WIND POWER PROJECT IN MAHARASHTRA, INDIA – ANDHRA LAKE PHASE - I

Document Prepared by CLP Wind Farms (India) Private Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Project

CLP Wind Farms (India) Private Limited (CLPWF), now onwards referred as the Project Proponent (PP), has developed a green-field wind-based electricity generation project at Andhra Lake, Pune District, in the State of Maharashtra.

The Project involved installation of 70 number of Wind World (India) Limited (formerly Enercon (India) Limited) make E-53 Wind Turbine Generators (WTGs) to generate electrical power for export to the distribution licensee. In the baseline scenario, the similar quantum of electricity would have been generated by the operation of grid connected power plants and by the addition of new generation sources that would have led to emission of Green House Gases (GHGs). The electricity generated from the wind farm exported to the Integrated Indian electricity grid. Distribution licensee thereby marginally contributing towards reduction in the energy demand supply gap in the state of Maharashtra, diversification of grid supply and reduction of greenhouse gas emissions. Initially, the Indian electricity system is divided into two regional grids, the synchronous Northern, Eastern, Western, and North Eastern (NEWNE) grid and the Southern grid. Each grid covers several states. However, Govt. of India has decided to integrate all the regional grid systems and thus, regional grids are not existed now. Thus, now the project activity is connected to Integrated Indian Grid system.

Technology

The project uses Wind World India Ltd"s wind energy technology. The project activity implements E-53 model of 0.8 MW WEGs. The specification for the WTGs is provided in section 1.11.

Project Boundary:

The Indian electricity system is an integrated grid system now which encompasses all regional grids, viz Northern, Eastern, Western, and North Eastern (NEWNE) grid and the Southern grid (SR Grid). Each grid covers several states. The project activity is connected to Integrated Indian Grid and this has been considered as the project boundary.

Baseline Scenario:

In accordance with ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system” (version 07).

The project activity involves installation of wind power plant at locations where no renewable power plant was operated prior to the implementation of the project activity (green-field plant). Hence, pre-project scenario and baseline scenario are the same.

The project will replace anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 82,885 tCO2e per year, thereon displacing 82,885 MWh/year amount of electricity from the generation-mix of power plants connected to the Indian electricity grid, which is mainly dominated by thermal/ fossil fuel based power plant.

Since project is undergoing crediting period renewal and verification, audit history of the project is provided below:

Audit Type	Period	Program	VVB Name	Number of years
Validation/ Verification	19/08/2011 – 30/07/2013	VCS	Bureau Veritas Certification Holding SAS	1 year, 11 months
Verification	31/07/2013 – 31/05/2017	VCS	Earthood Services Private Limited	3 years, 10 months
Verification	01/06/2017 to 31/12/2018	VCS	Earthood Services Private Limited	1 year, 7 months
Verification	01/01/2019 – 31/01/2020	VCS	LGAI Technological Center, S.A. (Applus+)	1 year, 1 month
Verification	01/02/2020 to 31/05/2021	VCS	Earthood Services Private Limited	1 year, 4 months
Verification	01/06/2021 to 18/08/2021	VCS	Earthood Services Private Limited	2 months
RCP and Verification	19/08/2021 to 30/09/2022	VCS	LGAI Technological Center, S.A. (Applus+)	1 year, 1 month
Total	19/08/2011 To 30/09/2022			11 years 1 month

1.2 Sectoral Scope and Project Type

According to the VCS list of sectoral scopes-1, the project activity may be categorized in: Scope Number: 1

Sectoral Scope: Energy (renewable/non-renewable)

Methodology: “Grid-connected electricity generation from renewable sources” Reference: ACM0002, Version 21

The project activity is not a grouped project.

1.3 Project Eligibility

In line with VCS Standard, the project shall be validated against the (current) scope of the VCS. Such validation report shall be issued after the end of the (previous) project crediting period but within two years after the end of the (previous) project crediting period. In this project activity, first Crediting Period of this registered project activity has been completed on 19-08-2021. This is the renewal of crediting period of existing registered project activity. Thus, this project is eligible under VCS Scheme.

1.4 Project Design

The Project Activity consists of a total of 56 MW wind power project consisting of 70 WEG of individual capacity 0.8 MW. The Project is using Wind World India Ltd (WWIL) make 0.8 MW E-53 WEG. The Project is fully commissioned and is supplying electricity to Indian Integrated Grid.

This project activity is not a grouped project.

Eligibility Criteria

The project does not consist of grouped projects. Hence, there is no requirement to identify eligibility criteria for inclusion of new instances of each project activity.

This project activity is not a grouped project.

1.5 Project Proponent

Organization name	CLP Wind Farms (India) Private Limited
Contact person	Navneet Kumar
Title	Head - Carbon & Sustainability
Address	7th Floor, Fulcrum, Sahar Road, Andheri (East), Mumbai – 400099, India
Telephone	+ 91-22 6758 8888

Email	carbon@clpindia.in

1.6 Other Entities Involved in the Project

Organization name	NA
Role in the project	NA
Contact person	NA
Title	NA
Address	NA
Telephone	NA
Email	NA

1.7 Ownership

CLP Wind Farms (India) Private Limited is the legal owner of project activity. The Project Activity consists of a total of 56 MW wind power project consisting of 70 WEG of individual capacity 0.8 MW. The Project is using Wind World India Ltd (WWIL) make 0.8 MW E-53 WEG. All the WTGs are owned by CLP Wind Farms (India) Private Limited. CLP Wind Farms (India) Private Limited is the sole owner of project activity, hence it possesses right of use of all emission reduction. Further the ownership is demonstrated through the following documents.

1) Commissioning certificates for the project WTGs in the name of CLP Wind Farms (India) Private Limited

2) Power Purchase Agreement between CLP Wind Farms (India) Private Limited and state utilities.

1.8 Project Start Date

The project start date for this project is 19/08/2011. This is the day on which the first WEG was commissioned under the Project activity.

1.9 Project Crediting Period

Project has begun generating GHG emission reductions from 19/08/2011. Hence, first crediting period for VCS begins on 19/08/2011 and ends on 18/08/2021 i.e., 10 years. This is the second crediting period of the project activity.

Start date of the second crediting period : 19/08/2021

End date of the second crediting period : 18/08/2031

Project crediting period : 10 years 0 months (renewable).

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	✓
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
19/08/2021 - 18/08/2022	82,885
19/08/2022 - 18/08/2023	82,885
19/08/2023 - 18/08/2024	82,885
19/08/2024 – 18/08/2025	82,885
19/08/2025 – 18/08/2026	82,885
19/08/2026 – 18/08/2027	82,885
19/08/2027 - 18/08/2028	82,885
19/08/2028 – 18/08/2029	82,885
19/08/2029 – 18/08/2030	82,885
19/08/2030 – 18/08/2031	82,885
Total estimated ERs	830,520
Total number of crediting years	**10**
Average annual ERs	**82,885**

1.11 Description of the Project Activity

The Project activity envisages implementation of a 56 MW wind power project consisting of 70 Wind Electric Generators (WEGs) of individual capacity 0.8 MW in Maharashtra state of India by CLP Wind Farms (India) Private Limited.

The electricity generated by the Project exported to the Indian electricity grid. The Project will therefore displace an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid. The Project Proponent plans to avail the VCS benefits for the Project.

The Project activity is in line with the sustainable development priorities of the country. The electricity generated from the wind farm exported to the Indian grid and sold to the state electricity utility, thereby marginally contributing to reducing the energy demand supply gap in the state of Maharashtra.

Technology

The project uses Wind World India Ltd"s wind energy technology. The project activity implements E-53 model of 0.8 MW WEGs.

The technical details for the WEG is as follows:

Turbine model	WWIL E- 53
Rated power	0.8 MW
Rotor diameter	52.9 m
Hub height	74 m
Turbine Type	Gearless, variable speed, variable pitch control
Power regulation	Independent electromechanical pitch system for each blade.
Cut in wind speed	3 *m/s*
Rated wind speed	12.6 *m/s*
Cut out Wind speed	24-28 m/s
Rated rotational speed	32 rpm
Operating range rot. speed	12-29 rpm
Orientation	Upwind
No of Blades	3
Blade Material	Fibre Glass Epoxy reinforced with integral lightning protection
Gear box type	Gear less
Generator type	Synchronous generator
Braking	Aerodynamic
Output Voltage	400 V
Tower	74 m concrete

No events or situations happened during the reported monitoring period which can alter the applicability of the applied methodology.

1.12 Project Location

The Project activity is located in the Khed and Maval taluk of Pune district in Maharashtra. The nearest airport and railway station are Pune city. The coordinates of individual WEGs of this site are as below:

Sr. No.	Location No.	Date of WEG commissioning	Latitude (N)			Longitude (E)		
			Deg.	Minutes	Second	Deg.	Minutes	Second
1	141	19/08/2011	18	56	54.2	73	39	18.0
2	140	19/08/2011	18	56	57.0	73	39	10.6
3	139	19/08/2011	18	57	1.4	73	39	2.6
4	138	19/08/2011	18	57	3.9	73	38	54.6
5	137	19/08/2011	18	57	8.2	73	38	42.1
6	136	19/08/2011	18	57	9.6	73	38	33.4
7	135	19/08/2011	18	57	16.4	73	38	32.4
8	134	19/08/2011	18	57	21.9	73	38	28.8
9	133	19/08/2011	18	57	26.6	73	38	26.3
10	132	19/08/2011	18	57	31.3	73	38	23.3
11	131	19/08/2011	18	57	37.0	73	38	21.6
12	130	19/08/2011	18	57	41.0	73	38	19.2
13	129	19/08/2011	18	57	46.4	73	38	15.9
14	128	19/08/2011	18	57	51.6	73	38	14.9
15	127	19/08/2011	18	57	56.9	73	38	15.9
16	48	19/08/2011	18	53	46.1	73	35	48.3
17	49	19/08/2011	18	53	49.5	73	35	45.0
18	50	19/08/2011	18	53	54.4	73	35	41.9
19	53	19/08/2011	18	54	10.6	73	35	25.9
20	54	19/08/2011	18	54	8.3	73	35	39.2
21	55	19/08/2011	18	54	16.7	73	35	35.2
22	56	19/08/2011	18	54	20.4	73	35	31.1
23	57	19/08/2011	18	54	27.4	73	35	26.5
24	58	19/08/2011	18	54	32.6	73	35	26.5
25	59	19/08/2011	18	54	41.7	73	35	21.2
26	60	19/08/2011	18	54	45.9	73	35	17.3
27	62	19/08/2011	18	54	54.3	73	35	12.2

Sr. No.	Location No.	Date of WEG commissioning	Latitude (N)			Longitude (E)		
			Deg.	Minutes	Second	Deg.	Minutes	Second
28	65	19/08/2011	18	55	9.8	73	35	6.7
29	66	19/08/2011	18	55	14.6	73	35	5.6
30	67	19/08/2011	18	55	17.3	73	34	49.7
31	68	19/08/2011	18	55	24.5	73	34	54.5
32	70	19/08/2011	18	55	36.0	73	34	26.1
33	71	19/08/2011	18	55	40.5	73	34	20.6
34	72	19/08/2011	18	55	43.0	73	34	15.0
35	98	19/08/2011	18	58	12.0	73	31	54.2
36	99	19/08/2011	18	58	17.6	73	31	51.3
37	100	19/08/2011	18	58	21.7	73	31	47.0
38	101	19/08/2011	18	58	27.0	73	31	45.0
39	102	19/08/2011	18	58	31.	73	31	42.3
40	103	19/08/2011	18	58	36.0	73	31	42.1
41	104	19/08/2011	18	58	42.1	73	31	42.1
42	105	19/08/2011	18	58	45.5	73	31	41.9
43	506	19/08/2011	18	58	55.5	73	31	50.4
44	106	19/08/2011	18	58	50.3	73	31	43.8
45	73	18/10/2011	18	55	51.2	73	34	16.1
46	74	18/10/2011	18	55	57.1	73	34	13.1
47	75	18/10/2011	18	56	1.0	73	34	7.6
48	77	18/10/2011	18	56	16.9	73	33	47.9
49	78	18/10/2011	18	56	19.9	73	33	46.1
50	79	18/10/2011	18	56	26.7	73	33	45.5
51	80	18/10/2011	18	56	31.7	73	33	43.7
52	82	18/10/2011	18	56	45.2	73	33	0.9
53	84	18/10/2011	18	56	56.5	73	32	57.5
54	85	18/10/2011	18	56	59.6	73	32	53.6
55	63	31/10/2011	18	54	59.9	73	35	10.0
56	64	31/10/2011	18	55	4.9	73	35	8.1
57	69	31/10/2011	18	55	30.5	73	34	53.9
58	88	31/10/2011	18	57	41	73	38	19.2

Sr. No.	Location No.	Date of WEG commissioning	Latitude (N)			Longitude (E)		
			Deg.	Minutes	Second	Deg.	Minutes	Second
59	51	28/12/2011	18	53	59.1	73	35	37.7
60	52	28/12/2011	18	54	4.0	73	35	33.7
61	61	28/12/2011	18	54	48.9	73	35	15.5
62	76	28/12/2011	18	57	21.9	73	38	28.8
63	83	28/12/2011	18	56	51.0	73	33	0.1
64	86	28/12/2011	18	57	9.6	73	38	33.4
65	87	28/12/2011	18	57	6.2	73	32	40.6
66	89	28/12/2011	18	57	14.8	73	32	27.1
67	90	28/12/2011	18	57	22.7	73	32	26.3
68	91	28/12/2011	18	57	29.3	73	32	27.5
69	92	28/12/2011	18	57	33.9	73	32	26.2
70	93	28/12/2011	18	57	38.4	73	32	20.1

The Location no. 127-141 are connected to feeder 4, Location no. 48-72 are connected to feeder 6, Location no. 73-80 & 82-89 are connected to feeder 7 and Location no. 90-93, 98-100, 101-106 & 506 are connected to feeder 8.

