

199.70 MW WIND PROJECT IN MAHARASHTRA BY BWDPL

Document Prepared By: EKI Energy Services Limited

Project Title	199.70 MW Wind Project in Maharashtra by BWDPL
Version	02
Date of Issue	16-May-2015
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1 PROJECT DETAILS

1.1 Summary Description of the Project

The main purpose of this project activity is to generate clean form of electricity through renewable wind energy source. Bothe Windfarm Development Pvt. Ltd. is the promoter of the proposed project activity. The Project activity envisages implementation of 40 WTGs of individual capacity 2 MW each and 57 WTGs of individual capacity 2.1 MW each in Maharashtra state of India by Bothe Windfarm Development Pvt. Ltd. The total project capacity is 199.7 MW.

The Project activity is a new facility (Greenfield) and it plans to utilize wind energy to generate electricity and supply it to distribution licences which is a part of the NEWNE (Northern, Eastern, Western and North-Eastern) grid of India. In the absence of Project activity, quantity of the electricity that would be delivered by the Project activity to the NEWNE grid would be sourced from the existing grid-connected power plants and future capacity additions to meet the growing electricity requirements. Hence, generation mix of NEWNE grid is considered as the baseline scenario. Thus, the project activity reduces the dependency on fossils fuels which are predominantly used for electricity generation in India and helps reduction of climate change impacts.

The Project activity is expected to supply 372.791 GWh of energy to the NEWNE Grid of India each year. This is expected to result in emission reductions of 364,217 tCO₂e per year of operation. The project will achieve emission reductions of 3,642,170 tCO₂e during the crediting period of 10 years.

1.2 Sectoral Scope and Project Type

As per the categorisation by UNFCCC, the project activity falls under: “Grid-connected electricity generation from renewable sources” Sectoral Scope 1

Methodology applied is ACM 0002 of version 16.0¹

Project type is renewable (wind).

The project is not a grouped project activity.

1.3 Project Proponent

The project proponent details are as follows:

Organization name	Bothe Windfarm Development Pvt. Ltd.
Contact person	Mr. Himir Shah
Title	Sr. Manager - Corporate Finance

¹ <https://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLLAR6MJ6VEU83>

Address	102, 'El Tara Building', Orchard Avenue, Hiranandani, Powai, Mumbai - 400 076
Telephone	+91-22-25701567
Email	himir.shah@continuumenergy.in

1.4 Other Entities Involved in the Project

Not applicable

1.5 Project Start Date

The project start date for this project is 17th May 2013. This is the day on which the first WTG was commissioned under the Project activity.

1.6 Project Crediting Period

The Project has begun generating GHG emission reductions from 17th May 2013. Hence, crediting period for VCS begins on 17th May 2013 and ends on 16th May 2023 i.e. 10 years crediting period which can be renewed for maximum 2 times.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

The project is a large scale project that involves setting up of 199.7 MW of wind power project.

Project Scale	
Project	
Large project	√

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1	364,217
Year 2	364,217
Year 3	364,217
Year 4	364,217
Year 5	364,217
Year 6	364,217
Year 7	364,217
Year 8	364,217

Year 9	364,217
Year 10	364,217
Total estimated ERs	3,642,170
Total number of crediting years	10
Average annual ERs	364,217

1.8 Description of the Project Activity

The Project activity envisages implementation of 40 WTGs of individual capacity 2 MW each and 57 WTGs of individual capacity 2.1 MW each in Maharashtra state of India by Bothe Windfarm Development Pvt. Ltd. The total project capacity is 199.7 MW.

The electricity generated by the Project will be exported to the NEWNE 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 will be exported to the NEWNE grid and sold to the state electricity utility, thereby marginally contributing to reducing the energy demand supply gap in the state of Rajasthan and Gujarat.

Technology

The project uses the technology of Suzlon Energy (2.1 MW) and Vestas (2 MW).

Key Technical Particulars of Vestas V-100 2.0 MW WTG

Particulars	Specifications
Make	Vestas
Model	V-100
Rated Capacity	2000 kW
Rotor Diameter	100 m
Hub height	95 m
Type of Tower	Tubular

Number of Blades	3
Geared/Gearless	Geared
Gear Box	One planetary stage and two helical stages
Cut-in Wind speed	3 m/s
Rated Wind speed	12 m/s
Cut-out Wind speed	20 m/s
Wind Class	IEC S (IEC IIIA average wind and IEC IIIA extreme wind)

Key Technical Particulars of Suzlon S- 97_90 2.1 MW WTG

Particulars	Specifications
Make	Suzlon
Model	S-97
Rotor diameter	97 m
Hub height	90 m
Estimated service life	20 years
Rated power	2.1 MW
Rated wind speed	11 m/s (without turbulence intensity according to GL guideline)
Cut in wind speed	3.0 m/s (30-second average)
Cut out wind speed	20 m/s (10-minute average)
Controller type	Programmable Logic Controller with SUZLON CONTROL SYSTEM software

Key Technical Particulars of Suzlon S- 97_80 2.1 MW WTG

Particulars	Specifications
Make	Suzlon
Model	S-97
Rotor diameter	97 m
Hub height	80 m
Estimated service life	20 years
Rated power	2.1 MW
Rated wind speed	11 m/s (without turbulence intensity according to GL guideline)
Cut in wind speed	3.0 m/s (30-second average)
Cut out wind speed	20 m/s (10-minute average)
Controller type	Programmable Logic Controller with SUZLON CONTROL SYSTEM software

Emission Reductions from anthropogenic sources:

The wind power generated from the Project will be displacing the electricity generated from thermal power stations feeding into NEWNE grid and will be replacing the usage of diesel generators for meeting the power demand during shortage periods. Since, the wind power is Green House Gas (GHG) emissions free, the power generated will prevent the anthropogenic GHG emissions generated by the fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by this project is limited to carbon dioxide (CO₂) only.

1.9 Project Location

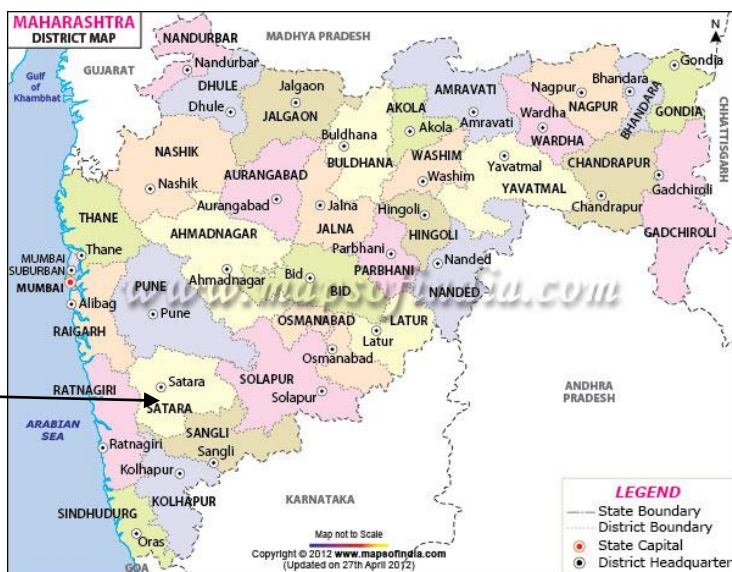
The project activity is located in 9 villages namely, Khokade, Bothe, Ransingwadi, Shripalwan, Ugalyachiwadi, Khandyachiwadi, Garudachiwadi, Katalgewadi, and Shirawali, in Satara district in the state of Maharashtra.

