 <b>Project design document form (Version 12.0)</b>	
<b>BASIC INFORMATION</b>	
<b>Title of the project activity</b>	15 MW Wind Energy Project in Maharashtra <sup>1</sup>
<b>Scale of the project activity</b>	<input type="checkbox"/> Large-scale <input checked="" type="checkbox"/> Small-scale
<b>Version number of the PDD</b>	4
<b>Completion date of the PDD</b>	28/03/2022
<b>Project participants</b>	1. M/s D.J. Malpani 2. Eneco Energy Trade B.V.
<b>Host Party</b>	India
<b>Applied methodologies and standardized baselines</b>	Methodology- A.M.S-I.D- Grid connected renewable electricity generation (Version 11) <sup>2</sup> Standardized Baseline- Not Applicable
<b>Sectoral scopes</b>	1 : Energy industries (renewable - / non-renewable sources)
<b>Estimated amount of annual average GHG emission reductions</b>	25,848 tCO <sub>2</sub> e

<sup>1</sup> <https://cdm.unfccc.int/Projects/DB/BVQ11207584460.66/view>

<sup>2</sup> [https://cdm.unfccc.int/filestorage/C/D/M/CDMWF\\_AM\\_UYF1PQNDY5FZ4VH4HZ28FYAP13SI9W/AMS\\_I.D\\_rev\\_ver11.pdf?t=d0p8cjl0N2FufDBFyfF6AfiW5RyeUvb89lv4](https://cdm.unfccc.int/filestorage/C/D/M/CDMWF_AM_UYF1PQNDY5FZ4VH4HZ28FYAP13SI9W/AMS_I.D_rev_ver11.pdf?t=d0p8cjl0N2FufDBFyfF6AfiW5RyeUvb89lv4)

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

>>

India is a large country with current population of around 1.12 billion<sup>3</sup>. Its population is expected to grow at a rate of about 1.6 per cent annually and GDP growth rate is estimated to grow at over 6 per cent over the next 10 years, requiring an energy growth rate of 9 per cent. At present, there is estimated peaking shortage of 13% and energy shortage is about 7.8%. The electricity demand is growing @ 8% annually in the country. The shortage is much greater in rural areas. The present per capita energy consumption in India is little over 400 kWh, which is already on a lower side and most of the consumption is in the urban areas. Consumption of coal and petroleum fuels is projected to nearly double by 2010. India is also projected to become an imported petroleum fuel dependent economy. Conditions are thus compelling for India to attempt to meet its growing energy needs in a self-reliant manner, through renewable energy.

#### Purpose of Project Activity

The main purpose of the project activity is the implementation and operation of 15 MW wind farms to generate electricity in high wind speed areas of Maharashtra. M/s D. J. Malpani (DJM) is the promoter of these wind farms. The project activity consists of 12 wind electric generators (WEGs) installed in three phases at various locations within Maharashtra. The generated electricity from WEGs is connected to state electric utility namely Maharashtra State Electricity Distribution Company Limited (MSEDCL) and transmitted through state electric grid.

Phase	WEG Location No.	Installed Capacity (MW)	Technology	Village, District	Substation
Phase - I	K 400	1.25	SUZLON, S70	Mandal, Nandurbar	Jamde Substation
Phase - I	K 401	1.25	SUZLON, S70	Mandal, Nandurbar	Jamde Substation
Phase - I	K 402	1.25	SUZLON, S70	Mandal, Nandurbar	Jamde Substation
Phase - I	K 407	1.25	SUZLON, S70	Mandal, Nandurbar	Jamde Substation
Phase - I	K 412	1.25	SUZLON, S70	Mandal, Nandurbar	Jamde Substation
Phase - I	K 413	1.25	SUZLON, S70	Mandal, Nandurbar	Jamde Substation
Phase-II	K 254	1.25	SUZLON, S70	Dhavlivihear, Dhulia	Valve Substation
Phase-II	K 118	1.25	SUZLON, S70	Titane, Dhulia	Jamde Substation
Phase-III	J114	1.25	SUZLON, S70	Isharde, Dhulia	Jamde Substation
Phase-III	J115	1.25	SUZLON, S70	Isharde, Dhulia	Jamde Substation
Phase-III	J127	1.25	SUZLON, S70	Isharde, Dhulia	Jamde Substation
Phase-III	J128	1.25	SUZLON, S70	Isharde, Dhulia	Jamde Substation
<b>Total</b>		<b>12 machines</b>			<b>15 MW</b>

#### Contribution of project activity to sustainable development:

<sup>3</sup> <https://www.indiastat.com/?gclid=COnd1I6djY0CFQblbgodcR4Zpw>

Government of India has stipulated following indicators for sustainable development in the interim approval guidelines<sup>4</sup> for CDM projects.

#### **i. Social well-being**

Social well being is assessed by contribution by the project activity towards improvement in living standards of the local community. The project activity has resulted in increased job opportunities for the local population on temporary and permanent basis. Manpower was required both during erection and operation of the wind farms. This has resulted in poverty alleviation of the local community and development of basic infrastructure leading to improvement in living standards of the local population.

#### **ii. Economic well being**

The project activity has created direct and indirect job opportunities to the local community during installation and operation of the WEGs. The investment for the project activity has increased the economic activity of the local area. The above have contributed to the economic well being and social well being of the local community. The project activity also contributes in economic well being of the nation's economy by reducing import of fossil fuel for electricity generation in hard currency.

#### **iii. Environmental well-being**

The project utilizes wind energy for generating electricity which otherwise would have been generated through alternate fuel (most likely - fossil fuel) based power plants, contributing to reduction in specific emissions (emissions of pollutant/unit of energy generated) including GHG emissions. As wind power projects produce no end products in the form of solid waste (ash etc.), they address the problem of solid waste disposal encountered by most other sources of power. Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment.

#### **iv. Technological well- being**

There is continuous research and development on the geometry of the wind blades, height of towers, diameters of towers, etc., which augurs well for the technological well being in the development of wind energy to produce clean electricity. Also, the generated electricity from the project activity is connected to the grid. The project activity improves the supply of electricity with clean, renewable wind power while contributing to the regional/local economic development. Wind energy plants provide local distributed generation, and provide site-specific reliability and transmission and distribution benefits including:

- Improved power quality
- Reactive power control
- Mitigation of transmission and distribution congestion

All the above are the contributions of the project activity to sustainable development.

The project activity qualifies as Type I project of categories of small-scale CDM Project activity as the capacity of the project activity is 15 MW which is equal to the threshold or maximum output capacity for Type I project as per the para 119 of the CDM project standard for project activities Ver 03.0.

#### **A.2. Location of project activity**

>>

The location of the project activity as mentioned below:-

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<sup>4</sup> <https://moef.gov.in/en/>

Country- India  
 State- Maharashtra  
 Site 1- Nandurbar Taluka, Nandurbar District

Site 2- Sakri Taluka, Dhulia District

The location of individual wind turbines are:-

PHASE	WINDMILL LOCATION NO	ADDRESSES	Latitude	Longitude
Phase-I	K 400	Gut No. 168/4/P, Village- Mandal, Taluka-Nandurbar, Dist.: Nandurbar	21° 16' 15.9" N	74° 19' 49.6" E
Phase-I	K401	Gut No. 161/1A/1, Village- Mandal, Taluka- Nandurbar, Dist.: Nandurbar	21° 16' 07.4" N	74° 19' 30.5" E
Phase-I	K402	Gut No. 46/P, Village- Akhatwade, Taluka-Nandurbar, Dist.: Nandurbar	21° 16' 12.6" N	74° 19' 07.2" E
Phase-I	K407	Gut No. 370/1/P, Village- Mandal, Taluka-Nandurbar, Dist.: Nandurbar	21° 16' 57.4" N	74° 19' 44.0" E
Phase-I	K412	Gut No. 375/1/P, Village- Mandal, Taluka-Nandurbar, Dist.: Nandurbar	21° 17' 08.1" N	74° 19' 27.7" E
Phase-I	K413	Gut No. 378/1B/P, Village- Mandal, Taluka- Nandurbar, Dist.: Nandurbar	21° 17' 21.9" N	74° 19' 29.2" E
Phase-II	K254	Gut No. 74/1A/P, Village- Dhavlivihir, Taluka- Sakri, Dist.: Dhulia	21° 11' 06.1" N	74° 14' 56.2" E
Phase-II	K118	Gut No. 43/1, Village- Titane, Taluka- Sakri, Dist.: Dhulia	21° 11' 33.2" N	74° 17' 10.3" E
Phase-III	J114	R.S. No.16, Village- Isharde, Taluka- Sakri, Dist.: Dhulia	21° 13' 54.1" N	74° 18' 21.2" E
Phase-III	J115	R.S. No.16, Village- Isharde, Taluka- Sakri, Dist.: Dhulia	21° 13' 39.6" N	74° 18' 19.1" E
Phase-III	J127	R.S. No.16, Village- Isharde, Taluka- Sakri, Dist.: Dhulia	21° 14' 17.5" N	74° 17' 29.0" E
Phase-III	J128	R.S. No.16, Village- Isharde, Taluka- Sakri, Dist.: Dhulia	21° 14' 06.5" N	74° 17' 09.6" E



Fig: 1 Map of India

Fig: 2 Location Map of project activity

### A.3. Technologies/measures

>>

All the machines are S70 make and have been developed by Suzlon Energy Ltd. (SUZLON) in association with its collaborators using state of the art technology. The primary driver for the development of the turbines was Suzlon's commitment to make wind energy more accessible - in terms of technology, yield and cost. In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy. Wind has considerable amount of kinetic energy when blowing at high speeds. This kinetic energy when passes through the blades of the WEG is converted into mechanical energy and rotates the wind blades. When the wind blades rotate, the connected generator also rotates, thereby producing electricity. The technology is a clean technology since there are no GHG emissions associated with the electricity generation.

#### The important parts of a windmill are:

##### i. Main Tower

This is a very tall structure with a door and inside ladder at the bottom. The door is used to enter into the tower for operation and maintenance.

##### ii. Blades

The WEGs are provided with three blades. The blades are self supporting in nature made up of Fiber Reinforced Polyester. The blades are mounted on the hub.

##### iii. Nacelle

The Nacelle is the one which contains all the major parts of a WEG. The nacelle is made up of thick rugged steel and mounted on a heavy slewing ring. Under normal operating conditions, the nacelle would be facing the upstream wind direction.

