

44 MW BUNDLED WIND POWER PROJECT IN MAHARASHTRA MANAGED BY ENERCON INDIA LIMITED.

(VCS Project ID 489 – Renewal of Crediting Period)

Wind World (India) Ltd.

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Project Title	44 MW Bundled Wind Power Project In Maharashtra Managed By Enercon India Limited.
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Table of Contents

1	Project Details.....	3
1.1	Summary Description of the Project.....	3
1.2	Sectoral Scope and Project Type	3
1.3	Project Proponent	4
1.4	Other Entities Involved in the Project	4
1.5	Project Start Date.....	10
1.6	Project Crediting Period.....	10
1.7	Project Scale and Estimated GHG Emission Reductions or Removals.....	11
1.8	Description of the Project Activity	11
1.9	Project Location	13
1.10	Conditions Prior to Project Initiation	16
1.11	Compliance with Laws, Statutes and Other Regulatory Frameworks.....	16
1.12	Ownership and Other Programs.....	16
1.12.1	Project Ownership	16
1.12.2	Emissions Trading Programs and Other Binding Limits	17
1.12.3	Other Forms of Environmental Credit	17
1.12.4	Participation under Other GHG Programs.....	17
1.12.5	Projects Rejected by Other GHG Programs.....	17
1.13	Additional Information Relevant to the Project	17
2	Application of Methodology.....	21
2.1	Title and Reference of Methodology.....	21
2.2	Applicability of Methodology.....	21
2.3	Project Boundary.....	24
2.4	Baseline Scenario	25
2.5	Additionality	26
2.6	Methodology Deviations	27
3	Quantification of GHG Emission Reductions and Removals	28
3.1	Baseline Emissions.....	28
3.2	Project Emissions.....	33
3.3	Leakage	33
3.4	Net GHG Emission Reductions and Removals	33
4	Monitoring	34
4.1	Data and Parameters Available at Validation	34
4.2	Data and Parameters Monitored.....	36
4.3	Monitoring Plan	39
5	Safeguards.....	48
5.1	No Net Harm.....	48
5.2	Environmental Impact.....	48
5.3	Local Stakeholder Consultation	49
5.4	Public Comments	49
	APPENDIX I : Baseline Emission factor	50

1 PROJECT DETAILS

1.1 Summary Description of the Project

The Project is a power generation activity from Wind Resource, located across Satara, Sangli, Nasik, and Ahmednagar District in the state of Maharashtra in India. It involves the installation of 55 Wind turbines with rated output of each turbine is 800kW. The total capacity of the project activity is 44 MW. The machines are manufactured, operated and maintained by Wind World (India) Ltd. The key descriptions of the project activity are as follows:

- The machines are of Enercon make (E-48) manufactured, operated and maintained by Wind World (India) Ltd. (erstwhile known as Enercon (India) Ltd., hereafter will be referred as Wind World (India) Ltd. (WWIL)).
- The first machine under the project activity was commissioned on 7th February 2006 and last machine under the project activity was commissioned on 10th December 2008. **The project investment was considered based on carbon revenue, hence was registered with VCS mechanism on 20th July 2009. The Project WTGs are currently operational and had successfully completed 10 years of crediting period under VCS (end date of first crediting period was 31/03/2016).**
- The purpose of the project activity is to generate electricity using wind power resources in the region. The generated power is then exported to regional grid via the state transmission system of the Maharashtra state electricity grid, which is part of the Indian grid¹ in India.
- The project activity is a green field project. In absence of the project activity an equivalent amount of electricity would have been supplied at the regional grid from the fossil fuel based power plants, Thus, the practice of continued generation of electricity from fossil fuel based power station was the existing scenario prior to the project activity. Hence implementation of the project activity contributes to emission reductions. It is estimated that project will generate an annual avg. of 75,368 tCO₂e and a total of 753,680 tCO₂e emission reductions over a period of 10 years of crediting period.
- The project contributes to sustainable development in the region by reducing pollution, creating employment opportunities, improving the livelihoods of the local people. At a larger scale, the project assists Maharashtra and ultimately India in stimulating and accelerating the commercialization of grid-connected renewable energy technologies and markets in India. As the project's WTGs have sufficient operational life time and the operation of the project activity has significantly contributed to sustainable development in the region, hence project activity is being submitted for Renewal of Crediting period for another 10 years of crediting.

1.2 Sectoral Scope and Project Type

Sectoral scope : 01, Energy Industries (renewable-/non renewable sources)

¹ As per CEA database version 11 (released in April 2016), in previous years the Indian electricity system was divided into two grids, the NEWNE and Southern Grid (SR). These are now integrated as a single Indian Grid covering all the states. Thus, the project activity earlier was considered under NEWNE Grid which is now referred as Indian Grid.

Project Type : I, Renewable energy project.
 Methodology : ACM0002, version 17. (Grid-connected electricity generation from renewable sources)

1.3 Project Proponent

Organization name	Wind World (India) Ltd.
Contact person	Mr. Yogeshh Mehra
Title	Managing Director
Address	Wind World Tower, A-9, Veera Industrial Estate, Veera Desai Road, Andheri West – 400053
Telephone	+91-22-66924848
Email	Yogeshh.mehra@windworldindia.com

1.4 Other Entities Involved in the Project

Organization name	G. B. Rubber Products
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	S-157, M.I.D.C., Bhosari, Pune
Telephone	+91-20-27120323
Email	gbrubber@vsnl.net

Organization name	Atlas Tours & Travels Pvt. Ltd
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	"Haji Mahal", 53 Mohammed Ali Road, Mumbai
Telephone	+91-22-6141-1000
Email	info@atlastravels.com

Organization name	Shah Lulla Estate Developers
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	'Poshish', 1 st Floor, Lale Plot, Madhavnagar Road, Sangli

Telephone	+91-233-2377585
Email	poshish@pn3.vsnl.net.in

Organization name	Liberty Oil Mills Ltd.
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	Amerchand Mansion, 'D' Wind: 16, Madame Cama Road, Colaba, Mumbai
Telephone	+91-22-66381000
Email	admin@libertyoilmills.com

Organization name	Paceman Sales Promotion P. Ltd.
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	14, Netaji Subhas Road, 4 th Floor, Kolkata.
Telephone	+91-33-2231-6142
Email	puti2961@dataone.in

Organization name	Delta Enterprises
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	Clover Centre, 7 Moledina Road, Pune
Telephone	+91-20-26132000
Email	<u>NA</u>

Organization name	Shreem Capacitors Pvt. Ltd.
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	P.B. No. 43, Industrial Estate, Plot No. 43/46, Jaisingpur
Telephone	+91-2322-221021
Email	kpr_shreem@sancharnet.in

Organization name	Kishor Food Products P. Ltd
Role in the project	Project Investor
Contact person	NA
Title	NA

Address	"Matruchhya" Post Box No. 23, Dondaicha
Telephone	+91-20-25630872
Email	NA

Organization name	Mahanagar Developers
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	San Mahu Complex, Bund Garden Road, Pune.
Telephone	+91-20-2612-4265
Email	sales@goelgangadevelopers.com

Organization name	Mr. J. P. Patel
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	39/D, Gultekdi, J.N. Marg, Pune
Telephone	+91-20 2644 4625
Email	NA

Organization name	Mr. C. P. Patel
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	39/D, Gultekdi, J.N. Marg, Pune
Telephone	+91-20 2644 4625
Email	NA

Organization name	Mr. V.V. Patel
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	39/D, Gultekdi, J.N. Marg, Pune
Telephone	+91-20 2644 4625
Email	NA

Organization name	Mr. J.V. Patel
Role in the project	Project Investor
Contact person	NA

Title	NA
Address	39/D, Gultekdi, J.N. Marg, Pune
Telephone	+91-20 2644 4625
Email	NA

Organization name	Mr. S.V. Patel
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	39/D, Gultekdi, J.N. Marg, Pune
Telephone	+91-20 2644 4625
Email	NA

Organization name	Mr. V.L. Patel
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	39/D, Gultekdi, J.N. Marg, Pune
Telephone	+91-20 2644 4625
Email	NA

Organization name	Laxmi Narayan Best Chiwda
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	374, Bhavani Peth, Pune
Telephone	+91-20-26454561
Email	NA

Organization name	Om Shanti Wind Farms P. Ltd
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	12-1-58, Gunj Road, Raichur
Telephone	+91-8532-235202
Email	kamal@askgroup.biz

Organization name	New Sahyadri Industries Ltd.
Role in the project	Project Investor
Contact person	NA

Title	NA
Address	"Swastik House", 39/D, Gultekdi, J.N. Marg, Pune
Telephone	+91-20-2645-8888
Email	swastikroofing@silworld.in

Organization name	Mr. P. L. Patel
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	39/D, Gultekdi, J.N. Marg, Pune
Telephone	+91-20 2644 4625
Email	NA

Organization name	Elpro International
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	17 th Floor, Nirmal, Nariman Point Mumbai
Telephone	+91-22-2202-3075
Email	NA

Organization name	Prachar Energy
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	105, B-Wing, Samkeet Apartments, Sant Janabai Marg, Off. Hanuman Road, Vile Parle (E), Mumbai
Telephone	+91-22-261-08750
Email	deepak@prachar.in

Organization name	D.J. Malpani
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	Plot No. 36, Somwar Peth, Pune
Telephone	+91-20-2612 5060
Email	NA

Organization name	International Conveyors Ltd.
Role in the project	Project Investor

Contact person	NA
Title	NA
Address	10, Middleton Row, Post Box No. 9282, Kolkata
Telephone	+91-33-2229-6033
Email	iclttd@vsnl.net

Organization name	Metalfab Hightech Private Limited
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	E21-25 & 33B/2, MIDC, Industrial Area, Hingna Road, Nagpur
Telephone	+91-7104-234240
Email	mfhpl@hotmail.com

Organization name	Gargi Construction Co. Pvt. Ltd.
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	Clover Centre, 7 Moledina Road, Pune
Telephone	+91-20-26132000
Email	NA

Organization name	Mohite & Mohite
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	'Mohite House', 240/B, Gen. Tihorat Marg, Tarabai park, Kolhapur
Telephone	+91-231-2669991
Email	mohicon@sancharnet.in

Organization name	Indiana Engineering Works (Bombay) P. Ltd.
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	Indiana House, Off. M.V. road, Marol Naka, Andheri (East), Mumbai
Telephone	+91(22)-2850 4743, 2850 5611
Email	NA

Organization name	Welpack Industries Ltd.
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	87, Government Estate, Ganesh Nagar, Nr. Gaurda Petrol Pump, Charkop, Kandivale (W), Mumbai
Telephone	+91-22-2867-8111
Email	info@welpackind.com

Organization name	Sunilkumar Ramanlal Shah
Role in the project	Project Investor
Contact person	NA
Title	NA
Address	"Jeevan Jyoti", 151, Bhavani Path, Palace Street, Satara.
Telephone	+91-9823016132
Email	NA

1.5 Project Start Date

07th February 2006.