S no.	WTG ID	Village Name	Commissioning Date	Easting	Northing	Turbine Type	Hub Height
1	I - 48	Khokade	21-06-13	432715	1970045	Vestas V100 - 2.0 MW	95 m
2	I - 64	Khokade	21-06-13	432816	1969730	Vestas V100 - 2.0 MW	95 m
3	I - 1	Khokade	27-05-13	433203	1970143	Vestas V100 - 2.0 MW	95 m
4	I - 66	Khokade	20-09-13	433311	1969611	Vestas V100 - 2.0 MW	95 m
5	I - 7	Khokade	17-05-13	433073	1969188	Vestas V100 - 2.0 MW	95 m
6	I - 23	Khokade	18-06-13	433292	1968940	Vestas V100 - 2.0 MW	95 m
7	I - 25	Khokade	21-06-13	433388	1968741	Vestas V100 - 2.0 MW	95 m
8	I - 29	Khokade	21-06-13	433497	1968475	Vestas V100 - 2.0 MW	95 m
9	I - 68	Khokade	21-06-13	433145	1968359	Vestas V100 - 2.0 MW	95 m
10	I - 2	Khokade	27-05-13	432698	1969429	Vestas V100 - 2.0 MW	95 m
11	I - 21	Khokade	18-06-13	433898	1968102	Vestas V100 - 2.0 MW	95 m
12	I - 27	Khokade	21-06-13	433987	1967849	Vestas V100 - 2.0 MW	95 m
13	I - 3	Khokade	27-05-13	433976	1968556	Vestas V100 - 2.0 MW	95 m
14	I - 39	Khokade	21-08-13	433489	1969269	Vestas V100 - 2.0 MW	95 m
15	I - 49	Khokade	09-10-13	433922	1969250	Vestas V100 - 2.0 MW	95 m
16	I - 30	Khokade	10-10-13	434504	1969161	Vestas V100 - 2.0 MW	95 m
17	I - 15	Bothe	10-10-13	433794	1964844	Vestas V100 - 2.0 MW	95 m
18	I - 47	Bothe	09-10-13	435661	1967519	Vestas V100 - 2.0 MW	95 m
19	I - 59	Bothe	24-01-14	435304	1966889	Vestas V100 - 2.0 MW	95 m
20	I - 52	Bothe	20-02-14	433629	1965759	Vestas V100 - 2.0 MW	95 m
21	I - 8	Bothe	11-09-13	433264	1966630	Vestas V100 - 2.0 MW	95 m
22	I - 35	Bothe	11-09-13	435970	1964202	Vestas V100 - 2.0 MW	95 m
23	I - 37	Bothe	24-01-14	435510	1963836	Vestas V100 - 2.0 MW	95 m
24	I - 5	Bothe	15-06-13	433407	1966182	Vestas V100 - 2.0 MW	95 m
25	I - 56	Bothe	11-09-13	434341	1966878	Vestas V100 - 2.0 MW	95 m
26	I - 41	Bothe	11-09-13	434513	1967378	Vestas V100 -	95 m

						2.0 MW	
27	I - 63	Bothe	11-09-13	435018	1967306	Vestas V100 - 2.0 MW	95 m
28	I - 6	Bothe	11-09-13	435393	1965677	Vestas V100 - 2.0 MW	95 m
29	I - 60	Bothe	09-10-13	435495	1967133	Vestas V100 - 2.0 MW	95 m
30	I - 4	Bothe	15-06-13	435579	1966475	Vestas V100 - 2.0 MW	95 m
31	I - 42	Bothe	11-09-13	435133	1964729	Vestas V100 - 2.0 MW	95 m
32	I - 40	Bothe	24-01-14	435431	1964130	Vestas V100 - 2.0 MW	95 m
33	I - 43	Bothe	11-09-13	434906	1963444	Vestas V100 - 2.0 MW	95 m
34	I - 45	Bothe	11-09-13	435538	1963390	Vestas V100 - 2.0 MW	95 m
35	I - 33	Bothe	31-01-14	432975	1966213	Vestas V100 - 2.0 MW	95 m
36	I - 71	Bothe	24-01-14	434722	1966997	Vestas V100 - 2.0 MW	95 m
37	I - 72	Bothe	24-01-14	434947	1965611	Vestas V100 - 2.0 MW	95 m
38	I - 73	Bothe	31-01-14	433888	1966254	Vestas V100 - 2.0 MW	95 m
39	I - 75	Bothe	31-01-14	434436	1964724	Vestas V100 - 2.0 MW	95 m
40	I - 76	Bothe	24-01-14	435844	1964579	Vestas V100 - 2.0 MW	95 m
41	I - 22	Bothe	29-03-14	432941	1966570	Suzlon S97 - 2.1 MW	90 m
42	I - 57	Bothe	26-03-14	433278	1965448	Suzlon S97 - 2.1 MW	90 m
43	I - 16	Bothe	26-03-14	433126	1964908	Suzlon S97 - 2.1 MW	90 m
44	I - 24	Bothe	26-03-14	433947	1965241	Suzlon S97 - 2.1 MW	90 m
45	I - 34	Bothe	31-03-14	435075	1966583	Suzlon S97 - 2.1 MW	90 m
46	I - 26	Bothe	07-09-13	434809	1964382	Suzlon S97 - 2.1 MW	90 m
47	I - 77	Bothe	24-01-14	435082	1963199	Suzlon S97 - 2.1 MW	90 m
48	I - 81	Bothe	26-03-14	434952	1966183	Suzlon S97 - 2.1 MW	90 m
49	I - 82	Bothe	26-03-14	435841	1963715	Suzlon S97 - 2.1 MW	90 m
50	I - 18	Ransingwadi	30-03-14	435175	1962459	Suzlon S97 - 2.1 MW	90 m
51	SP40	Shripalwan	11-12-14	437702	1972737	Suzlon S97 - 2.1 MW	90 m
52	SP05	Shripalwan	11-12-14	437652	1971805	Suzlon S97 - 2.1 MW	90 m
53	SP06	Shripalwan	11-12-14	437635	1972144	Suzlon S97 - 2.1 MW	90 m