1.13 Conditions Prior to Project Initiation

The project activity is a greenfield electricity generation project utilizing kinetic energy of wind for generation and sale of electricity to the Integrated Indian Grid under Power Purchase Agreements. Therefore, the project activity reduces GHG emissions by displacing an equivalent amount of electricity that would have been generated by power plants already operational and proposed to be added to the grid, which relies predominantly on fossil fuels. The project activity has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction.

In accordance with ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (version 7).

The project activity involves installation of wind power plant at locations where no renewable power plant was operated prior to the implementation of the project activity (green-field plant).

Hence, pre-project scenario and baseline scenario are the same. further details of baseline scenario is described in Section 3.4

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Indian power sector was primarily dominated by the public sector and was regulated by the Electricity (Supply) Act, 1948 until the amendment of the act in 1991 to create the provision for private generating companies to setup projects. This was replaced by the Electricity Act, 2003 which is the applicable regulation for the project activity. However, the Electricity Act, 2003 did not provide any incentive to less GHG-intensive technologies.

The implementation of project activity is a voluntary initiative and it is not mandatory or a legal requirement. For power generation, the Electricity Act, 2003 does not restrict or empower any authority to restrict the fuel choice, the applicable environmental regulations do not restrict the use of wind energy and there is no legal requirement on the choice of a particular technology.

The Project has received necessary approvals for development and commissioning for wind project from the state nodal agencies and is in compliance to the local laws and regulations. The Project activity conforms to all the applicable laws and regulations in India, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. The project activity comes under white category, thus there shall be no necessity of obtaining the Consent to Operate'' for White category of industries. Since project activity falls under white category and the non-polluting nature of project fulfils the compliance to the local laws and regulations.

The relevant national laws and regulations pertaining to generation of energy in India are:

Electricity Act 2003

National Electricity Policy 2005

Tariff Policy 2006

MERC Regulations Codes (https://merc.gov.in/existing-regulations)

The Project activity conforms to all the applicable laws and regulations in India:

- *Power generation using renewable energy is not a legal requirement or a mandatory option*
- *There are state and sectoral policies, framed primarily to encourage Renewable power projects*
- *These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments*
- *The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation*

- *There is no legal requirement on the choice of a particular technology for power generation*

Thus, the project is in compliance with laws and regulations required. There is no mandatory requirement to implement the project activity. Thus, the present national and/or sectoral policies and circumstances toward installation of any electricity generation is similar compared to at the time of project registration. Thus, baseline of this project has not changed.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has participated as CDM projects titled "Wind power project in Maharashtra, India – Andhra Lake Phase - I" and UNFCCC No: 6882. The project link is:

https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1343392693.61/view.

However, CLPWFPL has not claimed any CERs from the CDM project activity from project registration to till date. CLPWFPL has claimed the carbon credits from only one GHG programme during a monitoring period which would ensure that there will be no double counting of emission reductions. Further, carbon credits would be claimed only from one GHG programme which will ensure that there will be no double counting of emission reductions.

1.15.2 Projects Rejected by Other GHG Programs

The project activity has been registered under CDM. Apart from CDM, it has neither applied nor been rejected under any other GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The host country regulations do not require the project proponent to comply with any emissions trading program or meet any binding limits on GHG emissions.

1.16.2 Other Forms of Environmental Credit

The project proponent neither has nor intends to generate any other form of GHG-related environmental credit under CDM or any other program for GHG emission reductions claimed under the VCS Program for this particular project activity.

1.16.3 Supply Chain (Scope 3) Emissions

The project activity is a registered Wind Power Project. Hence supply chain (scope 3) emissions are not applicable.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

The project is already registered with VCS and currently undergoing renewable of crediting period (RCP) and verification. The contribution of this project activity in terms of following four indicators of sustainable development as stipulated by the National CDM Authority (NCDMA) of India is provided below:

Social wellbeing:

Since, the project activity is in a rural area, it will aid in the development of the region by generating direct and indirect employment opportunities for the local people. The project activity will also cause development of infrastructure like roads which will benefit the population in the nearby areas.

Economical wellbeing:

The project has created a business opportunity for local stakeholders such as suppliers, manufacturers, contractors etc. Use of wind as a source of energy reduces the dependence on imported fossil fuels like coal and associated price variation thereby leading to increased energy security. It will also narrow the existing electricity supply gap in the State of Maharashtra as well as India.

Environmental wellbeing:

Since, the project uses renewable source for power generation; it does not lead to any greenhouse gas emission. Avoidance of fossil fuel consumption results in reduction of Sulpher oxides (SOx), Oxides of nitrates (NOx) and particulate matter emission thus avoiding air pollution. The project activity is a step towards environmental sustainability by preventing exploitation and depletion of a natural, finite and non-renewable resource (fossil fuels). Consumption of large quantities of water that is required in generation of electricity in current mix of power plants is avoided.

Technological wellbeing:

The technology leads to utilization of environmentally safe and sound technologies in power sector. The project harnesses wind power potential in the region and encourages setting up such projects in near future. Increased interest in wind energy projects will encourage Research & Development efforts by technology providers to develop more efficient and better equipment in future.

1.17.2 Sustainable Development Contributions Activity Monitoring

The project activity contributes towards sustainable development but PP does not monitor the sustainable development contributions. Hence, PP has not reported the SD contribution below:

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
Not Applicable	*Not Applicable*	*Not Applicable*	*Since PP did not monitor SDG activities during current or previous monitoring period, No SDG indicator and its impact has been reported.*	*Not Applicable*	*Not Applicable*

1.18 Additional Information Relevant to the Project

Leakage Management

As per the applied methodology ACM0002 Version 21.0.0, there is no possibility of leakage in the project activity.

Commercially Sensitive Information

There is no commercially sensitive information that has been excluded from the public version of the project description.

Further Information

There is no additional relevant information that has a bearing on the eligibility of the project, the net GHG emission reductions, or the quantification of the project's net GHG emission reductions.

2 SAFEGUARDS

2.1 No Net Harm

In line with Ministry of Environment Forest and Climate Change, Govt. of India, Environmental Impact Assessment (EIA) is not mandatory for wind energy project. However, as per CLP's internal governance system, EIA is mandatory for all projects. Thus, EIA has been conducted before project installation and found that this project does not have any negative environmental and socio-economic impacts. Thus, this is not applicable for this project activity.

2.2 Local Stakeholder Consultation

CLPWFPL had identified different stakeholders for its wind power project as per the different phases of Implementation. Separate stakeholder consultation was carried out for all the 3 phases. Following are the identified stakeholders,

a) Representatives from EIL now WWIL;

b) Employees of CLPWFPL;

c) Contractor of CLPWFPL;

d) Villagers from nearby villages

The stakeholders who would be affected directly/indirectly by the project implementation were identified and invited to a meeting though invitation letters for discussing the impacts of the entire 113.6 MW Project activity. The meeting was conducted on 19th February 2010 at Mouli Bunglow, Hotel Sheetal, Vadgaon-Urse Phata, Vadgaon, Pune for which invitation were sent out in advance on 1st February 2010. A record of the people attending the meeting was maintained and all comments from the stakeholders received during the meeting were recorded.

During the meetings the stakeholders emphasized that the project has not only provided employment but also significantly contributed to the infrastructure development likes good (puccha) roads. The stakeholders also expressed satisfaction that the project would help alleviating the power deficit currently being faced by the region.

No negative feedback was received from any of the stakeholders. All of them supported the initiative and appreciated the project proponent for carrying out such an activity in the region. Hence no comments warranting action from the project proponent were received.

This stakeholder consultation was conducted during registration of the project.

Since this is the joint renewal of crediting period and verification of the project activity, hence, additional local stakeholders' consultation details are not applicable in this project activity. Further, As a part of continuous feedback from stakeholders, along with the 3rd party O&M contractor, CLP has also appointed independent Asset Managers at every site. These assets managers are responsible for site supervision and continuous day-to-day interaction with the local stakeholders e.g. local villagers, local govt. authorities and others. Based on the local requirements, CLP has initiated several CSR/sustainable development activities in the project catchment area. Further, CLP has also placed a grievance register onsite where-in, the stakeholders can put down their request/complaint/requirements. Same is continuously monitored and appropriate action are also being taken by management. Furthermore, CLP has also placed a notice board on site to communicate any necessary information/updates to local stakeholders. CLP has found this two-way communication with local stakeholders is very effective towards sustainability of the project in long run. In both the project sites, CLP has not received any complaints from the stakeholders of the project. However, all the stakeholders of the project supported these projects for uninterrupted operations.

2.3 Environmental Impact

According to Indian regulations, the implementation of the wind project does not require an environmental impact assessment. The Ministry of Environment and Forests (Government of India) notification S.O. 1533 (E) dated September 14, 2006 regarding the requirement of Environment Impact Assessment (EIA) studies as per the Environment Protection Rule, 1986 (Published in the Gazette of India, Extraordinary, Part-II, and Section 3, Sub-section (ii) MINISTRY OF ENVIRONMENT AND FORESTS) states that any project developer in India needs to file an

application to the Ministry of Environment and Forests[1] (including a public hearing and an EIA) in case the proposed industry or project is listed in a predefined list. Wind power projects are not included in this list and thus an EIA is not required. Further, the project activity does not have any significant impact on the environment.

2.4 Public Comments

This activity is the renewal of crediting period of this project activity. Thus, this clause is not applicable.

2.5 AFOLU-Specific Safeguards

This section is not applicable.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The approved consolidated baseline and monitoring methodology ACM0002 (Version 21), has been used to determine the baseline emissions and emission reduction due to the project activity. The title of this baseline methodology is "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

The other UNFCCC documents referred are as below:

1. Tool for the demonstration and assessment of additionality (Version 07.0.0, EB 65)
2. Tool to calculate the emission factor for an electricity system (version 7)
3. Guidance on assessment of investment analysis (05, EB 62)
4. Guidelines on demonstration of and assessment of prior consideration of the CDM (Version 04, EB 62)

3.2 Applicability of Methodology

The methodology being applied for the said project, ACM0002 (Version 21), is applicable to renewable power generation projects. The said project is a wind based renewable energy project and is designed to export the power generated to the grid and is thus suitable for the said

[1] Ministry name is changed as "Ministry of Environment, Forest and climate change (MoEFCC)".Previously known as "Ministry of Environment and Forests" (MoEF)

methodology. This methodology has certain specific applicability criterion, which are stated and accordingly addressed below:

<table>
<tr><th>S.N.</th><th>Applicability conditions of ACM0002</th><th>Project under consideration</th></tr>
<tr><td>1.</td><td>This methodology is applicable to grid-connected renewable energy power generation project activities that:

1. Install a Greenfield power plant;

2. Involve a capacity addition to (an) existing plant(s);

3. Involve a retrofit of (an) existing operating plants/units;

4. Involve a rehabilitation of (an) existing plant(s)/unit(s); or

5. Involve a replacement of (an) existing plant(s).)/unit(s)</td><td>The project activity is installation of Wind power plant at locations where no renewable power plant was operated prior to the implementation of the project activity (green-field plant).

The proposed project activity is a Greenfield, grid connected renewable power project. The project activity uses renewable wind source to generate electricity that will be fed into the Indian grid.

