

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

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**Revision history of this document**

<b>Version Number</b>	<b>Date</b>	<b>Description and reason of revision</b>
01	21 January 2003	Initial adoption
02	8 July 2005	<ul style="list-style-type: none"><li>• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.</li><li>• As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <a href="http://cdm.unfccc.int/Reference/Documents">http://cdm.unfccc.int/Reference/Documents</a>.</li></ul>
03	22 December 2006	<ul style="list-style-type: none"><li>• 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.</li></ul>

**SECTION A. General description of small-scale project activity**
**A.1 Title of the project activity:**

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**Title:** Bundled Wind Power generation project by Savita Oil Technologies Ltd., India

**Version:** 05.1

**Dated:** 04/11/2011

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

&gt;&gt;

The proposed project activity is an initiative by M/s Savita Oil Technologies Limited (SOTL), a well-established player in the petroleum sector of India, towards clean electricity generation using wind energy resources in the state of Maharashtra and Tamil Nadu. The project proponent is engaged in manufacture of petroleum products like oils, lubricants, waxes, inks, etc., in Silvassa and in the state of Maharashtra.

The main purpose of the project activity is to generate electrical energy through sustainable means using wind power resources, to utilize the generated output for supply to Maharashtra State Electricity Distribution Company Ltd. (MSEDCL) and the Tamil Nadu Electricity Board (TNEB) and to contribute to climate change mitigation efforts. This renewable energy will partially contribute to the electricity provided by the MSEDCL & TNEB.

Savita Oil Technologies Limited, (Project Proponent) have installed 8.25 MW bundled wind power project:

- (a) 3 nos. 1.25 MW Wind Turbine Generators (WTGs) of Suzlon make in Sadawaghapur forest site in Satara district of Maharashtra
- (b) 3 nos. 1.5 MW Wind Turbine Generators (WTGs) of Regen make at Thadichery & Koduvilarpatti site in Theni district of Tamil Nadu

The project will be utilizing wind energy for generating electricity which otherwise would have been generated through alternate fuels (most likely - fossil fuel) based power plants, contributing to reduction in specific emissions (emissions of pollutant/unit of energy generated) including GHG emissions. Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. The project proponent has developed this project keeping in consideration of the funding available under the Clean Development Mechanism (CDM) of the United Nations Framework Convention on Climate Change. This is because the project activity qualifies as a CDM project as it would reduce the power consumption from the electricity grid thereby helping in significant reduction of GHG emissions. The project activity is also responsible for sustainable economic growth and conservation of environment through use of wind as a renewable source.

**Sustainable development criteria**

SOTL believes that the project activity has the potential to shape the economic, environmental and social life of the people in the region and will make a positive contribution in the sustainable development of the region. The project activity will have a beneficial effect on rural areas and employment in the region. Government of India has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects.

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- *Social Wellbeing*
- *Economic Prosperity*
- *Environmental Well-being*
- *Technological Up-gradation*

***Social Well-being***

- ▶ The project activity will generate employment opportunities for the local people during the time of construction and subsequently during operation.

***Economic Prosperity***

- ▶ The project activity will directly contribute in saving of the precious natural resources and also aid in the reduction of pollution.

***Environmental Well-being***

- ▶ The project activity will not result in generation of any pollutant to the air (CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>x</sub> etc.) or water or land pollution, since it is a clean source of power generation, utilizing the wind energy. Thus the project activity will be generating power without having any adverse impact on the environment.

***Technological Up-gradation***

- ▶ The project activity involves the installation of WTGs. This project will therefore motivate other proponents in the surrounding area to put up high-efficiency WTGs.

Thus it is ensured that the project activity meets all the criteria for Sustainable development.

**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)	Savita Oil Technologies Limited – Private Entity	No

**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.:**

a) Maharashtra

b) Tamil Nadu

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

a) Village : Sadhawaghapur

District: Satara

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- b) Village: Thadichery & Koduvilarpatti  
District: Theni

**A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity (maximum one page):**

1. Village : Sadawaghapur  
Taluka : Patan  
District : Satara  
State : Maharashtra  
Country : India

The co-ordinates are:

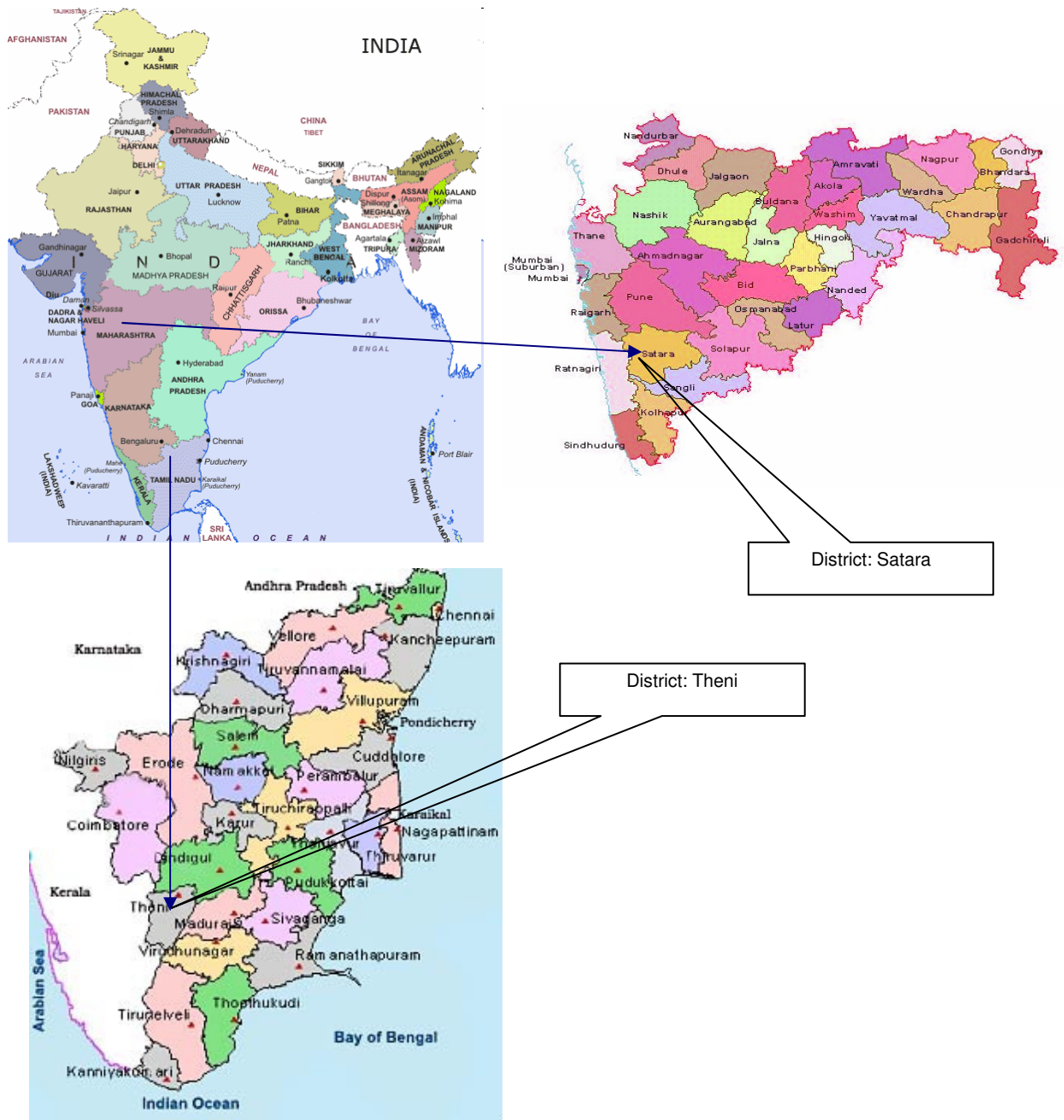
WTG	Latitude (N)	Longitude (E)
S – 40	17°24'00"	73°56'18"
S – 63	17°25'16.8"	73°55'33.6"
S – 64	17°25'22.8"	73°55'40.2"

2. Village : Thadichery & Koduvilarpatti  
Taluka : Theni  
District : Theni  
State : Tamil Nadu  
Country : India

The co-ordinates are:

WTG	Latitude (N)	Longitude (E)
T45	9°56'38.06"	77°27'54.78"
T46	9°56'44.20"	77°27'37.70"
T75	9°56'42.78"	77°29'39"

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

**Type & Category**

Since, the capacity of the proposed project is 8.25 MW, which is less than the maximum qualifying capacity of 15 MW, the project activity has been considered as a small scale CDM project activity and UNFCCC indicative simplified modalities and procedures are applied. The project activity utilizes the wind potential for power generation and exports the generated electricity to the grid. According to small-scale CDM modalities the project activity falls under the following category:

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**Sectoral Scope** : 1 Energy industries (renewable / non renewable sources)  
**Type** : I Renewable Energy Projects  
**Category** : Electricity generation for a system

**Technology**

In wind energy generation, kinetic energy of the wind is converted into mechanical energy and subsequently into electrical energy. Wind turbines capture the wind's energy with three blades, which are mounted on a rotor, to generate electricity. The turbines sit high atop towers, taking advantage of the stronger and less turbulent wind. As the wind blows through the blades of the windmill, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade towards it, causing the rotor to spin. The rotor turns the shaft that further spins the connected generator. The spinning of this generator produces the required electricity.

