20-2553 3206 | Mob. +91-98234 98582
Email: kishor@mitconconsultancy.in | Homepage: www.mitconindia.com

[22] M/s MITCON Consultancy & Engineering Services Ltd. is not the project participant listed in Annex 1.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

03/01/2011 (Purchase Order date of Wind Turbine Generators)

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

20 years and 0 months

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

The project activity has chosen renewable crediting period

C.2.1. Renewable crediting period

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

The starting date of the crediting period shall be 01/03/2012 or date of submission to registration whichever is later.

C.2.1.2. Length of the first crediting period:

7 years and 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The guidelines on Environmental Impact Assessment have been published by Ministry of Environment and Forests (MoEF), Government of India (GOI) under Environmental Impact Assessment notification 14/09/2006[23]. Further amendments to the notification have been done on 01/12/2009[24]. As per the notification:

"*The following projects or activities shall require prior environmental clearance from the concerned regulatory authority, which shall hereinafter referred to be as the Central Government in the Ministry of Environment and Forests for matters falling under Category 'A' in the Schedule and at State level the State Environment Impact Assessment Authority (SEIAA) for matters falling under Category 'B' in the said Schedule, before any construction work, or preparation of land by the project management except for securing the land, is started on the project or activity:*

(i) All new projects or activities listed in the Schedule to this notification;
(ii) Expansion and modernization of existing projects or activities listed in the Schedule to this notification with addition of capacity beyond the limits specified for the concerned sector, that is, projects or activities which cross the threshold limits given in the Schedule, after expansion or modernization;
(iii) Any change in product - mix in an existing manufacturing unit included in Schedule beyond the specified range."

As the wind power generation projects are not listed in any of the categories of the schedule, it does not require Environmental Impact Assessment.

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:

Wind energy projects are considered environmentally safe and as per Host party- India no EIA is required.

[23] EIA Notification 2006, http://envfor.nic.in/legis/eia/so1533.pdf
[24] EIA Amended Notification dated 01/12/2009, http://moef.nic.in/downloads/rules-and-regulations/3067.pdf

SECTION E. Stakeholders' comments

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

The stake holder meeting was conducted at Suzlon's Regional office at Jaisalmer (Rajasthan) on 24/03/2011 at 11.30 a.m. The stake holders were invited by Public Notice dated 12/03/2011, personal invitations were also given to the stake holders. The meeting was coordinated by Suzlon Energy Limited. Mr. Mohammad Abid & Mr. Himanshu Kulkarni represented Suzlon in the meeting. The PP was represented by Mr.Nitin Jadhav. The stake holders were identified based on the sustainability impact (direct & indirect) of this project activity on the life of the local people.

The project proponent & Suzlon welcomed the stakeholders for the meeting. The meeting was conducted in Hindi. Mr. Mohammad Abid explained the purpose of the meeting to the present stakeholders and introduced all the stakeholders to all the representatives. He briefed the stakeholders about the concept of Clean Development Mechanism, wind technology, climate change, effect of green house gases on human life, environmental benefits of the wind power projects etc.

During the meeting, Mr. Mohammad Abid explained about the power-deficit scenario in India and the need of energy. He explained importance of wind mills projects with respect to environmental well-being and its effect on local economy. He informed stakeholders about project promoter's keen interest in development of this proposed project and its effect on sustainable development of the local area.

Some villagers gave comments (which are discussed below) on the wind farm and its effect on their life. The stakeholder meeting ended with vote of thanks by Suzlon and PPs

E.2. Summary of the comments received:

During the meeting the project proponent & Suzlon invited the stakeholders to offer their comments on the project.

The stake holders present in the meeting gave a positive response; illustrating the different improvements made in the village due to the project activity like medical facilities, availability of ambulance, oxygen cylinders, civil work contracts to the local people etc. They further added that, different employment opportunities, like security guards, drivers, have been created for local people.

Baburam, one of the villagers, said that due to wind mill projects he has got employment at the wind farm, which has helped him to live much better life.

Jitendra, a local driver, said he is happy with the wind farm development in the local area as he has got job as a driver and that helped him to live a stable life.

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

No negative comments were received on the project activity, so no additional measures are required by the PP

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	D. J. Malpani
Street/P.O.Box:	Kasara Dumala
Building:	Malpani Estate
City:	Sangamner
State/Region:	Maharashtra
Postfix/ZIP:	422 605
Country:	India
Telephone:	+91-2425-225 261
FAX:	+91-2425-225 033
E-Mail:	prafulla@malpani.com
URL:	www.malpani.com
Represented by:	
Title:	Head - Wind Power Projects
Salutation:	Mr.
Last Name:	Khinvasara
Middle Name:	-
First Name:	Prafulla
Department:	-
Mobile:	+91-98223 22145
Direct FAX:	-
Direct tel:	-
Personal E-Mail:	-

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project activity is not availing any public funding.

Annex 3

BASELINE INFORMATION

The baseline is explained under section B.6.

Annex 4

MONITORING INFORMATION

The monitoring information is detailed under section B.7

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