In the absence of the project activity this power would have been produced by the current grid generation mix which is predominantly fossil fuel based, thus the project activity meets this criterion.</td></tr>
<tr><td>2.</td><td>In case the project activity involves the integration of a BESS, the methodology is applicable to grid-connected renewable energy power generation project activities that:
(a) Integrate BESS with a Greenfield power plant; (b) Integrate a BESS together with implementing a capacity addition to (an) existing solar photovoltaic or wind power plant(s)/unit(s);
(c) Integrate a BESS to (an) existing solar photovoltaic or wind power plant(s)/unit(s) without implementing any other changes to the existing plant(s);
(d) Integrate a BESS together with implementing a retrofit of (an) existing solar photovoltaic or wind power plant(s)/unit(s).

Table 2. Combinations of renewable energy technologies and mode of BESS applicable for integration
<table><tr><td>Renewable Energy</td><td>Solar</td><td>Other</td></tr></table></td><td>The proposed project activity involves the installation of a new greenfield wind power generation plant. Therefore, the project activity does not satisfying the said criteria.</td></tr>
</table>

S.N.	Applicability conditions of ACM0002	Project under consideration
	<table><tr><td>Technology Mode of installation of BESS</td><td>photovoltaic or wind</td><td>renewable technologies</td></tr><tr><td>BESS + (a) Greenfield plant(s)</td><td>Eligible</td><td>Eligible</td></tr><tr><td>BESS+ capacity addition to existing plant(s)</td><td>Eligible</td><td>Not eligible</td></tr><tr><td>BESS with no other changes to the existing plant(s)</td><td>Eligible</td><td>Not eligible</td></tr><tr><td>BESS + retrofit to existing plant(s)</td><td>Eligible</td><td>Not eligible</td></tr></table>	
3.	The methodology is applicable under the following conditions: (a) Hydro 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; (b) 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; (c) In case of Greenfield project activities applicable under paragraph 5 (a) above, the project participants shall demonstrate that the BESS was an integral part of the design of the renewable energy project activity (e.g. by referring to feasibility studies or investment decision documents); (d) The BESS should be charged with electricity generated from the associated renewable energy power plant(s). Only during exigencies may the BESS be charged with electricity from the grid or a fossil fuel electricity generator. In such cases, the	The proposed project activity involves the installation of a new greenfield wind power generation plant. Therefore, the project activity is satisfying the said criteria.

S.N.	*Applicability conditions of ACM0002*	*Project under consideration*
	corresponding GHG emissions shall be accounted for as project emissions following the requirements under section 5.4.4 below. The charging using the grid or using fossil fuel electricity generator should not amount to more than 2 per cent of the electricity generated by the project renewable energy plant during a monitoring period. During the time periods (e.g. week(s), months(s)) when the BESS consumes more than 2 per cent of the electricity for charging, the project participant shall not be entitled to issuance of the certified emission reductions for the concerned periods of the monitoring period.	
4.	In case of hydro power plants, one of the following conditions shall apply[2]: 1. The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or 2. The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (7), is greater than 4 W/m2; or 3. The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m^2; or 4. The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m^2, all of the following conditions shall apply: 1. The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m^2; 2. Water flow between reservoirs is not used	Not applicable as the proposed project activity involves electricity generation by installation of a wind power generation plant/unit. As the criteria are related to hydro power project, therefore, the said criteria are not applicable.

[2] Project participants wishing to undertake a hydroelectric project activity that results in a new reservoir or an increase in the volume of an existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

S.N.	*Applicability conditions of ACM0002*	*Project under consideration*
	by any other hydropower unit which is not a part of the project activity; 3. Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: 1. Lower than or equal to 15 MW; and 2. Less than 10 per cent of the total installed capacity of integrated hydro power project.	
5.	In the case of integrated hydro power projects, project proponent shall: 1. 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 2. 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 of five years prior to the implementation of the CDM project activity.	Not applicable as the proposed project activity involves electricity generation by installation of a wind power generation plant/unit. As the criteria are related to hydro power project, therefore, the said criteria are not applicable.
6.	The methodology is not applicable to: 1. 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; 2. Biomass fired power plants/units	The proposed project activity involves installation of a wind power plant. As the given criteria. are related to switching from fossil fuel and biomass fired power plants, therefore, the said criteria are not applicable.

S.N.	*Applicability conditions of ACM0002*	*Project under consideration*
7.	In the case of retrofits, rehabilitations, 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, that is 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 proposed project activity involves the installation of a new wind power plant. Hence, this is a greenfield project. Thus, criterion is not relevant to the project activity, thus, not applicable.
8.	In addition, the applicability conditions included in the tools referred to below apply.	Please refer tables below:

Tool to calculate the emission factor for an electricity system - Version 07.0 (EB 100, Annex 04)

Applicability Criteria	Project Case
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).	The project is a grid connected Greenfield wind power project and thus the tool is applicable.
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, two sub-options under the step 2 of the tool are available to the project participants, i.e. option II.a and option II.b. If option II.a is chosen, the conditions specified in "Appendix 1: 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 affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	Steps involved in calculation of Emission Factor are included below in section 4.1 as per the requirement of the tool.
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.	Project is located in non-Annex I country and hence the tool is applicable
Under this tool, the value applied to the CO2 emission factor of bio fuels is zero.	The project is a wind project and there is no involvement of biofuels

In light of the above discussion it can be stated that the present project activity is in compliance with the applicability condition stipulated in the approved consolidated baseline and monitoring methodology ACM0002, Version 21.

3.3 Project Boundary

According to ACM0002 for the baseline emission factor, the spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

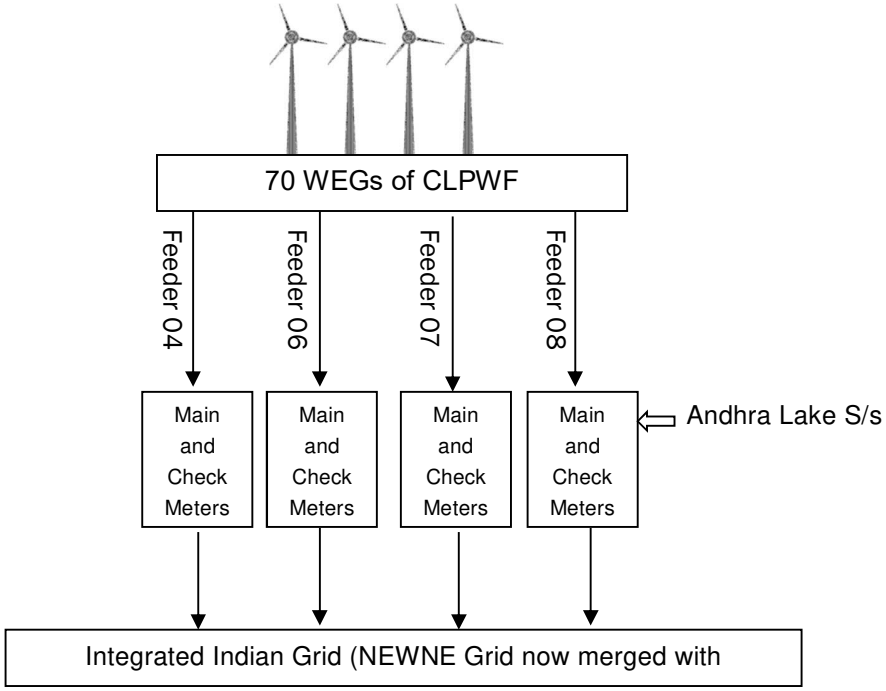
Initially, the Indian electricity system is divided into two regional grids, the synchronous Northern, Eastern, Western, and North Eastern (NEWNE) grid and the Southern grid (SR Grid). Each grid covers several states. However, Govt. of India has decided to integrate all the regional grid systems and thus, regional grids are not existed now. Thus, now the project activity is connected to Integrated Indian Grid and this has been considered as the project boundary.

Power generation and supply is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Depending on the demand and generation, there are electricity exports and imports between states in the Indian grid. A small power exchange also takes place with neighbouring countries like Bhutan and Nepal.

The project activity is located in the state of Maharashtra which is connected to the Integrated Indian Electricity Grid. The Electricity Grid represents the “electricity system” of the project. Accordingly, the project boundary encompasses the physical extent of the Integrated Indian grid which includes the project sites and all power plants connected physically to the electricity system.

Since the proposed project activity is a wind power project according to the methodology, the baseline emission sources are limited to the CO2 emissions from the power plants displaced by the project activity.

The flow diagram clearly demarcating the project boundary of the proposed project activity is as under:



Representation of the Project Boundary

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

	Source	Gas	Included?	Justification/Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	This is the main emission source because the combustion of fossil fuels for electricity generation leads to emission of CO2.
		CH_4	No	This is a minor emission source because the emission of CH4 from the combustion of fossil fuels is low.
		N_2O	No	This is a minor emission source because the emission of N2O from the combustion of fossil fuels is low.
Project	Electricity generation from the wind power Project	CO_2	No	Wind energy generation does not have any direct GHG emissions.
		CH_4	No	
		N_2O	No	

3.4 Baseline Scenario

The proposed project is located in the state of Maharashtra, which is a part of Integrated Electricity Grid of the Indian electricity system. Generated power from the project activity will be exported to the integrated Indian Electricity Grid. The proposed project activity is the installation

of a new wind power project and is not a modification/retrofit of an existing grid-connected renewable power plant/unit. Thus, the methodology ACM0002 Version 21 clearly states that if the proposed project activity is the installation of a new grid-connected renewable power unit/plant, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"

In the absence of the proposed VCS project activity the electricity delivered to the grid by the project would be generated in the future by the continued operation of grid-connected power plants and by the addition of new generation sources to meet the existing and future power requirement.

Accordingly, the baseline is all the generation sources connected to the Integrated Indian grid to which the power generated by the proposed project activity would be exported. This consists of the existing grid mix along with newly built additions to the grid and is calculated based on data published by the Central Electricity Authority, Government of India under the CO2 Baseline Database (Version 18.0)[3].

In line with the "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (EB66 Annex 47), the demonstration of the validity of the original baseline or its update does not require a reassessment of the baseline scenario, but rather an assessment of the emissions which would have been resulted from that scenario. The "CDM project standard for project activities" (Version 03.0) states in paragraph 284 that project participants shall assess and incorporate the impact of national and/or sectoral policies and circumstances existing at the time of requesting renewal of the crediting period, on the current baseline GHG emissions, without reassessing the baseline scenario.

As such and in accordance with above Tool and ACM0002 Version 21, the "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" is applied for the demonstration of the validity of the current baseline;

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

The validity of the current baseline is assessed using the following sub-steps:

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

The Project has received necessary approvals for development and commissioning for wind project from the state nodal agencies and is complying to the local laws and regulations. The Project activity conforms to all the applicable laws and regulations in India, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. The project activity comes under white category, thus there shall be no necessity of obtaining the Consent to Operate'' for White category of industries. Since project activity falls under white

[3] https://cea.nic.in/cdm-co2-baseline-database/?lang=en

category and the non-polluting nature of project fulfils the compliance to the local laws and regulations.

The relevant national laws and regulations pertaining to generation of energy in India are:

1. Electricity Act 2003
2. National Electricity Policy 2005
3. Tariff Policy 2006
4. MERC Regulations Codes (http://49.50.118.213/Regulations.htm)

The Project activity conforms to all the applicable laws and regulations in India:

1. Power generation using renewable energy is not a legal requirement or a mandatory option
2. There are state and sectoral policies, framed primarily to encourage Renewable power projects
3. These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments
4. The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation
5. There is no legal requirement on the choice of a particular technology for power generation

Thus, the project is in compliance with laws and regulations required. There is no mandatory requirement to implement the project activity. Thus, the present national and/or sectoral policies and circumstances toward installation of any electricity generation is similar compared to at the time of project registration. Thus, baseline of this project has not changed.

Step 1.2: Assess the impact of circumstances

An assessment of the impact of circumstances exists at the time of requesting renewal of the crediting period on the current baseline emissions has been conducted, without reassessing the baseline scenario. The emission factor for the Indian grid as well as the current grid matrix in the country has been revised. Accordingly, Baseline CO2 Emission Database, Version 18, published by Central Electricity Authority (CEA), Government of India has been used for estimation of baseline emissions.

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

Since the project activity is a Greenfield project with a life time of 20 years, the baseline scenario identified during the validation of the project was electricity generation in power plants which are connected to Indian Integrated grid, that are displaced due to the project activity and was not the continued use of the current equipment(s) or investment for the crediting period of which the renewal is being requested. Hence this sub step is not applicable for this project activity.