##### iv. Hub

The Hub is an intermediate assembly between the wing and the main shaft of the wind turbine. Inside the hub, a system to actuate the aerodynamic brake is fitted. The hub is covered with nose cone.

v. Main Shaft

The shaft is to connect the gear box and the hub. Solid high carbon steel bars or cylinders are used as main shaft. The shaft is supported by two bearings.

vi. Gear Box, Bearing and Housing

The gearbox is used to increase the speed ratio so that the rotor speed is increased to the rated generator speed. Oil cooling is employed to control the heating of the gearbox. Gearboxes are mounted over dampers to minimize vibration. The main bearings are placed inside housing.

vii. Brake

Brake is employed in the WEGs to stop the wind turbine mainly for maintenance check. Brakes are also applied during over speed conditions of the wind turbine. The brakes are placed on the high speed shaft.

viii. Generator

The generator uses induction type of generator. The generators are provided with monitoring sensors in each phase winding to prevent damage to the generators.

**Technical Details of 1.25 MW (S70) WTG**

S.No.	Particulars	Specifications
1	Rotor diameter	69.1 m
2	Hub Height	74 m
3	Installed electrical output	1250 kW
4	Cut-in-wind Speed	3m/s
5	Rated wind speed	12m/s
6	Cut-Out wind Speed	20m/s
7	Rotor swept area	3750 m <sup>2</sup>
8	Rotational speed	13.2/19.8
9	Rotor material	GRP
10	Regulation	Pitch
11	Generator	Asynchronous Generator, 4/6 poles
12	Rated output	250/1250kW
13	Rotational speed	1010/1515 rpm
14	Operating voltage	690 V
15	Frequency	50 Hz
16	Protection	IP 56
17	Insulation class	H
18	Cooling system	Air Cooled
19	Gear box	3 Stage gear box, 1 Planetary and 2 helical
20	Manufacturer	Winenergy
21	Gear ratio	77.848
22	Nominal load	1390 kW
23	Type of Cooling	Oil Cooling Sysytem
24	Yaw drive system	4 active electrical yaw motors
25	Yaw bearing	Polymide slide bearing
26	Safety system	
26.1	Aerodynamic brake	3 times independent pitch regulation
26.2	Mechanical brake	Spring power disc brake, hydraulically released, fail safe.
27	Control Unit	Microprocessor controlled, indicating actual operating conditions, UPS back up system
28	Tower	Tubular

29	Design standards	GL/IEC
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The average lifetime of the equipments of the project activity are considered to be 20 years from the date of commissioning of the project activity.

#### A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host Party)	M/s D.J. Malpani	No
United Kingdom of Great Britain and Northern Ireland (other Party)	Eneco Energy Trade B.V.	No

#### A.5. Public funding of project activity

>>The project has not received any public funding from Annex I countries and Official Development Assistance (ODA).

#### A.6. History of project activity

>>

The project has already been commissioned. The registration date of the project activity under CDM mechanism is 24/10/2008.

The link for the project activity is provided below:-

<https://cdm.unfccc.int/Projects/DB/BVQI1207584460.66/view>

The CDM project activity is neither registered as a component project activity (CPA) in a registered CDM programme of activities (PoA). The CDM project activity is also not a project activity that has been deregistered. The CDM project activity was not a CPA that has been excluded from a registered CDM PoA.

#### A.7. Debundling

>>Debundling is defined as the fragmentation of a large project 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 project activities. According to paragraph 2 of Appendix C to the Simplified Modalities and Procedures for Small-Scale CDM project activities (FCCC/KP/CMP/2005/8/Add.1), a proposed small-scale activity can be deemed 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;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale project.

The present project activity has been commissioned in three phases (phase I- 6 machines in Nandurbar in the year 2005-06; phase II- 2 machines in Sakri in 2006; and finally phase III- 4 machines in Sakri also in 2006) with total installed capacity of 15 MW. The promoters have not applied for or are in the process of applying for any other similar project activity for registration. This can be verified from the UNFCCC website <https://cdm.unfccc.int/Projects/DB/BVQI1207584460.66/view>

Hence the above said project activity is not a debundled component of any larger project activity.

## **SECTION B. Application of methodologies and standardized baselines**

### **B.1. References to methodologies and standardized baselines**

>>

**Project Type:** I- Renewable Energy Projects

**Project Category:** I-D – Grid connected renewable electricity generation (Version 11)<sup>5</sup>

**Reference:** Appendix B of the simplified M&P for small scale CDM project activities<sup>6</sup>

Latest version (4) of Tool for demonstration and assessment of additionality has also been used for deriving the benchmark for project IRR for the present case.

**Standardized Baseline:** Not Applicable for this project activity.

### **B.2. Applicability of methodologies and standardized baselines**

>>

The project will have a total installed capacity of 15 MW and will not exceed this limit throughout the 10 year crediting period (please refer to Annex 5 for further details) Since 15 MW is the threshold value of small scale project activity, the Simplified M&P for Small-Scale CDM Project Activity, Category I. D. is applicable in this case. This category “comprises renewable energy sources, such as photovoltaic, hydro, tidal/wave, wind, geothermal and biomass, that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit”.

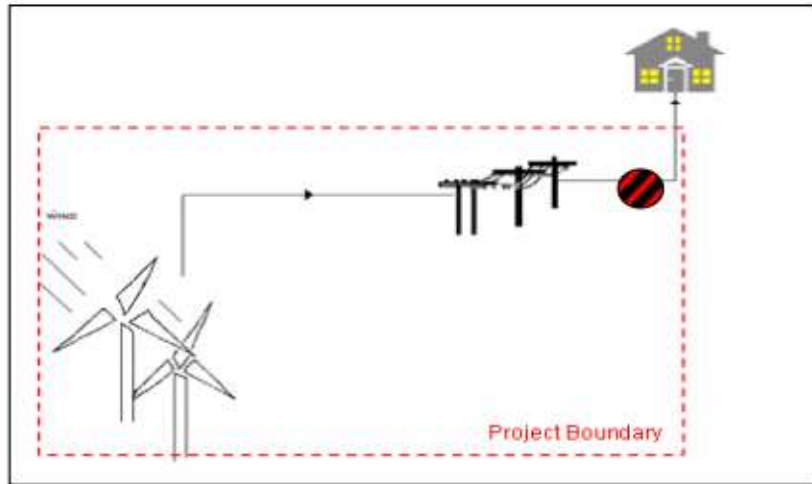
### **B.3. Project boundary, sources and greenhouse gases (GHGs)**

>>

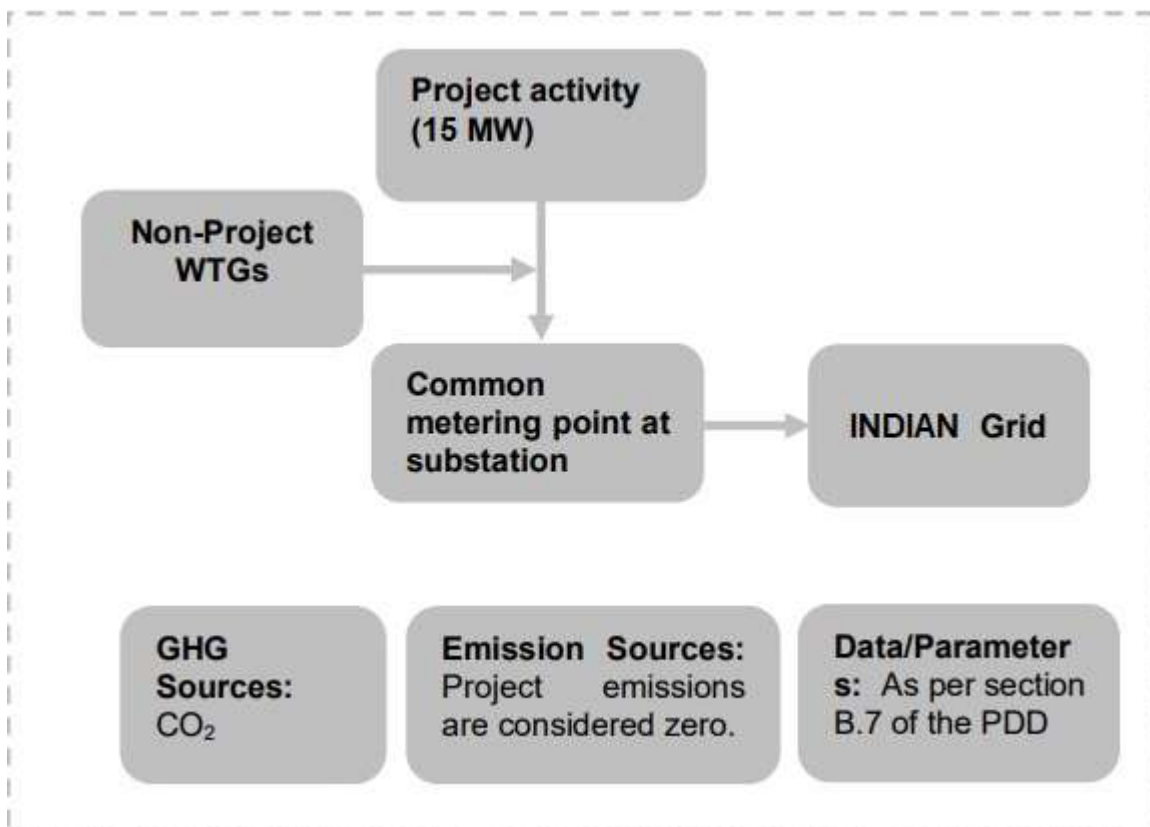
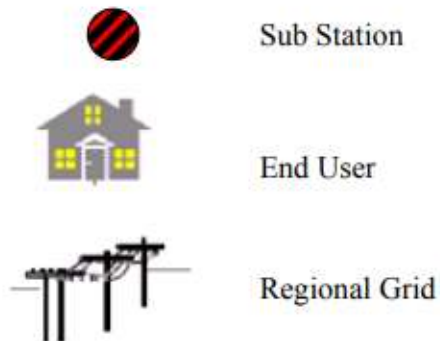
As mentioned under paragraph 6 of Type I.D. of ‘Annex-B of the simplified modalities and procedures for small-scale CDM project activities’, project boundary encompasses the physical, geographical site of the renewable generation source. For the project activity the project boundary is WEG, to the point of electricity supply to the grid interconnection point where the project proponent has full control. The interconnection of the project activity is to the grid. Thus project boundary covers wind electric generator and other accessory equipments. However, for the purpose of calculation of baseline emissions, MSEDCL electricity grid is also included in the boundary. Flow chart and project boundary is illustrated in the following diagram:

<sup>5</sup> [https://cdm.unfccc.int/filestorage/C/D/M/CDMWF\\_AM\\_UYF1PQNDY5FZ4VH4HZ28FYAP13SI9W/AMS\\_I.D\\_rev\\_ver11.pdf?t=R0Z8cjdieWRvfDDS-RYtLt5ZoYR6dCFaM0J](https://cdm.unfccc.int/filestorage/C/D/M/CDMWF_AM_UYF1PQNDY5FZ4VH4HZ28FYAP13SI9W/AMS_I.D_rev_ver11.pdf?t=R0Z8cjdieWRvfDDS-RYtLt5ZoYR6dCFaM0J)

<sup>6</sup> <https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTFQQQFQQH4SBK>



Key:



Project Boundary (Indicative)

The sources & greenhouse gases considered in the project boundary for the estimation of baseline & project emissions are given in the below table:

Source		GHG	Included?	Justification/Explanation
Baseline	Source 1	CO <sub>2</sub>	Yes	In absence of the project activity, CO <sub>2</sub> would have emitted from the operation of grid- connected power plants and by the addition of new generation sources
		CH <sub>4</sub>	No	No CH <sub>4</sub> emissions
		N <sub>2</sub> O	No	No N <sub>2</sub> O Emissions
Project activity	Source 1	CO <sub>2</sub>	No	The Project doesn't have any emissions.
		CH <sub>4</sub>	No	No CH <sub>4</sub> emissions
		N <sub>2</sub> O	No	No N <sub>2</sub> O Emissions

**B.4. Establishment and description of baseline scenario**

>>The project activity is a wind power project that supplies electricity to state grid. Since wind is a renewable resource, the GHG emissions from the project activity are zero.

The project will have a total installed capacity of 15 MW, hence this is a small-scale CDM project and the Simplified M&P for Small-Scale CDM Project Activity, Category I.D. is applicable. This category “comprises renewable energy sources, such as photovoltaic, hydro, tidal/wave, wind, geothermal and biomass, that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit”.

Baseline methodology for projects under Type I.D has been detailed in paragraphs 7-11(Type I.D) of the above-mentioned document. Paragraph 9 (Type I.D) applies to this project activity, which states that:

The baseline for all other projects (excluding landfill gas, waste gas, waste water treatment, agro-industry projects and projects where all generators use exclusively fuel oil and/or diesel fuel) is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO<sub>2</sub>equ/kWh) calculated in a transparent and conservative manner as:

- a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002.  
OR
- b) The weighted average emissions (in kg CO<sub>2</sub>equ/kWh) of the current generation mix.

Baseline emission reductions have been estimated using combined margin emission factor (in kgCO<sub>2</sub> equ/kWh) for the Western Region Grid.

Following information is used for baseline determination:

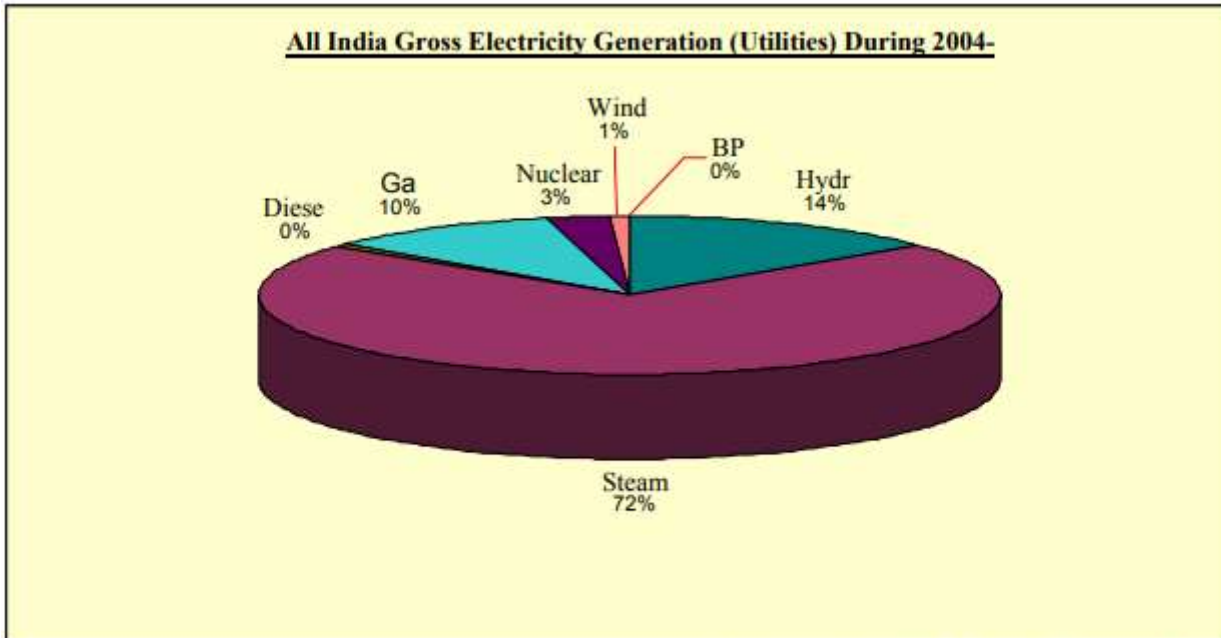
Sr.No.	Key information/data used for baseline	Source of data/information
1.	Electricity generated	Monthly Meter Reading
2.	Western Regional grid	CO <sub>2</sub> Baseline Database for the Indian Power Sector User Guide- Version 3.0 <sup>7</sup>

<sup>7</sup> [https://cea.nic.in/wp-content/uploads/baseline/2020/07/user\\_guide\\_ver3.pdf](https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver3.pdf)

		(15/12/2007) Central Electricity Authority, Government of India.
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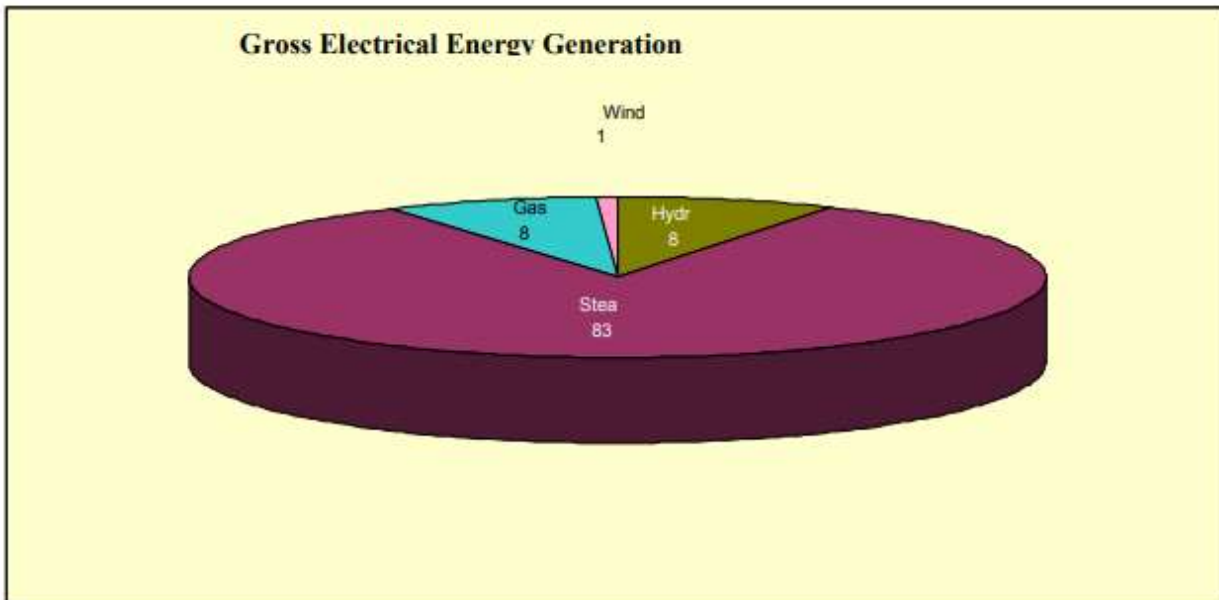
**B.5. Demonstration of additionality**

>>Wind energy contributes about 1% of the total electricity generation in India, as can be seen from following figure.



Source: CEA General Review 2006 (Table No 3.2)

Following the general trend, the electricity supply in the state of Maharashtra also, comes mainly from fossil fuel sources (91%). The share of electricity generated from wind is a meagre percent.



Source: CEA General Review 2006 (Table No 3.4)

**Justification for additionality of the project**

UNFCCC simplified modalities and procedures for small-scale CDM project activities seek to establish additionality of the project activity as per Attachment A to Appendix B. The Attachment A to Appendix B mentions various barriers and requires explanation to show that the project activity would not have occurred due to at least any one barrier.

The Project promoters have invested in wind farms in Maharashtra as well as Rajasthan and CDM benefits have been claimed for both the projects. Hence the promoters were well aware of the CDM benefits when they decided to go for the present project activity. In fact they had, at the time of negotiating the purchase of the WTGs, enquired from the WTG supplier about the possibility of this project qualifying for CDM fund. Related documents have been submitted to the DOE.

**Investment Analysis:**

Though it was envisaged that full support would be given to renewable power projects in the country by MNES and state governments by providing some incentives , historically it is observed that even this support is not sufficient enough to make these projects economically viable without some external funding like CDM revenue (which can be proven by registration of several renewable projects in India with UNFCCC) and hence the developer realized CDM funds would be needed to make the project an attractive investment as outlined below:

The term loan for the project was sanctioned by the Bank @ average 8.98% which is based on BPLR of the banks. But changes in the policy of RBI (i.e. increase in SLR and CRR), forced all banks to change its BPLR (Benchmark Prime lending rate), which resulted in an increase in rate of interest for the project proponent from average 8.98% to 10.10% (BPLR is revised) which has adversely affected the project.