						MW	
54	SP07	Shripalwan	11-12-14	437525	1972413	Suzlon S97 - 2.1 MW	90 m
55	SP08	Shripalwan	11-12-14	437221	1972545	Suzlon S97 - 2.1 MW	90 m
56	SP09	Shripalwan	11-12-14	438792	1972391	Suzlon S97 - 2.1 MW	90 m
57	SP10	Shripalwan	11-12-14	438573	1972616	Suzlon S97 - 2.1 MW	90 m
58	SP12	Shripalwan	25-12-14	439547	1972523	Suzlon S97 - 2.1 MW	90 m
59	SP13	Shripalwan	25-12-14	439328	1972768	Suzlon S97 - 2.1 MW	90 m
60	SP17	Shripalwan	25-12-14	439689	1973423	Suzlon S97 - 2.1 MW	90 m
61	SP19	Ugalyachiwadi	16-12-14	441226	1970762	Suzlon S97 - 2.1 MW	90 m
62	SP20	Ugalyachiwadi	16-12-14	441217	1971075	Suzlon S97 - 2.1 MW	90 m
63	SP21	Ugalyachiwadi	30-12-14	441113	1971358	Suzlon S97 - 2.1 MW	90 m
64	SP22	Khandyachiwadi	30-12-14	441487	1971736	Suzlon S97 - 2.1 MW	90 m
65	SP26	Khandyachiwadi	30-12-14	442326	1971555	Suzlon S97 - 2.1 MW	90 m
66	SP27	Khandyachiwadi	16-12-14	441879	1971908	Suzlon S97 - 2.1 MW	90 m
67	SP29	Khandyachiwadi	16-12-14	444070	1969891	Suzlon S97 - 2.1 MW	90 m
68	SP30	Khandyachiwadi	16-12-14	444028	1970223	Suzlon S97 - 2.1 MW	90 m
69	SP31	Khandyachiwadi	16-12-14	444072	1970498	Suzlon S97 - 2.1 MW	90 m
70	SP32	Khandyachiwadi	16-12-14	443768	1970738	Suzlon S97 - 2.1 MW	90 m
71	SP33	Khandyachiwadi	16-12-14	443821	1971105	Suzlon S97 - 2.1 MW	90 m
72	SP34	Khandyachiwadi	30-12-14	443637	1971320	Suzlon S97 - 2.1 MW	90 m
73	SP35	Khandyachiwadi	30-12-14	443207	1971303	Suzlon S97 - 2.1 MW	90 m
74	SP36	Khandyachiwadi	30-12-14	443201	1971719	Suzlon S97 - 2.1 MW	90 m
75	SP37	Khandyachiwadi	30-12-14	444567	1970614	Suzlon S97 - 2.1 MW	90 m
76	SP38	Khandyachiwadi	30-12-14	444335	1970801	Suzlon S97 - 2.1 MW	90 m
77	SP39	Khandyachiwadi	30-12-14	445038	1971267	Suzlon S97 - 2.1 MW	90 m
78	SP41	Garudachiwadi	16-12-14	441422	1972960	Suzlon S97 - 2.1 MW	90 m
79	SP24	Garudachiwadi	16-12-14	440601	1972323	Suzlon S97 - 2.1 MW	90 m
80	SP28	Garudachiwadi	30-12-14	441239	1972441	Suzlon S97 - 2.1	90 m

						MW	
81	I - 13	Ransingwadi	22-08-14	434217	1961171	Suzlon S97 - 2.1 MW	80 m
82	I - 19	Katalgewadi	01-10-14	434737	1961237	Suzlon S97 - 2.1 MW	80 m
83	I - 31	Katalgewadi	01-10-14	435289	1961773	Suzlon S97 - 2.1 MW	80 m
84	I - 38	Katalgewadi	03-11-14	435475	1961574	Suzlon S97 - 2.1 MW	80 m
85	I - 53	Katalgewadi	22-08-14	436157	1961880	Suzlon S97 - 2.1 MW	80 m
86	I - 69	Katalgewadi	03-11-14	434557	1960987	Suzlon S97 - 2.1 MW	80 m
87	I - 28	Shirawali	03-11-14	435370	1962109	Suzlon S97 - 2.1 MW	80 m
88	I - 46	Shirawali	22-08-14	435648	1962339	Suzlon S97 - 2.1 MW	80 m
89	I - 61	Shirawali	22-08-14	435954	1962087	Suzlon S97 - 2.1 MW	80 m
90	I - 51	Katalgewadi	03-11-14	436663	1962098	Suzlon S97 - 2.1 MW	80 m
91	I - 80	Shirawali	16-11-14	438325	1962057	Suzlon S97 - 2.1 MW	80 m
92	I - 78	Shirawali	27-11-14	437099	1961893	Suzlon S97 - 2.1 MW	80 m
93	I - 79	Shirawali	16-11-14	437872	1961810	Suzlon S97 - 2.1 MW	80 m
94	I - 83	Shirawali	16-11-14	437163	1962752	Suzlon S97 - 2.1 MW	80 m
95	I - 17	Shirawali	27-11-14	437427	1961851	Suzlon S97 - 2.1 MW	80 m
96	I - 84	Khandyachiwadi	30-12-14	444824	1971013	Suzlon S97 - 2.1 MW	80 m
97	SP25	Garudachiwadi	30-12-14	440644	1972737	Suzlon S97 - 2.1 MW	80 m



1.10 Conditions Prior to Project Initiation

The project is a Greenfield wind power project and does not involve generation of GHG emissions for the purpose of their subsequent reduction, removal or destruction.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received necessary approvals for development and commissioning for each WTG from the state Nodal agencies and is in compliance to the local laws and regulations.

1.12 Ownership and Other Programs

1.12.1 Right of Use

The Project comprises of 40 WTGs of individual capacity 2 MW each and 57 WTGs of individual capacity 2.1 MW each owned by Bothe Windfarm Development Pvt. Ltd. The PP is the sole owner of project activity, hence it possess right of use of ER credits. Further the Ownership is demonstrated through the following documents.

- 1) Commissioning certificates for the project WEGs in the name of PP
- 2) Purchase orders of the project activity
- 3) Power Purchase Agreements

1.12.2 Emissions Trading Programs and Other Binding Limits

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions of Bothe Windfarm Development Pvt. Ltd.

1.12.3 Other Forms of Environmental Credit

The Project does not intend to generate any other form of GHG-related environmental credit apart from GHG emission reductions or removals claimed under the VCS Program.

1.12.4 Participation under Other GHG Programs

The project has not participated in any other GHG Program.

1.12.5 Projects Rejected by Other GHG Programs

The Project is not rejected by other GHG program.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

This is not a grouped project activity. Thus, this section is not applicable for this project.

Leakage Management

Not applicable to the project activity.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Further Information

Contribution to sustainable development:

Ministry of Environment and Forests, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

Social wellbeing: The project would help in generating employment opportunities during the construction and operation phases. The project activity will lead to development in infrastructure in the region like development of roads and also may promote business with improved power generation.

Economic wellbeing: The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity will also help to reduce the demand supply gap in the state.

The project activity will generate power using zero emissions wind based power generation which helps to reduce GHG emissions and specific pollutants like SO_x, NO_x, and SPM associated with the conventional thermal power generation facilities.

Technological wellbeing: The successful operation of project activity would lead to promotion of wind based power generation and would encourage other entrepreneurs to participate in similar projects

Environmental well-being: Wind being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the Project activity also helps in avoiding significant amount of GHG emissions.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The methodology applied for the project is ACM 0002 of version 16.0 titled “Grid-connected electricity generation from renewable sources²”

ACM0002 draws upon the following tools which have been used in the PDD:

- a. Tool to calculate the emission factor for an electricity system (Version 04)³
- b. Tool for demonstration and assessment of additionality (Version 7.0.0)⁴

2.2 Applicability of Methodology

The following steps will show the applicability of the project under this methodology.