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

The emission factor for the grid as well as the current grid matrix in the country has been revised. Accordingly, Baseline CO2 Emission Database, Version 18, published by Central Electricity Authority (CEA), Government of India has been used for estimation of baseline emissions.

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

As a result of Step 1.4 above, this Step 2 is applied.

Step 2.1: Update the current baseline

Based on the latest approved ACM0002 and the assessment results of Steps 1.1, 1.2 and 1.4 above, the current baseline has been updated.

Step 2.2: Update the data and parameters

In line with Step 1.4, the following data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are updated according to relevant data sources listed in table below. All parameters regarding the grid emission factor are updated in the second crediting period. These data and parameters are applied to calculate the grid emission factors are described under section B.6.2 as well as described below;

As per the approved consolidated Methodology ACM0002 (Version 21) para 22:

"If the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

The project activity involves setting up of wind project to harness the power of wind to produce electricity and supply to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the Indian grid, which is fed mainly by fossil fuel fired plants. In the absence of the project activity, the equivalent amount of power would have been drawn from the Indian grid. Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid.

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source[4] (where available) and made publicly available. Since the project activity is a new grid-connected power plant, the above stated baseline is applicable for the project. Further, as per paragraph 39, 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 are to be calculated as follows:

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

Where:

BE_y = Baseline emissions in year y; (t CO_2)

[4] http://cea.nic.in/tpeandce.html

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh)

$EG_{PJ,y}$ = $EG_{PJ,facility,y}$ (for Greenfield projects and as per paragraph 41 methodology ACM0002,(Version 21))

Where,

$EG_{PJ,facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

As per ACM0002 Version-21, The emission factor can be calculated in accordance with the procedure provided in the "Tool to calculate the emission factor for an electricity system", Version 7.0.

Following information would be used for the calculation of baseline emissions:

1. Net electricity supplied by the project activity to the grid in year y taken from monthly Energy Statement / Joint Meter Reading sheets

2. CO2 Baseline Database (Version- 18) published by Central Electricity Authority (CEA), Government of India under Baseline Carbon Dioxide Emissions from Power Sector

Sr. No.	Parameters	Unit	Value	Reference
1.	$EF_{grid,OM,y}$	tCO_2/MWh	0.9518	Operating margin CO_2 emission factor for the project electricity system. The value is calculated for year 2019-20, 2020-21 and 2021-22.
2.	$EF_{grid,BM,y}$	tCO_2/MWh	0.8687	Build margin CO_2 emission factor for the project electricity system. The value is calculated for year 2021-22
3.	$EF_{grid,CM,y}$	tCO/ MWh	0.9310	Combined margin CO2 emission factor for the project electricity system

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as

reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"

The Combined Margin has been calculated using the "Tool to calculate the emission factor for an electricity system" Version 07. The Operating Margin (OM) and Build Margin (BM) emission factors have been considered from the information (CO2 Baseline Database for the Indian Power Sector -Version 18.0) published by the Central Electricity Authority (CEA), Ministry of Power, Govt. of India which has been computed according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system", version 07. Considering the individual weightings assigned to the OM and the BM emission factors, the combined margin emission factor for the Integrated Indian Grid has been estimated at 0.9310 tCO2e/MWh.

3.5 Additionality

The additionality of the project is ascertained in line with the applicable guidance from the UNFCCC.

In accordance with the "Guidelines on the demonstration and assessment of prior consideration of the CDM" Version 04, CLPWF notified the National Clean Development Mechanism (CDM) Authority - India, the Host Party DNA and the UNFCCC Secretariat on 25th August 2009 in writing of the commencement of the Project activity and of their intention to seek CDM status for it. The PP has sentthe revised prior consideration forms on 13 February 2012 after splitting the project activity in three phases.

The start date for the Project is 16th of September 2009, the date on which Notice to Proceed (NTP) was issued by Project Participant to WWIL and thus made Project Participant financially committed towards the implementation of project. The Notice to proceed was issued post intimation to UNFCCC. Hence, prior consideration of CDM is demonstrated by Project Participant for this Project activity.

Further, the PP had also appointed a CDM consultant for the Project activity on 14th May 2009. Subsequently, the PDD development was initiated for the entire project of 113.6 MW. However, due to various delays in obtaining regulatory clearances, the PP decided to split the Project into various phases for the purpose of implementation and CDM registration. Later, on 5 April 2011, the DOE was appointed to conduct the validation of the first phase under CDM.

The additionality of the Project is ascertained in line with the applicable guidance from the UNFCCC. Accordingly, the decision 17/cp.7, paragraph 43 is consulted; which states a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in absence of registered CDM project activity.

The demonstration of the additionality of the said Project activity is being carried out in accordance with the additionality tool provided by the UNFCCC i.e. *"Tool for demonstration and assessment of Additionality"* Version 6.0.0, EB 65.

This tool provides a step-wise approach to demonstrate additionality, which is dealt with below:

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

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

Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity.

The proposed Project activity envisages the installation of 70 WTGs of Enercon make supplied and each WTG has a capacity of 800 kW. The total installed generation capacity of the Project activity is 56 MW. As the purpose of the Project activity is to generate electrical power to be fed to the grid, the following alternatives are considered:

Alternative 1: The proposed project activity not undertaken as a CDM project activity.

The PP could proceed with the implementation of the project without CDM benefits. The electricity produced from the renewable energy project would have been sold to the grid. This is in compliance with all applicable legal and regulatory requirements and can be a part of the baseline. However, the Project activity is not feasible without CDM revenues. This argument has been discussed in step 2 of the Additionality section.

Alternative 2: No proposed project activity and equivalent amount of energy would have been **produced by the grid electricity system through its currently running power plants and by new capacity addition to the grid i.e. Continuation of the present situation.**

The PP would have continued without investment in Project activity with usual business activities. The grid would continue with the fossil fuel based power projects and this would result in GHG emissions. Hence, the new capacity add-on from a fossil fuel based power plant is appropriate, realistic & credible baseline alternative for the project activity.

Outcome of Sub-step 1a: All the realistic alternatives for the project activity have been enlisted above.

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

The alternative(s) shall be in compliance with all applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. (This sub-step does not consider national and local policies that do not have legally-binding status.).

The relevant national laws and regulations pertaining to generation of energy in India are:

- Electricity Act 2003
- National Electricity Policy 2005
- Tariff Policy 2006

The Project activity conforms to all the applicable laws and regulations in India:

- Power generation using wind energy is not a legal requirement or a mandatory option. There are state and sectoral policies, framed primarily to encourage wind power projects. These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments.

- The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation.

- There is no legal requirement on the choice of a particular technology for power generation.

Outcome of Sub-step 1b: Hence, both the alternatives enlisted above are found to comply with the mandatory laws and regulations taking into account the enforcement of the legislations in the region or country and EB decisions on national and/or sectoral policies and regulations. Alternative 2 has been selected as the appropriate baseline alternative.

Step 2. Investment analysis

Determine whether the proposed project activity is economically or financially less attractive than atleast one other alternative, identified in step 1, without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, use the following sub-steps:

Sub-step 2a: Determine appropriate analysis method

The Project activity envisages to export the power to Integrated Indian grid and the revenues from the sale would be generated in accordance with the terms and tariffs established in the Power Purchase Agreement(PPA). Thus, simple cost analysis cannot be used as the analysis method as the sale of the units of generated electricity shall result in a revenue stream during the operations of the Project activity.

After eliminating Option I, the use of Benchmark analysis (Option III) is the method of analysis that has been selected as the most suitable method. This method determines the attractiveness of the project activity for the investors, as well as provides a measure of the viability of the investment to generate revenues during its operation, as compared with other avenues and investment options. Hence, theBenchmark analysis method is to be employed for analysis of the said project.

Sub-step 2b (Option III): Apply benchmark analysis

The investment analysis using Benchmark analysis (Option III) is determined to be the most accurate indicator of the financial attractiveness of the Project. Further, this method illustrates the evaluation of the Project by the Project Proponent before the decision to undertake the project was taken and management approval granted.

Internal Rate of Return (IRR) is one of the known financial indicators used by banks, financial institutions and project developers for making investment decisions. PP has hence identified Equity IRR as the financial indicator for the Project and carried out an investment analysis of the Project activity.

The benchmark has been determined in accordance with para 6(a) sub step 2b of the "Tool for demonstration and assessment of additionality" Version 6.0.0 i.e. *Government bond rates increased by a suitable risk premium to reflect private investment and / or project type*.

The cost of equity for the Project has been calculated using the Capital Asset Pricing Model (CAPM). As per CAPM, the cost of equity investment is the return of a risk-free security plus beta times the difference between the market return and the risk-free return.

While considering a new project, CAPM can provide the required rate of return that the project needs to yield, taking into account the volatility (risk) of the stock relative to the market (Beta). This required return on equity represents the cost of equity benchmark for the project.

The formula of CAPM is as follows:

$$R_i = R_f + \beta (R_m - R_f)$$

where:

R_i	Rate of return on equity;
R_f	Risk-free rate of return;
β	Beta or systematic risk for this type of equity investment coefficient reflecting the volatility (risk) of the stock relative to the market;
R_m	Expected market returns
$R_m - R_f$	Market risk premium;

"Guidelines on the Assessment of Investment Analysis" (EB 62, Annex 5), paragraph 13, states that "*In the cases of projects which could be developed by an entity other than the project participant, the benchmark should be based on parameters that are standard in the market."* Since the project activity could have been implemented by an entity other than the PP, the benchmark return on equity has been calculated taking values from publicly available and reliable data sources that are frequently used in investment analysis, namely the websites of Reserve Bank of India, Bombay Stock Exchange, Interest Rates on Central and State Government Dated Securities have been referred from Reserve bank of India records. Thus, all the data sources utilized for benchmark computation are publicly available and are values that are standard in the market.

Further, the "Guidelines on the Assessment of Investment Analysis" (EB 62, Annex 5, paragraph 15, states, "*If the benchmark is based on parameters that are standard in the market, the cost of equityshould be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors*". In line with this guidance, the cost of equity has been determined through option (b) by using the best financial practices in the country based on publicly available and reliable data sources which can be clearly validated by the DOE.

Risk free rate:

Risk free rate = 8.3698%

Note: The above value considered is average for a period of 12 months from August 2007 to July 2008 based on latest data available at the time of decision making i.e. Sep 2008 (Web Link: http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/86853.pdf)

Beta (β) Value:

The β in the CAPM equation helps to account for the systematic risk by quantifying the sensitivity of the stocks of the companies representing a particular project type/sector with the market returns. Thus, it incorporates the risk of a specific sector in the calculation of the cost of equity. The Beta value taken for this analysis is based on the beta values of the listed power companies engaged in similar business at the time of investment decision (16/09/2008) estimated by regressing monthly returns (from Sep 2003 to August 2008) on stock against local index BSE Sensex for a period of 5 years or from the date of listing if the listing happened at a later date.

Company Name	Equity Beta (Levered)	Debt to Equity Ratio	Tax Rate (%)	Asset Beta (Unlevered)
CESC	1.0884	0.36	11.29%	0.83
GIPC	1.2261	0.60	19.36%	0.827
JHPL	1.4988	0.81	11.33%	0.875
Neyveli Lignite	1.4778	0.31	34.48%	1.229
BF Utilities	2.9988	0.71	12.29%	1.849
NTPC	0.8357	0.52	24.02%	0.600
Tata Power	1.3490	0.41	12.67%	0.995
Reliance Infrastructure	1.4524	0.46	11.90%	1.035
Average Beta				**1.030**

In order to understand the standard market returns, it is essential to consider a wide range of companies. Hence an attempt to study the beta values of companies with relatively significant investment in power sector including renewable and non-renewable energy has been done.

Conventional (Thermal and Large Hydro) power projects are a more attractive investment option as compared to non-conventional (renewable energy power projects) projects, primarily because of the lower risks that such project activities face as compared to renewable energy projects and in particular wind power projects. Conventional power plants supply firm power, operate on higher Plant Load Factor (PLF) and are not subject to the vagaries of nature as wind power plants. Wind power projects on the other hand operate at much lower PLF and have much higher capital costs. Thus, from the perspective ofa private investor, investments in thermal power plants are a safer option.

Hence it is assumed that such companies with significant investments in non-renewable energy projects face lower risk as compared to the wind power developers. Thus, as the use of the beta value for companies with significant investment in non-renewable power projects is representative of the returns generated in the baseline scenario and is also conservative, the same has been considered appropriate for the analysis. The average beta value of companies after unlevering has been estimated as **1.03** and the same has been used for further analysis.