As per VCS standard, "the project start date is the date on which the project began generating GHG emission reductions or removals". The first WTG under this project activity was commissioned on 7th February 2006, which was the date on which project has began generating emission reductions, Hence, it is considered as the start date of the project activity.

Project was validated under VCS version 1 and 10 years fixed crediting period was determined in the registered PD/Validation report. It is to be noted that in VCS there is no guidance or definition for fixed crediting period. Also in accordance with the note mentioned in section 3.8.5 of VCS standard v.3 *"The project crediting period under VCS Version 1 shall be deemed as 10 years, and commences at the specific project crediting period start date. Note also, VCS Version 1 allowed an earlier project start date than subsequent versions and such projects remain eligible for project crediting period renewal under VCS Version 3"*.

Since the project in compliance with the criteria mentioned under section 3.8.5 of VCS standard V.3, hence eligible for crediting period renewal.

1.6 Project Crediting Period

As per VCS Standard (v3.6, 19 Oct 2016), section 3.8.1 the crediting period (for non-AFOLU projects and ALM projects) will be renewed twice for the duration of ten year each. The first crediting period of the project activity was considered from 1-April-2006 to 31-March-2016. And project WTGs have a standard lifetime of 20 years. Hence, the project has been applied for Renewal Crediting period for a period of 10 years.

The duration of the 2nd Crediting Period is as follows:

Start date : 1st April 2016
End date : 31st March 2026.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	√
Large project	NA

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1 (1 st April 2016 to 31 st March 2017)	75,368
Year 2 (1 st April 2017 to 31 st March 2018)	75,368
Year 3 (1 st April 2018 to 31 st March 2019)	75,368
Year 4 (1 st April 2019 to 31 st March 2020)	75,368
Year 5 (1 st April 2020 to 31 st March 2021)	75,368
Year 6 (1 st April 2021 to 31 st March 2022)	75,368
Year 7 (1 st April 2022 to 31 st March 2023)	75,368
Year 8 (1 st April 2023 to 31 st March 2024)	75,368
Year 9 (1 st April 2024 to 31 st March 2025)	75,368
Year 10 (1 st April 2025 to 31 st March 2026)	75,368
Total estimated ERs	753,680
Total number of crediting years	10
Average annual ERs	75,368

1.8 Description of the Project Activity

The Project involves 55-wind energy converters (i.e. WTGs) of Enercon make (800 kW E- 48) with internal electrical lines connecting the project with local evacuation facility. The WTGs generate 3-phase power at 400V, which is stepped up to 33 KV. The Project can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ±12.5%.

The other salient features of the technology are:

- ✓ Gearless Construction - Rotor & Generator Mounted on same shaft eliminating the Gearbox.
- ✓ Variable speed function – has the speed range of 18 to 33 RPM thereby ensuring optimum efficiency at all times.
- ✓ Variable Pitch functions ensuring maximum energy capture.
- ✓ Near Unity Power Factor at all times.

- ✓ Minimum drawl (less than 1% of kWh generated) of Reactive Power from the grid.
- ✓ No voltage peaks at any time.
- ✓ Operating range of the WTG with voltage fluctuation of -20 to +20%.
- ✓ Less Wear & Tear since the system eliminates mechanical brake, which are not needed due to low speed generator which runs at maximum speed of 33 rpm and uses Air Brakes.
- ✓ Three Independent Braking Systems.
- ✓ Generator achieving rated output at only 33 rpm.
- ✓ Incorporates lightning protection system, which includes blades.
- ✓ Starts Generation of power at wind speed of 3 m/s.

Wind World (India) Ltd has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH, has established a manufacturing plant at Daman in India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured.

The expected electricity produced from the project under consideration can be calculated as follows:

Annual electricity supplied by the Project
 = 44 MW (Capacity) x 20% (PLF) x 8760 (hours)
 = 77,088 MWh
 = 7,708,800 kWh

Thus, expected electricity generation for the rest of the technical life of the project activity calculated with the 20% PLF is found to be 7,708,800 kWh per year.

Project description deviation:

There are couple of **Project Description Deviations considered and approved for the project activity** during the first crediting period. These deviations are discussed below.

Deviation 1:

During the third Monitoring Period under the first Crediting Period (i.e. during 01/10/2010 to 30/11/2011), **a project description deviation was taken, which was applicable for the entire crediting period.**

The details of the Project Description Deviation are as follows:

1. The Panama Wind Energy transferred its two Project WTGs to D.J. Malpani on April 2011.
2. EG_{Gross} parameter is not considered as monitoring parameter as currently the credit breakup is used as source for taking the values of EG_{export} & EG_{import}, the credit breakup is issued on monthly basis & is authorized by MSEDCL.

It can be confirmed that the deviation does not impacts the applicability of the methodology, additionality or the appropriateness of the baseline scenario.

Deviation 2:

During the last monitoring period of the first crediting period (i.e. 01-October-2014 to 31-March-2016) a deviation has been taken on account of delay in meter calibration and one of the meters being faulty. As per section 3.6.1 (2) "Where the deviation does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario, and the project

remains in compliance with the applied methodology, the deviation shall be described and justified in the monitoring report.”

Same has been explained and justified below.

1. The plan laid out to describe procedure followed when there is delay in Calibration of meter:

There was delay in calibration for few meters during the last monitoring period. As per the registered PD *“Adhering to the calibration and testing procedure as described in Power Purchase Agreement ensures the accuracy of monitoring parameter. The project adheres to all the mandatory regulatory and statutory requirements at the state as well as national level.”*

The calibration is not under the purview of the Project Participant and is performed by the Maharashtra State Electricity Distribution Company (MSEDCL) Ltd, Testing Division; which is the authorized body for meter testing as per Section 11.02 of the Wind Energy Purchase Agreement (PPA). The meters are tested, sealed and maintained by MSEDCL only in the presence of authorized representative of the PP who also signs the results. During the monitoring period, in the calibration certificates provided by MSEDCL for the meters with delayed calibration, the error factors were found to be within permissible limits of 0.2%. However, PP followed conservative approach and hence, an error factor equating the permissible limit of error for the meters had been applied for the entire delayed period (+0.2% for energy imported and -0.2% for energy exported).

2. The plan laid out to describe procedure when the Main Meter is faulty:

During the particular monitoring period, main meter of Feeder 1 of Panchpatta site was faulty since August 2014. Therefore, the reading of check meter is considered for billing by MSEDCL and hence the calibration for Check Meter 14831532 was done on 05-Sep-15. This was in line with the requirement of PPA signed between the wind energy generator and MSEDCL, which states *“If during testing, the main meter is found to be beyond permissible limits of error, but corresponding check meter is found within the permissible limits of error, then the energy computation for the month to-date and time of such check shall be in accordance with check meter.”* Also the registered PD mentions *“The monitoring of ‘electricity exported to the grid’ would be as per the details provided in PPA.”*

Thus, it can be confirmed from the above explanation that the deviations taken during the last crediting period do not have an impact on the applicability of the methodology, additionality or the appropriateness of the baseline scenario. Hence, there is no impact on the applicability of the current version of the Methodology also.

Also, the above mentioned ‘Deviation 1’ of “Project Description Deviations” is a permanent deviation which has already been approved; whereas Case B was temporary and was specific to the particular monitoring period only. Thus, the Project Description Deviation case A mentioned above shall remain applicable for the next crediting period as well.

1.9 Project Location

The Project is spread across villages in Kadvekhurd, Varekarwadi, Bhamburwadi & Panchpatta, Aundhewadiin Satara, Sangli, Nasik & Ahmednagar district in the state of Maharashtra. The location of the units is on the micro-siting data to get optimum performance. The latitudinal & longitudinal of individual machines are as given in the following table:

Sr. No.	Customers Name	Machine Capacity (MW)	Site	Taluka	District	Latitude	Longitude
1	G. B. Rubber Products	1.6	Kadvekhurd	Patan	Satara	N 17°33'15" to 17°33'56" E 73°55'28" to 73°56'51"	
2	Atlas Tours & Travels Pvt. Ltd	0.8	Kadvekhurd	Patan	Satara	N 17°33'15" to 17°33'56" E 73°55'28" to 73°56'51"	
3	Shah Lulla Estate Developers	0.8	Kadvekhurd	Patan	Satara	N 17°33'15" to 17°33'56" E 73°55'28" to 73°56'51"	
4	Liberty Oil Mills Ltd.	2.4	Kadvekhurd	Patan	Satara	N 17°33'15" to 17°33'56" E 73°55'28" to 73°56'51"	
	Liberty Oil Mills Ltd.	1.6	Varekarwadi	Patan	Satara	N 17°11'47.6" to 17°11'51.2" E 73°59'12.7" to 73°59'13.5"	
5	Paceman Sales Promotion P. Ltd.	0.8	Bhambarwad i	Shirla	Sangli	N 17°8'36.5" E 73°55'14.3"	
6	Delta Enterprises	2.4	Bhambarwad i	Shirla	Sangli	N 17°7'11.3" 17°8'35.6" 17°8'28.5" E 73°56'5.7" 73°55'2.8" 73°55'21.7"	
7	Shreem Capacitors Pvt. Ltd.	3.2	Bhambarwad i	Shirla	Sangli	N 17°8'52.1" 17°8'58.2" 17°9'2.8" 17°9'34.8" E 73°55'10.1" 73°55'6" 73°55'5.4" 73°55'6.1"	
8	Kishor Food Products P. Ltd	0.8	Bhambarwad i	Shirla	Sangli	N 17°8'53.2" E 73°54'57.7"	
9	Mahanagar Developers	7.2	Bhambarwad i	Shirla	Sangli	N 17°9'7.6" 17°9'14.7" 17°9'14.7" 17°9'14.7" 17°9'19.1" 17°9'19.1" 17°9'24.6" 17°9'24.6" 17°9'28.2" 17°9'28.2" 17°9'14.5" 17°9'14.5" 17°9'10.8" 17°9'10.8" 17°9'10.9" 17°9'10.9" 17°8'10.9" 17°8'10.9"	N 17°9'7.6" 17°9'14.7" 17°9'14.7" 17°9'14.7" 17°9'19.1" 17°9'19.1" 17°9'24.6" 17°9'24.6" 17°9'28.2" 17°9'28.2" 17°9'14.5" 17°9'14.5" 17°9'10.8" 17°9'10.8" 17°9'10.9" 17°9'10.9" 17°8'10.9" 17°8'10.9"
	Mahanagar Developers	0.8	Panchpatta	Sinnar	Nasik	N 19°39'12.8"	E 73°48'41.4"
10	Mr. J. P. Patel	0.8	Panchpatta	Sinnar	Nasik	N	N