The financial indicator selected for demonstrating viability of the project is Project IRR. The relevant Benchmark value has been determined according to Tool for demonstration and assessment of additionality (Version 04), Clause (a) of Sub-step 2b - Option III which states that- “benchmarks for IRR, NPV, etc. can be derived from Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert;

Following figures have been considered for arriving at the relevant benchmark

**Government Bond Rate<sup>8</sup>** = Average of rate for year 2004-05 for 20 year maturity period

November		Reserve Bank of India Bulletin										2005		
No. 27 C : MONTH-END YIELD TO MATURITY OF SGL TRANSACTIONS IN CENTRAL GOVERNMENT DATED SECURITIES FOR VARIOUS RESIDUAL MATURITIES													(Per cent)	
Term to Maturity (in years)	2004			2005										
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.		
20	—	7.6159	6.9602	6.9679	7.0577	7.1404	7.6059	7.4963	7.3517	7.4378	7.4994	7.4381		

= 7.3%

Market risk premium<sup>9</sup>

= 7.5%

<sup>8</sup> [https://www.rbi.org.in/scripts/BS\\_ViewBulletin.aspx](https://www.rbi.org.in/scripts/BS_ViewBulletin.aspx)

<sup>9</sup> <https://cercind.gov.in/rep1304.pdf>

Benchmark = 7.3% + 7.5% = 14.8%

Key assumptions made to calculate the IRR are given below-

Project Size	15 MW
Capacity of WEG	1.25 MW
No. of WEGs	12
<b>Project Cost</b>	
Cost of WTGs @491.25/WTG	5895
Erection and Installation (@ 75/WTG) <ul style="list-style-type: none"> <li>• Civil work</li> <li>• Electrical &amp; Mechanical</li> <li>• Erection and Commissioning</li> <li>• Loading &amp; Unloading</li> <li>• Temporary road for movement of crane</li> </ul>	900.00
Contribution towards common power evacuation infrastructure facilities(@ 30L/MW)	450
MEDA Processing Charges (@ 6.25/WTG)	75.00
MEDA Application fees (@ 0.03750/WTG)	0.45
Cost of Land (@ 15/WTG)	180.00
<b>Total Project Cost<sup>10</sup></b>	7500.45 lakhs
Cost per WEG	625.04
Cost of Project per MW	500.03
<b>Means of Finance</b>	
Debt	65%
Equity	35%
<b>Operating Parameters<sup>11</sup></b>	
Net billable units	28800 MWh
Plant Load Factor	21.92
Life of the wind turbine assumed	20.00
O & M Cost per WTG	11 lakhs
O & M Cost	132 lakhs
Escalation for year on year from the end of 4 <sup>th</sup> year	5%
<b>Insurance cost<sup>12</sup></b>	
Total Considered	8 lakhs
<b>Interest on term loan<sup>13</sup></b>	
Bank of Maharashtra	9.45%
Indusind Bank	8.50%
Tarrif <sup>14</sup>	
For first year	Rs. 3.50/unit
Esclation	Rs. 0.15/yr for 13 Years

Another approach that was used for calculation of Benchmark value for the given project is detailed below:

<sup>10</sup> From purchase orders and work orders for supply, erection and installation of the WTGs.

<sup>11</sup> From purchase order

<sup>12</sup> Certificate from the Statutory Auditor of the Company

<sup>13</sup> Loan sanction letters

<sup>14</sup> Power purchase agreement

Rate of interest@9% + inflation of 5% = 14%
---

For tariff determination Maharashtra Electricity Regulatory Commission (MERC) has assumed Return on Equity<sup>15</sup> (RoE) to be 16% for wind power projects commissioned after 1st April 2003. However no mention is made of the project IRR in the Tariff Order. Even the Central Electricity Regulatory Commission (CERC) does not specify the minimum Project IRR that should be considered for power projects. Hence in absence of any benchmark for project IRR specified by either state or central Electricity Regulatory Commissions, the abovementioned approach for determining benchmark was followed<sup>16</sup>.

Item	Rate of return
Minimum Expected rate of return	14%/14.8%
Rate of return without CDM benefit	13.03%
Rate of return with CDM benefit	14.39%

However the Project IRR in both cases is below the Benchmark value and hence the project activity is financially not viable without CDM.

### Sensitivity Analysis

The wind turbines set up by the project proponent generate an overall annual return of 13.03 %. This return is arrived at estimated generation of units, operation & maintenance expenses and all other variables materialize as expected. The adverse scenarios in any combinations have a significant negative impact on the project profitability. One of the scenarios with main variables is given below.

Scenarios	1	2	3	4
Saleable units :reduction by	10.0%	7.5%	5.0%	2.5%
IRR	11.15%	11.63%	12.10%	12.57%
Saleable units: increase by	10.0%	7.5%	5.0%	2.5%
IRR	14.82%	14.38%	13.93%	13.48%

We can see that the decrease in the generation of units affects the proposal adversely and the IRR comes down to 11.15% if the electricity generation is reduced by 10%, which is much lower than the minimum return expected from the project. In the reverse case i.e. if the net generation increases by 7.5% the IRR crosses the benchmark value.

However this situation is highly unlikely to happen as the WTGs of the same supplier set up by the project promoter in Satara and Rajasthan are working much below their stipulated potential<sup>17</sup>. Thus based on earlier experience, the promoters feel that there are more chances of the saleable units being reduced by 10% rather than a 7.5% increase.

<sup>15</sup> Maharashtra Electricity Regulatory Commission Order dated November 24, 2003 ; Page 58 Of 176- Table 3

<sup>16</sup> A comparison between assumptions considered by MERC in its Tariff Order and the project activity has been listed in Annex 6

<sup>17</sup> As per purchase order dated 20.12.2000, Suzlon Energy Ltd. (SEL) guarantees generation of 6 lakh units per WTG/year for N 3335- 0.35 MW machines. However generation data for the machines from 2001-02 to 2007-08 shows that the machines have not been able to attain even 5 lakh units in this span of 7 years.

Similarly according to PO dated 13.01.2003, SEL guarantees generation of 26 lakh units per WTG per year for S 66- 1.25 MW machines and whereas the maximum generation achieved during the last five years after commissioning has been 18.8 lakh units, a straight away 28% reduction in generation. The generation data for both these sites is available with the DOE.

The company has invested in proposed project activity. If the same amount were invested in to the existing activity of the company (Manufacturing & Sale of Chewing Tobacco) then the returns would have been different. We have considered the performance figures of the company for the financial year 2004-05 and 2005-06 to assess cash returns, the results are as under:

Particular	2004-05	2005-06
Net Profit after Tax	1702.45	4157.79
Depreciation	391.24	461.03
Cash profit (A)	2093.69	4618.82
Capital Accounts of partners	1000.00	1000.00
Current Accounts of partners	4204.97	3558.62
Secured Loan	2083.39	2428.85
Unsecured Loan	2258.17	5409.59
Total Investment in the Business (B)	9546.53	12397.06
Return against Investment (A/B)	21.93%	37.26%
<b>Average Return against Investment</b>	<b>29.59%</b>	

On the basis of above table, we can say that the company is getting a return of around 30% on the investment. So, if the amount would have been invested in to the existing business the company may have received return of 30% easily.

But, despite lower returns in wind energy, the Company decided to invest in to the same just to promote the renewable energy keeping in mind that the CDM benefit will improve the returns marginally.

#### Barrier Analysis:

##### Other Barriers

- i. Difficulty in arranging for finances

A major problem area for this sector has been high capital investment. The investment required for a wind power project is higher<sup>18</sup> than most other renewable energy projects. Moreover the plant load factor of biomass based cogen plant or SHP varies from 60 - 85 percent whereas for wind energy it comes to a maximum of 27 percent. This results into lower rate of return on the investment. Thus the promoters have taken considerable risk by investing in higher capital intensive and lesser reliable wind energy generation.

Sector	Capital cost(million \$/MW)	Generation cost(\$/KWh)
Small hydroelectric	0.69 to 1.38	0.023 to 0.046
<b>Wind energy</b>	<b>0.80 to 0.92</b>	<b>0.046 to 0.063</b>
Biomass power	0.69 to 0.92	0.040 to 0.046
Bagasse cogeneration	0.57 to 0.69	0.040 to 0.046
Biomass gasification	0.57 to 0.69	0.030to 0.340
Solar photovoltaic	5.70 to 6.89	0.230 to 0.370

<sup>18</sup> Source: Indian Renewable Energy Development Agency.

Besides this, the dire lack of financing institutions to back the huge capital cost investment required by wind farms is another major hurdle. The wind power sector is still predominantly debt-based for 60-75 per cent of the project cost. IREDA and a handful of other banks are not enough to meet the installation needs, due to which wind energy did not even take off in many states. Financing through IREDA is also not very encouraging. The following excerpt from the 39th STANDING COMMITTEE ON ENERGY (2003) REPORT<sup>19</sup> justifies this statement.

“The Committee has observed that in spite of being a developmental agency, the lending rates of IREDA are more than commercial financial institutions, which charges anything between 9% to 9.5% as against IREDA lending rate of 11.32%. Even REC lend at 9.2%. As a result, an entrepreneur is tempted to approach commercial FIs for obtaining loans rather than to IREDA. This raises a question of very existence of developmental agency like IREDA, which is totally dedicated to the cause of renewable energy. The Committee, therefore, feels that the difference between the cost of acquisition and lending of funds should not in anyway exceed 2%. The Committee is of the view that IREDA has now become a commercial financial institution, rather than a development promoting agency. The Committee views this seriously and recommends that ways and means should be found out to correct this imbalance, lest the goal to source 10% power by 2012 will remain a distant dream”

### Barrier due to prevailing practice

Energy planners and policy makers in India have generally supported conventional sources of energy for a variety of social and political reasons. Coal and oil based thermal power was preferred due to its short gestation period, marginal physical displacement of people and pressure of donor agencies. This discrimination is translated even in the strategy for the energy sector in the 10<sup>th</sup> Five Year Plan<sup>20</sup> –

“The Tenth Plan strategy for the sector includes increasing the production of coal and electricity, accelerated exploration for hydrocarbons, equity oil abroad.....”

The Plan recognizes energy generation with fossil fuels as the major thrust area with an insignificant mention of plans to reduce pollution caused from operation of conventional power plants. Owing to this apathy, addition in wind power capacity in India during the year 2004-05 was not very significant, barring few states.