The salient features of the technology employed in the two sites are:

Parameter	Maharashtra-Suzlon	Tamil Nadu-Regen
Rated Power	1250 kW	1,500 kW
Rotor diameter	66 m	76.84 m
Swept area	3421 m <sup>2</sup>	4634 m <sup>2</sup>
No. of blades	3	3
Cut in wind speed	3.0 m/s	3.0 m/s
Cut out wind Speed	22 m/s	22 m/s
Rotor Speed	20.30 rpm	Variable, 9-17.3 rpm
Hub Height	74.5 m	85 m
Insulation	Class H	Class F
Generator Type	Asynchronous generator	Synchronous, Variable speed

<b>A.4.3 Estimated amount of emission reductions over the chosen <u>crediting period</u>:</b>
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&gt;&gt;

Years	Annual estimation of emission reductions in tonnes of CO <sub>2</sub> e
2012	15,268
2013	15,268
2014	15,268
2015	15,268
2016	15,268

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2017	15,268
2018	15,268
2019	15,268
2020	15,268
2021	15,268
<b>Total estimated reductions (tonnes of CO<sub>2</sub>e)</b>	<b>152,680</b>
<b>Total number of crediting years</b>	<b>10 years</b>
<b>Annual average of the estimated reductions over the crediting period (tCO<sub>2</sub>e)</b>	<b>15,268</b>

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

&gt;&gt;

There is no public funding involved in the project activity. The project activity has been developed on the basis of in-house resources of the proponent & loan from the bank.

**A.4.5. Confirmation that the small scale project activity is not a debundled component of a Large Scale Project activity:**

According to paragraph 2 of Appendix C to the Simplified Modalities and Procedures for Small-Scale CDM project activities (FCCC/CP/2002/7/Add.3), a small-scale project is considered a debundled component of a large project activity if there is a registered small-scale activity or an application to register another small-scale activity:

- With the same project participants
- In the same project category and technology
- Registered within the previous two years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small scale activity

The project promoters hereby confirm that there is no registered small scale project activity registered within the previous two years with them in the same project category and technology whose project boundary is within 1km of the project boundary of the proposed small scale activity. Thus the project is not a debundled component of any other large-scale 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 project activity:**

&gt;&gt;

The methodology followed will be “AMS I.D. Version 16 - Approved methodology for Small Scale Projects” under the sectoral scope “Grid connected renewable electricity generation” which is most appropriate for this Project and is listed as per the UNFCCC norms.

**Project Type** : I – Renewable energy project  
**Project category** : D – Grid connected renewable electricity generation  
 (AMS I.D. Version 16, EB 54)  
 Methodology AMS I.D. also refers to:-  
**Tool to calculate the emission factor for an electrical system**  
 EB 63, Version 02.2.1  
**Reference** : Appendix B of simplified M&P for small scale project activities  
 (UNFCCC, Recent norms)<sup>1</sup>

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

&gt;&gt;

In accordance with Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project is categorized as Type – I.D.: Version 16, Scope 1, “Grid Connected renewable electricity generation”. Category I.D is applicable to projects that use renewable energy technologies that supply electricity to a grid.

The CDM project is leading to reduction in the emission of GHG due to the use of renewable energy source, i.e., wind, for power generation.

Sr.	Technology/measure	Justification
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.	The project activity is renewable energy generation using wind power. The generated electricity would be supplied to the respective state electricity boards.
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 <sup>1</sup> ; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity involves the installation of new power plant at the site where there was no renewable energy power plant operating prior to the implementation of the project activity.
3.	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: <ul style="list-style-type: none"> <li>• The project activity is implemented in an existing reservoir</li> </ul>	Not applicable as the project activity is power generation by wind.

<sup>1</sup> <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>

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	with no change in the volume of reservoir; <ul style="list-style-type: none"> <li>• 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<sup>2</sup>;</li> <li>• 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<sup>2</sup>.</li> </ul>	
4.	In the case of biomass power plants, no other biomass types than renewable biomass is to be used in the project plant.	Not applicable as the project activity is power generation by wind.
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.	Not applicable as project activity involves only renewable power generation.
6	Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable as the project activity is power generation by wind and co-generation is not involved.
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 should be lower than 15 MW and should be physically distinct <sup>6</sup> from the existing units.	Not applicable, as the project activity is green field project and does not involve any capacity addition.
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 the project activity is green field project and does not involve any retrofit or replacement.

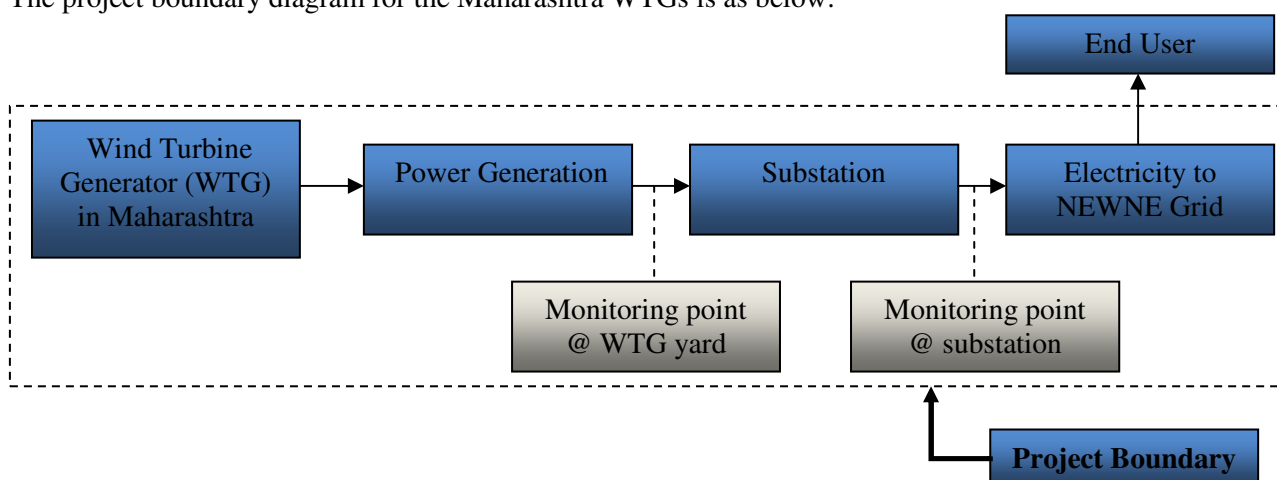
In this project, total installed capacity of all 6 windmills is 8.25 MW, which is less than the limit of 15 MW of maximum output capacity as specified in Annex-II “Simplified Modalities & Procedures for Small Scale CDM Project Activities” for Type (I) project activities: renewable energy project activities with a maximum output capacity equivalent to up to 15 MW (or an appropriate equivalent) (decision 17/CP.7, paragraph 6 (c) (i)). Thus, this project reduces anthropogenic emissions by sources and its maximum output capacity is less than 15 MW. Therefore it conforms to this category thereby qualifying as a small-scale project activity.

### **B.3. Description of the project boundary**

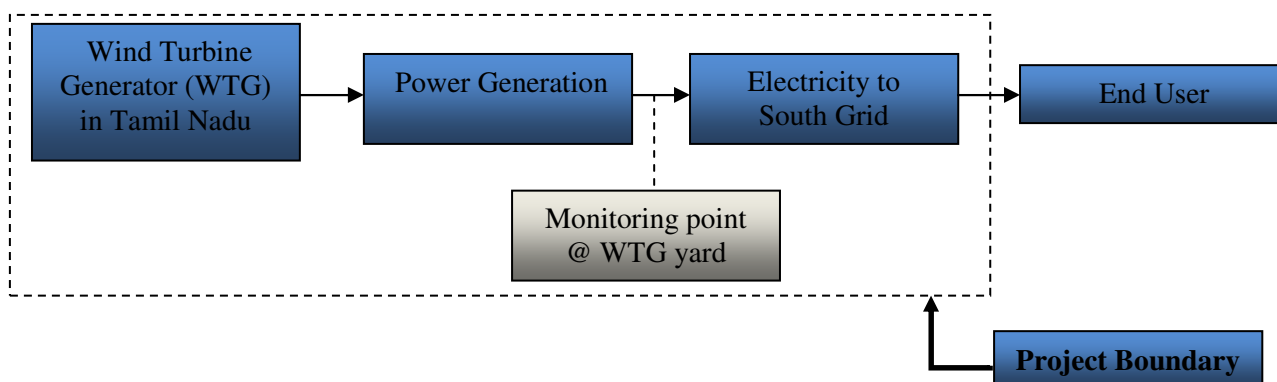
As per the guidelines mentioned in Type I. D. of Annex B of the simplified modalities and procedures for small-scale CDM project activities, project boundary encompasses the physical and geographical site of the renewable generation source.

The project boundary includes the electricity generation equipment at the site and the transport through the electricity grid to the substation. Hence, project boundary is considered within these terminal points.

The project boundary diagram for the Maharashtra WTGs is as below:



The project boundary diagram for the Tamil Nadu WTGs is as below:



**Gases and Sources considered in the project activity:**

The table provided below shows the gases and sources considered in the project activity

Overview on emission sources included in or excluded from the project boundary				
Source		Gas	Included?	Justification / Explanation
Baseline	CO <sub>2</sub> emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO <sub>2</sub>	Yes	Main emission source.
		CH <sub>4</sub>	No	Minor emission source.
		N <sub>2</sub> O	No	Minor emission source.

Overview on emission sources included in or excluded from the project boundary				
Source		Gas	Included?	Justification / Explanation
Project Emissions	CO <sub>2</sub> emissions from electricity imported from the grid and produced in fossil fuel fired power plants	CO <sub>2</sub>	No	No emission source.
		CH <sub>4</sub>	No	No emission source
		N <sub>2</sub> O	No	No emission source

#### B.4. Description of baseline and its development

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##### Identification of the baseline scenario

The project activity is the installation of a new wind power plant. This project is not a modification/ retrofit of any existing electricity generation facility. Hence, in accordance to the approved methodology AMS I.D, Version 16, the baseline scenario for new installation facility is described as:

*“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.”*

Hence, the NEWNE grid is considered to be the baseline for the Maharashtra project and the South grid for the Tamil Nadu project.