						19°45'53.4"	19°45'53.4"
11	Mr. C. P. Patel	0.8	Panchpatta	Sinnar	Nasik	N 19°45'17.1"	N 19°45'17.1"
12	Mr. V. V. Patel	0.8	Panchpatta	Sinnar	Nasik	N 19°44'58"	N 19°44'58"
13	Mr. J. V. Patel	0.8	Panchpatta	Sinnar	Nasik	N 19°45'12.7"	N 19°45'12.7"
14	Mr. S. V. Patel	0.8	Panchpatta	Sinnar	Nasik	N 19°45'46.9"	N 19°45'46.9"
15	Mr. V. L. Patel	0.8	Panchpatta	Sinnar	Nasik	N 19°44'33.5"	N 19°44'33.5"
16	Laxmi Narayan Best Chiwda	0.8	Panchpatta	Sinnar	Nasik	N 19°45'2.9"	N 19°45'2.9"
17	Om Shanti Wind Farms P. Ltd	0.8	Aundhewadi	Sinnar	Nasik	N 19°45'7.7"	N 19°45'7.7"
18	New Sahyadri Industries Ltd.	1.6	Panchpatta	Akole	Ahmednagar	N 19°44'24.3" 19°44'28.2"	N 19°44'24.3" 19°44'28.2"
19	Mr. P. L. Patel	0.8	Panchpatta	Akole	Ahmednagar	N 19°41'7.2"	N 19°41'7.2"
20	Elpro International	0.8	Panchpatta	Akole	Ahmednagar	N 19°41'41.8"	N 19°41'41.8"
21	Prachar Energy	1.6	Panchpatta	Akole	Ahmednagar	N 19°39'17.8" 19°39'22.7"	N 19°39'17.8" 19°39'22.7"
22	D.J. Malpani ²	1.6	Panchpatta	Akole	Ahmednagar	N 19°41'16.6" 19°41'20.6"	N 19°41'16.6" 19°41'20.6"
23	International Conveyors Ltd.	0.8	Panchpatta	Akole	Ahmednagar	N 19°41'37"	N 19°41'37"
24	Metalfab Hightech Private Limited	0.8	Panchpatta	Akole	Ahmednagar	N 19°41'11.9"	N 19°41'11.9"
25	Gargi Construction Co. Pvt. Ltd.	1.6	Panchpatta	Akole	Ahmednagar	N 19°41'26.1" 19°41'31.1"	N 19°41'26.1" 19°41'31.1"

² The Panama Wind Energy transferred WTGs to D.J. Malpani on April 2011

26	Mohite & Mohite	2.4	Panchpatta	Akole	Ahmednagar	N 19°42'15.6" 19°42'20.5" 19°42'25.6"	N 19°42'15.6" 19°42'20.5" 19°42'25.6"
27	Indiana Engineering Works (Bombay) P. Ltd.	1.6	Panchpatta	Akole	Ahmednagar	N 19°39'27.5" 19°39'32.4"	N 19°39'27.5" 19°39'32.4"
28	Welpack Industries Ltd.	0.8	Panchpatta	Akole	Ahmednagar	N 19°39'7.9"	N 19°39'7.9"
29	Sunilkumar Ramanlal Shah	0.8	Panchpatta	Akole	Ahmednagar	N 19°44'38.6"	N 19°44'38.6"

1.10 Conditions Prior to Project Initiation

The Project activity was a greenfield initiative. The project generates electricity and supplies it to the MSEDCL that comes under the Indian Grid. In the absence of the project activity, an equivalent amount of electricity would have been generated at grid using the conventional fossil fuel based power plants connected to the grid.

The project activity is located in Maharashtra and supplies electricity to the regional grid which is a part of unified Indian grid system and hence the baseline for the project activity will be emissions that would have occurred by the operation of grid connected power stations and by the addition of new generating stations at Indian Grid.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Renewable energy projects are not mandated in India by any enforced law or other regulatory framework. However, for guidance on voluntary wind energy based electricity generation, there are policies introduced/incentives declared by the state governments. These policies have been considered for the project activity and are available at <http://www.windpowerindia.com/govtinc.html>.

For the implementation of the project, the project proponent has obtained land lease deeds/sale deeds and has secured MEDA (Maharashtra Electricity Development Authority) clearances for infrastructure and commissioning of the WTG in the state of Maharashtra.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The ownership of the project is referred to the section 8.1 of the registered VCS PD.

The title of the project activity is “44 MW Bundled Wind Power Project in Maharashtra managed by Enercon India Limited”. Also, the project had been successfully commissioned and is currently operational under valid Power Purchase Agreement (PPA). The commissioning certificates for the wind turbines and the PPAs have been provided to DOE as proof of ownership.

Also, all the customers in bundled project had authorized Wind World (India Ltd. (previously designated as WWIL) as project proponent; the undertaking for the same from WWIL and authorisation letters from all the customers had been submitted to DOE as a proof of title, at the time of validation and registration of the Project activity under VCS.

1.12.2 Emissions Trading Programs and Other Binding Limits

The project activity is not a part of any Emission Trading Programs and Other Binding Limits or any Other Forms of Environmental Credit. A letter of undertaking has been submitted by PP.

1.12.3 Other Forms of Environmental Credit

The project activity has not been applied for any other form of Environmental Credit. Project activity is only registered with VCS mechanism and have been availing VCU without any double accounting of emission reductions. A letter of undertaking has been submitted by PP.

1.12.4 Participation under Other GHG Programs

The project activity has not been applied for or participated under any other GHG Programs. Project activity is only registered with VCS mechanism and have been availing VCU without any double accounting of emission reductions. A letter of undertaking has been submitted by PP.

The VCS project ID reference is VCS-489.

1.12.5 Projects Rejected by Other GHG Programs

The project activity has not been applied under any other GHG Programs. Hence, it is not rejected by any programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

As per the section 3.4.9 of the VCS standard, Eligibility Criteria shall be demonstrated for grouped projects. The current project activity does not fall under the definition of grouped project; hence no specific set of eligibility criteria has been included.

Leakage Management

The project activity involves harnessing of wind energy and its conversion to electricity. The project activity has been registered with the methodology “ACM 0002 version 10” and the renewal of crediting period is assessed with the latest version of the methodology, i.e. 17; which confirms that there is no project emission for the project activity.

Thus, project activity does not lead to any leakage; hence there is no leakage management plan or risk mitigation measures are required.

Commercially Sensitive Information

There is no commercially sensitive information that has been excluded from the public version of the project description. PP would like to confirm that all information related to Baseline and Additionality of the project had been demonstrated in the registered VCS PD.

Sustainable Development

The National CDM Authority (NCDMA), the Designated National Authority (DNA) for Government of India (GoI), has stipulated four indicators of sustainable development in pursuant to their approval guidelines for Clean Development Mechanism (CDM) projects from India. This project activity under VCS also contributes towards these sustainable development indicators, as follows:

Social well-being:

- ✓ The project activity has been contributing to socio-economic development in the region through improving the infrastructure for road network and other mode of communications in the remote part of the state during both the construction and operational phases.
- ✓ The project activity has been supporting to alleviate poverty by means of direct and indirect benefits through employment generation and improved economic activities by strengthening of local grid of the state electricity utility. Thus, contributes to the livelihood of the society.

Environmental well-being:

- ✓ The project activity utilizes renewable energy source for electricity generation instead of fossil fuel based electricity generation which would have emitted gaseous, liquid and/or solid effluents/wastes. Thus, the project causes no negative impact on the surrounding environment and contributes to environmental well-being.
- ✓ The project activity contributes towards reduction of the GHG emissions as well as emission of pollutants like SO_x, Suspended Particulate Matters (SPMs) etc. as in absence of the project an equivalent amount of power would have been generated at Grid from grid connected power plants which are pre-dominantly run by fossil fuels, associated with high level of SO_x, NO_x, SPMs etc.

Economic well-being:

- ✓ The project generates electricity utilizing renewable source, i.e. wind. Thus it will increase the contribution of renewable based power generation in the region and will also help in reducing the demand - supply gap of the respective grid.
- ✓ The project activity involves substantial amount of investment, manpower, operational amenities etc. Thus it contributes towards generation of direct and indirect employment opportunities as per the requirement of the skilled and semi-skilled manpower, both during construction and operational phase.
- ✓ Use of a renewable source of energy reduces the dependence on imported fossil fuels and associated price variation, which leads to economic stability of the nation. Also, it leads to increased energy security.

Technological well-being:

- ✓ Increased interest in wind energy projects will further push R&D efforts by technology providers to develop more efficient and better machinery in future.
- ✓ Clean energy development is a national need. The project activity promoting a clean energy technology which encourages govt. to adopt more and more technically advance practices and thus lead to an overall technological wellbeing.

Further Information

Additional information are discussed below as per the section 1.16 of the registered PD:

Legislative:

All the legal and regulatory requirements like statutory consents, etc were obtained for the project under consideration from various governmental authorities.

Technical:

- ✓ The project exhibits India's technical prowess with regards to wind energy turbine manufacturing, as the WTGs used are latest technology available in the market, and have been manufactured by Wind World (India) Ltd.
- ✓ The project activity consists of 55 nos. machines of Enercon make 800 kW wind turbines, totalling to a capacity of 44 MW.
- ✓ The gearless technology with variable speed function is being used.
- ✓ Three independent braking systems along with incorporation of lightning protection system with generation of power at 2m/sec.
- ✓ While increased interest in wind energy projects will further push R&D efforts by technology providers to develop more efficient and better machinery in future

Economic:

- ✓ The project activity requires temporary and permanent, skilled and semiskilled manpower at the wind park; this will create additional employment opportunities.

- ✓ The generated electricity will be fed into the western regional grid through local grid, thereby improving the grid frequency and availability of electricity to the local consumers (villagers & sub-urban habitants) which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development.