State	As on 31/03/2004			As on 31/03/2005			Addition During 2004-05 (MW)
	Demonstration Projects (MW)	Private Sector Projects (MW)	Total Capacity (MW)	Demonstration Projects (MW)	Private Sector Projects (MW)	Total Capacity (MW)	
Andhra Pradesh	5.4	93.4	98.8	5.4	115.2	121	21.8
Gujarat	17.3	184.7	202	17.3	236.2	254	51.5
Karnataka	4.6	204.6	209.2	7.1	403.6	411	201.5
Kerala	2	0	2	2	0	2	0
Madhya Pradesh	0.6	22	22.6	0.6	28.3	28.9	6.3
Maharashtra	8.4	399.1	407.5	12.2	444.1	456	48.8
Rajasthan	6.4	172.1	178.5	6.4	278.4	285	106.3
Tamil Nadu	19.4	1342.1	1362	19.4	2018	2037	675.4
West Bengal	1.1	0	1.1	0	1.1	0	0
Others	0.5	0	0.5	0	0	0	0
Total (all india)	65.7	2418	2484	71.5	3523	3595	1111

<sup>19</sup> <http://164.100.24.208/ls/committeeR/Energy/39.pdf>

<sup>20</sup> <https://niti.gov.in/planningcommission.gov.in/docs/plans/planrel/fiveyr/10th/10defaultchap.htm>

Source: Electrical India<sup>21</sup>; December 2006

The table above demonstrates that capacity addition in Maharashtra was only 4.39% of all India total where as for states like Tamil Nadu and Karnataka the increase is 60.79 and 18.13 percent respectively. This shows that wind electricity generation hasn't achieved substantial market penetration in Maharashtra as yet.

The above paragraphs explain that barriers existed for given project activity. It thus satisfies the additionality conditions as required under Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The CDM benefits will help the project activity to cover up some of the risks that it is presently facing.

## B.6. Estimation of emission reductions

### B.6.1. Explanation of methodological choices

>>

The baseline emission ( $BE_y$  in  $tCO_2e$ ) is the product of the baseline emission factor ( $EF_{grid,y}$  in  $tCO_2e/MWh$ ) times the electricity supplied by the project activity to the grid ( $EG_y$  in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities ( $EG_{baseline}$  in MWh), as follows:

$$BE_y = (EG_y - EG_{baseline}) \times EF_{grid,y}$$

Since the following project does not involve any modification or retrofit of the existing generation facility hence  $EG_{baseline} = 0$

$EF_{grid,y}$  is determined as follows: the weighted average of the Operating Margin emission factor ( $EF_{OM,y}$ ) and the Build Margin emission factor ( $EF_{BM,y}$ ):

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

where the weights  $w_{OM}$  and  $w_{BM}$ , by default, are 50% (i.e.,  $w_{OM} = w_{BM} = 0.5$ ), and  $EF_{OM,y}$  and  $EF_{BM,y}$  are calculated as described in Steps 1 and 2 below and are expressed in  $tCO_2e/MWh$ .

For wind and solar projects, the default weights are as follows:  $w_{OM} = 0.75$  and  $w_{BM} = 0.25$  (owing to their intermittent and non-dispatchable nature).

$$EF_{GRID,Y} = 0.75 \times EF_{OM,y} + 0.25 \times EF_{BM,y}$$

Where,

$EF_{OM,y}$  = Operating Margin Emission Factor

$EF_{BM,y}$  = Build Margin Emission Factor

#### 1. Calculation of operating margin emission factor for the region based on simple OM

For calculation of operating margin four options are available:

- a) Simple operating margin;
- b) Simple adjusted operating margin;
- c) Dispatch data analysis operating margin;
- d) Average operating margin.

<sup>21</sup> Volume 46 No 12, page-40

According to AMS ID / Version11 dispatch data analysis should be the first choice but for the current project, dispatch data analysis cannot be used because of unavailability of data.

The simple OM method was used as the low-cost/must run resources constitute less than 50% of the total grid generation of Western, Northern and Southern Grid in average of the five most recent years.

The simple OM emission factor (EF<sub>OM, simple, y</sub>) is calculated as the generation-weighted average emissions per electricity unit (tCO<sub>2</sub>e/MWh or MU) of all generating sources serving the system, not including low-operating cost and must-run power plants.

$$EF_{OM,y} = \frac{\sum F_{i,j,y} * COEF_{i,j,y}}{\sum GEN_{j,y}}$$

Where:

F<sub>i, j, y</sub> -is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y, j refers to the power sources delivering electricity to the grid, not including low operating cost and must run power plants, and including imports to the grid,

COEF<sub>i,j y</sub> -is the CO<sub>2</sub> emission coefficient of fuel i (tCO<sub>2</sub>e / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and

GEN<sub>j,y</sub> -is the electricity (MWh or MU) delivered to the grid by source j.

The CO<sub>2</sub> emission coefficient COEF<sub>i</sub> is obtained as

$$COEF_i = NCV_i * EF_{CO_2,i} * OXID_i$$

Where:

NCV<sub>i</sub> - is the net calorific value (energy content) per mass or volume unit of a fuel i,

OXID<sub>i</sub> - is the oxidation factor of the fuel

EF<sub>CO<sub>2</sub>, i</sub> - is the CO<sub>2</sub> emission factor per unit of energy of the fuel i.

## 2. Calculation of build margin factor for the region (ex ante)

Build margin can be calculated as the generation weighted average emission factor (tCO<sub>2</sub>e/MWh or MU) of a sample of power plant m, as follows:

$$EF_{BM,y} = \frac{\sum F_{i,m,y} * COEF_{i,m}}{\sum GEN_{m,y}}$$

Where,

F<sub>i,m,y</sub>, COEF<sub>i,m</sub> are analogous to the variables described for the simple OM method for plants m.

## 3. Baseline emission factor (EF<sub>y</sub>)

The baseline emission factor EF<sub>y</sub> is calculated as the weighted average of the operating margin emission factor (EF<sub>OM, simple, y</sub>) and the build margin emission factor (EF<sub>BM, y</sub>), where the weights w<sub>OM</sub>

and  $w_{BM}$ , by default, are 50% (i.e.,  $w_{OM} = w_{BM} = 0.5$ ), and  $EF_{OM,y}$  and  $EF_{BM,y}$  are calculated as described in Steps 1 and 2 above and are expressed in tCO<sub>2</sub>e/MWh or MU.

The applicable values for  $w_{OM,y}$  &  $w_{BM,y}$  are 0.75 & 0.25 respectively which was used during registration of the project activity.

$$EF_{GRID,Y} = 0.75 \times EF_{OM,y} + 0.25 \times EF_{BM,y}$$

Data Used for arriving at the  $EF_{GRID,Y}$

Simple Operating Margin (tCO <sub>2</sub> /MWh) (incl. Imports)							
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.98	0.98	1.00	0.99	0.98	1.00	1.00
East	1.22	1.19	1.17	1.20	1.17	1.13	1.09
South	1.02	1.00	1.01	1.00	1.00	1.01	1.00
West	0.98	1.01	0.99	0.99	1.01	1.00	0.99
North-East	0.74	0.71	0.74	0.74	0.90	0.70	0.70
India	1.01	1.02	1.02	1.02	1.02	1.02	1.01
Build Margin (tCO <sub>2</sub> /MWh) (not adjusted for Imports)							
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					0.53	0.60	0.63
East					0.90	0.97	0.93
South					0.70	0.71	0.71
West					0.77	0.63	0.59
North-East					0.15	0.15	0.23
India					0.69	0.68	0.68

*Values for all regional grids for FY 2000-2001 until FY 2006-2007, including inter-regional and cross-border electricity transfers. (CEA, Data Base: Version 3.0)*

**Grid Emission Factor = 0.8975 t CO<sub>2</sub>e/MWh**

**Emission Reduction Due to Project Activity**

Emission reduction = Baseline emission – Project emission – Leakage

As wind energy projects fall under clean energy sources for electricity generation, the emission from the project is taken as zero.

Leakage estimation is also not required.

**Emission Reduction = Baseline Emission**

**B.6.2. Data and parameters fixed ex ante**

<b>Data/Parameter</b>	<b>EF<sub>grid,y</sub></b>
Data unit	tCO <sub>2</sub> e/MWh
Description	tons of CO <sub>2</sub> per MWh of electricity produced by the project activity
Source of data	CO <sub>2</sub> Baseline Database for the Indian Power Sector, User Guide, Version 3.0 CEA <sup>22</sup>
Value(s) applied	0.8975
Choice of data or measurement methods and procedures	The value has been provided by Central Electricity Authority for the year 2006-2007
Purpose of data	Calculation for Baseline Emissions
Additional comment	NA

**B.6.3. Ex ante calculation of emission reductions**

&gt;&gt;

**Western Regional Grid Emission Factor – 0.8975 tCO<sub>2</sub>e/MWh**

Baseline emissions or CERs generated by the project are estimated to be:

**Baseline emissions** (project)(tons of CO<sub>2</sub>)

**= Grid emission factor (tons of CO<sub>2</sub>/MWh) \* Power generated from the project (MWh/year)**

$$= 0.8975 * (2400 * 12)^{23}$$

$$= 25,848 \text{ tons CO}_2\text{e/year}$$

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

Year	Baseline emissions (t CO <sub>2</sub> e)	Project emissions (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	Emission reductions (t CO <sub>2</sub> e)
2008	25,848	0	0	25,848
2009	25,848	0	0	25,848
2010	25,848	0	0	25,848
2011	25,848	0	0	25,848
2012	25,848	0	0	25,848
2013	25,848	0	0	25,848
2014	25,848	0	0	25,848
2015	25,848	0	0	25,848
2016	25,848	0	0	25,848
2017	25,848	0	0	25,848
<b>Total</b>	258,480	0	0	258,480
<b>Total number of crediting years</b>	10 Years			

<sup>22</sup> [https://cea.nic.in/wp-content/uploads/baseline/2020/07/user\\_guide\\_ver3.pdf](https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver3.pdf)

<sup>23</sup> 2400 MWh is the net billable units as guaranteed by the manufacture and supplier of the WTGs.