Determination of emission factor figures have been calculated and provided in section B.6.1 of this PDD.

#### 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:

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The project activity meets the eligibility criteria to use simplified modalities and procedure for small-scale CDM project activities as set out in paragraph 6 (c) of decision 17/CP.7.

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

Further referring to Attachment A to Appendix B to Annex B document of indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories, project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barrier(s) ;

- a) Investment Barrier
- b) Technological Barrier

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- c) Barrier due to prevailing practice
- d) Other Barriers

**National Policies relevant to the project activity**

The Government of India enacted the Electricity Act in the year 2003 to harmonize and rationalize the provisions in the then existing laws in India. The Act consolidated the laws relating to generation, transmission, distribution, trading and use of electricity. With the enactment of the Act, the then existing laws viz, The Indian Electricity Act 1910, The Electricity Supply Act, 1948 and The Electricity Regulatory Commissions Act, 1998 were repealed. The Electricity Act 2003 was in force at the time of the completion of the baseline study for the PDD.

The Tamilnadu Electricity Regulatory Commission (TNERC), had issued a comprehensive tariff order on Wind Energy on the 20<sup>th</sup> March, 2009<sup>2</sup> wherein a tariff of Rs. 3.39/kWh has been suggested and which has been used in the analysis.

Similarly, the Maharashtra Electricity Regulatory Commission (MERC), had issued a tariff order on wind energy on the 24<sup>th</sup> November, 2003<sup>3</sup>, wherein a tariff of INR 3.50/kWh with an annual escalation of INR 0.15/kWh has been suggested and which has been used in the analysis.

**Investment Analysis**

The project activity involves setting up of 8.25 MW of wind power in Maharashtra & Tamil Nadu which will be supplied to the state electricity grid. The, benchmark analysis method has been selected to depict the investment analysis as the project activity has a revenue source other than CDM revenue. The financial indicator chosen is IRR and it is evaluated separately for the two sites, each of which is then compared to the benchmark.

The benchmark is taken as per the Reserve bank of India (RBI) Benchmark Prime lending rate (BPLR) for the time when the investment decision was being taken, i.e., October 2009 for Maharashtra site and January 2010 for Tamil Nadu site. The BPLR at the time of decision making was 11-12 %<sup>4</sup> at both the times.

**Project financial analysis:*****Project details for Suzlon:***

1	Rating	1250 kW	
2	No. of Machines	3	
3	Size of the Project(MW)	3.75	
4	Price / WTG (Rs. INR million)		
	- Depreciable Amount	63.50	
	- Non-depreciable (Land)	1.50	Quote
	Total Price / WTG	65.0	Quote

<sup>2</sup> [TNERC Order](http://tnerc.gov.in/order-20-03-2009.htm) (http://tnerc.gov.in/order-20-03-2009.htm)

<sup>3</sup> [MERC Order](http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf) (http://www.mercindia.org.in/pdf/Detail\_Wind\_Energy\_Order.pdf)

<sup>4</sup> BPLR published

a) 23/10/2009 (http://www.rbi.org.in/scripts/WSSView.aspx?Id=14137)

b) 29/01/2010 (http://www.rbi.org.in/scripts/WSSView.aspx?Id=14459)

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5	Price of the Project (Rs. INR million)	195.0	
6	Generation (Million kWh/WTG)	2.189 <sup>5</sup>	Quote
7	O & M (Price/WTG - INR million)	1.35	Quote
8	Escalation	5.0%	Quote
9	Free O & M (yr.)	1	Quote
10	I.T. Depreciation (Rate)	80%	
11	Bank Funding (on Windmill)	70%	MERC Tariff Order <sup>6</sup>
12	Tariff (Rs. per unit)	3.50	MERC Tariff Order <sup>7</sup>
13	Tariff Escalation (INR Per kWh)	0.15	MERC Tariff Order <sup>8</sup>
14	Interest Rate	11.00%	BPLR Published <sup>9</sup>
15	Loan Term (Year) incl. Moratorium	10	MERC Tariff Order <sup>10</sup>
16	Moratorium	1	MERC Tariff Order <sup>11</sup>
19	Corporate Tax rate	33.99%	IT Act

**Project details for Regen:**

1	Rating	1500	kW
2	No. of Machines	3	
3	Size of the Project(MW)	4.5	
4	Price / WTG (INR million)		
	- Depreciable Amount	93.10	
	- Non-depreciable (Land)	1.90	Assumed 2% of project cost
	Total Price / WTG	95.0	
5	Price of the Project (INR million)	285.00	Quote
6	Generation (Million kWh/WTG)	3.431	Quote
7	O & M (Price/WTG - INR million)	1.50	Quote

<sup>5</sup> The PLF/generation estimate referred in the purchase order issued by the PP is lower as compared to that in the loan application letter and the Quote for WTG. Loan application letter and quote for WTG have the same estimated generation (2.189 million kWh/WTG). Hence, the higher PLF (as in the loan application letter) is used for financial analysis, while the lower PLF (2.004 million units/WTG as in the PO) is used for the emission reduction estimate. This is deemed conservative.

<sup>6</sup> [MERC Order](http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf) (http://www.mercindia.org.in/pdf/Detail\_Wind\_Energy\_Order.pdf)

<sup>7</sup> [MERC Order](http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf) (http://www.mercindia.org.in/pdf/Detail\_Wind\_Energy\_Order.pdf)

<sup>8</sup> [MERC Order](http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf) (http://www.mercindia.org.in/pdf/Detail\_Wind\_Energy\_Order.pdf)

<sup>9</sup> [BPLR Published: 23/10/2009](http://www.rbi.org.in/scripts/WSSView.aspx?Id=14137) (http://www.rbi.org.in/scripts/WSSView.aspx?Id=14137)

<sup>10</sup> [MERC Order](http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf) (http://www.mercindia.org.in/pdf/Detail\_Wind\_Energy\_Order.pdf)

<sup>11</sup> [MERC Order](http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf) (http://www.mercindia.org.in/pdf/Detail\_Wind\_Energy\_Order.pdf)

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8	Escalation	5%	TNERC Tariff Order <sup>12</sup>
9	Free O & M (yr.)	1	Quote
10	I.T. Depreciation (Rate)	80%	
11	Bank Funding (on Windmill)	70%	TNERC Tariff Order <sup>13</sup>
12	Tariff (INR per kWh)	3.39	TNERC Tariff Order <sup>14</sup>
13	Tariff Escalation (INR Per kWh)	0.00	
14	Interest Rate	11.00%	BPLR Published <sup>15</sup>
15	Loan Term (Year) incl. Moratorium	10	TNERC Tariff Order <sup>16</sup>
16	Moratorium	1	TNERC Tariff Order <sup>17</sup>
19	Corporate Tax rate	33.99%	IT Act

**Step 4:**

a) For Suzlon: The IRR established for Suzlon WTGs in Maharashtra is 9.58%  
Sensitivity Analysis with variation in various parameters is as follows:

Parameter	Variation	IRR	Benchmark IRR
Normal	0%	9.58%	11%
Generation	+10%	11.59%	
	-10%	7.29%	
O&M Costs	+10%	9.24%	
	-10%	9.91%	
Capital Cost	+10%	7.97%	
	-10%	11.42%	
Tariff	+10%	11.33%	
	-10%	7.74%	

**Generation:**

It may be noted that even though a 10% growth in net generation has been considered in accordance to the sensitivity analysis, such a growth is not possible due to technical boundaries within which the machine must operate. Though the above analysis indicates that the Suzlon site in Maharashtra may be a feasible option in the event of an increase in generation by 10%, yet such an increase in generation is not

<sup>12</sup> [TNERC Order](http://tnerc.gov.in/order-20-03-2009.htm) (http://tnerc.gov.in/order-20-03-2009.htm)

<sup>13</sup> [TNERC Order](http://tnerc.gov.in/order-20-03-2009.htm) (http://tnerc.gov.in/order-20-03-2009.htm)

<sup>14</sup> [TNERC Order](http://tnerc.gov.in/order-20-03-2009.htm) (http://tnerc.gov.in/order-20-03-2009.htm)

<sup>15</sup> [BPLR Published: 29/01/2010](http://www.rbi.org.in/scripts/WSSView.aspx?Id=14459) (http://www.rbi.org.in/scripts/WSSView.aspx?Id=14459)

<sup>16</sup> [TNERC Order](http://tnerc.gov.in/order-20-03-2009.htm) (http://tnerc.gov.in/order-20-03-2009.htm)

<sup>17</sup> [TNERC Order](http://tnerc.gov.in/order-20-03-2009.htm) (http://tnerc.gov.in/order-20-03-2009.htm)

a prevalent phenomenon. Annual generation records for WTGs located at Satara, as available on the website of Maharashtra Energy Development Agency (MEDA)<sup>18</sup>, indicate that only 1.219 Million kWh/MW of installed capacity has been recorded as compared to the generation estimate of 2.190 Million kWh/MW of installed capacity provided by Suzlon (55% of the generation estimate). The Project Proponent has conservatively used the quoted values for generation, but it may be concluded that such an assumption is an over-estimation and the same may not be actually realized which makes the overall project activity to be financially not feasible.

#### O&M Cost

The IRR of the project does not cross the benchmark with the 10% variation in the O&M cost. Thus the variation in the O&M cost does not make the project financially feasible.

#### Tariff:

Even though the sensitivity analysis has been performed on tariff, but such a variation in the tariff is not possible as the value of tariff is fixed as per the tariff order issued by MERC<sup>19</sup> and Power Purchase Agreement signed between the PP and MSEDCL.