Sectoral Scope:

- ✓ Increase in the electricity availability.
- ✓ Shorter power cuts.
- ✓ Optimum utilization of freely available natural resources.

Social:

- ✓ The project activity has led to the development of supporting infrastructure such as road network etc., in the wind park location, which also provides access to the local population.
- ✓ The project activity leads to alleviation of poverty by establishing direct and indirect benefits through employment generation and improved economic activities by strengthening of local grid of the state electricity utility.
- ✓ Use of a renewable source of energy reduces the dependence on imported fossil fuels and associated price variation thereby leading increased energy security.

Environmental:

- ✓ The project activity involves use of renewable energy source for electricity generation instead of fossil fuel based electricity generation which would have emitted gaseous, liquid and/or solid effluents/wastes.
- ✓ 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 contributing to environmental wellbeing.

Geographic:

- ✓ The project is located at Satara, Sangli, Nasik and Ahmednagar district of Maharashtra state. The location of the units is on the micro-siting data to get optimum performance.
- ✓ The project involves 55 units of 800 KW out of which:
 - 9 Units are located at Pathan Taluka in Satara district
 - 18 Units are located at Shirala Taluka in Sangli district
 - 9 Units are located at Sinnar Taluka in Nasik district
 - 19 Units are located at Akole Taluka in Ahmednagar district

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The project was registered under the CDM approved methodology for small-scale, **ACM0002, Version 10** (as approved by VCS 2007.1).

However, as per VCS standard the renewal of crediting period is now assessed with the latest version of the methodology, i.e. **ACM0002, version 17**.

The title of this baseline and monitoring methodology:

“Grid-connected electricity generation from renewable sources.”

The tools referenced in this methodology are:

- ✓ Tool to calculate the emission factor for an electricity system, version 05.0 (<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf>)
- ✓ Tool for the demonstrations and assessment of additionality, version 05.2 (<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf>).

2.2 Applicability of Methodology

The identified project is a Wind power project of 44 MW capacity and there is no non-renewable components linked with it. The project will displace electricity in the Indian grid via western regional grid which is predominantly carbon intensive.

The approved consolidated baseline and monitoring methodology ACM0002 Version 17 is the relevant baseline and monitoring methodology. The justifications to the applicability are as follows:

Para No.	Applicability Conditions as per ACM0002	Applicability to this Project Activity
1.	This methodology is applicable to grid-connected renewable power generation project activities that: • install a Greenfield power plant; • involve a capacity addition to (an) existing plant(s); • involve a retrofit of (an) existing operating plants/units; • involve a rehabilitation of (an) existing plant(s)/unit(s) or • involve a replacement of (an) existing plant(s)/unit(s).	The project activity is the installation of a new grid connected wind power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (i.e. Greenfield plant) and hence this criterion is applicable.
2.	The project activity may include renewable energy power plant/unit of one of the following types: hydro	The project activity is grid connected renewable power generation from

	power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	wind. Hence applicable.
3.	In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	This condition is not relevant, as the project activity does not involve capacity additions, retrofits or replacements. It's a green field activity.
4.	In case of hydro power plants: • The project activity is implemented in an existing single or multiple reservoir, with no change in the volume of reservoir; or • The project activity is implemented in an existing single or multiple reservoir, where the volume of reservoir is increased and the power density is greater than 4 W/m²; or • The project activity results in new single or multiple reservoirs, and the power density is greater than 4 W/m²; or • The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m², all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m²; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m² shall be: a) Lower than or equal to 15 MW; and b) Less than 10 per cent of the total installed capacity of integrated hydro power project.	This condition is not relevant, as the project activity does not involve any installation of a hydro power plant.
5.	In the case of integrated hydro power projects, project proponent shall: • Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or	The project activity is a grid connected wind power project and not a hydro power plant. Therefore, these criteria are not relevant to the project activity.

	Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	
6.	The methodology is not applicable to the following: - Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; - Biomass fired power plants;	The project activity does not involve any of the given criteria hence methodology is applicable for the project activity.
7.	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	The project activity is a new renewable power plant involves in installation new wind turbines. Also no replacement, modification and retrofit measures are implemented / involved in the project activity. Hence, this criterion is also not relevant to the project activity.

Applicability conditions of "Tool to calculate the emission factor for an electricity system"	
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	This condition is applicable. OM, BM and CM are estimated using the tool under section 3.1 for calculating baseline emissions.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off grid power plants. In the latter case, the conditions specified in "Appendix 2: Procedures related to off grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively	Since the project activity is grid connected, this condition is applicable and the emission factor has been calculated accordingly.

affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project activity is located in India, a non-Annex I country. Therefore, this criterion is not applicable for the project activity.
Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero.	The project activity is a grid connected wind power project and not a hydro power plant. Therefore, this criterion is not applicable for the project activity.

From the above table, it is evident that the project activity meets all the applicability conditions of the approved methodology ACM0002 (version 17).

2.3 Project Boundary

- ✓ The sources, sinks and reservoir would be the mitigation of CO₂ which would have otherwise been liberated from the fossil fuel based power plants.
- ✓ There are no sources sinks and reservoir related to the GHG project.
- ✓ There are no sources sinks and reservoir affected by the GHG project.

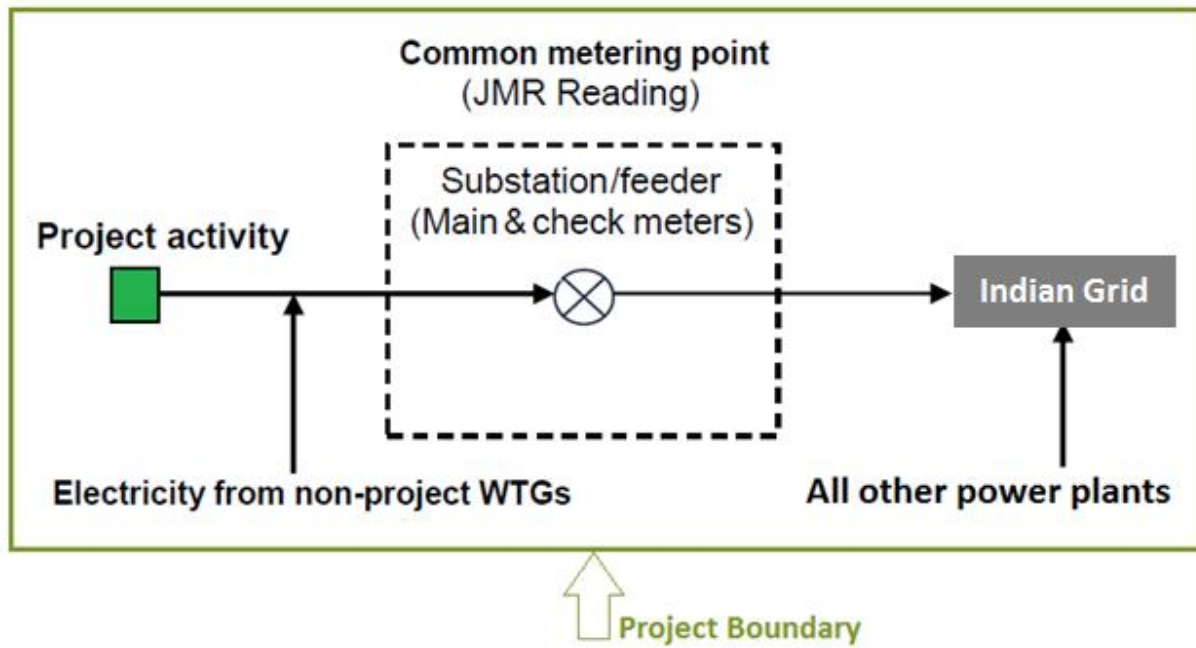
The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the Table below:

Source		Gas	Included?	Justification/Explanation
Baseline Scenario	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO ₂	Included	Main source of emission.
		CH ₄	Excluded	Excluded for simplification. This is conservative.
		N ₂ O	Excluded	Excluded for simplification. This is conservative.
		Other	Excluded	No other GHG emission is expected. Hence excluded for simplification. This is conservative.
Project Scenario	Source 1	CO ₂	Excluded	Zero-emissions grid connected electricity generation from renewable energy
		CH ₄	Excluded	Project does not lead to any methane generation
		N ₂ O	Excluded	Project does not lead to any Nitrous Oxide generation.
		Other	Excluded	Project does not lead to any other GHG emissions

As per the methodology, "the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is

connected to". Therefore, the project boundary for the project activity essentially includes the project WTGs, other WTGs (non-project), all common metering point, interconnection to Indian Grid and all other power plants attached to the grid.

Diagrammatic representation of the Project Boundary:



2.4 Baseline Scenario

Baseline scenario for the second crediting period has been assessed in line with the methodological tool **"Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period."** Version 03.0.1.

This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 300 of Project Standard & 49 (a) of the modalities and procedures of the Clean Development Mechanism.

The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: *Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies*

There is no legal and regulatory requirement that mandates the production of energy by the chosen technology. Investment in wind energy projects in the State of Maharashtra and the western regional electricity grid is not mandatory. There are no national or local laws or regulations that require this investment to be undertaken, i.e. setting up of wind power project. The setting up of wind energy projects is a voluntary activity. Baseline for the project activity is in compliance with relevant mandatory national and sectoral policies. **Hence, it remains unchanged in the current situation also, i.e. in the next crediting period.**

Step 1.2: *Assess the impact of circumstances*

The baseline scenario identified at the validation of the project activity was grid i.e. an equivalent amount of electricity would have been supplied to the grid from connected power plants which are predominantly operated using fossil fuels (which was also evident from the Combined Margin Emission factor calculated and detailed in the registered PD). Project activity was a green field installation; the baseline scenario for the project activity in the current context remains same i.e. grid and the grid still supplies primarily fossil fuel based electricity as reflected in the Combined Margin emission factor (as detailed in the Appendix 1).

Hence, circumstances and the externalities for determining the baseline for the project activity are same. **Therefore, there is no change in baseline scenario for the next crediting period.**

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

This sub-step has to be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment. Since this is not the case with the project activity under consideration, **hence this condition is not applicable.**

Step 1.4: Assessment of the validity of the data and parameters

This step stipulates that *"Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity."*

In the context of the present project activity the emission factor has been updated along with the approach used to calculate the emission factor.

Step 2: Update the current baseline and the data and parameters

As evident from the explanation provided above the baseline scenario remains unchanged. Only the approach used to calculate the baseline emission factor is updated as per the latest version of CEA database available at the time of PD submission for renewal.