Applicability criteria	Applicability Status of this project
This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s).	The proposed project activity is a Greenfield, NEWNE grid-connected renewable power plant. Therefore, it confirms to the said criteria
The project activity may include renewable energy power plant/unit of one of the following types: 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;	The project activity is the installation of a new grid connected renewable wind power project. Thus, it meets the first applicability condition
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.	The proposed project activity is the installation of a new wind power plant/unit. Therefore, the said criteria is not applicable
In case of hydro power plants, one of the following conditions shall apply: The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable

² <https://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLAR6MJ6VEU83>

³ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf>

⁴ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>

Applicability criteria	Applicability Status of this project
any of the reservoirs; or - 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 (3), is greater than 4 W/m² ; or - The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m² ; or - The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m², all of the following conditions shall apply: i. The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m²; ii. Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; iii. Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m² shall be: a) Lower than or equal to 15 MW; and b) Less than 10 per cent of the total installed capacity of integrated hydro power project.	
In the case of integrated hydro power projects, project proponent shall: - Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or - Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable

Applicability criteria	Applicability Status of this project
CDM project activity.	
The methodology is not applicable to: - Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; - Biomass fired power plants/units	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
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 is a Greenfield project, thus this criteria is not applicable.
In addition, the applicability conditions included in the tools referred to below apply	The project applies the following tools and is in compliance to the same; (a) "Tool to calculate the emission factor for an electricity system"; (b) "Tool for the demonstration and assessment of additionality";

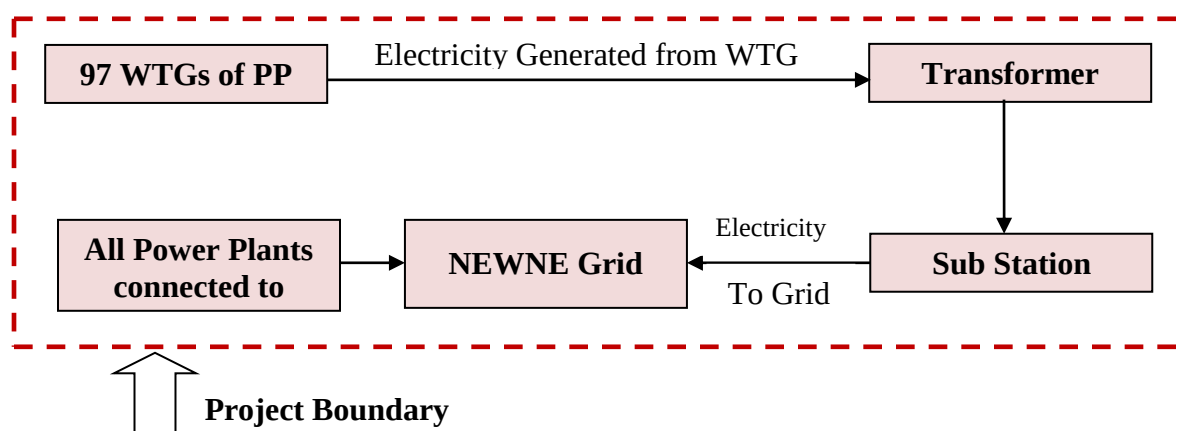
2.3 Project Boundary

As per the para 20 of the applicable methodology ACM0002 (Version 16.0.0) “*The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to*”.

Therefore, the project boundary includes all the 97 numbers of WTGs along with the WTGs of the other project proponents connected to the sub-station, which is further connected to the network of the NEWNE grid, i.e. the project boundary also includes the NEWNE grid. Thus, the project boundary further includes all the power plants physically connected to the NEWNE grid.

Source		Gas	Included?	Justification/Explanation
Baseline	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO ₂	Yes	Major emission source
		CH ₄	No	Minor Emission Source
		N ₂ O	No	Minor Emission Source
Annex 1	Grid Connected wind power based	CO ₂	No	Electricity generation by

Source	Gas	Included?	Justification/Explanation
electricity generation	CH ₄	No	using WEGs does not generate any emissions
	N ₂ O	No	
	Other	No	

Project Boundary Diagram:**2.4 Baseline Scenario**

As per para 23 of ACM0002 version 16.0, 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”.

As per para 46 of ACM0002 version 16.0, “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 case is in compliance with all applicable legal and regulatory requirements.

2.5 Additionality

In line with VCS Standard version 3.4, the additionality of the Project activity is ascertained in line with the applicable guidance from the UNFCCC. The demonstration of additionality for the proposed 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 07.0.0,. The tool provides a step-wise approach to demonstrate additionality which is displayed below:

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind;

No, this project activity is not first-of-its-kind project. The additionality of the project activity has demonstrated by using the investment barrier and the same has been discussed in the following steps.

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 VCS project activity.

The Project activity envisages implementation of 40 WTGs of individual capacity 2 MW each and 57 WTGs of individual capacity 2.1 MW each in Maharashtra state of India by Bothe Windfarm Development Pvt. Ltd. The total project capacity is 199.7 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 VCS project activity.

The PP could proceed with the implementation of the project without Carbon credit 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 revenues from sale of Carbon Credits. 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. However, Alternative 2 has been selected as the appropriate baseline alternative for this project activity.

Step 2: Investment analysis

Determine whether the proposed project activity is economically or financially less attractive than at least one other alternative, identified in step 1, without the revenue from the sale of emission reductions credits. 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 NEWNE 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, the Benchmark 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 approach (Option III) has been chosen. Further, this method illustrates the evaluation of the Project by the PP before the decision to undertake the project was taken and management approval granted.

Choice of Financial Indicator:

As allowed by the Guidance on the Assessment of Investment Analysis (Version 5)⁵, post tax Equity Internal Rate of Return (IRR) was selected as the financial indicator to assess the attractiveness of the project.

Choice of Benchmark:

As per para 15 of Guidelines on the assessment of the investment analysis (Annex 05, EB 62), the value for cost of equity is selected from Appendix A of Annex 05 of EB 62. The default value of Return on Equity for Group-1 projects in India is 11.75%.

As per paragraph 7 of Appendix A of the above mentioned document, *“In situations where an investment analysis is carried out in nominal terms, project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the **inflation forecast of the central bank of the host country for the duration of the crediting period**. If this information is not available, the target inflation rate of the central bank shall be used. If this information is also not available, then the average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) or the World Bank for the next five years after the start of the project activity shall be used”*.