#### Capital Cost:

It may be noted that even though the sensitivity analysis has been performed on the capital cost but a decrease of 10% in the capital cost is not a realistic scenario. Even for this project activity, the project cost actually incurred by the PP is only 3% less than the cost estimated at the time of investment decision. This 3% decrease has improved the IRR to 10.01% only. Thus, at this point of time when the purchase order has already been placed, a 10% decrease in capital cost is a hypothetical scenario.

b) For Regen: The IRR established for Regen WTGs in Tamil Nadu is 7.84%  
Sensitivity Analysis with variation in various parameters is as follows:

Parameter	Variation	IRR	Benchmark IRR
Normal	0%	7.84%	11%
Generation	+10%	9.61%	
	-10%	5.98%	
O&M Costs	+10%	7.35%	
	-10%	8.10%	
Capital Cost	+10%	6.39%	
	-10%	9.50%	
Tariff	+10%	9.61%	
	-10%	5.98%	

Analyzing the above sensitivity chart, the IRR of the project does not cross the benchmark even with a 10% increase in generation or tariff. It may please be noted here that the rate of sale of power is mandated as per relevant clause in the Power Purchase Agreement and hence, sensitivity of tariff values is not

<sup>18</sup> <http://www.mahaurja.com/Download/WindGenerationInfo0809.xls>

<sup>19</sup> [MERC Tariff Order](http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf) ([http://www.mercindia.org.in/pdf/Detail\\_Wind\\_Energy\\_Order.pdf](http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf))

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possible. Variations in the project cost and the O&M cost were also not likely to make the project financially viable.

In view of this, the wind project is additional and not the same as baseline scenario and would not have occurred without the CDM. A brief chronological sequence of events for the entire bundle is as follows:

Sl. No.	Event	Date
1.	Board approval for Suzlon site	30/10/2009
2.	Purchase Order to Suzlon	14/12/2009
3.	Board approval for Regen site	30/01/2010
4.	Purchase Order to Regen	05/02/2010
5.	Prior Consideration to UNFCCC and MoEF	04/03/2010
6.	Appointment of DOE	08/04/2010
7.	Stakeholders' meeting at Suzlon site	12/05/2010
8.	Stakeholders' meeting at Regen site	22/05/2010
9.	Host Country Approval	16/11/2010

**B.6. Emission reductions:**

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**B.6.1 Explanation of the methodological choices:**

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The procedure followed for estimating the emissions reductions from this project activity during the crediting period are as per the following steps which corresponds with AMS-I.D.

Steps	Description	Equation used	Methodological choices
1.	Procedure followed for calculating Baseline emissions	$BE_y = EG_{y,Mah} \times EF_{NEWNE,CM,y} + EG_{y,TN} \times EF_{South,CM,y}$	<p>The Grid Emission Factors (<math>EF_{NEWNE,CM,y}</math> &amp; <math>EF_{South,CM,y}</math>) have been calculated using operating and build margin emission factor taken from CEA published data.</p> <p><math>EG_{y,Mah}</math> &amp; <math>EG_{y,TN}</math> = Quantity of net electricity supplied by the WTG in Maharashtra and WTG in Tamil Nadu to the respective regional grid as a result of the implementation of the CDM project activity in year y (MWh)</p>
2.	Procedure followed for calculating Project emissions ( $PE_y$ )	$PE_y = 0$	
3.	Procedure followed for calculating Leakage emissions ( $LE_y$ )	$LE_y = 0$	
4.	Procedure followed for calculating Emission reduction ( $ER_y$ )	The emission reductions are calculated as per equation $ER_y = (BE_y - PE_y - LE_y)$	

$EF_{Grid,CM,y}$  (Grid may refer to NEWNE or South as the case may be) has been determined as follows:

### **Calculation of the Baseline Emission Factor**

#### **Step 1: Identifying the relevant electric power system**

A “project electricity system” is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

A “connected electricity system” is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint. The tool requires the following considerations while determining whether significant transmission constraints exist or not:

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5% between the systems during 60% or more of the hours of the year.
- The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.

In the Indian context, as no well established spot markets exist, the first criterion is not applicable. Similarly, a transmission line fulfilling the second criteria is an exception in Indian Context. Hence the use of these criteria does not result in a clear grid boundary. In such a scenario, the use of a regional grid definition in case of large countries with layered dispatch systems (e.g. provincial, regional/national) is recommended. Further, it states that a provincial grid definition may in many cases be too narrow given significant electricity trade among provinces that might be affected, directly or indirectly, by a CDM project activity.

Of all the regional grids of the Indian Electricity system, the project is located in

- a) The state of Maharashtra which is one of the states included in the NEWNE grid.
- b) The state of Tamil Nadu which is one of the states included in the South grid.

Each state in a regional grid meets its own demand with its own generation facilities and also with allocation from power plants owned by the central sector. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The volume of the net transfers between the regions in India is relatively small and electricity is largely produced and consumed within the same states. Consequently, it is appropriate to assume that the impacts of the project activity will be confined to the regional grid in which it is located. Hence for the purpose of estimation of the baseline emission factor, the NEWNE grid has been chosen as the relevant electricity system for evaluating CERs of Maharashtra project and the South grid has been chosen, for the same purpose, for the Tamil Nadu project,.

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

The project proponent wishes to include only grid power plants in the calculation, while off-grid plants will be excluded.

#### **Step 3: Selection of an Operating Margin method**

The project proponent wishes to use the Simple Operating Margin (OM) method for the estimation of the Operating Margin Emission Factor. 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 data pertaining to the total grid generation and the low/cost must run resources have been included in Annex 3. The Ex ante option has been chosen where in a three year generation weighted average based on the most recent data has been calculated ex ante and is fixed for the first crediting period. Hence, the parameters for the calculation of OM do not need to be monitored and the OM does not need to be calculated during the chosen first crediting period.

#### **Step 4: Calculation of the Operating Margin Emission Factor according to the Simple OM method**

The simple OM emission factor is calculated as the generation-weighted average CO<sub>2</sub> emissions per unit net electricity generation (tCO<sub>2</sub>/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. This may be calculated by any of the two options:

Option A: Based on the net electricity generation and a CO<sub>2</sub> emission factor of each power unit

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. This option 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).

Net electricity generation and fuel consumption of each power plant is available through the data provided by the Central Electricity Authority (CEA), an official data source<sup>20</sup> and hence Option A has been used. The same has been detailed in Annex 3. CEA database, Version 5, dated 1<sup>st</sup> November, 2009 is the latest version at the time of commencement of validation and hence, has been used.

#### **Assumptions:**

The following assumptions have been made in case of unavailability of data at station level:

- Net generation: In case of stations where only gross generation is available, CEA standard values for auxiliary consumption have been applied to calculate the net generation data.
- GCV: Default GCV values for some thermal power stations have been used for cases where station specific data was unavailable.

The following assumptions have been used in case of unavailability of data at unit level:

Net generation: The data is not monitored at a unit level and hence the following assumptions have been made

1. The auxiliary consumption (in % of gross generation) of the unit was assumed to be equal to that of the respective stations in the following cases:

- a) All units of a station fall into the build margin; or
- b) All units of a station have the same installed capacity; or

<sup>20</sup> [http://cea.nic.in/reports/planning/cdm\\_co2/cdm\\_co2.htm](http://cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm)

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- c) The units in the station have different capacities but do not differ with respect the applicable standard auxiliary consumption.
2. In all other cases, standard values for auxiliary consumption adopted by CEA were applied.
3. Fuel consumption and GCV: Fuel consumption and GCV are generally not measured at unit level. Instead, the specific CO<sub>2</sub> emissions of the relevant units were directly calculated based on heat rates.

**Calculation Approach:**

The Simple OM has been calculated using the following formula:

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

Where:

$EF_{Grid,OMsimple,y}$  = Simple operating margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/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<sub>2</sub> emission factor of power unit m in year y (tCO<sub>2</sub>/MWh)

m = All power units serving the grid in year y except low-cost / must-run power units

y = The relevant year as per the data vintage chosen in Step 3

**Determination of  $EF_{EL,m,y}$**

The emission factor of each power unit m should be determined as follows:

- Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ( $EF_{EL,m,y}$ ) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

Where:

$EF_{EL,m,y}$  = CO<sub>2</sub> emission factor of power unit m in year y (tCO<sub>2</sub>/MWh)

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

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

$EF_{CO2,i,y}$  = CO<sub>2</sub> emission factor of fossil fuel type i in year y (tCO<sub>2</sub>/GJ)

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

m = All power plants / units serving the grid in year y except low-cost / must-run power plants / units

i = All fossil fuel types combusted in power plant / unit m in year y

y = The three most recent years for which data is available at the time of submission of the PDD to the DOE for validation (for ex ante option)

The three most recent years for which data was available at the time of submission to the DOE included 2006-07, 2007-08 and 2008-09 and the same is presented in Annex 3 of the PDD.

The generation weighted average operating margin value for these three years works out to:

- 1)  $EF_{NEWNE,OM,y} = 1.0049$  tCO<sub>2</sub>/MWh for Maharashtra site

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- 2)  $EF_{\text{South,OM,y}} = 0.9868 \text{ tCO}_2/\text{MWh}$  for Tamil Nadu site

#### Step 5: Calculate the build margin emission factor

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.

The sample group of power units  $m$  used to calculate the build margin has been determined as per the following procedure, consistent with the data vintage selected above:

- The set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ( $SET_{5\text{-units}}$ ) was identified and their annual electricity generation ( $AEG_{SET\text{-}5\text{-units}}$ , in MWh) was determined;
- The annual electricity generation of the project electricity system, excluding power units registered as CDM project activities ( $AEG_{\text{total}}$ , in MWh) was determined. The set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of  $AEG_{\text{total}}$  (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ( $SET_{\geq 20\%}$ ) was identified and their annual electricity generation ( $AEG_{SET\text{-}\geq 20\%}$ , in MWh) was determined;
- From  $SET_{5\text{-units}}$  and  $SET_{\geq 20\%}$  the set of power units that comprises the larger annual electricity generation ( $SET_{\text{sample}}$ ) was selected;

Since none of the power units in  $SET_{\text{sample}}$  started to supply electricity to the grid more than 10 years ago, this set  $SET_{\text{sample}}$  has been used to calculate the build margin.