The approved consolidated baseline methodology, ACM0002, (Version 17), has been used to determine the baseline and the estimation of emission reductions for the applicable crediting period. As referred in the methodology "Tool to calculate the emission factor for an electricity system" (version 05.0) has been used to determine continued validity of the baseline based on combined margin (CM) calculations.

The details of CM Emission Factor calculation are reported under the Appendix I of this report. The values of the parameters are also reported under the section 4.1.

2.5 Additionality

The project additionality has been demonstrated and established under the registered VCS PD. The section 2.5 of the registered PD, dated 20th July 2009, has demonstrated additionality using the relevant guidelines which confirms that project activity is additional.

As per section 3.8.5 of the VCS Standard (v3.6, 19th Oct 2016): *“a full reassessment of additionality is not required when renewing the project crediting period. However, regulatory surplus shall be demonstrated in accordance with Section 4.6.3) and the project description shall be updated accordingly”*.

Now as per section 4.6.3: *“the project shall not be mandated by any law, statute or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute or other regulatory framework. For UNFCCC non-Annex I countries, laws, statutes, regulatory frameworks or policies implemented since 11 November 2001 that give comparative advantage to less emissions intensive technologies or activities relative to more emissions-intensive technologies or activities need not be taken into account. For all countries, laws, statutes, regulatory frameworks or policies implemented since 11 December 1997 that give comparative advantage to more emissions-intensive technologies or activities relative to less emissions-intensive technologies or activities shall not be taken into account.”*

As per the registered PD, section 2.5, Sub step 1(b) of Step 1 (Regulatory Surplus), it has been demonstrated that:

“There are no legal and regulatory requirements for this particular technology for power generation, i.e. for Wind Power Projects.”

At current scenario also the project activity is not a legal or regulatory requirement.

As per the current regulatory norms, setting up of wind energy project is not mandated by any enforced law, statute or other regulatory framework in India. However, for guidance on voluntary wind energy based electricity generation, there are policies introduced/incentives declared by the state governments. These policies have been considered for project activity and are available at <http://www.windpowerindia.com/govtinc.html>

Thus, project activity is additional.

2.6 Methodology Deviations

There is no methodological deviation is applied to the project activity.

Project activity is applicable under the same methodology, i.e. ACM0002; however for renewal of crediting period latest version of the methodology has been applied. The demonstration has already been included under the section 2.4 above.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

The Baseline emissions are calculated based on methodology version 17, ACM0002.

As per the methodology, baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid connected power plants.

The baseline emissions (BE_y in tCO₂) are the product of the baseline emissions factor (EF_y in tCO₂/MWh) and the net electricity supplied by the project activity to the grid (EG_y in MWh).

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y}$$

BE_y : Baseline Emissions in year y (tCO₂).
 EG_{BL,y} : Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
 EF_{CO₂,grid,y} : CO₂ emission factor of the Indian grid in year y (t CO₂/MWh)³

Calculation of EG_{BL,y}:

The calculation of EG_{BL,y} is different for Greenfield plants, capacity additions, retrofits, rehabilitations and replacements.

For Green field project activity, EG_{BL,y} = EG_{PJ,facility,y} = Quantity of net electricity supplied by the project plant/unit to the grid in year y(MWh).

The Emission Factor calculation is demonstrated as follows:

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

OR

(b) The weighted average emissions (in tCO₂/MWh) of the current generation mix. The data of the year in which project generation occurs must be used."

The approach proposed in the "Option (a)" i.e. "Combined Margin" has been used for ascertaining Baseline Emission Reductions. The operating margin and the build margin emission factor have been considered from the information (Baseline Carbon Dioxide Emission Database -Version 11, April 2016)⁴ published by the Central Electricity Authority (CEA), Ministry of Power, Govt. of India which have been

³ The emission factor has been calculated using the latest version of the CEA database, i.e. CEA Database version 11, dated April 2016 (http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf). The calculation details are reported in the ER sheet and source of values are also reported under the Appendix I.

⁴ Reference: http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

computed according to the procedures prescribed in 'Tool to calculate the emission factor for an electricity system' version 05.0.

The baseline scenario has been identified as per the combined margin (CM) approaches which consists of operating margin (OM) and build margin (BM) factors as described in this section.

STEP 1. Identify the relevant electricity System:

Historically, the Indian power system was divided into five independent regional grids, namely Northern, Eastern, Western, Southern, and North-Eastern. Each grid covered several states (see Table below). Since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY2007-08 onwards for the purpose of this CO2 Baseline Database. As of April 2016, the Southern grid has also been synchronised with the NEWNE grid, hence forming one unified Indian Grid. For the unified grid, the main emission factors are calculated in accordance with the relevant CDM methodologies.

The project activity is located in the state of Maharashtra, which comes under western grid of unified Indian Grid. In the proposed baseline, therefore calculation pertaining to the Unified Indian Grid has been used as the reference grid system for estimating the baseline emission.

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

STEP 2. Choose Whether to Include Off-Grid Power Plants in the Project Electricity System (Optional):

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

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

Project participant has chosen **Option I** to include only grid power plants in the calculation.

STEP 3. Select a method to Determine the Operating Margin (OM)

As per the "tool to calculate the emission factor for an electricity system", version 05.0.0," "the operating margin refers to a cohort of power plants that reflect the existing power plants whose electricity generation would be affected by the proposed CDM project activity."

Further, the OM is to be determined based upon the following methods

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

The simple OM method (option a) can only be used if low cost/must run resources⁵ constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

In the context of the present project activity simple OM has been considered since the contribution of low cost must run resources in the unified Indian grid mix amongst the five most recent years generation of the grid mix is less than 50% of total grid generation. Hence, the statistics provided in the table above quite evidently demonstrate the fact that power generation from the low cost must run resources within the Indian grid is less than 50 % of the total generation. Hence, the use of simple operating margin method towards formulation the baseline scenario remains justified.

Further as per Step 3, the emission factor can be calculated using either of the two data vintages:

- **Ex-ante option:** If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation.
- **Ex post option:** If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For the project activity, the Ex-ante option is chosen for emission factor estimation.

The Simple OM factor is calculated as under in Step 4.

Step 4: Calculate the Operating Margin Emission Factor According to the Selected Method

As per Step 3 of the 'tool to determine the emission factor of an electricity system', the simple OM emission factor can be calculated using the ex-ante option which states that for calculation of OM 'A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period'.

In this regard, the simple OM emission factor has been sourced from the most recent data available at the time of submission of the VCS PD for renewal of crediting period and has **therefore been fixed for this 2nd crediting period** (Please refer to Appendix 1 for data related to operating margin in Indian grid).

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units.

⁵ Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

The simple OM may be calculated:

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

OR

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

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO₂ Baseline Database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India. The Combined Margin in the CEA database is calculated ex ante using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system, Version 05.0.0". We have, therefore, used the Combined Margin data published in the CEA database, for calculating the Baseline Emission Factor.

As per 'Tool to calculate the emission factor for an electricity system' **Option A** (i.e. "Based on the net electricity generation and a CO₂ emission factor of each power unit") is used to calculate simple OM emission factor. Where Option A is used, the simple OM emission factor is calculated based on the electricity generation of each power unit and an emission factor for each power unit, as follows:

$$EF_{\text{grid,OMsimple},y} = \sum (EG_{m,y} \times EF_{EL,m,y}) / \sum EG_{m,y}$$

Where:

$EF_{\text{grid,OMsimple},y}$	Simple operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO ₂ emission factor of power unit m in year y (tCO ₂ /MWh)
m	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

The CO₂ emission factor ($EF_{EL,m,y}$) data for simple OM, available under the CEA database⁶ (Version 11, April 2016) for the last three years is as follows.

CO ₂ emission factor for simple OM (tCO ₂ /MWh) (incl. Imports)			
Indian Grid	2012-13	2013-14	2014-15
	0.9922	1.0002	0.9903

Net Generation Total (GWh)			
Indian Grid	2012-13	2013-14	2014-15
	697,187	721,632	808,417

⁶ http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

The net electricity generation ($EG_{m,y}$) data, available under the CEA database⁷ (Version 11) of all generating power plants (not including low-cost / must-run power plants / units) for the last three year has been taken from the database.

Thus, as can be seen from the above tables, the 3 years generation-weighted OM average for the most recent three years available at the time of PD for validation, i.e. 2012-13, 2013-14 and 2014-15 for Indian grid is:

The ex-ante OM value obtained is 0.9941 tCO₂/MWh

Step 5: Calculate the Build Margin (BM) Emission Factor

In terms of vintage of data, project participants can choose between one of the following two options:

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

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

The project participant has chosen Option 1 for vintage of the data.

Therefore BM for the 2nd crediting period is considered as the build margin data of the most recent available period, i.e. year 2014-15. Thus, $EF_{grid, BM, y} = 0.9285 \text{ tCO}_2\text{e/MWh}$ ⁸.

Step 6: Calculate the Combined Margin Emissions Factor

Combined Margin has been used for ascertaining Baseline Emission Reductions. The combined margin emission factor consists of two components i.e. the operating margin and the build margin. The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the simple operating margin and build margin emission factor for the unified Indian grid. According to 'Tool to calculate the emission factor an electricity system' version -05, the combined margin emission factor is calculated as follows:

The weighted average CM method (option A) is preferred for calculation of combined margin emission factor.

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

Where:

$EF_{grid, OM, y}$: Operating Margin CO₂ emission factor in the year y (tCO₂/MWh)

⁷ http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

⁸ Refer ER sheet for detailed calculation, and also referred in Appendix I.

W_{OM} : Weighting of operating margin emission factor (%)
 $EF_{grid,BM,y}$: Build Margin CO₂ emission factor in the year y (tCO₂/MWh)
 W_{BM} : Weighting of build margin emission factor (%)

The combined margin emission factor has been derived from the simple operating margin and build margin emission factors after considering/ factoring the weights of 0.75 and 0.25 for operating margin (OM) and build margin (BM) emission factors respectively relevant to the hydro power generation project activities as per the 'Tool to calculate the emission factor for an electricity system (Version 05)

Combined Margin (CM) in tCO₂/MWh for grid is

$$\begin{aligned}
 EF_{CO_2,grid,y} &= 0.75 \times \text{Wt. average of OM for last 3 years} + 0.25 \times \text{BM} \\
 &= 0.9777 \text{ tCO}_2/\text{MWh}
 \end{aligned}$$

Thus,
 $BE_y = 77,088.00 \times 0.9777$
 $BE_y = 75,368 \text{ tCO}_2\text{e}$ (rounded down value has been considered)

3.2 Project Emissions

Since the project activity is a renewable energy project which generates electricity using wind power and hence does not result in project emissions as per the applicable methodology ACM0002, version 17.