<b>Annual average over the crediting period</b>	25,848	0	0	25,848
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## B.7. Monitoring plan

### B.7.1. Data and parameters to be monitored

<b>Data/Parameter</b>	<b>EG<sub>y</sub></b>
Data unit	MWh
Description	Net Electricity exported to the grid by the Project Activity
Source of data	Joint meter reading/credit note issued by MSEDCL for promoter with the help of O& M contractor by applying logic of apportioning described in section B.7.3.
Value(s) applied	-
Measurement methods and procedures	Net electricity is calculated by subtracting monthly Export & monthly Import values obtained from Monthly credit note provided by MSEDCL.
Monitoring frequency	Continuous Monthly Monitoring
QA/QC procedures	The project revenue is based on the net units displaced as calculated by applying apportioning logic on the values that are monitored with the help of metering system involving common bulk meter and inbuilt control panel meter of the WTGs. The common bulk meters constitute main meter and check meter. The accuracy of the main meter and check meter can be verified by comparing with each other. The calibration of the common bulk meters (main & check meter) will be done by state utility normally on annual basis or as per the schedule of MSEDCL.
Purpose of data	Calculation for baseline Emission
Additional comment	This data will be archived in paper form up-to two years after the completion of crediting period or last issuance whichever is later.

<b>Data/Parameter</b>	<b>EG<sub>MSEDCL</sub></b>
Data unit	MWh
Description	Total net electricity supplied to the grid measured at the substation by common bulk meters (main and check meter).
Source of data	This parameter is calculated by subtracting imported electricity from the exported electricity to grid and monitored with the help of bulk meters.
Value(s) applied	-
Measurement methods and procedures	Net export from all the WTGs is calculated by subtracting import from the export. Export and import of electricity is measured at the common bulk meters (i.e. main meter & check meter)The readings at the common bulk meter will be taken on a monthly basis, in presence of the representative of MSEDCL & O &M contractor(PP's representative).
Monitoring frequency	Continuous Monthly Monitoring
QA/QC procedures	The common bulk meters constitute main meter and check meter. The meter are of accuracy class 0.2. The accuracy of the main meter and check meter can be verified by comparing with each other. The calibration of the common bulk meters (main & check meter) will be done by state utility normally on annual basis or as per the schedule of MSEDCL.
Purpose of data	Calculation of Baseline Emission
Additional comment	This data will be archived in paper form up-to two years after the completion of crediting period or last issuance whichever is later

### B.7.2. Sampling plan

>>Not Applicable for this Project Activity

### B.7.3. Other elements of monitoring plan

The project activity essentially involves generation of electricity from wind, the employed WEG can only convert wind energy into electrical energy and cannot use any other input fuel for electricity generation. Thus no special ways and means are required to monitor leakage from the project activity.

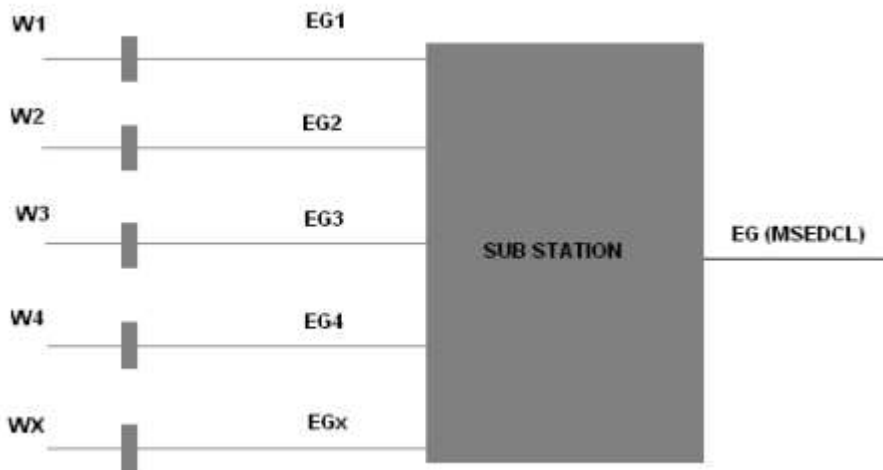
- The proposed project activity requires evacuation facilities for sale to grid and the evacuation facility is essentially maintained by the state power utility (MSEDCL).
- The electricity generation measurements are required by the utility and the investors to assess electricity sales revenue and / or wheeling charges.
- The project activity has therefore envisaged two independent measurements of generated electricity from the wind turbines.
- The primary recording of the electricity fed to the state utility grid will be carried out jointly at the incoming feeder of the state power utility (MSEDCL). Machines for sale to utility are connected to the feeder.
- The joint measurement will be carried out once in a month in presence of both parties (the developer's representative and officials of the state power utility). Both parties will sign the recorded reading.
- The secondary monitoring, which will provide a backup (fail-safe measure) in case the primary monitoring is not carried out, would be done at the individual WEGs. Each WEG is equipped with an integrated electronic meter. These meters are connected to the Central Monitoring Station (CMS) of the entire wind farm through a wireless Radio Frequency (RF) network (PLC). The generation data of individual machine can be monitored as a real-time entity at CMS. The snapshot of generation on the last day of every calendar month will be kept as a record both in electronic as well as printed (paper) form.
- Trivector Meter - is a device that measures the amount of electrical energy supplied to the utility. It is called as tri-vector meter because it measures energy consumption of the three phase lines R, Y B which are 120 phase difference from each other. It measures the consumption in terms of the active energy, reactive energy, apparent energy, power factor.

### Description of calibration of WEG Controller

SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multi-function Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current/voltage are converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed/stored. Woodward relay does not have a display and needs special protocol to view energy readings as this relay communicates digital signal through special communication protocol hence, it is not possible to calibrate. Moreover, turbine can not run without this relay hence it can not be removed for calibration during operation.

### Description of billing calculation from net meter to individual meters

Each substation is connected to a number of wind turbines. The generation reading is collectively displayed by the substation meter. The net generation of each of the wind turbines is then calculated in the following manner:



The generated electricity is measured through inbuilt control panel meter of the WTGs. The monitoring of electricity generation from all these wind turbines is done at common monitoring station as a part of central monitoring system. The system consists of a state- of- the- art controlling and monitoring and well trained staff personnel of O&M contractor, Suzlon Energy Limited, are always present on site to monitor various parameters of power generation and deal with any problems related to generation, transmission or maintenance. The Electricity Generated from the wind turbine/s (either individual or group) of the project proponent in MWh is presented as

$$\sum_0^n EG_{n,y}$$

And the summation of total Electricity Generated from all the wind turbines at the given site and connected to common bulk meter in MWh as measured at inbuilt control panel meters of the WTGs is presented as:

$$\sum_0^m EG_{m,y}$$

A ratio based on these two set of measured values is used for apportioning the net electricity supplied to the western regional grid (Now integrated in to Indian Grid) by the project activity. The second metering is carried out at grid interconnection point (sub station) wherein the Joint Meter Reading (JMR) is carried out, usually in the first week of every month, in presence of the representatives of the project proponent & the state electricity utility (MSEDCL). This JMR is used for calculation of the amount of electricity supplied to the grid against which the utility makes the payment to the project proponent. The JMR gives both the “export” ( $EG_{JMR,export}$ ) and “import” ( $EG_{JMR,import}$ ) of the electricity to/ from the western grid (Now integrated in to Indian Grid). There are common bulk meter which monitors both the export and import of electricity to the grid.

The apportioning of electricity generated from the various wind turbines is done by MSEDCL based on the values of generation for WTG’s provided by the O & M contractor and Total net electricity supplied to the grid measured at the substation by common bulk meters (main and check meter) as per below enumeration:

$$EG_y = \left[ \frac{\sum_0^n EG_{n,y}}{\sum_0^m EG_{m,y}} \right] \times EG_{MSEDCL}$$

Where,

$EG_y$	Net Electricity exported to the grid by the Project Activity.
$\sum_0^n EG_{n,y}$	Electricity generation by WTG/s owned by DJM (either individual or group)
$EG_{MSEDCL}$	Total net electricity supplied to the grid measured at the substation by common bulk meters (main and check meter).
$\sum_0^m EG_{m,y}$	Total electricity generation by all the WTGs connected to the common bulk meters

The Apportioning procedure is done by Maharashtra State Electricity Distribution Company Limited (MSEDCL) i.e. State Utility for preparing Credit Note, which is not under control of PP. The  $EG_{n,y}$  and  $EG_{m,y}$  parameters are not always available with PP, hence not considered in Monitoring Plan.

For this project the feeder connections are as follows:

WTG No.	Location	WTG Connected on 220 KV/33 KV Feeder	Detail of Feeder Change
K 400		Jamde 15	Gangapur 09 <sup>24</sup>
K 401		Jamde 08	Gangapur 09 <sup>25</sup>
K 402		Jamde 15	Gangapur09 <sup>26</sup>
K 407		Jamde 08	Gangapur 09 <sup>27</sup>
K 412		Jamde 15	Gangapur 08 <sup>28</sup>
K 413		Jamde 15	Gangapur 08 <sup>29</sup>
K 254		Valve 1	Valve 1
K 118		Jamde 04	Jamde 04
J114		Jamde 03	Jamde 03
J115		Jamde 03	Jamde 03
J127		Jamde 03	Jamde 03
J128		Jamde 03	Jamde 03

Recording of generation at the joint meter (JMR) is usually from 1<sup>st</sup> of one month to 1<sup>st</sup> or 2<sup>nd</sup> of next month.

<sup>24</sup> Feeder was changed from Jamde 15 to Gangapur 09 on dated 21 May 2009 and accordingly meter no. was updated.