The data pertaining to the units thus identified are detailed in the Version 5 of the Baseline Carbon Dioxide Emissions database of the CEA.

The build margin emissions factor is the generation-weighted average emission factor ( $\text{tCO}_2/\text{MWh}$ ) of all power units  $m$  during the most recent year  $y$  for which power generation data is available and will be calculated as follows:

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

Where:

$EF_{\text{Grid,BM,y}}$  = Build margin  $\text{CO}_2$  emission factor in year  $y$  ( $\text{tCO}_2/\text{MWh}$ )

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

$EF_{EL,m,y}$  =  $\text{CO}_2$  emission factor of power unit  $m$  in year  $y$  ( $\text{tCO}_2/\text{MWh}$ )

$m$  = Power units included in the build margin

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

The Build Margin has been calculated ex ante during the crediting period. For ex ante calculation the most recent data available has been used and the build margin thus calculated is,

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- 1)  $EF_{NEWNE,BM,y} = 0.6752 \text{ tCO}_2/\text{MWh}$  for Maharashtra site
- 2)  $EF_{South,BM,y} = 0.8179 \text{ tCO}_2/\text{MWh}$  for Tamil Nadu site

**Step 6: Calculation of the Combined Margin Emission Factor**

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

**(a) Weighted average CM**

The combined margin emission factor is calculated as follows:

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

Where,

$EF_{Grid,BM,y}$  = Build margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh)

$EF_{Grid,OM,y}$  = Operating margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh)

$w_{OM}$  = Weighting of operating margin emissions factor (%)

$w_{BM}$  = Weighting of build margin emissions factor (%)

The default values to be used for Wind Power projects are

$$w_{OM} = 0.75 \quad w_{BM} = 0.25$$

Hence, the Baseline Emission Factor is calculated as below:

- 1) For Maharashtra site:

$$\begin{aligned} EF_{NEWNE,CM,y} &= w_{OM} * EF_{NEWNE,OM,y} + w_{BM} * EF_{NEWNE,BM,y} \\ &= 0.75 * 1.0049 + 0.25 * 0.6752 \\ &= 0.9224 \text{ tCO}_2/\text{MWh} \end{aligned}$$

- 2) For Tamil Nadu site:

$$\begin{aligned} EF_{South,CM,y} &= w_{OM} * EF_{South,OM,y} + w_{BM} * EF_{South,BM,y} \\ &= 0.75 * 0.9868 + 0.25 * 0.8179 \\ &= 0.9445 \text{ tCO}_2/\text{MWh} \end{aligned}$$

**B.6.2. Data and Parameters that are available at validation:**

<b>Data / Parameter:</b>	$EF_{NEWNE,CM,y}$
Data unit:	tCO <sub>2</sub> /MWh
Description:	Combined Margin Grid emission factor for NEWNE grid
Source of data used:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value applied:	0.9224
Justification of the choice of data or description of measurement methods and procedures actually applied :	As required by the methodology AMS-I.D data from the official source need to be used for the calculation of emission factor and emission reduction. To meet this requirement here, emission factor is calculated using $EF_{Grid,OM}$ and $EF_{Grid,BM}$ . Following formula is used in calculation  $EF_{NEWNE,CM,y} = 0.75 \times EF_{NEWNE,OM,y} + 0.25 \times EF_{NEWNE,BM,y}$
Any comment:	Data will be kept for crediting period + 2 Years.

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<b>Data / Parameter:</b>	$EF_{\text{South,CM,y}}$
Data unit:	tCO <sub>2</sub> /MWh
Description:	Combined Margin Grid emission factor for South Grid
Source of data used:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value applied:	0.9445
Justification of the choice of data or description of measurement methods and procedures actually applied :	As required by the methodology AMS-I.D data from the official source need to be used for the calculation of emission factor and emission reduction. To meet this requirement here, emission factor is calculated using $EF_{\text{Grid,OM}}$ and $EF_{\text{Grid,BM}}$ . Following formula is used in calculation  $EF_{\text{South,CM,y}} = 0.75 \times EF_{\text{South,OM,y}} + 0.25 \times EF_{\text{South,BM,y}}$
Any comment:	Data will be kept for crediting period + 2 Years.

<b>Data / Parameter:</b>	$EF_{\text{NEWNE,OM,y}}$
Data unit:	tCO <sub>2</sub> /MWh
Description:	Weighted average of 3 years (2006-07, 2007-08, 2008-09) CO <sub>2</sub> Operating Margin emission factor of the NEWNE grid
Source of data used:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value applied:	1.0049
Justification of the choice of data or description of measurement methods and procedures actually applied :	As required by the applied methodology AMS-I.D data from the official source need to be used for the calculation of emission factor and emission reduction. To meet this requirement here, emission factor is calculated by taking generation based weighted average OM of last three years from officially published by Central Electricity Authority, Government of India.
Any comment:	Data will be kept for crediting period + 2 Years.

<b>Data / Parameter:</b>	$EF_{\text{South,OM,y}}$
Data unit:	tCO <sub>2</sub> /MWh
Description:	Weighted average of 3 years (2006-07, 2007-08, 2008-09) CO <sub>2</sub> Operating Margin emission factor of the South grid
Source of data used:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value applied:	0.9868
Justification of the choice of data or description of measurement methods and procedures actually applied :	As required by the applied methodology AMS-I.D data from the official source need to be used for the calculation of emission factor and emission reduction. To meet this requirement here, emission factor is calculated by taking generation based weighted average OM of last three years from officially published by Central Electricity Authority, Government of India.
Any comment:	Data will be kept for crediting period + 2 Years.

<b>Data / Parameter:</b>	$EF_{\text{NEWNE,BM,y}}$
Data unit:	tCO <sub>2</sub> /MWh
Description:	CO <sub>2</sub> Built Margin emission factor of the NEWNE grid
Source of data used:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value applied:	0.6752

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Justification of the choice of data or description of measurement methods and procedures actually applied :	As required by the methodology AMS-I.D data from the official source need to be used for the calculation of emission factor and emission reduction. To meet this requirement here, emission factor is estimated and officially published by Central Electricity Authority, Government of India.
Any comment:	Data will be kept for crediting period + 2 Years.

<b>Data / Parameter:</b>	$EF_{\text{South,BM,y}}$
Data unit:	tCO <sub>2</sub> /MWh
Description:	CO <sub>2</sub> Built Margin emission factor of the South grid
Source of data used:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value applied:	0.8179
Justification of the choice of data or description of measurement methods and procedures actually applied :	As required by the methodology AMS-I.D data from the official source need to be used for the calculation of emission factor and emission reduction. To meet this requirement here, emission factor is estimated and officially published by Central Electricity Authority, Government of India.
Any comment:	Data will be kept for crediting period + 2 Years.

<b>Data / Parameter:</b>	$w_{OM}$
Data unit:	Dimensionless
Description:	Weightage for Operating Margin
Source of data used:	Tool to calculate the emission factor for an electricity system. (Version 02.2.1)
Value applied:	0.75
Justification of the choice of data or description of measurement methods and procedures actually applied :	As required by the Tool to calculate the emission factor for an electricity system. (Version 02.2.1)
Any comment:	Data will be kept for crediting period + 2 years

<b>Data / Parameter:</b>	$w_{BM}$
Data unit:	Dimensionless
Description:	Weightage for Build Margin
Source of data used:	Tool to calculate the emission factor for an electricity system. (Version 02.2.1)
Value applied:	0.25
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the Tool to calculate the emission factor for an electricity system. (Version 02.2.1)

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Any comment:	Data will be kept for crediting period + 2 years
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### B.6.3 Ex-ante calculation of emission reductions:

#### Baseline Emissions Calculations:

The baseline emissions are to be calculated using the following formula

$$\text{Baseline Emissions} = EG_{y,\text{Mah}} \times EF_{\text{NEWNE,CM,y}} + EG_{y,\text{TN}} \times EF_{\text{South,CM,y}}$$

Section B.6.1 details the procedures followed for the calculation of the baseline emissions factor which is estimated to be equal to 0.9224 tCO<sub>2</sub>/MWh for Maharashtra (=EF<sub>NEWNE,CM,y</sub>) and 0.9445 tCO<sub>2</sub>/MWh for Tamil Nadu (=EF<sub>South,CM,y</sub>). The net export expected from the project activity is on an annual basis is

- 6015 MWh for Maharashtra (considered based on the estimated generation indicated in the purchase order issued by PP<sup>21</sup>)
- 10293 MWh for Tamil Nadu. (as referred in the loan application document)

$$\text{Hence BE}_y = 0.9224 \times 6015 + 0.9445 \times 10293 = 5547 + 9721 = 15268 \text{ tCO}_2$$

#### Project Emission Calculations:

As per methodology, project emissions are to be considered for geothermal power plants and for water reservoirs of hydro power plants and for most renewable energy project activities, PE<sub>y</sub>= 0.

Since this project is not a geothermal or a hydro power plant, PE<sub>y</sub>= 0.

#### Leakage Emission Calculation:

The project proponents have identified no anthropogenic greenhouse gases by sources outside the project boundary that are significant, measurable and attributable to the project activity. Hence, no leakage is considered from the project activity.

$$LE_y = 0$$

#### Emission Reduction Calculation:

Thus for the project the total CER potential is:

$$\begin{aligned} ER_y &= 15268 - 0 - 0 \text{ tCO}_2 \\ &= \underline{\underline{15268 \text{ tCO}_2 \text{ per annum}}} \end{aligned}$$

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

Year	Estimation of project activity emissions (t CO <sub>2</sub> e)	Estimation of baseline emissions (t CO <sub>2</sub> e)	Estimation of leakage (t CO <sub>2</sub> e)	Estimation of overall emission reductions (t CO <sub>2</sub> e)
2012	0	15,268	0	15,268
2013	0	15,268	0	15,268

<sup>21</sup> The PLF/generation estimate referred in the purchase order issued by the PP is lower as compared to that in the loan application letter. Hence, the higher PLF (as in the loan application letter) is used for financial analysis, while the lower PLF (as in the PO) is used for the emission reduction estimate.