Thus, $PE_y = 0$

3.3 Leakage

According to the applied methodology ACM0002, guidance on leakage, there is no leakage emission from this project activity has been considered. Thus, $LE_y = 0$.

3.4 Net GHG Emission Reductions and Removals

According to equation prescribed in ACM0002 (version 17), the Emission Reduction is calculated by subtracting the project emissions from the baseline emissions.

Thus $ER_y = BE_y - PE_y - LE_y$

As described under section 3.2 and 3.3, the Project emission and Leakage emissions are zero for the project activity, therefore,

$$ER_y = (BE_y - 0 - 0) = BE_y$$

The summary of ex ante estimates of emission reductions are tabulated below:

Year	Estimated baseline emissions	Estimated project emissions	Estimated leakage emissions	Estimated net GHG emission

	or removals (tCO ₂ e)	or removals (tCO ₂ e)	(tCO ₂ e)	reductions or removals (tCO ₂ e)
Year 1 (1 st April 2016 to 31 st March 2017)	75,368	0	0	75,368
Year 2 (1 st April 2017 to 31 st March 2018)	75,368	0	0	75,368
Year 3 (1 st April 2018 to 31 st March 2019)	75,368	0	0	75,368
Year 4 (1 st April 2019 to 31 st March 2020)	75,368	0	0	75,368
Year 5 (1 st April 2020 to 31 st March 2021)	75,368	0	0	75,368
Year 6 (1 st April 2021 to 31 st March 2022)	75,368	0	0	75,368
Year 7 (1 st April 2022 to 31 st March 2023)	75,368	0	0	75,368
Year 8 (1 st April 2023 to 31 st March 2024)	75,368	0	0	75,368
Year 9 (1 st April 2024 to 31 st March 2025)	75,368	0	0	75,368
Year 10 (1 st April 2025 to 31 st March 2026)	75,368	0	0	75,368
Total	753,680	0	0	753,680

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid, y}
Data unit	tCO ₂ / MWh
Description	Combined margin emission factor of Indian grid
Source of data	Calculated from operating and built margin, using 75%-25% weights used (Source: CEA database, Version 11, April 2016 http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf)
Value applied	0.9777
Justification of choice of data or description of measurement methods and procedures applied	CEA has estimated the simple operating margin and build margin emission factors for the Indian grid. For calculating the CO ₂ emission factor as per combined margin method for the second crediting period, the weights of 0.75 for operating margin and 0.25 for build margin are considered as per 'Tool to calculate the emission factor for an electricity system (Version 05.0)
Purpose of Data	Calculation of baseline emissions

Comments	This value is calculated on ex-ante basis and will remain fixed for the entire crediting period.
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Data / Parameter	EF_{OM,y}
Data unit	tCO ₂ / MWh
Description	Simple Operating margin emission factor of Indian Grid
Source of data	Calculated from CEA database, Version 11, April 2016 http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf
Value applied	0.9941
Justification of choice of data or description of measurement methods and procedures applied	CEA has estimated the simple operating margin and build margin emission factors for the Indian grid. For calculating the CO ₂ emission factor as per combined margin method for the second crediting period, the weighted average value of simple operating margin has been considered, as per 'Tool to calculate the emission factor for an electricity system (Version 05.0)
Purpose of Data	Calculation of baseline emissions
Comments	This value is calculated on ex-ante basis and will remain fixed for the entire crediting period.

Data / Parameter	EF_{BM,y}
Data unit	tCO ₂ / MWh
Description	Build margin emission factor of Indian grid
Source of data	Calculated from CEA database, Version 11, April 2016 http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf
Value applied	0.9285
Justification of choice of data or description of measurement methods and procedures applied	CEA has estimated the build margin emission factors for the Indian grid. For calculating the CO ₂ emission factor as per combined margin method for the second crediting period, the build margin value for the most recent year (i.e. 2014-15) has been considered, as per 'Tool to calculate the emission factor for an electricity system (Version 05.0)
Purpose of Data	Calculation of baseline emissions
Comments	This value is calculated on ex-ante basis and will remain fixed for the entire crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	EG_{y, net}
Data unit	MWh
Description	Net electricity supplied to the grid by the Project.
Source of data	Calculated from EG _{,export} and EG _{,import} as (EG _{,export} – EG _{,import})
Description of measurement methods and procedures to be applied	Net electricity supplied to the grid will be calculated by the values of Electricity import and Electricity export.. The Net electricity is recorded as following: (Net Electricity = Net Export – Net Import) The procedures for metering and meter reading will be as per the provisions of the PPA
Frequency of monitoring/recording	Monthly
Value applied	To be considered on actual.
Monitoring equipment	The Energy Meters of accuracy class 0.2s has been used to measure the electricity exported & imported to grid. Details of energy meters are included under the monitoring plan, under section 4.3
QA/QC procedures to be applied	QA/QC procedures will be implemented pursuant to PPA agreement.
Purpose of data	Calculation of baseline emissions
Calculation method	Described in Section 4.3
Comments	Not Applicable.

Data / Parameter	EG_{Export}
Data unit	MWh
Description	Electricity exported to the grid by the project activity in year y
Source of data	Monthly certificates issued by MSEDCL (Credit Note)
Description of measurement methods and procedures to be applied	The Energy generated at the wind farm will be metered and measured by MSEDCL on monthly basis at the sending end substation of the Wind Farm. The monitoring of 'electricity exported to the grid' would be as per the details provided in PPA.
Frequency of monitoring/recording	Continuous monitoring and Monthly recording

Value applied	To be applied on actual
Monitoring equipment	The Energy Meters of accuracy class 0.2s has been used to measure the electricity exported (at substation) and same is being apportioned by MSEDCL to calculate electricity exported by the project activity. Details of energy meters are included under the monitoring plan, under the section 4.3
QA/QC procedures to be applied	Every month these meter readings are jointly recorded by MSEDCL representative and plant personnel. The meters at the substation are the two-way meters and are in the custody of MSEDCL. Since the readings are taken at the point of supply of power to the grid, the transmission and distribution losses and the minimum reactive power consumption has already been taken into account.
Purpose of data	Calculation of baseline emissions
Calculation method	Described in Section 4.3
Comments	Not Applicable

Data / Parameter	EG Import,
Data unit	MWh
Description	Electricity imported from the grid by the project activity in year y.
Source of data	Monthly certificates issued by MSEDCL (Credit Note)
Description of measurement methods and procedures to be applied	The Energy received at the wind farm will be metered and measured by MSEDCL on monthly basis at the sending end sub-station of the Wind Farm.
Frequency of monitoring/recording	Continuous monitoring and Monthly recording.
Value applied	To be applied on actual
Monitoring equipment	The Energy Meters of accuracy class 0.2s has been used to measure the electricity imported (at substation) and same is being apportioned by MSEDCL to calculate electricity imported by the project activity. Details of energy meters are included under the monitoring plan, under the section 4.3
QA/QC procedures to be applied	Every month these meter readings are jointly recorded by MSEDCL representative and plant personnel. The meters at the substation are the two-way meters and are in the custody of MSEDCL. Since the readings are taken at the point of supply of power to the grid, the transmission and distribution losses and the minimum reactive

	power consumption has already been taken into account.
Purpose of data	Calculation of baseline emissions
Calculation method	Described in Section 4.3
Comments	Not Applicable

4.3 Monitoring Plan

Monitoring Plan has been proposed as prescribed under the registered PD (with the consideration of deviations as described under the section 2.4 above). Also, as the renewal crediting period applies the latest version of the Methodology (i.e. ACM0002 version 17), hence monitoring of emission reductions are also comply with the requirements of the methodology.

The monitoring includes collection, monitoring, recording, reporting and archiving of data. The applied methodology requires monitoring of net electricity supplied to the grid. The values of grid emission factors are fixed ex-ante and remain same throughout the crediting period.

a) Purpose of monitoring: The main purpose of the monitoring is to check the electricity exported to the Indian grid from the project under consideration.

b) Types of data and information to be reported, including units of measurement EG_y (Net electricity supplied to the grid by the Project)

c) Origin of the data: Electricity supplied by the project activity to the grid as per energy generation certificates given by Maharashtra State Electricity Distribution Co. Ltd (MSEDCL)

d) Monitoring, modelling, measurement or calculation approaches:

- Measurement or Calculation Approaches:
 - As per registered VCS PD, the generated electricity is measured through a two step procedure wherein the first metering is carried out at the controller of the machine with on-board meter. The monitoring of all these wind turbines is done from a 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, Wind World India Limited, are always present on site to monitor various parameters of power generation and deal with any problems related to generation, transmission or maintenance. $EG_{gross, y}$ is the electricity generated from an individual wind turbine measured through its panel meter.

The summation of total Electricity exported and imported from wind turbine of the project proponent from individual meters (panel meter) in MWh is presented as:

$$\sum EG_{gross\ export, y} \text{ and } EG_{gross\ import, y}$$

And the summation of total Electricity exported and imported (panel data) from the other wind turbines attached to the common MSEDCL meter at the sub-station in MWh is presented as:

$$\sum EG_{\text{total import}} \text{ and } EG_{\text{total export}}$$

A ratio based on these two set of measured values would be used for apportioning the net electricity supplied to the Indian grid by the project activity. The second metering is carried out at grid interconnection point (substation) wherein the Joint Meter Reading (JMR) is carried out on last day 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" ($EG_{\text{JMR,export}}$) and "import" ($EG_{\text{JMR,import}}$) of the electricity to/ from the Indian grid. There is a single meter which gives both the export and import values, this metered reading would give value net of line losses and auxiliary consumption. Further, as there is a common MSEDCL joint meter for multiple project proponents, the joint meter reading (JMR) is taken every month by MSEDCL personnel reflects the cumulative monthly generation for all wind turbines connected to this MSEDCL meter. The apportioning of electricity generated from the various wind turbines is done by WWIL, based on the power generation from the individual wind turbines connected to this MSEDCL meter. O&M personnel from WWIL prepare a monthly report on generation and consumption. This report contains details of power exported/imported to/from the grid by each of the wind turbines connected. This apportioned value is then used by the project proponent to raise invoice from MSEDCL.