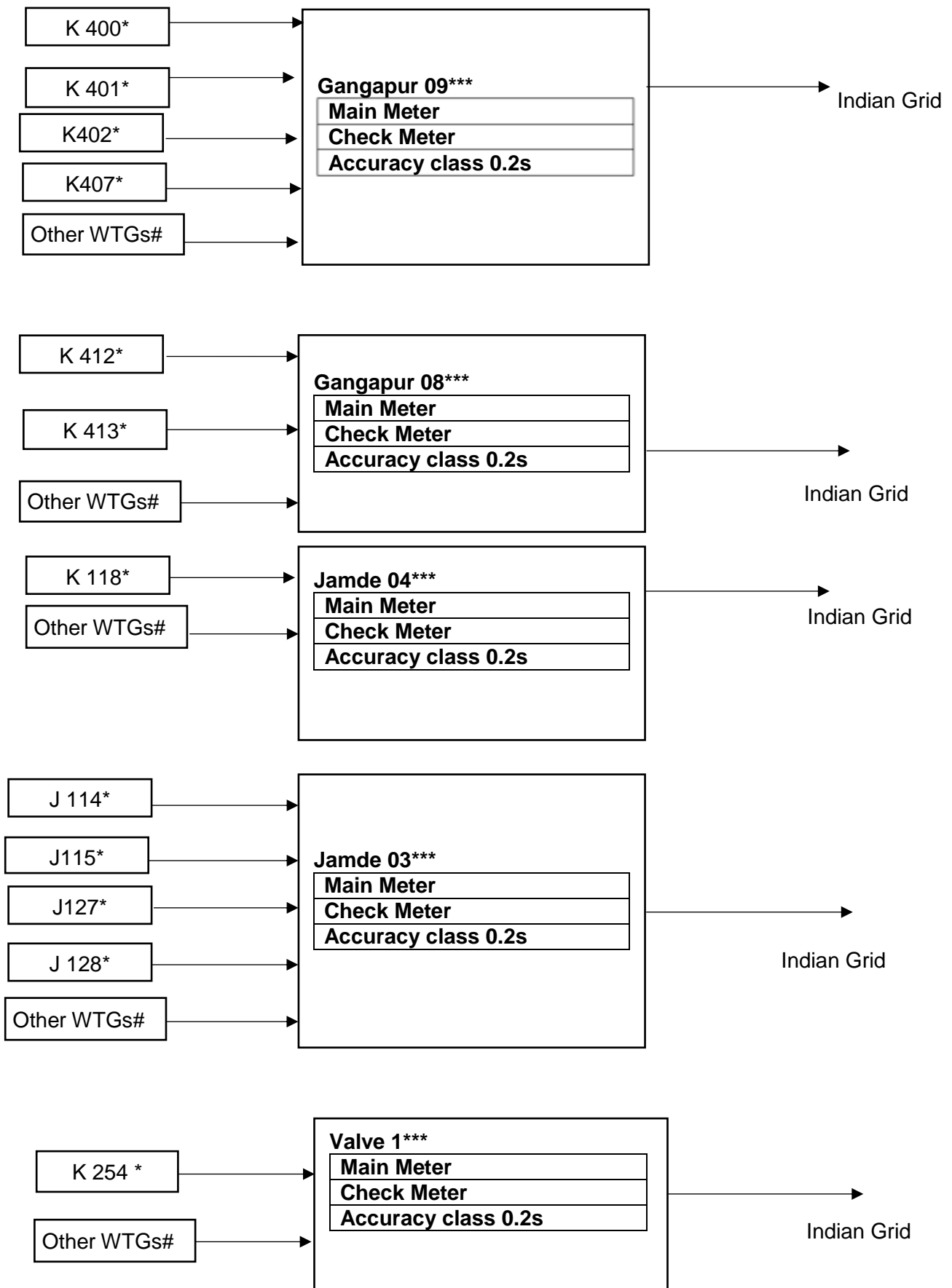
<sup>25</sup> Feeder was changed from Jamde 08 to Gangapur 09 on dated 21 May 2009 and accordingly meter no. was updated.

<sup>26</sup> Feeder was changed from Jamde 15 to Gangapur 09 on dated 21 May 2009 and accordingly meter no. was updated.

<sup>27</sup> Feeder was changed from Jamde 08 to Gangapur 09 on dated 21 May 2009 and accordingly meter no. was updated.

<sup>28</sup> Feeder was changed from Jamde 15 to Gangapur 09 on dated 21 May 2009 and accordingly meter no. was updated

<sup>29</sup> Feeder was changed from Jamde 15 to Gangapur 09 on dated 21 May 2009 and accordingly meter no. was updated.



\* : WTGs owned by DJM

# : WTGs owned by other PP

\*\*\* : Monitoring point EG<sub>MESDCL</sub>

**Line Diagram showing all relevant monitoring point**

**Routine Maintenance Services:**

The project proponents have signed an “Operation and Maintenance” agreement with the supplier of the wind turbines for the operation of the wind farm. The O & M management structure is as follows:

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 –

- a) Tower Torquing
- b) Blade Cleaning
- c) Nacelle Torquing and Cleaning
- d) Transformer Oil Filtration
- e) Control Panel & LT Panel Maintenance
- f) Site and Transformer Yard Maintenance

**Security Services:** This service includes watch & ward and security of the wind farm and the equipment.

**Management Services:**

- a) Data logging in for power generation, grid availability, machine availability.
- b) Preparation and submission of monthly performance report in agreed format.
- c) Taking monthly meter reading jointly with utility of power generated at wind farm 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:**

- a) Visual inspection of the WEG and all parts thereof.
- b) Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services.
- c) Annual and monthly training schedules are organized by the manufacturers and suppliers of the wind turbines.

The responsibilities of CDM project team is presented below

Designation	Responsibilities
Project Head	<ul style="list-style-type: none"> <li>▪ Overall performance monitoring</li> <li>▪ Project Execution</li> </ul>
Project Executor and Controller	<ul style="list-style-type: none"> <li>▪ Operation</li> <li>▪ Verification of data</li> <li>▪ Site visit to check authenticity of data and take corrective action, wherever necessary</li> <li>▪ Storage of data</li> </ul>

Site Main Controller	<ul style="list-style-type: none"> <li>▪ Operation, Monitoring and Verification of data</li> <li>▪ Data recording</li> <li>▪ Storage of data</li> </ul>
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## Training

Training of staff operating and maintaining the WTGs is carried out by the WTG manufacturer and supplier (Suzlon). Special emphasis is given to the training of the employees to enable them to develop their skills to meet changing WTG technology and to provide efficient and effective O&M services. There is an initial learning programme as well as continuous learning programmes for all employees. All newly hired employees are required to attend an intensive two- to four-week, full-time training programme to familiarize them with business and operations.

Besides the usual training programs for their staff Suzlon conducts specific familiarization capsules for customers, such that they are fully aware of the capabilities of the highly sophisticated WECs of Suzlon.

1. The training programme focuses mainly on the management, monitoring and maintenance, and safety and reliability aspects of wind power. The objectives include:
2. Understanding the various stages and aspects in the management of Wind Power systems
3. Understanding the importance of monitoring and maintenance of Wind Power systems and hence the various tasks involved in this.
4. Understanding the importance of safety and reliability aspects involved with Wind Power and the measures taken.
5. Managing generation and other data for future reference.

## SECTION C. Start date, crediting period type and duration

### C.1. Start date of project activity

>> The starting date of the project activity is taken as 27/10/2005 based on the first purchase order released.

### C.2. Expected operational lifetime of project activity

>> 20 years 0 months

### C.3. Crediting period of project activity

#### C.3.1. Type of crediting period

>>Fixed

#### C.3.2. Start date of crediting period

>>

The start date of the crediting period is 24/10/2008.

#### C.3.3. Duration of crediting period

>>

10 Years 00 Months

Duration- 24/10/2008 to 23/10/2018

## **SECTION D. Environmental impacts**

### **D.1. Analysis of environmental impacts**

>> Government of India in its notification dated 14/09/2006, has directed that “construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the Schedule to the above mentioned notification entailing capacity addition with change in process and or technology shall be undertaken in any part of India only after the prior environmental clearance from the Central Government or as the case may be, by the State Level Environment Impact Assessment Authority, duly constituted by the Central Government”.

Hence all new projects or expansion and modernization of existing projects or activities listed in category A and B of the Schedule to the notification has to obtain prior EIA clearance. However, wind power projects have not been included in either of the categories thus these projects do not require to undertake environmental clearance prior to their installation.

### **D.2. Environmental impact assessment**

>>

Brief review of the environmental impacts project activity is discussed below –

#### During construction phase

The construction phase involved erection of WEG at particular location. Although movement of materials for erection produced some dust pollution, the impacts were negligible and do not have any significant impact on the environment.

#### During operation phase

##### **Impact on Air**

There are absolutely no negative impacts on air due to the project activity.

##### **Impact on water**

No water is consumed for the project activity and no effluent is discharged from the project activity and hence, there is no impact on water due to the project activity.

##### **Impact on bio-diversity**

The installation of a wind farm does not cause negative impact on biodiversity. It does not affect flora and fauna in any way.

## **SECTION E. Local stakeholder consultation**

### **E.1. Modalities for local stakeholder consultation**

>>

M/s D.J. Malpani organized stakeholder consultation meeting on 25/04/2007 at SWSL Office campus, Nandurbar with the objective to inform the interested stakeholders on the environmental and social impacts of the project activity and discuss their concerns related to the development and operation of the activity. The number of public groups that exist around the project area was established in order to identify the key stakeholders. Next, these groups were analysed from an institutional and social perspective. Once a comprehensive list of stakeholders was identified, they were invited to attend the public meeting to assert their opinions on the project. The local population in the vicinity of the project activity comprises mainly of farmers and rural population, who are the major stakeholders in the project activity. The other stakeholders are the regional pollution control board, the party off-taking power from the project activity as well as other parties involved in the

construction, operation of the project activity. M/s. D.J. Malpani has transmitted the information to the relevant stakeholders to obtain the necessary clearances.

All the stakeholders were invited for a discussion on the project activity through invitation letter dated 15/04/07 and the date and venue were informed to them through formal invitations. The stakeholder consultation meeting was conducted on 25/04/2007 at Akhtwade & Mandal villages in district Nandurbar and Dhavlivihir, Isharde, Titane villages- district Dhule and was attended by all the stakeholders. The equipments and technology used in the project activity, prospective benefits of GHG reduction and contribution to sustainable development were apprised by M/s. D.J.Malpani to the stakeholders through a presentation in English and in the regional language (Marathi).

### **E.2. Summary of comments received**

>> Once the project and process was explained, including the local job creation and benefits, the local stakeholders had no objections or negative comments relating to the project. In fact they were excited about the new developments in their immediate surroundings. They showed enthusiasm when proponent explained that as a result of the windmills infrastructure facilities such as roads and medical facilities will improve.