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2014	0	15,268	0	15,268
2015	0	15,268	0	15,268
2016	0	15,268	0	15,268
2017	0	15,268	0	15,268
2018	0	15,268	0	15,268
2019	0	15,268	0	15,268
2020	0	15,268	0	15,268
2021	0	15,268	0	15,268
<b>Total</b> (tonnes of CO <sub>2</sub> e)	<b>0</b>	<b>152,680</b>	<b>0</b>	<b>152,680</b>

**B.7 Application of a monitoring methodology and description of the monitoring plan:****B.7.1 Data and parameters monitored:**

<b>Data / Parameter:</b>	<b>EG<sub>v,Mah</sub></b>
Data unit:	MWh/year
Description:	Net electricity exported to grid
Source of data to be used:	Electricity generation statements
Value of data:	6015
Description of measurement methods and procedures to be applied:	<p><u>Monitoring:</u> Monitored through the meter readings from bi-directional main meter (electronic tri-vector meter) capable of monitoring electricity export and electricity import. Meter shall be located at sub-station. Meter accuracy class 0.2.</p> <p><u>Data type:</u> Measured &amp; Calculated</p> <p><u>Archiving:</u> Electronic</p> <p><u>Recording Frequency:</u> Continuous monitoring, hourly measurement and at least monthly recording</p> <p><u>Responsibility:</u> The site-in-charge shall be responsible for the regular recording of data.</p> <p><u>Calibration Frequency:</u> The meters shall be calibrated annually.</p>
QA/QC procedures to be applied:	Meter calibration shall be conducted annually in Maharashtra and internal audit system is in place as mentioned in Section B.7.2. Measurement results shall be cross checked with records for sold/purchased electricity (e.g., invoices/receipts)
Any comment:	The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

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<b>Data / Parameter:</b>	<b>EG<sub>v,TN</sub></b>
Data unit:	MWh/year
Description:	Net electricity exported to grid
Source of data to be used:	Electricity generation statements
Value of data:	10293
Description of measurement methods and procedures to be applied:	<p><b>Monitoring:</b> Monitored through the meter readings from bi-directional main meter (electronic tri-vector meter) capable of monitoring electricity export and electricity import. Meter shall be located at sub-station. Meter accuracy class 0.5</p> <p><b>Data type:</b> Measured &amp; Calculated</p> <p><b>Archiving:</b> Electronic</p> <p><b>Recording Frequency:</b> Continuous monitoring, hourly measurement and at least monthly recording</p> <p><b>Responsibility:</b> The site-in-charge shall be responsible for the regular recording of data.</p> <p><b>Calibration Frequency:</b> The meters shall be calibrated once every three years.</p>
QA/QC procedures to be applied:	Meter calibration shall be conducted once every three years in Tamil Nadu and internal audit system is in place as mentioned in Section B.7.2. Measurement results shall be cross checked with records for sold/purchased electricity (e.g., invoices/receipts)
Any comment:	The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

### **B.7.2 Description of the monitoring plan:**

The project activity is in accordance with approved small scale methodology AMS I.D, and therefore, can use the monitoring methodology for type I.D of 'Appendix B of the simplified M&P for small-scale CDM project activities-Version 16, - Grid connected renewable electricity generation.

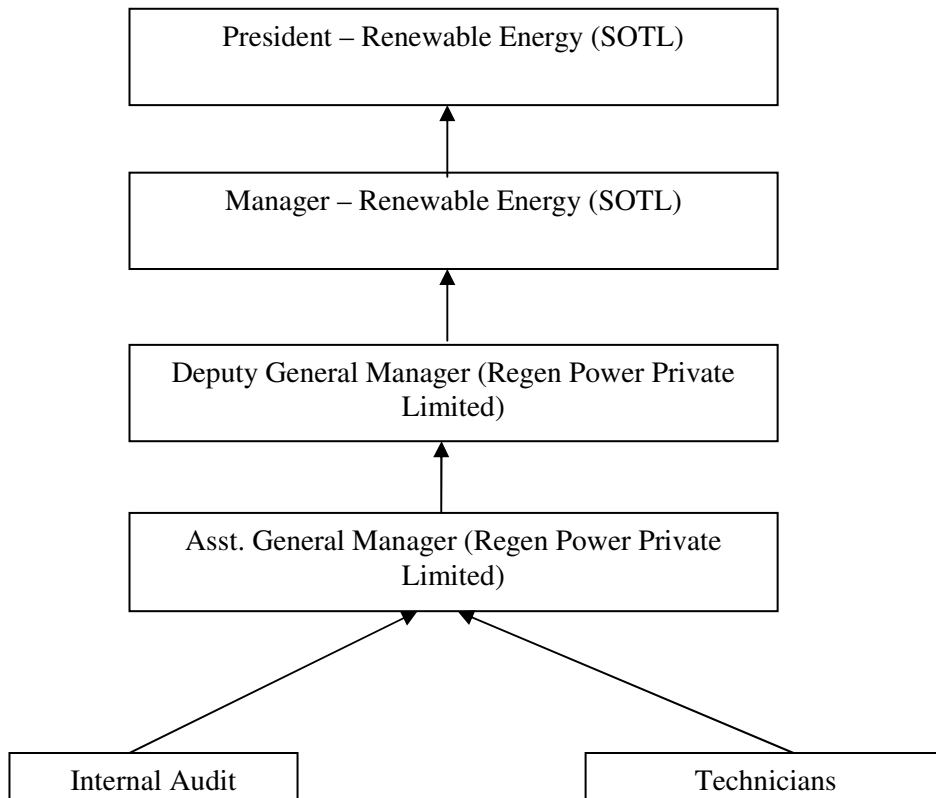
The monitoring methodology specified in the methodology requires that the project-monitoring plan to consist of metering the electricity generated by the renewable technology. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to grid by the project activity multiplied by emission factor for regional grid, would form the baseline for the project activity.

Since the baseline methodology is based on ex ante determination of the baseline, the monitoring of baseline emission factor is not required. The sole parameter for monitoring is the electricity exported to the grid.

#### **Monitoring at Tamil Nadu**

The Project is operated and managed by M/s Regen Powertech Pvt. Ltd. (RPPL) in Tamil Nadu. The operational and management structure implemented by RPPL is as follows:

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RPPL has provided panel meter on each WTG panel where the daily generation is monitored by the O&M service provider. Daily meter reading on panel will be taken by site-in-charge or personnel from O&M contractor. Meter reading will be noted electronically.

However, Tamil Nadu Electricity Board (TNEB) have installed TNEB owned electronic tri-vector meters (Main meters) at each WTG transformer yard where the export and import of electrical energy is metered and the readings are taken by TNEB officials in presence of site-in-charge once in a month. The net energy generated from the specific WTG will be calculated as a difference between electricity export and import values of the recording meter. These export/import values are obtained by multiplying the export/import readings of the recording meter with the multiplying factor of the recording meter. Monthly TNEB statement of net generation is provided to SOTL on the basis of which invoices are raised.

Main meters are calibrated at least once in three years as per the CEA Metering Regulations 2006.

The performance of the machines will be monitored through:

1. Electric meters: Daily generation is monitored on panel meter provided on the WTG panel
2. Main meter by TNEB for recording the actual generation.

Daily Report: Daily report will be generated and sent to SOTL by O&M service provider. Report will consist of number of units produced, generation hours, grid and machine availability hours, and details of downtime due to machine/grid.

### ***Internal audits & Performance review***

The records are regularly audited and checked by the senior officials from project proponent on an annual basis. The officials will monitor the actual emission reduction. The personnel responsible for taking readings at site are adequately trained.

### ***Emergency Preparedness***

In the context of the project activity, the main meters will be kept in sealed by TNEB and all maintenance will be taken up by TNEB only. With reference to clause (4) of the Article 4 of the Energy Purchase agreement as provided below:

*“(4) The State Transmission Utility/Distribution Licensee may provide Check Meters of the same specification as Main meters”, the project proponents have not opted for check meters. Further, it may please be noted as per clause (8) and (9) of Article 4 of the Energy Purchase agreement:*

*“(8) Check meter readings shall be considered when Main Meters are found to be defective or stopped. Provided that, if difference between the readings of main and check meters vis-à-vis main meter reading exceeds twice the Percentage error applicable to the relevant class, both meters shall be tested and the one found defective shall be immediately replaced and reading of other will be considered.*

*(9) If during test or calibration, both the main meter and check meter are found to have errors beyond permissible limits, the bill shall be revised for the previous 3 (Three) months or the exact period if known and agreed upon by the parties, by applying correction as determined by the meter testing Wing of the STU/Distribution Licensee to the consumption registered by the meter with lesser error.”*

Hence, in case of failure of the main meter clause (9) of Article 4 of the Energy Purchase agreement will come into effect and the generation would be accordingly calculated and approved by the meter testing Wing of the State Transmission Utility/Distribution Licensee.