Deviation inclusion:

In the last monitoring period verification of the first crediting period, the parameter EG_{Gross} has not been considered similar to the previous verifications⁹, because now the credit breakup is used as source for taking the values of EG_{export} & EG_{import} , the credit breakup is issued on monthly basis & is authorized by MSEDCL.

There is no requirement of apportioning of EG_{export} & EG_{import} to be done by PP, as it is done by MSEDCL & a credit breakup is issued.

⁹ A deviation was sought and had been approved. Please refer to third verification report of project (for the period from 01/10/2010 to 30/11/2011) activity at following weblink:
<https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=2&i=489&lat=17.554167&lon=73.924444&bp=1>)

EG_{export} the electricity exported to the grid by the project activity was previously calculated as follows:

$$EG_{\text{export}} = \frac{EG_{\text{JMR, export}} \times \sum^n EG_{\text{gross export, y}}}{(\sum^n EG_{\text{gross export, y}} + \sum^n EG_{\text{total export, y}})}$$

EG_{import} the electricity drawn from the grid by the project activity is calculated as follows:

$$EG_{\text{import}} = \frac{EG_{\text{JMR, import}} \times \sum^n EG_{\text{gross import, y}}}{(\sum^n EG_{\text{gross import, y}} + \sum^n EG_{\text{total import, y}})}$$

From third monitoring period (i.e. from 01/10/2010 to 30/11/2011) of the first crediting Period, the deviation has been taken as the values of EG_{export} & EG_{import} are available in the Credit Breakup given by MSEDCL, so from the breakup sheet the values will be sourced & the net electricity supplied to grid will be calculated as the difference between Electricity Exported & Electricity Imported.

EG_y , the net electricity supplied to the grid by the project activity, is calculated as follows:

$$EG_y = EG_{\text{export}} - EG_{\text{import}}$$

The meters located at the grid sub-station are sealed, maintained and calibrated by the state electricity utility. The meters are tested and maintained as per the Metering Code for Maharashtra. Additionally, each wind turbine is equipped with an integrated electronic meter. The electricity generated is recorded 24 hours.

Net electricity supplied to the grid will be measured by the two-way trivector meter.

The Net electricity is recorded as following:

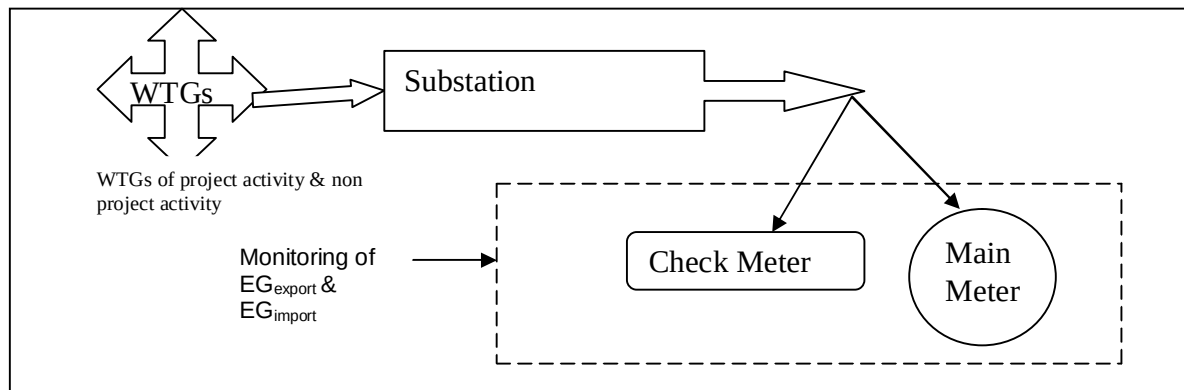
$$(\text{Net Electricity} = \text{Total Export} - \text{Total Import})$$

The procedures for metering and meter reading will be as per the provisions of the power purchase agreement signed between PPs and MSEDCL.

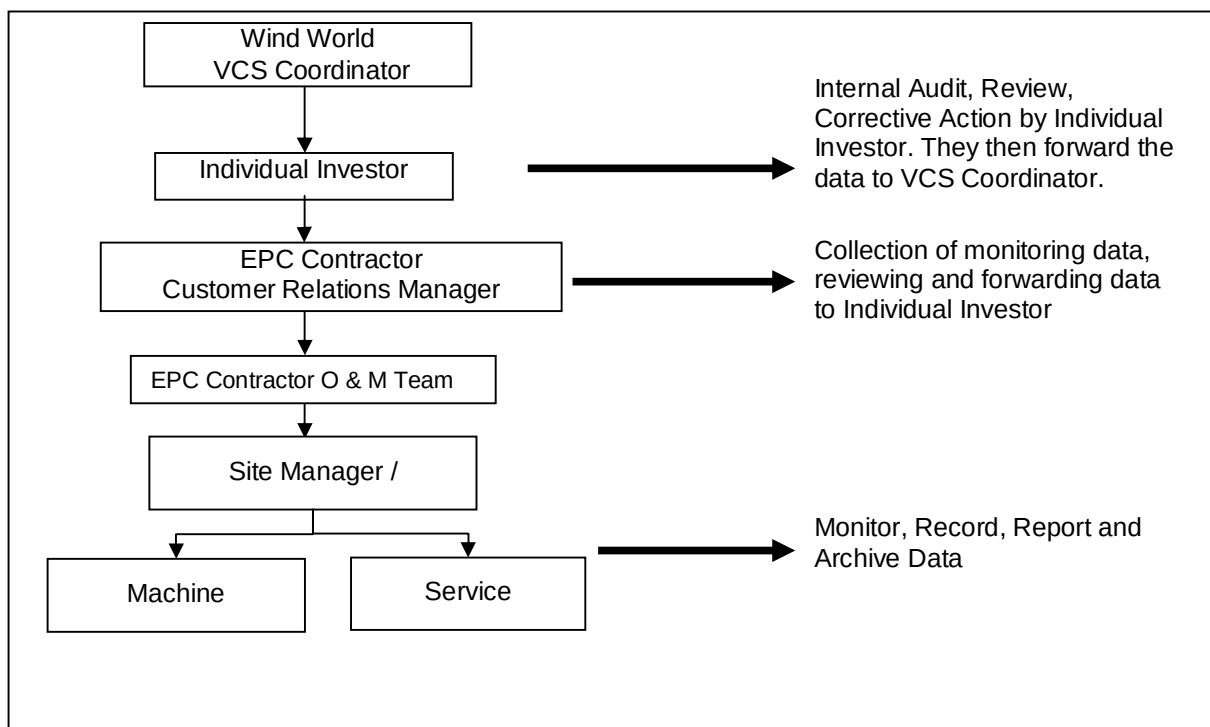
e) Monitoring times and periods, considering the needs of intended users: The Net electricity supplied to the grid is recorded monthly by taking a Joint Meter Reading (JMR) in the presence of officials from off-taking Utility (MSEDCL) and Wind World as O&M contractor, on behalf of project sponsor. The Joint meter reading contains the value of energy imported and exported and the net export to the grid

during the recording period. This Joint meter reading is certified by the Executive engineer of utility and by Wind World Officials.

f) Monitoring roles and responsibilities: The sole parameter for monitoring is the electricity supplied to the grid. The Project is operated and managed by Wind World (India) Ltd. The GHG collection diagram is as follows:



The operational and management structure implemented by Wind World is as follows:



Wind World India limited follows an ISO 9001:2008 certified Quality Management system. Wind World India limited follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance,

construction, commissioning and operation of the wind power project. Adhering to the calibration and testing procedure as described in Power Purchase Agreement ensures the accuracy of monitoring parameter. The project adheres to all the mandatory regulatory and statutory requirements at the state as well as national level.

g) Managing Data Quality:

Data management is as per the ISO certification standards.

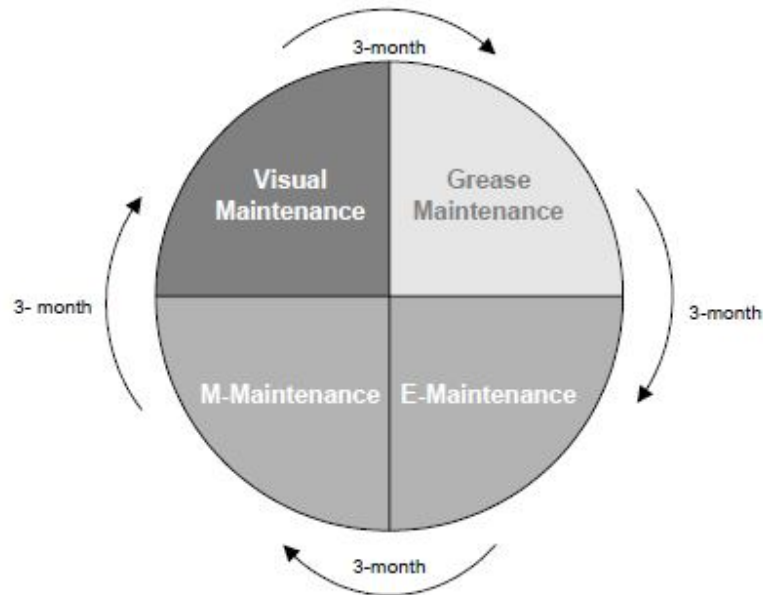
- ✓ The data collection is ongoing process. The Net electricity supplied to the grid is recorded monthly by taking a Joint Meter Reading (JMR) in the presence of officials from MSEDCL and Wind World as O&M contractor, on behalf of project sponsor. This Joint meter reading is certified by the Executive engineer of utility and by Wind World Officials.
- ✓ Two-way meter will be calibrated on annual basis and as per the requirement stipulated by SEB. Project Head would be responsible for regular calibration of the meter. Regular calibration of meters ensures the accuracy of amount of electricity supplied to the grid.
- ✓ SCADA system connected to individual WTGs ensures continuous online monitoring of all WTGs.
- ✓ The net electricity supplied by individual customer's WTGs as mentioned in Credit Breakup given by MSEDCL can be cross-checked with invoices raised by customers to the MSEDCL.

h) Annual maintenance and major breakdown detail:-**Description of maintenance intervals:**

On project site there is a schedule for annual maintenance for the entire machine. There are four types of maintenance and machine has to stop for defined time period for maintenance as follows:

1. Visual maintenance : average 3 to 4 hr stop of WTG
2. Grease maintenance : average 3 to 4 hr stop of WTG
3. Electrical maintenance: average 16 to 20 hr stop of WTG
4. Mechanical maintenance: average 16 to 20 hr stop of WTG

Cycle for annual maintenance is according to following picture:

**Annual Maintenance cycle**

Maintenance comprises not only activities to determine and assess a wind turbine's actual state but also those to keep the system's nominal state. Repair work necessary to reconstruct the nominal state are not, however, part of these maintenance instructions.