Default Value Benchmark Calculations:

⁵ http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

As mentioned in Appendix A in EB62 Annex 5 and latest Clarification from UNFCCC in EB 73 (Applicability of the “Guidelines on the assessment of investment analysis” version 05.0), default value benchmark is presented below:

Appendix A in EB62 Annex 5 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = 11.75%

The Required return on equity (benchmark) was computed in the following manner:

$$\text{Nominal Benchmark}^6 = \{(1 + \text{Real Benchmark}) * (1 + \text{Inflation rate})\} - 1$$

Where:

- Default value for Real Benchmark = 11.75% (as per Appendix of Annex 5, EB 62)
- Inflation Rate forecast by Reserve Bank of India (RBI) (i.e. Central Bank of India) for India

Inflation Forecast as per RBI:

WTG Owner	Inflation Forecast		Benchmark	
	5 Years	10 Years	5 Years	10 Years
Bothe Windfarm Development Pvt. Ltd. (Suzlon 40 WTGs)	6.20% ⁷	6.00%	18.68%	18.46%
Bothe Windfarm Development Pvt. Ltd. (Suzlon 17 WTGs)	5.90% ⁸	5.60%	18.34%	18.01%
Bothe Windfarm Development Pvt. Ltd. (Vestas 40 WTGs)	6.50% ⁹	6.00%	19.01%	18.46%

As a conservative approach, benchmark of 18.34% has been selected for this project activity.

Based on input parameters, the IRR comes out to be:

WTG Owner	Equity IRR w/o CDM	Benchmark
Bothe Windfarm Development Pvt. Ltd. (Suzlon 40 WTGs)	14.38%	18.46%
Bothe Windfarm Development Pvt. Ltd. (Suzlon 17 WTGs)	12.21%	18.01%
Bothe Windfarm Development Pvt. Ltd. (Vestas 40 WTGs)	10.80%	18.46%

Sub-step 2c: Sensitivity Analysis:

⁶ As per Pg. 320 of Corporate Finance, Second Edition of Aswath Damodaran

⁷ <http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/01SPF300712F.pdf>

⁸ <http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/01SPA281013.pdf>

⁹ <http://www.rbi.org.in/scripts/PublicationsView.aspx?id=14608>

As per Guidance 20 and 21 of Annex 5 of EB 62 Annex 5, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets. Guidance also states, "All parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude". The Annex also states, as a general point of departure, variations in the sensitivity analysis should at least cover a range of +10% and -10%, unless this is not deemed appropriate in the context of the specific project circumstances.

Since the project cost is already firmed up, the cost is not variable. The tariff is determined by PPA which is fixed for years mentioned as per the tariff order and hence it need not be subjected to variation. All other expenses are much less than 20% of the total cost. Hence, only PLF needs to be subjected to reasonable variation. Nevertheless, following factors have been subjected to sensitivity analysis:

- (a) PLF
- (b) O&M Cost
- (c) Project Cost
- (d) Tariff Rate

The results of sensitivity analysis are as follows:

Equity IRR	Bothe Windfarm Development Pvt. Ltd. (Suzlon 40 WTGs)			
Variation %	-10%	Normal	10%	Breaching Value
PLF	11.20%	14.38%	17.73%	12.11%
O&M Cost	14.68%	14.38%	14.08%	-146.50%
Project Cost	17.78%	14.38%	11.76%	-11.68%
Tariff Rate	11.20%	14.38%	17.73%	12.11%

Equity IRR	Bothe Windfarm Development Pvt. Ltd. (Suzlon 17 WTGs)			
Variation %	-10%	Normal	10%	Breaching Value
PLF	9.32%	12.21%	15.15%	19.29%
O&M Cost	12.47%	12.21%	11.95%	-244.12%
Project Cost	15.29%	12.21%	9.82%	-16.91%
Tariff Rate	9.50%	12.21%	15.03%	20.17%

Equity IRR	Bothe Windfarm Development Pvt. Ltd. (Vestas 40 WTGs)			
Variation %	-10%	Normal	10%	Breaching Value
PLF	8.03%	10.80%	13.68%	25.69%
O&M Cost	11.15%	10.80%	10.44%	-246.00%
Project Cost	13.62%	10.80%	8.60%	-22.32%
Tariff Rate	8.03%	10.80%	13.68%	25.69%

It has been observed that in various scenarios wherein there are changes in tariff, O&M cost, net saleable units and project's capital cost, the Equity IRR does not cross the benchmark. Thus, it can be concluded that revenue from sale of VERs is important to alleviate this gap and hence the project has been considered to be additional.

	Probability to breach the benchmark
PLF	Not possible as the PLF has been reported as per the Third Party Report based on long term data and hence a PLF fluctuation of more than 10% is unlikely to happen. Moreover, the project activity has considered 6.55% higher PLF than what the applicable MERC order ¹⁰ considers.
O&M	With the country experiencing 5% inflation on an average, the question of O&M coming down is ruled out. Moreover, the purchase orders provide for a 5% escalation in the cost every year. Even the tariff order of Maharashtra provides for a higher 5.72% escalation in the O&M cost.
Project Cost	The total project cost is 0.17% higher than considered at the time of decision making cost. Since the project cost is firm, there is no possibility of project cost going below this level. However, we have conducted sensitivity analysis for project cost being 10% less than that considered during decision making. Still, the IRR does not breach the Benchmark.
Tariff Rate	The tariff is determined by PPA which is fixed for years mentioned as per the State Electricity Board's tariff order. Hence, there is no probability to get variation for the same.

Step 3: Barrier analysis

Barrier analysis has not been used.

Step 4: Common practice Analysis

Sub-step 4a: Analyze other activities similar to the proposed Project activity:

Common practice analysis has been carried out as per "Guidelines on Common Practice, version 02.0 EB69, Annex 8". In the context of the project activity, the following parameters are defined as per **Part I. Definitions** of the Guidelines on Common Practice:

1. Applicable Geographical Area (Para 1): The host country, i.e. India has been considered as the applicable geographical area for this project.
2. Measure (Para 2): The project activity reduces greenhouse gas emissions by generating electricity using renewable energy source-wind. Therefore, 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
3. Output (Para 3): The project activity produces electricity. Therefore, electricity is considered as output of the project activity.
4. Different Technologies (Para 4): The project activity uses wind energy for producing electricity and hence as per Para 4(a), the technologies which use energy source/ fuel other than wind will be considered as the different technologies for the project activity.

¹⁰

[http://www.mercindia.org.in/pdf/Order%2058%2042/MERC_RE%20Tariff%20Order%20\(SuoMotu\)_for%20FY2012-13_Case%20No.%2010%20of%202012.pdf](http://www.mercindia.org.in/pdf/Order%2058%2042/MERC_RE%20Tariff%20Order%20(SuoMotu)_for%20FY2012-13_Case%20No.%2010%20of%202012.pdf)

The common practice analysis is carried out step by step as per Part II. Stepwise approach for common practice as follows:

Step (1): calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.

Range	Capacity	Unit
+50%	299.55	MW
Capacity of the proposed project activity	199.7	MW
-50%	99.85	MW

Step (2): identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

- The projects are located in the applicable geographical area;
- The projects apply the same measure as the proposed project activity;
- The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
- The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;
- The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
- The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

Identification of the similar projects (CDM and non-CDM) is carried out as per sub-steps of Step (2) as follows:

- As the projects are located in India, therefore, the applicable geographical area is India and projects in the host country India have been chosen for analysis.
- The project activity is a green-field wind power project and uses measure (b) “Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies”.
Therefore, all projects applying same measure (b) as the proposed project activity are candidates for similar projects.
- The energy source used by the project activity is wind. Hence, only wind energy projects have been considered for analysis.
- The project activity produces electricity; therefore, all power plants that produce electricity are candidates for similar projects.
- The capacity range of the projects is within the applicable capacity range from 99.85 MW to 299.55 MW.