In continuation to the above clause, the correction would be taken in accordance with Clause (viii) of the Circular dated 06/01/1993 issued by the Chief Engineer, TNEB, which states:

*“During the defective period of the meters, the units generated can be computed based on the units recorded in the panel of the windmill and by comparison with the nearby windmill generator.”*

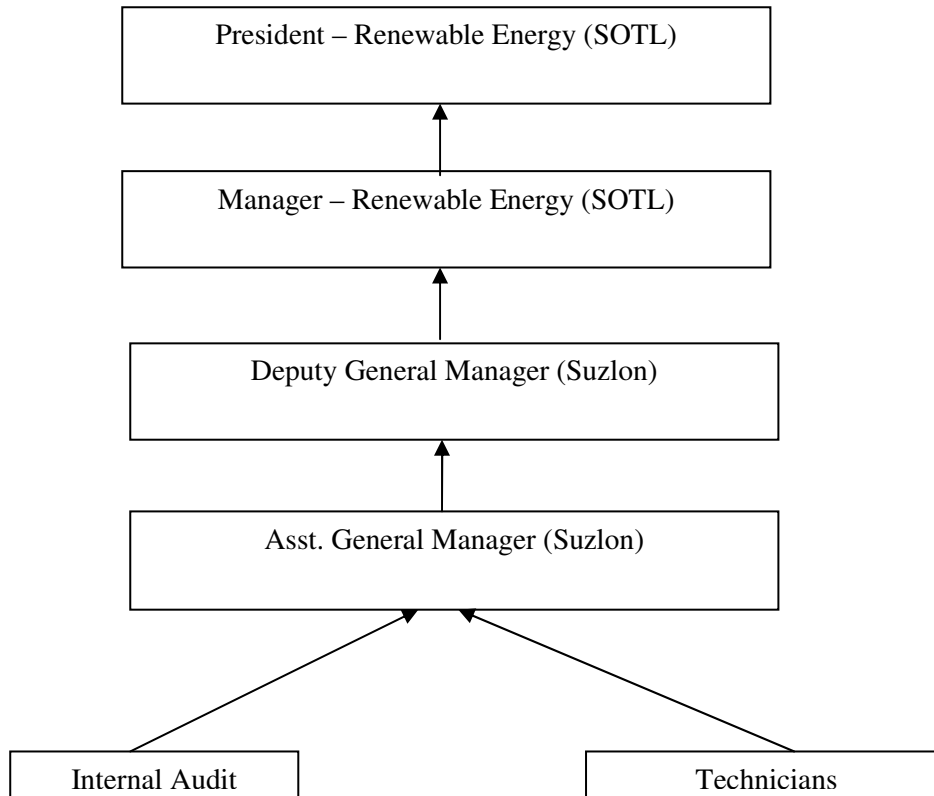
The actual generation record (both at the panel meter and the TNEB main meter) for the period 18/03/2010 to 10/11/2010 suggests a difference of only 0.21% between the panel meter & the TNEB main meters. The deviation is lower than the error margin of the TNEB main meter (0.5% as already mentioned in Section B.7.1 above). Hence, in order to introduce conservativeness & uniformity, any generation recorded as per the Clause (viii) would be subjected to a discount of 0.5% during the crediting period. It may be please noted that such discounting is also in line with paragraph 4(a) of the “*Guidelines for assessing compliance with the calibration frequency requirements, Version 01, EB 52.*”

The project promoters have contracted the technology supplier for providing O&M services for the power project. The service provider would be responsible for maintenance of the necessary spare parts and consumables for the maintenance of the WTGs such as anemometers, wind vanes and sensors, oil filters, batteries, auxiliary motors and pumps, WTG controllers, slip rings, limit switches and sensors, detergents & solvents etc. The service provider would also be responsible for supply of necessary main components of the WTG such as main gearboxes, blades, generators, towers, hubs, main shafts & bearings, ground and top controller and hydraulic systems. The service provider would also ensure that occupational health

and safety procedures are adhered to during the operation & maintenance activities. Additionally, spare meters would also be kept available at the site for replacement in case of failure of any of the monitoring equipment.

### **Monitoring at Maharashtra**

The Project is operated and managed by Suzlon in Maharashtra. The operational and management structure implemented by Suzlon is as follows:



All the WTGs are connected & captured in a digital system located at that site only. The daily generation reports are made available to SOTL by the O&M service providers. SOTL has the overall responsibility for collating the monitored data received from all the three locations. Any failure in the WTG, including in its monitoring system, will trigger the interlocking circuit which will stop generation of electricity immediately.

A particular feeder may comprise of WTGs belonging to owners other than SOTL but belonging to the same O&M service provider. At the MSEDCL sub-station, the total export & import to this feeder is monitored using the main meter & the check meter, which are electronic trivector meters. The total export at this meter is generally arrived at by multiplying the monthly meter reading to the multiplying factor of the meter concerned. The monthly meter reading is arrived at as the difference between the current meter reading and the previous meter reading. The period between these two readings is usually a period of 30 days which may vary. In a similar fashion, total import at this meter is also calculated. Hence, net

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electricity export is calculated as the difference between total export and total import at the meter. Additionally, MSEDCL receives daily export & import figures for each WTG from the O&M service provider with the help of which it calculates the electricity export by each WTG at the WTG controller. The WTG controller is located within the WTG assembly itself. It then arrives at the export value of each WTG by apportioning the reading of the main/check meter in the same ratio at which each of the WTG had exported electricity. The formula applied on each WTG of a particular feeder is as follows:

***Export of WTG to Grid***

= (% generation of individual WTG connected to feeder) x (Net Electricity Export @ MSEDCL meter for the feeder)

where, % generation of individual WTG connected to feeder

= (Controller reading @ Individual WTG)/(Sum of Controller reading of all WTGs connected on feeder)

Net Electricity Export @ MSEDCL meter for the feeder is obtained from the electricity export and electricity import readings recorded by the bi-directional energy meters located at the sub-station.

The electricity export reports are generated by MSEDCL on credit notes and sent to SOTL through the O&M service provider on a monthly basis. Thus, to further elaborate, it may be said, that every month, SOTL receives credit notes from MSEDCL for all its WTGs from the O&M service provider. Some of the information mentioned in the credit notes is as follows:

1. Current meter reading of total export of the concerned feeder
2. Previous meter reading of total export of the concerned feeder
3. Current meter reading of total import of the concerned feeder
4. Previous meter reading of total import of the concerned feeder
5. Multiplying factor of meter
6. % generation of individual WTG connected to meter

Upon receipt of these reports, SOTL generates invoices on sale of electricity and sends to MSEDCL. Thereafter MSEDCL makes payments against the invoices.

SOTL is overall responsible for storing and archiving data as well as the preparation of monitoring report and communicate with EB of UNFCCC for project performance, registration and verification of the CDM project activity.

***Internal audits & Performance review***

The records are regularly audited and checked by the senior officials from project proponent on an annual basis. The officials will monitor the actual emission reduction. The site in-charge will be responsible for taking readings at site.

***Emergency Preparedness***

Incase if monitoring meter failure errors, the grid officials would immediately replace the meter with a calibrated meter. There are two meters provided at each feeder: a Main Meter and a Check Meter. In case of failure of the meters, generation will be calculated based on the corresponding norms (Section 11.02 [c], [d] & [e]) as laid down in the Power Purchase Agreement:

*“[c] If during testing, both the Main and Check Meter are found within the permissible limit of error i.e. 0.5%, the energy consumption will be as per the Main Meter. If during test, any of the Main Meters is*

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*found to be within the permissible limits of error but the corresponding Check Meter is beyond the permissible limit; the energy consumption will be as per the Main Meter. The Check Meter shall be calibrated immediately.*

*If during the tests, the Main Meter is found to be beyond the permissible limits of error, but the corresponding Check Meter is found to be within the permissible limits of error, then the energy consumption for the month to-date and time of such test shall be in accordance with Check Meter. The Main Meter shall be calibrated immediately and the energy for the period thereafter shall be as per the calibrated Main Meter.*

*[d] If during any of the monthly meter readings, the variation between the main meter and the check meter is more than 0.5%, all the meters shall be re-tested and calibrated immediately by MSEDCL, at the Seller's<sup>22</sup> cost.*

*[e] The correction required as per the result of the testing will be applied to the generation and consumption of energy for the period from last meter reading to the time of such test checks. Energy for the periods thereafter shall be in accordance with the calibrated Main Meter.”*

The O&M service provider would be responsible for maintenance of the necessary spare parts and consumables for the maintenance of the WTGs such as anemometers, wind vanes and sensors, oil filters, batteries, auxiliary motors and pumps, WTG controllers, slip rings, limit switches and sensors, detergents & solvents etc. The service provider would also be responsible for supply of necessary main components of the WTG such as main gearboxes, blades, generators, towers, hubs, main shafts & bearings, ground and top controller and hydraulic systems. The service provider would also ensure that occupational health and safety procedures are adhered to during the operation & maintenance activities. Additionally, spare meters would also be kept available at the site for replacement in case of failure of any of the monitoring equipments.

<b>B.8 Date of completion of the application of the <u>baseline and monitoring methodology</u> and the name of the responsible person(s)/entity(ies)</b>
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Date of completion: 14/06/2010

Person Responsible: Mr. Chandrakant L. Kale

Authorised Signatory, Savita Oil Technologies Limited

Detailed contact address of the project participant is given in Annex 1.

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<sup>22</sup> “Seller” refers to the project proponent as per the Power Purchase Agreement

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**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:**

&gt;&gt;

14/12/2009

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

&gt;&gt;

20 Years 0 months

**C.2 Choice of the crediting period and related information:**
**C.2.1. Renewable crediting period**

&gt;&gt;

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

&gt;&gt;

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:**

&gt;&gt;

01/01/2012 or the date of registration whichever is later

**C.2.2.2. Length:**

&gt;&gt;

10 years 00 months

**SECTION D. Environmental impacts****D.1. If required by the host Party documentation on the analysis of the project activity:**

&gt;&gt;

In the applicable EIA notification i.e. S.O. 1533<sup>23</sup>, dated 14<sup>th</sup> September 2006, Ministry of Environment & Forests (MoEF), Govt. of India, the wind projects are not included in the list of projects that has to get Prior Environmental Clearance (EC) either from State or Central Govt. authorities and hence no EIA study was conducted.