The stakeholders have not put forth any negative comments about the project activity, instead they have appreciated the initiative taken up by the project participants for promoting wind power projects in their locality. The stakeholders viewed project as contributing to local environmental benefits and socio-economy. Overall, there was agreement that the project activity was a beneficial project from the local sustainable development. The local stakeholders interviewed during the site visit of the validation activity endorsed these views.

### **E.3. Consideration of comments received**

>> There were no negative comments received therefore it was not necessary to incorporate the comments into the project design or alter the project in any way.

## **SECTION F. Approval and authorization**

>>The Approval & Authorization for the project activity can be found as per footnote<sup>30</sup>:-

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<sup>30</sup><https://cdm.unfccc.int/Projects/DB/BVQ11207584460.66/view>

## Appendix 1. Contact information of project participants

<b>Organization name</b>	M/s D.J. Malpani
<b>Country</b>	India
<b>Address</b>	Malpani Estate, Kasera Dumala, Sangamner, Dist- Ahmednagar, Maharashtra Pin- 422605
<b>Telephone</b>	+91 2425 225035
<b>Fax</b>	+91 2425 225035
<b>E-mail</b>	<a href="mailto:malapni@malpani.com">malapni@malpani.com</a>
<b>Website</b>	-
<b>Contact person</b>	Mr. Prafulla Khinvasara,

## Appendix 2. Affirmation regarding public funding

- The project has not received any public funding and Official Development Assistance (ODA).
- The project is a unilateral project.

## Appendix 3. Applicability of methodologies and standardized baselines

Please refer to section B.2

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

Please refer to section B.6.1

## Appendix 5. Further background information on monitoring plan

Baseline emissions are calculated as the kWh produced by the renewable generating unit multiplied by an emission co-efficient for the Western Region Grid, calculated in a transparent and conservative manner. AMS I.D. provides two options for calculation of grid emission co-efficient for such project activities.

A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002.

OR

The weighted average emissions (in kg CO<sub>2</sub>e/kWh) of the current generation mix.

### Emission Reduction Due to Project Activity

**Emission reduction = Baseline emission – Project emission – Leakage**

As wind energy projects fall under clean energy sources for electricity generation, the emission from the project is taken as zero.

Leakage estimation is also not required.

**Emission Reduction = Baseline Emission**

Baseline emission reductions have been estimated using combined margin emission factor (in kgCO<sub>2</sub> equ/kWh) for the Western Region Grid

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE							
VERSION	3.0						
DATE	15 December 2007						
BASELINE METHODOLOGY	ACM0002 / Ver 07						
Simple Operating Margin (tCO <sub>2</sub> /MWh) (incl. Imports)							
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.98	0.98	1.00	0.99	0.98	1.00	1.00
East	1.22	1.19	1.17	1.20	1.17	1.13	1.09
South	1.02	1.00	1.01	1.00	1.00	1.01	1.00
West	0.98	1.01	0.99	0.99	1.01	1.00	0.99
North-East	0.74	0.71	0.74	0.74	0.90	0.70	0.70
India	1.01	1.02	1.02	1.02	1.02	1.02	1.01
Build Margin (tCO <sub>2</sub> /MWh) (not adjusted for imports)							
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					0.53	0.60	0.63
East					0.90	0.97	0.93
South					0.70	0.71	0.71

West	0.77	0.63	0.59
North-East	0.15	0.15	0.23
India	0.69	0.68	0.68

Calculation of Baseline Emission Factor: Combined margin			
Parameter	Unit	Value	Reference
Simple operating margin(2004-05)	tCO <sub>2</sub> /MWh	1.01	CEA CO <sub>2</sub> Baseline database
Simple operating margin(2005-06)	tCO <sub>2</sub> /MWh	1.00	CEA CO <sub>2</sub> Baseline database
Simple operating margin(2006-07)	tCO <sub>2</sub> /MWh	0.99	CEA CO <sub>2</sub> Baseline database
<b>Average Operating Margin (OM)</b>	tCO <sub>2</sub> /MWh	1.00	CEA CO <sub>2</sub> Baseline database
<b>Build Margin (2006-07) (BM)</b>	tCO <sub>2</sub> /MWh	0.59	CEA CO <sub>2</sub> Baseline database
Weight of OM (w <sub>OM</sub> )		0.75	ACM0002
Weight of BM (w <sub>BM</sub> )		0.25	ACM0002
<b>Combined Margin (BEF)</b>	tCO <sub>2</sub> /MWh	<b>0.8975</b>	

$$BE = EG_y * EF_{grid}$$

Where:

EG<sub>y</sub> - is the net quantity of electricity generated by the project in year y, and

EF<sub>grid</sub> – is the carbon emission factor of the Grid  
 Emission Estimation:

**Western Regional Grid Emission Factor – 0.8975 tCO<sub>2</sub>e/MWh**

Baseline emissions or CERs generated by the project are estimated to be:

**Baseline emissions** (project)

(tons of CO<sub>2</sub>)

**= Grid emission factor (tons of CO<sub>2</sub>/GWh) \* Power generated from the project (MWh/year)**

= 0.8975 \* (2400 \* 12)<sup>31</sup>

= 25,848 tons CO<sub>2</sub>e/year

Years	Annual estimation of emission reductions in tons of CO <sub>2</sub> e												
	K 400	K 401	K 402	K 407	K 412	K 413	K 254	K 118	J 114	J 115	J 127	J 128	Total
2008	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	25848
2009	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	25848
2010	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	25848
2011	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	25848
2012	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	25848
2013	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	25848
2014	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	25848
2015	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	25848
2016	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	25848
2017	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	2154	25848
<b>Total estimated reductions</b>	<b>21540</b>	<b>21540</b>	<b>21540</b>	<b>21540</b>	<b>21540</b>	<b>21540</b>	<b>21540</b>	<b>21540</b>	<b>21540</b>	<b>21540</b>	<b>21540</b>	<b>21540</b>	<b>258480</b>
<b>Total number of crediting years</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>
<b>Annual average over the crediting period of estimated red. (t of CO<sub>2</sub> equiv.)</b>	<b>2154</b>	<b>2154</b>	<b>2154</b>	<b>2154</b>	<b>2154</b>	<b>2154</b>	<b>2154</b>	<b>2154</b>	<b>2154</b>	<b>2154</b>	<b>2154</b>	<b>2154</b>	<b>25848</b>

<sup>31</sup> 2400 MWh is the net billable units as guaranteed by the manufacture and supplier of the WTGs.

## Appendix 6. Summary report of comments received from local stakeholders

Please refer to section E.2

## Appendix 7. Summary of post-registration changes

Old PDD Version 2	New PDD Version 4	Justification
The Parameter $\sum_0^n EG_{n,y}$ was included in Version 2.	The parameter $\sum_0^n EG_{n,y}$ has been removed in version 4.	This parameter is used by MSEDCL for Net electricity exported to the grid. The parameter value is not available in the JMR/credit note <sup>32</sup> in this current verification period as the JMR/ credit note in this period only mentions the value of Export, Import & Net electricity exported to the grid. As the value is used for the calculation of Export, Import & Net electricity and in the purview of state electricity board which is also not in the control of PP therefore the same is removed from the approved revised monitoring plan.
The Parameter $\sum_0^m EG_{m,y}$ was included in Version 2.	The Parameter $\sum_0^m EG_{m,y}$ has been removed in Version 4.	This parameter is used by MSEDCL for Net electricity exported to the grid. The parameter value is not available in the JMR/ credit note in this current verification period as the JMR/ credit note in this period only mentions the value of Export, Import & Net electricity exported to the grid. As the value is used for the calculation of Net electricity and in the purview of state electricity board which is also not in the control of PP therefore the same is removed from the approved revised monitoring plan.

Following corrections were carried out in the revised PDD version 4 dated 28/03/2022. Due to the new template i.e. PDD Version 12 of the UNFCCC following corrections are carried out:

Cover page: PP has added “Eneco Energy Trade B.V. “ as other parties involved.

<sup>32</sup> As per Maharashtra State Electricity Distribution Company Limited (MSEDCL) JMR were prepared earlier which mentions the value of export, import & net electricity fed to the grid by the project activity. The JMR has been replaced by the Credit note which is now being prepared by the apportioning procedure mentioned in the revised monitoring plan approved earlier by CDM on 02/08/2010 which is also mentioned in section B.7.3. of the revised PDD Version 04 which included the value of Export, Import & Net electricity same is used by PP for calculation of emission reductions.

Section A.4 has been updated as per the latest template requirement added "Eneco Energy Trade B.V." as other parties involved.

Section A.6 has been updated as per the latest template requirement which includes "History of the Project Activity".

Section A.7 has been updated as per the latest template requirement which includes information regarding debundling of the Project activity.

Section B.6.3 has been updated which includes correction of grid emission factor which was mentioned 897.5 tCO<sub>2</sub>/GWh earlier in the old PDD has been revised as 0.8975 tCO<sub>2</sub>/MWh.

Section B.7.3 has been updated which includes details of feeder change and single line diagram of metering arrangement has been added.

Indicative Project boundary diagram has been now included in Section B.3. of the revised PDD version 4.

Appendix 7 has been also included as per the requirement of the latest template of the PDD which describes the PRC (Post-registration changes) applied to the registered PDD version 02.

## Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
12.0	8 October 2021	Revision to: Improve consistency with version 03.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN).
11.0	31 May 2019	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Make editorial improvements.</li> </ul>
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Improve consistency with the “CDM project standard for project activities” and with the PoA-DD and CPA-DD forms;</li> <li>• Make editorial improvement.</li> </ul>
09.0	24 May 2017	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with the “CDM project standard for project activities” (CDM-EB93-A04-STAN) (version 01.0);</li> <li>• Incorporate the “Project design document form for small-scale CDM project activities” (CDM-SSC-PDD-FORM);</li> <li>• Make editorial improvement.</li> </ul>
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the “Standard: Applicability of sectoral scopes” (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: <ul style="list-style-type: none"> <li>• Include provisions related to statement on erroneous inclusion of a CPA;</li> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to local stakeholder consultation;</li> <li>• Provisions related to the Host Party;</li> <li>• Make editorial improvement.</li> </ul>
05.0	25 June 2014	Revision to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1;</li> <li>• Change the reference number from F-CDM-PDD to CDM-PDD-FORM;</li> <li>• Make editorial improvement.</li> </ul>

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<i>Version</i>	<i>Date</i>	<i>Description</i>
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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