- f. The start date of the project activity is 17-05-2013. As Kyoto Protocol was ratified by India on 26/08/2002¹¹, therefore projects, which had started commercial operation between 26/08/2002 to 17-05-2013, have been identified.

Numbers of Similar projects (CDM and non-CDM) indentified, which fulfil above-mentioned conditioned are:

Particulars	No. of Projects	Source
N _{wind}	20	Directory - Indian Wind Power published by CECL, Bhopal

Sources: Indian Wind Power Directory 2013¹²

Step (3): within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

All the projects identified in step-2 are either registered or project activities submitted for registration, or project activities undergoing validation.

Thus N_{all} = 0

Step (4): within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

From the projects identified above, those projects which employ “different technologies” have been excluded and the number of such projects has been identified as N_{diff}.

As N_{all} = 0; thus N_{diff} = 0

Step (5): calculate factor $F=1-N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

Calculate $F=1-N_{diff}/N_{all}$

As N_{all} is zero thus, N_{all}-N_{diff} = 0; is less than 3

Outcome of Step 5:

As,

- F = Not defined
- N_{all}-N_{diff} = 0; is less than 3

¹¹ http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

¹² <http://www.indiacore.com/bookstore-ic/details/de-ipdi/ipdi134.html>

Thus, the proposed project activity is not a “common practice” within a sector in the applicable geographical area.

2.6 Methodology Deviations

There are no methodology deviations.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

As per para 46 of ACM0002 version 16.0, 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:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Where:

BE_y = Baseline emissions in year y (tCO₂)

$EG_{PJ,y}$ = 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)

$EF_{grid,CM,y}$ = 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” (tCO₂/MWh)

Baseline Emissions

As per the equation 6 of the methodology ACM 0002 (Version 16.0),

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

Where:

BE_y : Baseline emissions in year y (tCO₂e/yr)

$EG_{PJ, y}$: 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)

$EF_{grid, CM, y}$: 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” (tCO₂e/MWh)

Calculation of $EG_{PJ,y}$

The methodology ACM 0002 (Version 16.0) has procedures for calculation of $EG_{PJ, y}$ for the following cases:

- (a) Greenfield plants,
- (b) Retrofits and replacements, and
- (c) Capacity additions.

As all the three projects included in the proposed CDM project activity are Greenfield plants, option (a) as provided in the methodology ACM 0002 (Version 16.0) shall be applicable and is described below:

"If 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, then:

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

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 ACM 0002 (Version 16.0) 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"*.

As per version 4 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:

- STEP 1: 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 CO₂ baseline database in its version 9.0¹³ (January, 2014). 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

Grid/project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

The Southern grid and the NEWNE Grid form the two independent regional grids of India. As the project activity comprises the project activity located in the state of Rajasthan, the NEWNE grid is applicable to the proposed CDM project.

Each state in a regional grid meets its own demand with its own generation facilities and also with allocation from power plants owned by the central sector. Depending on the demand and

¹³ http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

generation, there are electricity exports and imports between states in the regional grid. The volume of the net transfers between the regions in India is relatively small and electricity is largely produced and consumed within the same states. Consequently, it is appropriate to assume that the impacts of the project activity will be confined to the regional grid in which it is located. Hence for the purpose of estimation of the baseline emission factor, the NEWNE grid has been chosen as the relevant electricity system.

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

Off-grid power plants have not been included in the project electricity system

Step 3: Selection of an Operating Margin method

The project proponent wishes to use the Simple Operating Margin (OM) method for the estimation of the baseline. The use of the Simple OM method is justified as the share of the low cost/ run resources constitute less than 50% of the total grid generation.

The data pertaining to the total grid generation and the low/cost must run resources are as follows;

Grid	2009-10	2010-11	2011-12	2012-13	2013-14
NEWNE	15.9%	17.6%	19.0%	17.2%	18.0%

Note: As per the above information, it can be clearly established that the share of the low cost/ run resources constitute to less than 50% of the total grid generation.

With regards to data vintage, the project participant wishes to use the ex-ante option wherein the project proponent wishes to use the ex ante option wherein the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

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

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂e/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units.

The data provided by the Central Electricity Authority (CEA), an official data source has been relied upon for the calculation of the OM. The latest version of the database, Version 10 (December, 2014) has been used. The OM calculations have been based upon generation data, fuel consumption and the Gross Calorific value (GCV) of the fuel.

Option A has been chosen for calculating Operating Margin emission factor for the project. OM has been determined based on fuel consumption and net efficiency generation of each power plant/ unit, since fuel consumption data for each power plant/ unit is available.

Assumptions

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

Net generation: In case of stations where only gross generation is available, CEA standard values for auxiliary consumption have been applied to calculate the net generation data.

GCV: Default GCV values for some thermal power stations have been used for cases where station specific data was unavailable.

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

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

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

- All units of a station fall into the build margin; or
- All units of a station have the same installed capacity; or
- The units in the station have different capacities but do not differ with respect to the applicable standard auxiliary consumption.

2. In all other cases, standard values for auxiliary consumption adopted by CEA were applied.

Fuel consumption and GCV: Fuel consumption and GCV are generally not measured at unit level. Instead, the specific CO₂ emissions of the relevant units were directly calculated based on heat rates.

Calculation Approach

The Simple OM has been calculated using the following formula:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y})}{EG_y} \quad (3)$$

Where:

- EF_{grid, OM simple, y}: Simple operating margin CO₂ emission factor in year y (tCO₂e/MWh)
- FC_{i, y}: Amount of fossil fuel type *i* consumed in the project electricity system in year y (mass or volume unit)
- NCV_{i, y}: Net calorific value (energy content) of fossil fuel type *i* in year y (GJ/mass or volume unit)
- EF_{CO₂, i, y}: CO₂ emission factor of fossil fuel type *i* in year y (tCO₂e/GJ)
- EG_y: Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)
- i*: All fossil fuel types combusted in power sources in the project electricity system in year y
- Y*: The relevant year as per the data vintage chosen in Step 3

As per CEA Database, the last 3 year generation values are 0.9699, 0.9919 and 0.9953 tCO₂e/MWh.

The 3-year generation-weighted average was taken and the same has been derived as

$$EF_{grid,OM,y} = 0.9862 \text{ tCO}_2\text{e/MWh}$$

Step 5: Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO₂e/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 CO₂ emission factor in year y (tCO₂e/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}: CO₂ emission factor of power unit m in year y (tCO₂e/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 2013-14) has been used and the build margin thus calculated is 0.9495 (tCO₂e/MWh)

Therefore, EF_{grid, BM, y} = 0.9495 (tCO₂e/MWh)

Step 6: Calculation of the Combined Margin emission factor

The combined margin emission factor will be calculated as follows:

$$EF_{grid, CM, y} = EF_{grid, OM, y} \times w_{OM} + EF_{grid, BM, y} \times w_{BM} \quad (5)$$

Where,

EF_{grid, BM, y} = Build margin CO₂ emission factor in year y (tCO₂e/MWh)
 EF_{grid, OM, y} = Operating margin CO₂ emission factor in year y (tCO₂e/MWh)
 w_{OM} = Weightage of operating margin emissions factor (%)
 w_{BM} = Weightage of build margin emissions factor (%)

As per the 'Tool to calculate the Emission Factor for an electricity system' version 04, 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:

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

$$EF_{grid, CM, y} = 0.75 * 0.9862 + 0.25 * 0.9495 \text{ (tCO}_2\text{/MWh)}$$

$$EF_{grid, CM, y} = 0.9770 \text{ tCO}_2\text{/MWh}$$

3.2 Project Emissions

As per the para 35 of methodology ACM 0002 (Version 16.0), "For most renewable power generation project activities, PE_y = 0.