R_m – R_f (Market Risk Premium)

The market risk premium is the return that an investor expects over and above the risk free returnavailable in the market. The market risk premium has been estimated using historical approach. This can be defined as the historical differential return of the market and the risk-free rate. The most common method of calculating this is the difference between historical return of the stock market index and the historical return of the risk free rate. Accordingly we have calculated market risk premium as the historical return on the stocks (using the BSE Sensex[3] Index) minus the return on government securities. This would give the incremental returns over and above the risk free rate.

Market Rate of Return (R_m)

= (14564.53/100)^(1/29.42) -1

= 18.45% (Calculations provided in the excel sheet)

Market Risk Premium

= 18.45% - 8.3698%

= 10.08%

Rate of return on equity or cost of equity benchmark isR_i = R_f + β (R_m-R_f)

= 8.3698% + 1.03 x 10.08%

= 18.75%

Hence the benchmark for equity IRR of the Project is the Cost of equity of companies engaged in similar business as that of the Project which is calculated as 18.75%.

The equity internal rate of return for the proposed Project activity without CDM revenues was computed for a period of 20 years, corresponding to the lifetime of the wind farm based on the following assumptions[5] including various benefits available to the Project activity from the National and Sectoral policies for promoting renewable energy generation in India.

The key assumptions used to calculate the equity IRR are listed below:

[5] The Investment analysis includes various benefits available to the project activity from the national and sectoral policies for promoting renewable energy generation in India such as accelerated depreciation, tax holidays etc.

Particulars	Value	Unit	Source
Project details			
No. of wind turbines	70	Nos	Internal Assumption based on presentation submitted to Investment committee meeting dated 16/09/2008.
Capacity of each wind turbine	0.8	MW	Enercon offer letter
Capacity of the project	56	MW	Calculated
Energy generation			
Net Generation	890.28[6]	Lakh units[7]	Apportioned value from Long Term Annual Energy Output Estimate (LTAEOE) by Hydro Tasmania Consulting April 2010 for E-53 machines. Total no. of machines in wind farm = 142
CUF	18.15	%	Apportioned value from Wind assessment study by Hydro Tasmania Consulting April 2010 for E-53 machines. Total no. of machines in wind farm = 142
Capital expenditure			
Project cost	30,800	INR Lakhs	Calculated on the basis of offer
WTG cost	440	INR Lakh/WTG	Enercon offer letter[8]
Debt	70	%	MERC tariff order dated 24 Nov 2003 - Group III - (New) Projects
Equity	30	%	MERC tariff order dated 24 Nov 2003 - Group III - (New) Projects
Debt	21,560	INR Lakhs	Calculated Value
Equity	9,240	INR Lakhs	Calculated Value
Loan			
Interest rate	12.50	%	MERC tariff order dated 24 Nov 2003 - Group III - (New) Projects
Debt tenure	10	Years	MERC tariff order dated 24 Nov 2003 - Group III - (New) Projects
Moratorium	1	Year	MERC tariff order dated 24 Nov 2003 - Group III - (New) Projects
Operation and maintenance costs			

[6] Total Capacity assessed as a part of LTAEOE study was 113.6 MW comprising of 142 WTGs of capacity 0.8 MW each. The Net generation for this project activity (consisting of 56 MW/70 WTGs) has been derived by apportioning the estimated net generation value as [180.6GWh * (56MW/113.6MW)] = 89.028 GWh i.e 890.28 Lakh units

[7] 1 unit = 1 kWh

[8] Offer letter mentions the cost Rs 460 Lacs /WEG with Rs 20 Lacs/WEG as infrastructure development cost (Refundable)

Particulars	Value	Unit	Source
Operation and Maintenance (first year) per WTG	0	INR Lakhs	Enercon offer letter
Operation and Maintenance (2nd year) per WTG	5	INR Lakhs/WTG /annum	Enercon offer letter
Escalation in O & M (3 to 20)	5	%	Enercon offer letter
Service tax on O & M fees	12.36	%	Enercon offer letter
Insurance cost			
Insurance cost per turbine	0.22	INR Lakhs	Insurance premium payments for similar project
Insurance cost for the project	15.43	INR Lakhs	Insurance premium payments for similar project
Tariff	3.50	INR/kWh	MERC tariff order dated 24November 2003, Group III project
Escalation in Tariff YoY till 13thYear	0.15	INR/kWh	MERC tariff order dated 24November 2003, Group III project
Depreciation			
Depreciation Rate (Book)	5.28	%	Rate specified in Indian Companies Act, Schedule XIV, II Plant & Machinery (b) for continuous process plant. Wind power project is considered to be continuous process plant
IT Depreciation Rate	7.69	%	Indian IT Act - Rule 5(1A)
Generation based incentive			
GBI	0.50	INR/kWh	MNRE GBI Guidelines
GBI cumulative cap	62.00	INR Lakhs per MW	MNRE GBI Guidelines
Max. GBI allowed in a year	15.50	INR Lakhs per MW	MNRE GBI Guidelines
Max. GBI allowed in a year	868.00	INR Lakhs	Calculated
GBI cumulative cap	3472.00	INR Lakhs	Calculated
Max duration for GBI	10	years	MNRE GBI Guidelines
Income tax			
Income tax rate	33.99	%	IT Act
MAT rate	11.33	%	IT Act
Service Tax	12.36	%	Finance Act
Terminal Value	10	%	Industry best practice

S.I units Conversion:

1 Lakh INR= 100,000 INR

1 Lakh units= 100,000 kWh

The base case equity IRR has been calculated as 7.89%.

The equity IRR for the Project activity was calculated in accordance with the "Guidelines on theAssessment of Investment Analysis" Version 6.0.0 as demonstrated below:

General issues in calculation and presentation:

Guidance: *The period of assessment should not be limited to the proposed crediting period of the CDM project activity. Both project IRR and equity IRR calculations shall as a preference reflect the period of expected operation of the underlying project activity (technical lifetime), or - if a shorter period ischosen - include the fair value of the project activity assets at the end of the assessment period. Ingeneral a minimum period of 10 years and a maximum of 20 years will be appropriate. The IRR calculation may include the cost of major maintenance and/or rehabilitation if these are expected to be incurred during the period of assessment. Project participants are requested to justify and DOEs are requested to validate the appropriateness of the period of assessment in the context of the underlying project activity, without reference to the proposed CDM crediting period.*

The period of assessment has been chosen as the operational life of the Project activity i.e. 20 years which also satisfies the criteria of the maximum period of 20 years in accordance with the above guidance. The IRR calculation has been done to include the cost of operation and maintenance that would be incurred during the period of assessment in accordance with the Warranty Operations & Maintenance Agreement that has been signed with Enercon (India) Limited.

Guidance: *The fair value of any project activity assets at the end of the assessment period should be included as a cash inflow in the final year. The fair value should be calculated in accordance with local accounting regulations where available, or international best practice. It is expected that such fair value calculations will include both the book value of the asset and the reasonable expectation of the potential profit or loss on the realization of the assets.*

The assessment period has been considered for the same duration as the operational life of the Project activity i.e. 20 years. The book value of the Project activity assets calculated in accordance with the accounting procedures and rates mentioned in the Companies Act at the end of this period is also zero. Hence, no cash inflow on account of the salvage value at the end of assessment periodhas been considered in the financial analysis.

Guidance: *Depreciation, and other non-cash items related to the project activity, which have been deducted in estimating gross profits on which tax is calculated, should be added back to net profits forthe purpose of calculating the financial indicator (e.g. IRR, NPV). Taxation should only be included asan expense in the IRR/NPV calculation in cases where the benchmark or other financial indicator is intended for post-tax comparisons.*

Depreciation and all other non-cash items related to the Project activity were added back to net profit for the purpose of calculating the equity IRR. Tax has been included as an expense in the equity IRR calculation since the benchmark i.e. cost of equity calculated using the CAPM model is intended only for post-tax comparisons.

Guidance: *Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant. The DOE is therefore expected to validate thetiming of the investment decision and the consistency and appropriateness of the input values with this timing. The DOE should also validate that the listed input values have been consistently applied in all calculations.*

The input values such as project cost and O&M expenses used in the investment analysis are as per the actual agreements signed with WWIL on 29th September 2008.

Guidance: *In the case of project activities for which implementation ceases after the commencement and where implementation is recommenced due to consideration of the CDM the investment analysis should reflect the economic decision making context at point of the decision to recommence the project. Therefore capital costs incurred prior to the revised project activity start date can be reflected as the recoverable value of the assets, which are limited to the potential reuse/resale of tangible assets.*

The implementation of the Project activity did not cease at any point of time after the initial decision for investment in the project after consideration of revenues from CDM was made on 26th September2008.

Guidance: *Project participants should supply spreadsheet versions of all investment analysis. All formulas used in this analysis be readable and all relevant cells be viewable and unprotected. The spreadsheet will be made available to the Executive Board, UNFCCC secretariat and others contractedto assess the request for registration on behalf of the Board including assigned members of the Registration and Issuance Team. In cases where the project participant does not wish to make such a spreadsheet available to the public an exact read-only or PDF copy shall be provided for general publication. In case the PP wishes to black-out certain elements of the publicly available version, a clear justification for this shall be provided to the UNFCCC secretariat by the DOE when requesting registration.*

The spreadsheets for calculation of equity IRR as well as the benchmark (cost of equity) are being made available to the DOE as well as the Executive Board, UNFCCC secretariat and others contracted to assess the request for registration on behalf of the Board including assigned members of the Registration and Issuance Team with all formulae used in a readable, viewable and unprotected format.

Specific Guidance on the Calculation of Project IRR and Equity IRR:

Guidance: *The cost of financing expenditures (i.e. loan repayments and interest) should not be included in the calculation of project IRR.*

Project IRR has not been selected as the financial indicator for the Project activity. The equity IRRhas been calculated for the Project activity and assessed with the benchmark for the Project activity i.e. cost of equity. Hence, the financing expenditures i.e. loan repayments and interest on debts wereconsidered in the calculations.

Guidance: *In the calculation of equity IRR only the portion of investment costs which is financed by equity should be considered as the net cash outflow, the portion of the investment costs which*

is financed by debt should not be considered a cash outflow. In the calculation of equity IRR, only the part of the project cost that was financed by equity was considered as a cash outflow.

Using the assumptions in the tables above and referring to the guidance by the EB as demonstrated above, the equity IRR for the Project activity is found to be 7.89%, which clearly depicts the fact that the Project activity is not very attractive as an investment option since the returns are much below theselected benchmark. From the analysis above, it is also clear that the Project activity does not meet the stipulated benchmark without the CDM revenues and is hence additional.

Sub-step 2c: **Sensitivity Analysis:**

As per guidance provided in the latest version of "Tool for the demonstration and assessment of additionality", the variables, including the initial investment cost, that constitute more than 20% of total project costs or total project revenues have been identified and subjected to a reasonable variation and the results of this variation have been presented below:

S.No.	Parameters	Variation	Equity IRR	Breakeven point
Project scenario			**7. 89%**	
1	PLF/Net Generation	+10 %	10.30%	43.8%
		-10 %	5.50%	
2	Project Cost	+10 %	5.91%	-31.8%
		-10 %	10.37%	
3	Tariff	+10 %	9.78%	53.9%
		-10 %	6.05%	
4	O&M cost	+10 %	7.59%	-403. 0%
		-10 %	8.19%	

The above sensitivity analysis shows the IRR for the Project does not exceed the benchmark even after variation of generation, O&M costs and Project cost hence establishing that the financial analysis presented above is robust to variations in critical parameters.

Step 4: Common practice analysis

In the context of the present project activity, the following parameters are defined in line with paragraphs 5 – 10 of this approved methodological tool:

Measure: As per paragraph 6, the project activity falls under the following measure:

"*(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);*"

Output: As per paragraph 7, "power generation" may be considered to be the output in the context of the project activity. Further as per Step 1 of paragraph 47 of the same tool, the applicable output range willbe 28 MW to 84 MW, i.e. ±50% of installed capacity of the project activity (56 MW).

As per paragraph 47 of the approved methodological tool, the following Stepwise approach has been followed by the project activity to demonstrate that it is not a Common Practice in the applicable geographical area:

Step 1: *Calculate applicable output range as +/- 50% of the design output or capacity of the proposed project activity*

The capacity of the project activity is 56 MW. The project capacity has been subject to the variation inthe range of +/- 50%, the following table depicts the outcome of the variation applied. Hence, the applicable output range will be 28 MW to 84 MW, i.e. ±50% of installed capacity of the project activity

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities shall not be included in this step.

India has been considered applicable geographical area as a default, for the common practice analysis of project activity. All power plants generating electricity within the capacity range of 28 MW to 84 MW and having commercial operations date before project activity start date (16/09/2009) have been considered in this analysis. The power generation plants identified in this step are hydro, thermal, nuclear, biomass based, solar and wind power projects. The total number of power plants in the applicable output range = 411.