The project does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. However due weightage has been given to environmental aspects.

Some of the environmental impacts taken into consideration during the construction and operation of the wind farm are as follows:

1. Land Use: Due consideration has been taken in order to ensure that the land available for the setting up of the wind farm has no alternative use. Appropriate measures were followed in order to prevent any soil erosion during the construction phase.
2. Noise Pollution: Typically, the wind farms are located in isolated areas and thereby the noise impacts on the neighbouring population are reduced. Also during the construction phase, suitable noise prevention and reduction measures were employed in order to reduce the ill-effects of noise pollution on the construction labourers.
3. Water Pollution: No water bodies exist in the area of the project activity. Suitable measures were adopted in order to prevent the contamination of water bodies during the construction phase, e.g. soak pits were provided for the colony of construction workers.
4. Air Pollution: The implementation of the project activity will reduce the dependence on fossil fuel generated power and thereby lead to the improvement in air quality during the operational phase. Regular wetting of approach roads was undertaken during the construction phase. This reduced the re-suspension of dust during the vehicle transits.
5. Visual Impact: As gathered in the stakeholder analysis, the wind mills do not have a negative impact on the surrounding villagers in terms of visual intrusion/impact.
6. Local Flora and Fauna: The land used for the purpose of setting up the wind farm was a barren land and therefore did not require any destruction of local flora. The only vegetation in the vicinity was shrubs and weeds. Bird hit is not a frequent phenomenon in this region. This wind farm is not located along the path of migratory birds.

Hence it can be concluded that the proposed project activity does not have any major negative impacts.

<sup>23</sup> Page No: 10, S. O. 1533, Ministry of Environment & Forests (MoEF), Govt. of India, <http://envfor.nic.in/legis/eia/so1533.pdf>

**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:**

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The environmental impacts of the project activity are not considered to be significant by the project participant or the host party. The project will not cause any emissions and no fuel is required for operation of wind turbines. The project activity would help in avoidance of emissions caused due to the combustion of fossil fuels such as SO<sub>x</sub>, NO<sub>x</sub> and particulate matter. Additionally, fuel consumption for mining of fossil fuels and transportation is also saved. It does not cause any water pollution as well.

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

Comments from the Local Stakeholders were invited by arranging meeting at both the sites. PP has considered following as local stakeholders,

1. Local community & administration
2. WTG supplier
3. O&M Team
4. SOTL Employees
5. Other people involved in the project

Local stakeholders were invited by PP through invitation notice. These invitation were issued 15 days prior to the local stakeholder's consultation meeting. Details of meeting are as below,

***Meeting - 1***

Location: Project site office, Theni, Tamil Nadu

Date: 12<sup>th</sup> May 2010

***Meeting - 2***

Location: Project site office, Sadawaghapur, Maharashtra

Date: 22<sup>th</sup> May 2010

During the meeting Chairperson has explained the details of project activity, its benefits and CDM to all stakeholders. Meeting was very interactive and got very encouraging response from stakeholders. During the meeting stakeholders had expressed their views and comments about the project activity. Chairperson along with other team member has answered all questions raised during the meeting.

**E.2. Summary of the comments received:**

SOTL has received all necessary approvals / clearances / permissions from various local bodies which represent the local stakeholders. The stakeholders meetings were conducted at the respective project sites and were attended by the office bearers and residents of the nearby villages and those employed in the project activity. The local villagers and the office bearers expressed their happiness with the setting up of an environment friendly power project in their village as it had resulted in generation of direct and indirect employment opportunities both for literate and illiterate people They also hoped that with the setting up of wind power plant, the quality of power supply would also improve. Development of infrastructure in the locality was highly appreciated. The employees hired for the project activity from the local area stated that the project activity has provided them with a means of livelihood in their own village and will help them in getting equipped with technical skills. Some of the points discussed in the meeting are as follows:

Location: Project site office, Theni, Tamil Nadu

Date: 12<sup>th</sup> May 2010

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Sl. No.	Name	Designation/ Occupation	Query	Response of Project Proponent
1.	V. Senthyl Kumar	Local	Will the setting up of new wind mills create any job opportunities?	Unskilled workers will get some civil works during installation and few will be appointed as security personnel even after the completion of installation work
2.	K.Krishnan	TNEB - Wireman	Have the wind mills in the past affected population of local wildlife in any way?	There is no effect on the wildlife. The present project is not in the wildlife area as well. There are red colour strips painted on the blades of windmill to distract the birds from its way and avoid hitting.
3.	S.Murugan	Local	Does the wind mill affect grazing of cattle?	There are no effects on cattle due to windmills. Cattle do graze in the wind farms area already under operation. So locals can be free of this fear and can graze their cattle. All electrical equipments and cables are safely laid as per norms.
4.	K.Raj Kumar	Local	Have windmills affected fertile land or soil quality in any way?	Wind mills will not affect the soil as there is no waste disposal during its operation. It is environmentally safe.
5.	M.Rajangam	Local	Have windmills posed any new health concerns for the local population?	There will be no health concerns for the locals due to windmill. The sound effects will not be there for the habitats as they are sufficiently away from the wind mill area.
6.	Anand N.M.	Local	Which other states are having wind mills set up?	Mainly in Maharashtra, Karnataka, Gujarat, Rajasthan and Andhra.

Location: Project site office, Sadawaghapur, Maharashtra

Date: 22<sup>th</sup> May 2010

Sl. No.	Query	Response of Project Proponent
1.	Will the project help in improving the electricity supply to the villagers?	Once electricity is generated, it is fed in to the state grid and then the state government decides the load dispatch process
2.	Does this affect the groundwater in any manner?	Windmills don't affect the level of ground water. They don't draw water from the ground
3.	Do these projects affect the rainfall?	No, such projects do not affect the rainfall.
4.	Are there any other benefits of wind power projects that you have observed? If yes, please list below	Contracts for civil work have been given to local villages. Other work pertaining to these projects have helped the local villagers also such as hiring of transport services, civil contracts, couriers, office automation facilities.

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

SOTL has taken care of all the conditions stipulated in the relevant clearances and no adverse comment has been raised.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Savita Oil Technologies Limited
Street/P.O.Box:	Nariman Point
Building:	66/67, Nariman Bhavan
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400 016
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Telephone:	+91 22 2288 3061
FAX:	+91 22 2202 9364
E-Mail:	<a href="mailto:clkale@savita.com">clkale@savita.com</a>
URL:	<a href="http://www.savita.com">www.savita.com</a>
Represented by:	
Title:	President – Renewable Energy
Salutation:	Mr.
Last Name:	Kale
Middle Name:	L.
First Name:	Chandrakant
Department:	
Mobile:	-
Direct FAX:	+91 22 2202 9364
Direct tel:	+91 22 2288 3061
Personal E-Mail:	<a href="mailto:clkale@savita.com">clkale@savita.com</a>

**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

No public funding for this project activity including any funding from ANNEX 1 countries. Thus the project participant hereby confirms that no diversion of Official Development Assistance is caused due to the project activity.

**Annex 3**  
**BASELINE INFORMATION**

The latest data available has been used for the estimation of the baseline emissions. 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 is available on the following website and is detailed below as well:

[http://cea.nic.in/reports/planning/cdm\\_co2/cdm\\_co2.htm](http://cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm)

Version 5.0 of the database has been used.

**Gross Generation Total (GWh)**

	2006-07	2007-08	2008-09
NEWNE	499,380	531,539	548,029
South	161,897	167,379	167,587

**Net Generation Total (GWh)**

	2006-07	2007-08	2008-09
NEWNE	465,361	496,119	509,776
South	152,206	157,315	157,336

**20% of Net Generation (GWh)**

	2006-07	2007-08	2008-09
NEWNE	93,072	99,224	101,955
South	30,441	31,463	31,467

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

	2004-05	2005-06	2006-07	2007-08	2008-09
NEWNE	9.1%	18.0%	18.5%	19.0%	17.3%
South	21.6%	27.0%	28.3%	27.1%	22.8%

**Net Generation in Operating Margin (GWh)**

	2006-07	2007-08	2008-09
NEWNE	379,471	401,642	421,803
South	109,116	114,702	121,471

**Net Imports (GWh)**

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	2006-07	2007-08	2008-09
NEWNE	5,126	8,193	0
South	0	0	6,326

**Net Generation in Build Margin (GWh)**

	2006-07	2007-08	2008-09
NEWNE	93,524	100,707	102,589
South	30,442	31,613	31,606

**Emission Data****Absolute Emissions Total (tCO<sub>2</sub>)**

	2006-07	2007-08	2008-09
NEWNE	385,692,794	406,861,785	430,423,184
South	109,020,456	113,626,240	117,880,640

**Absolute Emissions OM (tCO<sub>2</sub>)**

	2006-07	2007-08	2008-09
NEWNE	385,692,794	406,861,785	430,502,442
South	109,020,456	113,626,240	117,880,640

**Absolute Emissions BM (tCO<sub>2</sub>)**

	2006-07	2007-08	2008-09
NEWNE	59,042,467	60,193,616	69,297,387
South	21,348,182	22,550,310	25,851,336

**Emission Factor****Simple Operating Margin (tCO<sub>2</sub>/MWh) (incl. Imports)**

	2006-07	2007-08	2008-09
NEWNE	1.01	1.00	1.01
South	1.00	0.99	0.97

**Build Margin (tCO<sub>2</sub>/MWh) (not adjusted for imports)**

	2006-07	2007-08	2008-09
NEWNE	0.63	0.60	0.68
South	0.70	0.71	0.82

**Annex 4**

**MONITORING INFORMATION**

The monitoring information has already been provided in section B.7 above.

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