3.3 Leakage

As per para 60 of the methodology ACM 0002 (Version 16.0) does not consider any leakage emissions.

3.4 Net GHG Emission Reductions and Removals

Baseline Emissions

As per the equation 6 of the methodology ACM 0002 (Version 16.0),

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

Where:

BE_y : Baseline emissions in year y (tCO₂e/yr)

$EG_{PJ, y}$: 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)

$EF_{grid, CM, y}$: 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" (tCO₂e/MWh)

Thus, $BE_y = EG_{PJ, y} * EF_{grid, CM, y}$

$$BE_y = 372,791 \text{ (MWh)} * 0.9770 \text{ tCO}_2/\text{MWh}$$

$$BE_y = 364,217 \text{ tCO}_2$$

Project Emissions

As per the para 35 of methodology ACM 0002 (Version 16.0), "For most renewable power generation project activities, $PE_y = 0$."

Leakage Emissions

As per para 60 of the methodology ACM 0002 (Version 16.0) does not consider any leakage emissions.

Emission reductions

As per equation number (13) of the applied methodology, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (7)$$

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,

$$\begin{aligned} ER_y &= 364,217 - 0 \\ &= 364,217 \text{ tCO}_2 \end{aligned}$$

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
Year 1	364,217	0	0	364,217

Year 2	364,217	0	0	364,217
Year 3	364,217	0	0	364,217
Year 4	364,217	0	0	364,217
Year 5	364,217	0	0	364,217
Year 6	364,217	0	0	364,217
Year 7	364,217	0	0	364,217
Year 8	364,217	0	0	364,217
Year 9	364,217	0	0	364,217
Year 10	364,217	0	0	364,217
Total	3,642,170	0	0	3,642,170

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014 ¹⁴
Value applied:	0.9862 (NEWNE Grid)
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 04.0.0" as 3-year generation weighted average using data for the years 2011-2012, 2012-2013 & 2013-2014. The data are obtained from "CO ₂ Baseline Database for Indian Power Sector" version 10.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ /MWh
Description	Build Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014
Value applied:	0.9495 (NEWNE Grid)
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 04.0.0" for the year 2013-2014. The data is obtained from "CO ₂ Baseline Database for Indian Power Sector" version 10.0, published by the Central Electricity Authority,

¹⁴ http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

	Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh
Description	Combines Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014 ¹⁵
Value applied:	0.9770 (NEWNE Grid)
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where: EF_{grid,BM,y} = Build margin CO₂ emission factor in year y (tCO₂/MWh) EF_{grid,OM,y} = Operating margin CO₂ emission factor in year y (tCO₂/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 75% W_{BM} = Weighting of build margin emissions factor (%) = 25%
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	EG _{PJ,y}
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project to the grid in year y
Source of data	Monthly electricity share certificates
Description of measurement methods and procedures to be applied	The value of net electricity generation supplied to the grid as per Monthly electricity share certificates forms the basis for calculation of the emission reductions; which can be cross checked from the invoice raised to DISCOM. Net electricity supplied to grid will be calculated as the difference of the measured values of “export” and “import” of electricity through the dedicated SEB energy meter (electronic trivector bidirectional main meter & check meter which measures both export & import concurrently) installed at the delivery point (i.e. the connected substation).

¹⁵ http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

	Net electricity generated and supplied by the project to the grid = Electricity Export to the grid - Electricity Import from the grid Monthly meter readings are taken from the main and check meter installed at the substation and certified by the representatives of SEB Officials and the representatives of the project proponent. For apportioning procedure refer section 4.3
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and at least monthly recording
Value applied:	349,874 MWh
Monitoring equipment	Monitoring: Tri vector meter will be used Data type: Measured Type of meter: Static type meter (Main & Check). Both are Bidirectional meters. Class of meter: 0.2s
QA/QC procedures to be applied	• The energy meter reading are taken on monthly basis • Energy meters will be calibrated annually and faulty meters will be duly replaced immediately. • All the energy meters are under the control of state utility and calibration/testing of energy meters is also under the jurisdiction of state utility. • The Net electricity exported to the grid will be cross checked against the invoice raised by the PP towards the DISCOM
Purpose of data	Calculation of Baseline emissions
Calculation method	-
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

4.3 Monitoring Plan

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

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

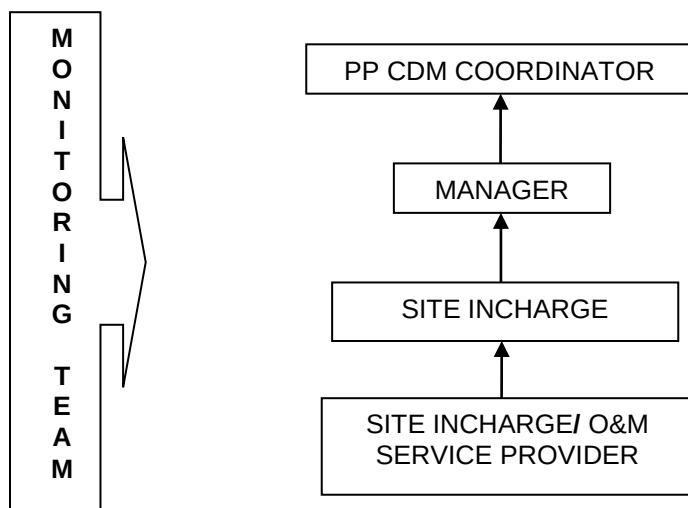
Aim of monitoring:

The monitoring procedure will set guidelines for the project investor to monitor the parameters regularly and to ensure quality and accuracy in monitoring. It elaborates on the functions of the monitoring team and procedures to be followed in monitoring of the CDM parameters.

The monitoring shall include all the equipments that contribute towards reduction in GHG emissions. Since the project activity focuses mainly on the generation of renewable power, it is important to monitor all the equipments involved in the metering of all the necessary instruments.

The project investor has a well defined management structure for monitoring the project activity.

Organizational Structure for monitoring



Organizational Structure for monitoring:

Designation	Responsibilities
PP CDM COORDINATOR	Overall project monitoring including collecting and aggregating JMRs/Invoices for all WTG investors
MANAGER	Holds complete control over monitoring aspects pertaining to the project
SITE INCHARGE	- Recording - Verification - Storage of Data
SITE INCHARGE/ O&M SERVICE PROVIDER	- Operation and Maintenance - Storage of data - Data Recording

Personnel Training:

The project personnel, including those involved in data recording, maintenance and direct data assessments will be provided with training on the application and usage of the manual.