Category of Power plants	No. of Projects
Thermal	155
Hydro	233
Wind	6
Nuclear	0
Solar	0
Biomass	17
Total (N_{all})	**411**

Therefore N_{all} =411.

Note: Registered CDM project activities have been excluded in this step. The spreadsheet containing the list of the plants identified has been provided separately to the DOE.

Step 3: *Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.*

In accordance with Guidelines on Common practice following criterion has been used to arrive at the number of different technology power plants;

Different technologies *in the context of the project activity*:

Energy Source / Fuel

The project activity involves electricity generation from wind. The other project activities using water (Hydro, Biomass, Solar), conventional fuels (Coal, Lignite, Natural Gas & Liquid Fuel based – i.e. Thermal) as energy sources for the generation of electricity respectively are considered as plants with different technologies and included under N_{diff}.

The N_{diff} value is thus arrived at as tabulated below:

Category of Power plants	No. of Projects
Thermal	155
Hydro	233
Wind	0
Nuclear	0
Solar	0
Biomass	17
Total (N_{diff})	**405**

Step 4: *Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity*

N_{all}	411
N_{diff}	405
$N_{all} - N_{diff}$	6
$F = 1-N_{diff}/N_{all}$	0.0146

The factor F and $N_{all}-N_{diff}$ is calculated and following values are arrived at;F = 0.0146;

$N_{all}-N_{diff} = 6$;

As value of F is not greater than 0.2, it can be concluded that the project activity is not a common practice in the applicable geographical area.

The above discussions show that wind power development is not a common practice in the applicable geographical area and the Project activity is not financially attractive; hence the Project activity is additional.

In view of the above, the PP had considered CDM as a source of additional revenue to improve financial viability of the project while deciding to make invest in the Project activity

Chronology of Events:

The chronology of events related to the Project activity and the efforts of the PP to secure CDM fundingfor the Project activity are summarized below:

Sr. No.	Event	Reference	Date
1.	Offer Letter received from Technology Supplier	Enercon offer letter	15/07/2008
2.	Receipt of Long Term Annual EnergyOutput Estimate from Hydro Tasmania Consulting (HTC)	Hydro Tasmania Consulting (HTC) report	12/09/2008
3.	Board Decision to implement the 113.6 MW project	Board resolution by CLP	26/09/2008
4.	Signing of Facilitation Agreement with technology Supplier #	Facilitation Agreement	29/09/2008
5.	Appointment of CDM Consultant by the PP	Engagement letter	14/05/2009
6.	UNFCCC & DNA intimation for the 113.6 MW project (Initial)	Prior Consideration forms sent to UNFCCC and DNA	25/08/2009
7.	Notice to proceed to technology supplier for the project (Start Date) #	NTP from CLP to Enercon	16/09/2009
8.	Local stakeholders' consultation meeting	Minutes of the Meeting and attendance sheet	19/02/2010
9.	Appointment of DoE	DOE engagement letter	01/04/2011
10.	Global stakeholder process initiation (web hosting of PDD)	UNFCCC	31/08/2011
11.	Commissioning of the Project	Commissioning certificates	28/12/2011
12.	Revised UNFCCC & DNA Intimation for the project *	Prior Consideration Forms	13/02/2012

* Initially, the project was conceptualized as a single 113.6 MW CDM project. However, due to various delays in obtaining regulatory clearances, the PP decided to split the project into three phases of 56.0MW, 50.4 MW and 7.2 MW viz. Andhra Lake-I, Andhra Lake-II and Andhra Lake-III projects respectively. The UNFCCC and DNA (MoEF, Government of India) were informed about the same.

 # The PP had taken an investment decision on 26/09/2008 and signed a Facilitation Agreement with the technology supplier on 29/09/2008. As per the one of the conditions precedent (Clause

2.3 (c)) of the facilitation agreement, the technology supplier shall not commence the works for the project until the Company (i.e. PP) has issued a Notice To Proceed (NTP). On failing to issue a NTP, the Facilitation Agreement shall terminate automatically and the technology supplier. In such cases, Facilitation Agreement is a non-binding to supplier as well as to the project proponent and it does not create any financial or any other type of commitment or obligation to PP. PP's commitment for the Project Activity starts after issuance of NTP also their expenditure related to construction of project activity starts after issuance of NTP. The PP had issued a Notice to Proceed to the technology supplier on 16/09/2009. As per the "Glossary of CDM terms", the start date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins. Thus, the date ofissue of NTP has been considered as start date for the project activity and not the date of signing of facilitation agreement with the technology supplier

3.6 Methodology Deviations

There are no deviations from the applied baseline and monitoring methodology ACM0002 Version 21 "Grid-connected electricity generation from renewable sources".

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

Andhra Lake Ph-I has implemented of a 56 MW wind power project consisting of 70 Wind Electric Generators (WEGs) of individual capacity 0.8 MW by CLP Wind Farms (India) Private Limited. Total capacity of 56 MW has been commissioned. The first WEG under this project has commissioned on 19-Aug-2011 and last WEG has been commissioned on 28-Dec-2011. Thus, the project is now operation to its full operational capacity of 56 MW. A comprehensive list of WEGs commissioning dates are provided under section 1.7.

The project activity has been implemented as per the description in the registered VCS PD. The Project is owned by CLP Wind Farms (India) Private Limited and WWIL is responsible for operation and maintenance of the wind farm. The project has been under operation since commissioning without any major breakdowns. Though normal breakdowns due to O&M measures are continuously being worked upon by the dedicated O&M contractor for the projects WEGs. There has been no events that may have an impact on the GHG emissions or removals during the current monitoring period.

Further, there are no changes to the project participant for the project activity during the monitoring period. Further, there are no changes to the project participant for the project activity during the monitoring.

5 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As per ACM0002 Version 21.0, Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,\ y} * EF_{grid,\ CM,\ y} \quad (1)$$

Where:

BE_y Baseline emissions in year y (tCO_2)

$EG_{PJ,\ y}$ result Quantity of net electricity generation that is produced and fed into the grid as a of the implementation of the CDM project activity in year y (MWh/yr)

$EF_{grid,\ CM,\ y}$ Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2e/MWh)

Calculation of $EG_{PJ,\ y}$

The methodology ACM0002 (Version 21) has procedures for calculation of $EG_{PJ,y}$ for the following cases:

(a) Greenfield plants,

(b) Capacity addition to wind, solar, wave or tidal plant

(c) Capacity addition to hydro or geothermal power plant

(d) Retrofit or rehabilitation or replacement of an existing renewable energy power plant

The proposed VCS project activity are Greenfield plants, option (a) as provided in the methodology ACM0002 (Version 21) shall be applicable and is described below:

"If the project activity is the installation of a new grid-connected renewable power plant:

$$EG_{PJ,\ y} = EG_{facility,\ y} \quad (2)$$

Where:

$EG_{PJ,\ y}$ Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EG_{facility,\ y}$ Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)"

Calculation of $EF_{grid, CM, y}$

The methodology ACM0002 (Version 21.0) requires that the combined margin for the grid be calculated in accordance with the procedure provided in the "Tool to calculate the emission factor for an electricity system", Version 7.0.

As per version 7 of Tool to calculate emission factor for an electricity system, following steps are included in the calculation of the emission factor for the baseline scenario:

Step1. Identify the relevant electricity systems

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

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

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

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

STEP 6: Calculate the combined margin (CM) emissions factor.

The Central Electricity Authority (CEA) has published CO_2 baseline database in its Version 18. The values for OM, BM, CM are given excluding and including imports. For the present project activity, including imports are considered.

Step 1: Identifying the relevant electricity system

The tool defines that "for the purpose of determining the electricity emission factors, identify the relevant electricity system. Similarly, identify any connected electricity systems". It also states that "If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used". Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However, 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 FY 2007-08 onwards for the purpose of this CO2 Baseline Database. In April 2016, the Southern grid has also been synchronized with the NEWNE grid, hence forming one unified Integrated Indian Grid. The project activity is located in the state of Maharashtra which come under Integrated Indian grid system. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

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.

The project participant has chosen Option I for the calculation of the operating and build margin emission factor i.e. off-grid power plants are not being included in the calculation.

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

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods which are described under step 4 (Refer "Tool to calculate the emission factor for an electricity system", version 07.0):

(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 resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long term averages for hydroelectricity production. The 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. Thus, for the proposed project activity simple OM method has been chosen to calculate the operating margin emission factor ($EF_{grid, OM, y}$).

The Share of Low Cost / Must-Run (% of Net Generation) in the generation profile of the Integrated Indian grid in India in the last five years is as follows:

Grid	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Integrated Indian Grid	15.1%	14.6%	14.3%	14.5%	17.0%	16.5 %

Source: CEA Baseline Carbon Dioxide Emission Database Version 18

Ref: CO_2 Baseline Database for the Indian Power Sector – CEA, Version 18 (https://cea.nic.in/cdm-co2-baseline-database/?lang=en)

In Indian Grid, the low-cost/must run resources vary from 14.3% to 17.0% of the total net grid generation (From Year 2015-16 to Year 2019-20). The calculation above shows that the generation from low-cost/must-run resources always constitutes less than 50% of total grid generation, hence usage of the Simple OM method in the project case is justified.

The Simple OM emission factor can be calculated using either of the two following data vintages for years(s) y:

- Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period,
  or
- Ex post option: 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.

As observed in the CEA database, (Version 18) the percentage of total grid generation by low-cost/must-run plants (on the basis of average of six most recent years) for the Indian grid is much lesser than 50% of the total generation. Thus, Simple OM method has been used for calculating the emission factor.

The project proponents choose the Ex ante option for estimating the simple OM emission factor wherein as described above 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 will be undertaken.

Step 4: Calculation of the OM according to the Simple OM method

The simple OM method has been selected as justified above. The simple OM emission factor is calculated based on the net electricity generation of each power unit and a CO_2 emission factor for each power unit, as follows:

$$EF_{grid,OM,simple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,,y}$	=	Simple operating margin CO_2 emission factor of in year y (tCO_2/MWh)
$FC_{i,m,y}$	=	Amount of fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	=	Net electricity generated and delivered to the grid by power unit m in year y (MWh)
m	=	All power units serving the grid in year y except low-cost / must-run power units
I	=	All fuel types combusted in power plant / unit m in year y
y	=	Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) or the applicable year

during monitoring (ex post option), following the guidance on data vintage in step 2

In India, the Central Electricity Authority (CEA) has estimated the baseline emission factor for the power sector. This data is the most authentic information available in the public domain. The details of same can be found on CEA website at http://cea.nic.in/tpeandce.html.

The operating margin emission factor has been calculated using a 3 years data vintage:

Net Generation in Operating Margin (GWh) (incl. imports)		
2018-19	**2019-20**	**2020-21**
960,693	995,957	965,009

Simple Operating Margin Emission Factors (tCO2/MWh) (incl. Imports)		
2018-19	**2019-20**	**2020-21**
0.9543	0.9685	0.9555

Therefore, weighted OM average for Indian grid comes out to be 0.9518 tCO_2/MWh

i.e. $EF_{grid,OM,y}$ = 0.9518 tCO_2/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 CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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

Option 1 has been considered for this project activity

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

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

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

In India, the installed capacity and corresponding annual generation from power plants is quite high. The Central Electricity Authority (CEA) has estimated the annual electricity generation from $SET_{\geq 20\%}$ to be larger than the generation from $SET_{5\text{-units}}$. The details of same can be found on CEA website at http://cea.nic.in/tpeandce.html.

Further, none of the power units in $SET_{\geq 20\%}$ started to supply electricity to the grid more than 10 years ago.

Therefore, SET_{sample} is selected as $SET_{\geq 20\%}$ for the estimation of build margin.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

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

Where:

$EF_{grid, BM, y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL, m, y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m	=	Power units included in the build margin
y	=	Most recent historical year for which electricity generation data is available

Calculations for the Build Margin emission factor $EF_{gid,\ BM,\ y}$ is based on the most recent information available on the plants already built for sample group m at the time of PDD submission. The sample group m consists of the power plant capacity additions in the electricity system that comprise 20 % of the system generation and that have been built most recently ($SET_{\geq 20\%}$). PP has sourced the data from CEA website at http://cea.nic.in/tpeandce.html and same in inline with the Tool to calculate the emission factor of the electricity system.