The details of the calibration are mentioned in the table 4 below:

Table 4: Meter calibration detail

Sr. No	Customer Name	Individual Capacity	Site	Loc No.	Date of Commissioning	Feeder details	Meter Serial Number	Accuracy Class	Make	Status of Previous Calibrations		
1	G. B. Rubber Products	0.8	Kadvekhurd	1	14-Feb-06	-	04760188	0.2	E L S T E R	06-Jun-14	24-Apr-15	NA
2	G. B. Rubber Products	0.8	Kadvekhurd	2	14-Feb-06							
3	Shah Lulla Estate Developers	0.8	Kadvekhurd	4	14-Feb-06							
4	Atlas Tours & Travels Pvt. Ltd.	0.8	Kadvekhurd	5	7-Feb-06							
5	Liberty Oil Mills Ltd.	0.8	Kadvekhurd	6	7-Feb-06							
6	Liberty Oil Mills Ltd.	0.8	Kadvekhurd	7	7-Feb-06							
7	Liberty Oil Mills Ltd.	0.8	Kadvekhurd	8	7-Feb-06							
8	Liberty Oil Mills Ltd.	0.8	Varekarwadi	1	8-Feb-06	F-1	5269382	0.2	E L S T E R	25-Jun-14	19-Jun-15	NA
9	Liberty Oil Mills Ltd.	0.8	Varekarwadi	2	8-Feb-06							
10	Delta Enterprises	0.8	Bhambarwadi	19	15-Jun-06	F-1	16595516	0.2	E L S T E R	06-Dec-13	18-Dec-14	17-Mar-16
11	Paceman Sales Promotion P. Ltd.	0.8	Bhambarwadi	36	22-Mar-06							
12	Delta Enterprises	0.8	Bhambarwadi	37	22-Mar-06							
13	Delta Enterprises	0.8	Bhambarwadi	38	15-Jun-06							
14	Mahanagar Developers	0.8	Bhambarwadi	63	5-Jan-07							
15	Kishor Food Products P. Ltd.	0.8	Bhambarwadi	47	10-Dec-08	F-3	04862747	0.2	E L S T E R	06-Jan-14	18-Dec-14	17-Mar-16
16	Shreem Capacitors Pvt. Ltd.	0.8	Bhambarwadi	50	10-Dec-08							
17	Shreem Capacitors Pvt. Ltd.	0.8	Bhambarwadi	51	10-Dec-08							
18	Shreem Capacitors Pvt. Ltd.	0.8	Bhambarwadi	52	10-Dec-08							
19	Mahanagar Developers	0.8	Bhambarwadi	53	5-Mar-07							
20	Mahanagar Developers	0.8	Bhambarwadi	54	6-Mar-07							
21	Mahanagar Developers	0.8	Bhambarwadi	55	5-Jan-07							
22	Mahanagar Developers	0.8	Bhambarwadi	56	5-Jan-07							
23	Mahanagar Developers	0.8	Bhambarwadi	57	5-Jan-07							

24	Shreem Capacitors Pvt. Ltd.	0.8	Bhambarwadi	58	10-Dec-08							
25	Mahanagar Developers	0.8	Bhambarwadi	60	6-Mar-07							
26	Mahanagar Developers	0.8	Bhambarwadi	61	5-Jan-07							
27	Mahanagar Developers	0.8	Bhambarwadi	62	6-Mar-07							
28	Mr. P. L. Patel	0.8	Panchpatta	45	6-Feb-07	F-1	14831531	0.2	E L S T E R	19-Nov-13	02-Feb-15	05-Sep-15
29	Metalfab Hightech Private Limited	0.8	Panchpatta	46	6-Feb-07							
30	Panama Wind Energy Pvt. Ltd./D.J. Malpani	0.8	Panchpatta	47	30-Dec-06							
31	Panama Wind Energy Pvt. Ltd./D.J. Malpani	0.8	Panchpatta	48	30-Dec-06							
32	Gargi Construction Co. Pvt. Ltd.	0.8	Panchpatta	49	30-Dec-06							
33	Gargi Construction Co. Pvt. Ltd.	0.8	Panchpatta	50	30-Dec-06							
34	International Conveyors Ltd.	0.8	Panchpatta	51	30-Dec-06							
35	Elpro International	0.8	Panchpatta	52	30-Dec-06							
36	Mohite & Mohite	0.8	Panchpatta	59	30-Dec-06							
37	Mohite & Mohite	0.8	Panchpatta	60	30-Dec-06							
38	Mohite & Mohite	0.8	Panchpatta	61	30-Dec-06							
39	Welpack Industries Ltd.	0.8	Panchpatta	29	28-Feb-07	F-4	14831520	0.2	E L S T E R	19-Nov-13	07-Mar-15	05-Sep-15
40	Mahanagar Developers	0.8	Panchpatta	30	28-Feb-07							
41	Prachar Energy	0.8	Panchpatta	31	3-Mar-07							
42	Prachar Energy	0.8	Panchpatta	32	3-Mar-07							
43	Indiana Engineering Works (Bombay) P. Ltd.	0.8	Panchpatta	33	3-Mar-07							
44	Indiana Engineering Works (Bombay) P. Ltd.	0.8	Panchpatta	34	3-Mar-07							
45	Sahyadri Industries Ltd.	0.8	Panchpatta	74	27-Jan-07	F-5	14831522	0.2	E L S	16-Jan-14	02-Feb-15	28-Aug-15
46	Sahyadri Industries Ltd.	0.8	Panchpatta	75	27-Jan-07							

									T E R			
47	Sunilkumar Ramanlal Shah	0.8	Panchpatta	77	30-Mar-08	F-6	14831533	0.2	E L S T E R	19-Nov-13	02-Feb-15	28-Aug-15
48	Mr. V. L. Patel	0.8	Panchpatta	76	29-Mar-07							
49	Mr. V. V. Patel	0.8	Panchpatta	80	31-Mar-07							
50	M/s Laxmi Narayan	0.8	Panchpatta	81	29-Mar-07							
51	Om Shanti Wind Farms P. Ltd.	0.8	Aundhewadi	82	31-Mar-07							
52	Mr. J. V. Patel	0.8	Panchpatta	83	29-Mar-07							
53	Mr. C. P. Patel	0.8	Panchpatta	84	31-Mar-07							
54	Mr. S. V. Patel	0.8	Panchpatta	94	29-Mar-07							
55	Mr. J. P. Patel	0.8	Panchpatta	95	29-Mar-07							

5 SAFEGUARDS

5.1 No Net Harm

Not applicable for the project activity.

5.2 Environmental Impact

As demonstrated in the Registered VCS PD, the Schedule 1 of the EIA notification dated 14th September 2006 (<http://envfor.nic.in/legis/eia/eia-2006.htm>), given by the Ministry of Environment and Forests (Government of India) under the Environment (Protection) Act 1986, EIA is not a regulatory requirement in India for wind energy projects.

Thus, Environmental Impact Assessment (EIA) of this project was/is not an essential regulatory requirement. However, WWIL voluntarily conducted an EIA to study impacts on the environment resulting from the project activity, thereby ensuring a sustainable development of the project. WWIL appointed M/s CARE Sustainability Pvt. Ltd. to conduct a Rapid EIA in the Districts of Satara, Sangli, Nashik and Ahmadnagar where the project is located, to assess the impact of the project on the local environment.

This description had already been included in the registered VCS PD. The same is being discussed below for transparency:

The EIA study included identification, prediction and evaluation of potential impacts of the Project activities on air, water, noise, land, biological and socio-economic environment within the study area. The ambient air concentrations of Suspended Particulate Matter, Respirable Particulate Matter, Oxides of Nitrogen, Sulphur dioxide and Carbon Monoxide were monitored and were found under limits as specified by Central Pollution Control Board (CPCB), India. The noise levels were observed throughout the study period and were found to be in the permissible range as specified by the state pollution control board and National Ambient Air Quality Standards. Water quality monitoring studies were carried out for determination of physico-chemical characteristics of bore wells. The pH level for groundwater was found to be between 6.4 – 7.5 indicating alkaline nature and surface water (6.8 – 7.8) which was found to be in specified limits.

The study area represents part of Sangli, Nasik, Ahmednagar and Satara district in Maharashtra. The terrain comprises hilly areas which are sparingly populated, the hills are generally covered with shrubs and grass and trees are not found on the hilltops. Moreover the project area doesn't fall under any protected land for wildlife and it has no adverse ecological impacts on the surroundings, flora and fauna found in the vicinity of the project area. The wind-farms do not affect the path of migratory birds.

5.3 Local Stakeholder Consultation

Before starting of the VCS project activity, a stakeholders' consultation had been conducted in the project site. There were no negative comments or resistance to the project activity, whereas project activity was supported by the local people.

The details of local stakeholders' consultation had been already reported in the section 6 & Annex 1 of the registered VCS PD.

5.4 Public Comments

Not applicable for the project activity.

APPENDIX I : Baseline Emission factor

Baseline Emission factor has been calculated as Combined margin emission factor of Indian grid.

CEA database, Version 11, April 2016 has been used for calculation. CEA has estimated the simple operating margin and build margin emission factors for the unified Indian grid. For calculating the CO₂ emission factor as per combined margin method for the second crediting period, the weights of 0.75 for operating margin and 0.25 for build margin are considered as per 'Tool to calculate the emission factor for an electricity system (Version 05.0)'. The details are provided below:

Simple Operating Margin (tCO₂/MWh) (incl. Imports) (1) (2)			
	2012-13	2013-14	2014-15
Indian Grid	0.9922	1.0002	0.9903

Net Generation in Operating Margin (MWh)			
	2012-13	2013-14	2014-15
Indian Grid	697.187	721.632	808.417

Build Margin (tCO₂/MWh) (not adjusted for imports)			
	2012-13	2013-14	2014-15
Indian Grid	0.9739	0.9521	0.9285

Operating Margin (OM) - weighted average	
Indian Grid	0.9941

Combined Margin EF		
		Indian Grid
	Weights	tCO ₂ e/MWh
Operating Margin	0.75	0.9941
Build Margin	0.25	0.9285
Combined Margin		0.9777