Training and maintenance requirements:

O&M operator would provide training to the on-site staffs on operation and maintenance of the metering system and adherence to the Monitoring Plan of the project activity. Training for operation of projects shall be provided by the respective O&M Operators.

For WTGs, 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 WTGs, it is extremely

essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure that technology providers' service staff 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.

Reading and Correction of Meters:

For the purpose of energy accounting, O&M operator will provide ABT compliant meters at the interface points. Interface metering will confirm to the Central Electricity Authority (Installation and Operation Meters) Regulation, 2006. In the event that the main meter is not in service as a result of maintenance, repairs or testing, then the check meter will be used during the period the main meter is not in service.

Calibration of Meters:

Calibration of all the meters will be undertaken annually and faulty meters will be duly replaced immediately. Calibration will be done by an authorized agency or reputed laboratory.

Apportioning Procedure

The net electricity supplied to the grid would be reported as the difference between the net export and import from the WTG. The electricity export and import data will be monitored via main and check meters connected to feeders at the respective sub-station.

In case of NEWNE grid, multiple WTGs would be connected to the feeder, one of which would be part of the project activity and rest of which would not be part of the project activity (WTGs owned by other entities). The import and export of electricity is continuously monitored by the export/import meter and the data is recorded on a monthly basis jointly by the proponent and the electricity board. The meter is located at the delivery point of wind power in the grid. This accounts for the import of electricity that is used by the Project proponent. Hence the net electricity generated is calculated from the joint meter reading and recorded /archived in paper/electronic.

SEB/O&M Contractor follows an apportioning procedure to account for electricity generation from individual WTGs based on data from individual WTG controllers.

Following the joint meter readings, apportioning of net electricity supplied to grid by each WTG is done by the SEB/O&M Contractor based on the individual meter readings recorded from the controller panel meter of each WTG and based on the meter reading recorded from the meters situated at the connected substations.

Based on the monthly export and import data as per main/check meters and the WTG controller readings, SEB provides a break-up of the electricity exported and imported for each WTG.

A monthly joint meter reading of the energy meters is taken by MSEDCL officials and O&M contractors (representatives of the project investor). Apportioning of net electricity generation from each WTG connected to NEWNE grid is then determined as follows:

1.	Apportioning Ratio	=	Generation at WTG Controller
			Total Generation of All WTG Controller for the feeder

2.	Electricity Import from WTG by the grid (EG_{import})	=	Import from Main/Check Meter * Apportioning Ratio
3.	Electricity Export to the WTGs by the grid (EG_{export})	=	Export from Main/Check Meter * Apportioning Ratio
4.	Net electricity generated by WTG	=	Electricity Import from WTG by the grid – Electricity Export to the WTGs by the grid

Above steps for calculation of EG_{import} and EG_{export} are carried out by MSEDCL Officials & energy break-up sheet is issued by the MSEDCL Officials. Based on the break-up sheets Project investor raises invoice to DISCOM which forms the cross-check for the net electricity generated. The Project investor has no role in the entire procedure of apportioning

Emergency Preparedness and Uncertainty Procedure:

In case Main meter or check meter is found to be outside the acceptable limits of accuracy or faulty or not functioning properly, it will be repaired, recalibrated or replaced as soon as possible. In the event that the Main meter is not in service as a result of maintenance, repairs or testing, the check meter will be used. In case both the main and check meter are found to be outside the acceptable limits of accuracy or faulty or not functioning properly, both the meters shall be calibrated immediately and the error percentage found in the main meter during its calibration shall be applied to its metered energy data for the entire period since its last calibration to obtain the corrected value of net electricity exported to the grid.

Data Recording and Archiving:

O&M operator will keep complete and accurate records of operating log at the Power Plant. The data will be archived electronically as well as in log books at the power plant and 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.

In case the dates of a particular monitoring period do not match with the dates of the billing cycle, the net electricity exported to the grid would be calculated from:

- Apportioning the net electricity exported to grid, as recorded in the consolidated Share Certificate / JMR Report / Credit Notes certified by the respective state discom, based on the number of days in the monitoring period and the number of days for which Share Certificate / JMR Report / Credit Notes was prepared.

The calculated value after apportioning would be used for calculation of emission reductions during that period.

5 ENVIRONMENTAL IMPACT

As per the Schedule 1 of the EIA notification dated 1/12/2009¹⁶ and latest notification dated 24/12/2013¹⁷, given by the Ministry of Environment and Forests under the Environment (Protection) Act 1986, the proposed Project activity does not fall under the list of activities requiring EIA as the environmental impacts for such project are not considered as significant by the host Party or PP.

¹⁶ <http://moef.nic.in/downloads/rules-and-regulations/3067.pdf>

¹⁷ <http://envfor.nic.in/sites/default/files/ia-24122013.pdf>

6 STAKEHOLDER COMMENTS

PP decided the date and venue for local stakeholder consultation and informed local stakeholder regarding the meeting. The followings are the local stakeholders for the project activity:

- Local community
- Local village administration
- Technology suppliers
- Local vendors

All the stakeholders have been invited on 13/04/2015 through submission of the invitation letter and Public Notice to attend the stakeholders meeting. The meeting was held on 01/05/2015.

In the introductory speech, the representatives of EKI Energy Services Ltd. welcomed the gathering and informed the stakeholders about the project activity; project's associated benefits with respect to CO₂ emission reductions and explained the purpose of conducting the stakeholder meeting in order to gather the views and comments of the local stakeholders on the project activity. Subsequent to the introductory speech, comments were received from the stakeholders. The villagers raised various queries as summarised below:

- Will there be free supply of power to the local people?
- The stakeholders of the project wanted to know if there could be employment generation due to the project activity for youth from the adjoining areas.
- Are there any safety practices to be adopted for this project?
- Will the project release pollutants or hazardous, toxic or noxious substances to air?
- Will the project cause any noise & vibration or release of light, heat energy or harmful radiations?

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.

APPENDIX 1

From CO₂ database of CEA, Version 10 published by Government of India, Ministry of Power Central Electricity Authority, Government of India

CENTRAL ELECTRICITY AUTHORITY: CO ₂ BASELINE DATABASE	
VERSION	10
DATE	Dec-14
BASILINE METHODOLOGY	ACM0002 / Ver 16.0 and "Tool to Calculate the Emission Factor for an Electricity System", Version 4.0

Net Generation in Operating Margin (MWh) (incl. Imports)			
	2011-12	2012-13	2013-14
NEWNE	508,004,381	546,941,372	569,215,756

Simple Operating Margin (tCO ₂ /MWh) (incl. Imports) (1) (2)			
	2011-12	2012-13	2013-14
NEWNE	0.9699	0.9919	0.9953

Weighted Generation Operating Margin	
NEWNE	0.9862

Build Margin (tCO ₂ /MWh) (not adjusted for imports)			
	2011-12	2012-13	2013-14
NEWNE	0.9331	0.9813	0.9495

Combined Margin Emission Factor	
NEWNE	0.9770