Build margin emission factor is calculated, ex-ante as per the most recent data available. So, build margin emission factor for Indian grid for 2021-22 is 0.8687 tCO2/MWh

$EF_{grid,\ BM,\ y}$ = 0.8687 tCO2e/MWh

The build margin emissions factor is the generation-weighted average emission factor (tCO_2e/MWh) of all power units m during the most recent year y for which power generation data is available and will be calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \quad (4)$$

Where:

$EF_{grid,\ BM,\ y}$: Build margin CO_2 emission factor in year y (tCO_2e/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_2e/MWh)

m: Power units included in the build margin

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

As described above, the Build Margin would be calculated annually during the entire crediting period. For the purpose of ex-ante emission reduction calculations the most recent data available (from CEA for 2021-22) has been used and the build margin thus calculated is 0.8687 (tCO_2e/MWh)

Therefore, $EF_{grid,BM,y}$ = 0.8687 (tCO_2e/MWh)

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

The combined margin emissions factor is calculated as follows:

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

Where:

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

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

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.
- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

As per the 'Tool to calculate the Emission Factor for an electricity system' version 07, the default values for w_{OM} and w_{BM} are taken as 0.75 and 0.25 respectively as per the guidance provided for wind project activities for the first crediting period and subsequent crediting periods.

Hence, the Baseline Emission Factor is calculated using the formula stated below:

$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$

$EF_{grid,CM,y} = 0.75* 0.9518 + 0.25* 0.8687$ (tCO_2/MWh)

$EF_{grid,CM,y} = 0.9310\ tCO_2/MWh$

5.2 Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 21, there will be no project emissions in the project activity

PEy = 0.

5.3 Leakage

As per ACM0002 Version 21, no leakage has been considered for the calculation of emission factor.

According to ACM0002, No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, & transport).

5.4 Estimated Net GHG Emission Reductions and Removals

Baseline emissions

Parameter	Value	Units	Source
Installed Capacity	*56*	*MW*	*Installed capacity*
Net Generation	*89,028*	*MWh*	*Wind Assessment Report by third party*
Indian Grid Emission Factor ($EF_{Integrated,grid,CM,y}$)	*0.9310*	*tCO_2e/MWh*	*CEA Database, Version 18.0*

Baseline emissions (BE_y) are calculated as follows:

BE_y = 0.9310 tCO2e/MWh x 89,028 MWh/year

= 82,885 tCO2/year

Project activity emissions

Since, the project activity is a wind power project, there are no project emissions from fossil fuel consumption, release of non-condensable gases or water reservoirs.

Hence, $PE_y = 0$

Emission Reductions

Emission reductions are calculated as follows:

$ER_y = BE_y - PE_y$

Where:

ER_y = Emission reductions in year y (t CO_2e)

BE_y = Baseline emissions in year y (t CO_2)

PE_y = Project emissions in year y (t CO_2e)

Emission Reductions:

$ER_y = BE_y - PE_y$ **= 82,885 tCO_2e**

The ex-ante estimate of baseline emissions, project emissions, leakage emissions and net emission reductions are provided in the table below:

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
19/08/2021 – 18/08/2022	82,885	0	0	82,885
19/08/2022 – 18/08/2023	82,885	0	0	82,885

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
19/08/2023 – 18/08/2024	82,885	0	0	82,885
19/08/2024 – 18/08/2025	82,885	0	0	82,885
19/08/2025 – 18/08/2026	82,885	0	0	82,885
19/08/2026 – 18/08/2027	82,885	0	0	82,885
19/08/2027 – 18/08/2028	82,885	0	0	82,885
19/08/2028 – 18/08/2029	82,885	0	0	82,885
19/08/2029 – 18/08/2030	82,885	0	0	82,885
19/08/2030 – 18/08/2031	82,885	0	0	82,885
Total	828,850	**0**	**0**	828,850

6 MONITORING

6.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{OM,y}$
Data unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor of Indian Integrated Grid
Source of data	Central Electricity Authority: CO2 Emission Database CEA CO2 Baseline database Version 18.0
Value applied:	

	2019-20	2020-21	2021-22

	Net Generation in Operating Margin (GWh)	965,009	958,218	1,035,672
	Simple Operating Margin (tCO_2/MWh)	0.9541	0.9402	0.9605
	Wt. Average (tCO_2/MWh)	0.9518		
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07". The data are obtained from "CO_2 Baseline Database for Indian Power Sector" 18.0, published by the Central Electricity Authority, Ministry of Power, Government of India.			
Purpose of Data	Calculation of Baseline emissions			
Comments	This database is an official publication of Government of India for the purpose of baseline emission calculations. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done ex ante its value will remain fixed for the entire crediting period.			

Data / Parameter	$EF_{BM,y}$
Data unit	tCO_2/MWh
Description	Build margin CO2 emission factor of Indian Intergard grid
Source of data	Central Electricity Authority: CO2 Emission Database CEA CO_2 Baseline database Version 18.0
Value applied:	0.8687
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07". The data are obtained from "CO_2 Baseline Database for Indian Power Sector" 18.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	Calculation of Baseline emissions
Comments	This database is an official publication of Government of India for the purpose of baseline emission calculations. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has

	been done ex ante its value will remain fixed for the entire crediting period.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined CO_2 emission factor of Indian Integrated Grid
Source of data	Central Electricity Authority: CO2 Emission Database CEA CO_2 Baseline database Version 18.0[9]
Value applied:	Operating margin CO_2 emission factor (tCO_2/MWh): 0.9518 Build margin CO2 emission factor (tCO_2/MWh): 0.8687 Weighted Average (tCO_2/MWh): = 0.9518* 0.75 + 0.8687 *0.25 = 0.9310
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07". The data are obtained from "CO2 Baseline Database for Indian Power Sector" version 18.0 published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	Calculation of Baseline emissions
Comments	This database is an official publication of Government of India for the purpose of baseline emission calculations. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done ex ante its value will remain fixed for the entire crediting period.

6.2 Data and Parameters Monitored

Data / Parameter	$EG_{export,y}$
Data unit	MWh/yr
Description	Quantity of electricity exported by the Project to the grid in year y

[9] https://cea.nic.in/cdm-co2-baseline-database/?lang=en

Source of data	Joint Meter Reading Sheets and credit notes issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) for all the feeders to which WTGs of the project activity are connected. $EG_{export,y}$ is the summation of readings of individual Joint Meter Reading Sheets.
Description of measurement methods and procedures to be applied	CLPWF has duly installed the approved ABT meters with accuracy class of 0.2s with online metering features at the metering point (Main Meter). CLPWF has also installed Check meter with separate CT/PT of class 0.2s. Quantity of electricity exported by the Project to the grid has been calculated using the sum of readings taken at the main/check meter installed at the interconnection points. Data monitoring is being taking place at the substation on a continuous basis and recorded on at least monthly basis. On the basis of these readings taken, a generation report has also been issued by MSEDCL.
Frequency of monitoring/recording	Monthly
Value monitored	Measured Value
Monitoring equipment	CLPWF has duly installed the approved ABT meters with accuracy class of 0.2s with online metering features at the metering point (Main Meter). CLPWF has also installed Check meter with separate CT/PT of class 0.2s. Quantity of electricity exported by the Project to the grid has been calculated using the sum of readings taken at the main/check meter installed at the interconnection points. Data monitoring is being taking place at the substation on a continuous basis and recorded on at least monthly basis. On the basis of these readings taken, a generation report has also been issued by MSEDCL. For Type, Accuracy Class, Serial numbers of energy meters kindly refer Appendix 01.
QA/QC procedures to be applied	The readings from main and check meters installed at the interconnection point have been checked every month at the time of metering of electricity generation. In case the meters are found to be operating beyond the permissible limits, it shall be immediately sent for calibration. The frequency of meter testing is once in 5 years. It would be prudent to note that the meter testing and calibration is not within the control of the Project Proponent.
Purpose of the data	Baseline Emissions calculation
Calculation method	Measured Value

Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VERs for this Project activity, whichever occurs later.

Data / Parameter	$EG_{import,y}$
Data unit	MWh/yr
Description	Quantity of electricity imported by the Project from the grid in year y
Source of data	Joint Meter Reading Sheets and credit notes issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) for all the feeders to which WTGs of the project activity are connected. $EG_{import, y}$ is the summation of readings of individual Joint Meter Reading Sheets.
Description of measurement methods and procedures to be applied	Quantity of electricity imported by the Project to the grid is calculated using the sum of readings taken at the main/check meter installed at the interconnection points. Data monitoring has been done at the substation on continuous basis and recorded on at least a monthly basis. On the basis of these readings taken, a generation report is issued by MSEDCL.
Frequency of monitoring/recording	Monthly
Value monitored	Measured Value
Monitoring equipment	CLPWF has duly installed the approved ABT meters with accuracy class of 0.2s with online metering features at the metering point (Main Meter). CLPWF has also installed Check meter with separate CT/PT of class 0.2s. Quantity of electricity imported by the Project to the grid has been calculated using the sum of readings taken at the main/check meter installed at the interconnection points. Data monitoring is being taking place at the substation on a continuous basis and recorded on at least monthly basis. On the basis of these readings taken, a generation report has also been issued by MSEDCL. For Type, Accuracy Class, Serial numbers of energy meters kindly refer Annex 01.
QA/QC procedures to be applied	The readings from main and check meters installed at the interconnection point have been checked every month at the time of metering of electricity generation. In case the meters are found to be operating beyond the permissible limits, it shall be immediately sent for calibration. The frequency of meter testing is once in 5 years. It would be prudent to note that the meter testing and calibration is not within the control of the Project Proponent.

Purpose of the data	Baseline Emissions calculation
Calculation method	Measured Value
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VERs for this Project activity, whichever occurs later.

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Joint Meter Reading Sheets and credit notes issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) for all the feeders to which WTGs of the project activity are connected.
Description of measurement methods and procedures to be applied	Net electricity supplied by the project is calculated as the difference of electricity exported to and imported from the grid measure using the readings taken at the main/check meter installed at the interconnection point. $EG_{facility,y} = EG_{export,y} - EG_{import,y}$ Joint Meter Reading Sheets and generation report issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) on a monthly basis is used for this purpose.
Frequency of monitoring/recording	Monthly
Value monitored	89,028 MWh
Monitoring equipment	Not applicable as it is a calculated value
QA/QC procedures to be applied	The value of this parameter can be cross checked with all the invoices generated for the sold electricity during the year y.
Purpose of the data	Baseline Emissions calculation
Calculation method	Measured value
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VERs for this Project activity, whichever occurs later.

6.3 Monitoring Plan

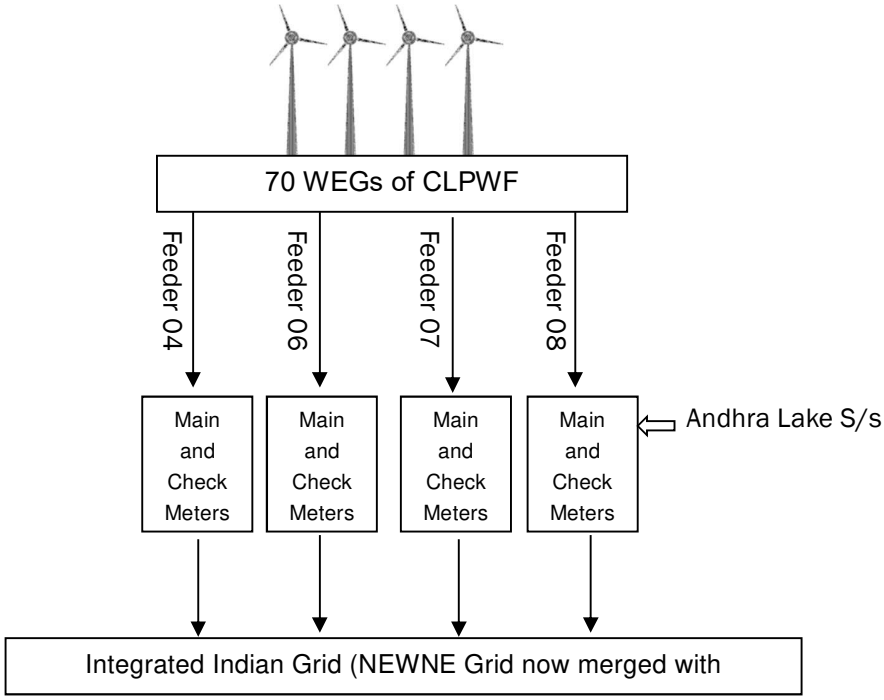
Wind World India Limited (WWIL) is O&M contractor for the project activity. WWIL is responsible for the maintaining all the monitoring data on behalf of state utility in respect of the project activity. WWIL has implemented the management structure for managing the monitored data.

This approved monitoring methodology requires monitoring of the following:

Net electricity supplied from the project activity. While Emission factor of the project activity is fixed ex ante hence no further monitoring of this parameter is required. As per ACM0002 leakage need not be considered hence leakage has not been considered for the project activity. Hence, the sole parameter for monitoring is the net electricity supplied by the project activity to the grid.

The Project activity is operated by WWIL (O&M contractor for the project activity) and managed by the PP. The operational and maintenance contract for the project activity is with WWIL, which is an ISO 9001 certified company. WWIL 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.

Calibration of Meters: The readings from main and check meters installed at the interconnection point has been checked every month at the time of metering of electricity generation. In case the meters are found to be operating beyond the permissible limits, it shall be immediately sent for calibration. The frequency of meter testing is once in 5 years. Location of the meters are mentioned below:



Apportioning of electricity:

In case dates of monitoring period do not match with the dates of Joint Meter Reading Sheets / Credit notes issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL)

Apportioning has been carried out based on ratio of generation data recorded using LCS meters installed at the WTG. The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WTGs.

The emission reductions of that particular period (from the date of registration of the project till the end of the month) will be calculated based on percentage generation of that particular period at WTG using LCS data multiplied with the total units generated in the month as per the Joint Meter Reading Sheets / Generation report issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL).

The sample calculation is furnished below:

Generation from CLPWF WTGs for the monitoring period = A (From LCS data) Generation from CLPWF WTGs for the billing period = B (From LCS data)

Net energy exported from CLPWF WTGs for the billing period = C (JMR/Generation share report by MSEDCL)

Net energy export used for calculation of emission reduction for the monitoring period = (C * A/B)

Calibration Details of billing meters for the project activity are provided in the Appendix 1.

Frequency of meter reading: The meters installed at the metering point will have 15 minutes block online reading. However, the main/check meter reading at the metering point is undertaken jointly by the representative of the MSEDCL and authorized officials of the CLPWF on 1st day of every month for the preceding month.

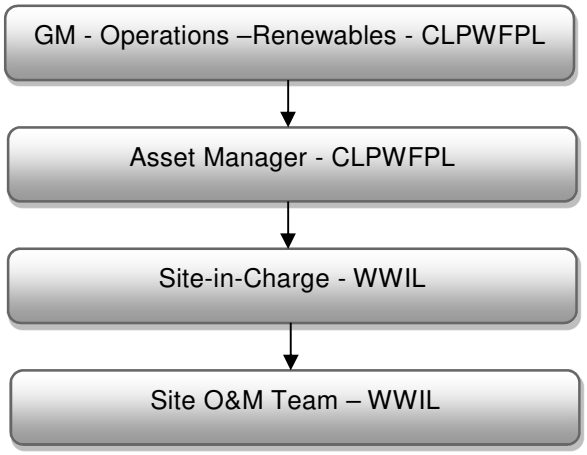
Data archiving: Data has been archived electronically. The data would be archived two years after crediting period or last issuance whichever is later.

Training and maintenance requirements: Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Energy Generators (WEGs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure that WWIL's service staffs is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. The WWIL Training Academy provides need-based training to meet the training requirements of WWIL projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving.

Monitoring roles and responsibilities

CLPWF has formulated a Project Team to ensure proper and continuous monitoring of the performance of turbines and generation of power.

The operation and management structure implemented by the CLPWF for the purpose of the Project activity is illustrated below:



The Project activity is operated by WWIL (O&M contractor for the project activity) and managed by the PP. The operational and maintenance contract for the project activity is with WWIL, which is an ISO 9001 certified company. WWIL 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. The data for the project is compiled by the O&M Contractor and subsequently stored by the PP, the data flows as per the below mentioned flow chart starting from Site O&M team which monitors day to day operational data and monthly recording. The roles and responsibilities for the project are described as below:

Data Recording

The state utility and representative of concerned Power Producer / developer shall jointly read the metering system every month at the delivery point.

Meter readings taken jointly will be signed by the representatives of state utility and of concerned power producer/developer. If Power Producer/ Developer"s representative is not present for joint meter reading then the meter reading taken by state utility shall be considered as final; provided a signed copy of the meter reading is sent to the Power Purchase / Developer within twenty four (24) hours of such reading of the main metering system or back up metering system as the case may be.

Emergency Preparedness

In case of any abrupt breakdown, the fault will be immediately identified by the O&M personnel. All minor faults shall be taken care of by the O& M personnel, In case of any major faults, the grid personnel will be informed and replacement of the equipment shall be made within 24 hours.

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

Data / Parameter	$EG_{export,y}$
Data unit	MWh/yr
Description	Quantity of electricity exported by the Project to the grid in year y
Source of data	Joint Meter Reading Sheets and credit notes issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) for all the feeders to which WTGs of the project activity are connected. $EG_{export,y}$ is the summation of readings of individual Joint Meter Reading Sheets.
Description of measurement methods and procedures to be applied	CLPWF has duly installed the approved ABT meters with accuracy class of 0.2s with online metering features at the metering point (Main Meter). CLPWF has also installed Check meter with separate CT/PT of class 0.2s. Quantity of electricity exported by the Project to the grid has been calculated using the sum of readings taken at the main/check meter installed at the interconnection points. Data monitoring is being taking place at the substation on a continuous basis and recorded on at least monthly basis. On the basis of these readings taken, a generation report has also been issued by MSEDCL.
Frequency of monitoring/recording	Monthly
Value monitored	121,458.44 MWh
Monitoring equipment	CLPWF has duly installed the approved ABT meters with accuracy class of 0.2s with online metering features at the metering point (Main Meter). CLPWF has also installed Check meter with separate CT/PT of class 0.2s. Quantity of electricity exported by the Project to the grid has been calculated using the sum of readings taken at the main/check meter installed at the interconnection points. Data monitoring is being taking place at the substation on a continuous basis and recorded on at least monthly basis. On the basis of these readings taken, a generation report has also been issued by MSEDCL.

	For Type, Accuracy Class, Serial numbers of energy meters kindly refer Annex 01.
QA/QC procedures to be applied	The readings from main and check meters installed at the interconnection point have been checked every month at the time of metering of electricity generation. In case the meters are found to be operating beyond the permissible limits, it shall be immediately sent for calibration. The frequency of meter testing is once in 5 years. It would be prudent to note that the meter testing and calibration is not within the control of the Project Proponent.
Purpose of the data	Baseline Emissions calculation
Calculation method	Measured Value
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VERs for this Project activity, whichever occurs later.

Data / Parameter	$EG_{import,y}$
Data unit	MWh/yr
Description	Quantity of electricity imported by the Project from the grid in year y
Source of data	Joint Meter Reading Sheets and credit notes issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) for all the feeders to which WTGs of the project activity are connected. $EG_{import, y}$ is the summation of readings of individual Joint Meter Reading Sheets.
Description of measurement methods and procedures to be applied	Quantity of electricity imported by the Project to the grid is calculated using the sum of readings taken at the main/check meter installed at the interconnection points. Data monitoring has been done at the substation on continuous basis and recorded on at least a monthly basis. On the basis of these readings taken, a generation report is issued by MSEDCL.
Frequency of monitoring/recording	Monthly
Value monitored	82.19 MWh
Monitoring equipment	CLPWF has duly installed the approved ABT meters with accuracy class of 0.2s with online metering features at the metering point (Main Meter). CLPWF has also installed Check meter with separate CT/PT of class 0.2s. Quantity of electricity imported by the Project to the grid has been calculated using the sum of readings taken at the

	main/check meter installed at the interconnection points. Data monitoring is being taking place at the substation on a continuous basis and recorded on at least monthly basis. On the basis of these readings taken, a generation report has also been issued by MSEDCL. For Type, Accuracy Class, Serial numbers of energy meters kindly refer Annex 01.
QA/QC procedures to be applied	The readings from main and check meters installed at the interconnection point have been checked every month at the time of metering of electricity generation. In case the meters are found to be operating beyond the permissible limits, it shall be immediately sent for calibration. The frequency of meter testing is once in 5 years. It would be prudent to note that the meter testing and calibration is not within the control of the Project Proponent.
Purpose of the data	Baseline Emissions calculation
Calculation method	Measured Value
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VERs for this Project activity, whichever occurs later.

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Joint Meter Reading Sheets and credit notes issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) for all the feeders to which WTGs of the project activity are connected.
Description of measurement methods and procedures to be applied	Net electricity supplied by the project is calculated as the difference of electricity exported to and imported from the grid measure using the readings taken at the main/check meter installed at the interconnection point. $EG_{facility,y} = EG_{export,y} - EG_{import,y}$ Joint Meter Reading Sheets and generation report issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) on a monthly basis is used for this purpose.
Frequency of monitoring/recording	Monthly

Value monitored	121,376.25 MWh
Monitoring equipment	Not applicable as it is a calculated value
QA/QC procedures to be applied	The value of this parameter can be cross checked with all the invoices generated for the sold electricity during the year y.
Purpose of the data	Baseline Emissions calculation
Calculation method	Measured value
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VERs for this Project activity, whichever occurs later.

7.2 Baseline Emissions

The baseline emissions are calculated as follows:

$BE_y = EG_{PJ,y} . EF_{Integrated\ grid,CM,\ y}$

Where:

BE_y = Baseline emissions in year y (tCO_2)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for Integrated Indian grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"

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

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

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh)

Baseline Emission (BE_y):

Baseline emissions (BE_y) are calculated as follows:

$BE_y = EG_{facility,y} \times EF_{Integrated,grid,CM,y}$

Vintage Period	*Net Electricity Export (MWh)*	*Emission Factor (tCO2/MWh)*	*Baseline Emissions (tCO2)*

2021 (19/08/2021 to 31/12/2021)	37,527.14	0.9310	34,937
2022 (01/01/2022 to 30/09/2022)	83,849.12	0.9310	78,063
	121,376.25		**113,000**

7.3 Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 21.0.0, there will be no project emissions in the project activity PEy = 0

7.4 Leakage

As per ACM0002 Version 21.0.0, no leakage has been considered for the calculation of emission factor.

7.5 Net GHG Emission Reductions and Removals

According to the approved methodology ACM0002 (Version 21) Emission Reductions are calculated as

$ER_y = BE_y - PE_y$

Where:

ER_y Emission reductions in year y (tCO2e/yr)

BE_y Baseline Emissions in year y (tCO2e/yr)

PE_y Project Emissions in year y (tCO2e/yr)

Thus,

ER_y = 113,000- 0 tCO_2e

= *113,000* tCO_2e

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2021 (19/08/2021 to 31/12/2021)	34,937	0	0	34,937
2022 (01/01/2022 to 30/09/2022)	78,063	0	0	78,063
Total	**113,000**	**0**	**0**	**113,000**

Ex-ante emissions reductions /removals	Achieved emissions reductions /removals	Percent difference	Justification for the difference
92,649	113,000	21.97%	The actual emission reductions for the current monitoring period are 21.97 % higher than estimated emission reductions. Wind availability is a natural phenomenon which is beyond the control of CLP. Further, current monitoring period covers two high wind season of project activity. Moreover, actual PLF achieved during current monitoring period is 22.13% which is 21.97% higher than compare to estimated PLF of 18.15% as per registered VCS PD. Sensitivity analysis as per registered VCS project documents (PD) shows that the IRR for the Project does not exceed the benchmark even after 43.8% increase in PLF/Net generation. Hence, PLF increase of 21.95% is well below additionality limits and there is no adverse impact on additionality due to this variation.

APPENDIX 1: CALIBRATION DETAILS

Main Meter

Feeder No.	Meter identification-Sl No.	Meter Make	Accuracy Class	Date of Calibration	Valid Till
4	13098992	Elster	0.2s	16/02/2017	15/02/2022
				13/07/2021	12/07/2026
6	13098994	Elster	0.2s	17/02/2017	16/02/2022
				13/07/2021	12/07/2026
7	15687864	Elster	0.2s	17/02/2017	16/02/2022
				13/07/2021	12/07/2026
8	13098996	Elster	0.2s	17/02/2017	16/02/2022
				13/07/2021	12/07/2026

Check Meter

Feeder No.	Meter identification-Sl No.	Meter Make	Accuracy Class	Date of Calibration	Valid Till
4	13098993	Elster	0.2s	16/02/2017	15/02/2022
				13/07/2021	12/07/2026
6	13098995	Elster	0.2s	17/02/2017	16/02/2022
				13/07/2021	12/07/2026
7	13099005	Elster	0.2s	17/02/2017	16/02/2022
				13/07/2021	12/07/2026
8	13098997	Elster	0.2s	17/02/2017	16/02/2022
				13/07/2021	12/07/2026