



**Verified Carbon
Standard**

WIND ENERGY PROJECT IN SAMANA, GUJARAT AND SAUNDATTI, KARNATAKA



Document Prepared by CLP Wind Farms (India) Private Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity being undertaken by CLP Wind Farms (India) Private Limited (CLPWFPL) is a greenfield project that involves the utilization of kinetic energy of wind for generation of electricity and supply to the Integrated Indian grid (previous known as North-East-West-North East (NEWNE) and Southern Regional grids.)

The project activity includes two sub-projects i.e. installation of 12 Wind Turbine Generators (WTGs) at Samana site in Gujarat and 55 WTGs at Saundatti site in Karnataka. The WTGs have an individual capacity of 800 kW and are supplied by Wind World India Limited (previously known as Enercon (India) Ltd).

Site	No. of WTGs	Capacity of each WTG (MW)	Total Installed capacity (MW)	Grid
Samana	12	0.8 MW	9.6	Integrated Indian Grid
Saundatti	55	0.8 MW	44	Integrated Indian Grid
TOTAL	67	-	53.6	-

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 will be 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.

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.

Emission Reductions from anthropogenic sources

The electricity generated from the Project activity would displace the electricity generated from thermal power stations feeding into the regional Integrated Indian grid. Since the electricity generation using wind power is GHG emissions free, the power generated from the Project will reduce the anthropogenic GHG emissions generated by fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. Thus, the proposed Project activity leads to an emission reduction of greenhouse gases over the chosen crediting period.

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 17, EB 100).

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 108,961 tCO₂e per year, thereon displacing 116.58 GWh/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. The estimated emission reductions over the 10 years renewable crediting period would be 1,089,610 tCO₂e.

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 20

The project activity is not a grouped project.

1.3 Project Eligibility

In line with VCS Standard V4.1, para 3.8.9, 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 22-June-2020. 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 includes two sub-projects i.e. installation of 12 Wind Turbine Generators (WTGs) at Samana site in Gujarat, India and 55 WTGs at Saundatti site in Karnataka, India. The WTGs have an individual capacity of 800 kW and are supplied by Wind World India Limited (previously known as Enercon (India) Ltd.)

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	Sandip Saha
Title	Deputy Manager - Carbon & Sustainability
Address	7th Floor, Fulcrum, Sahar Road, Andheri (East), Mumbai – 400099, India
Telephone	+ 91-22 6758 8888
Email	Sandip.saha@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 both the project activities. The project has uses wind energy technology by Wind World India Limited and implemented 12 numbers of WTGs of E-53 model with a capacity of 0.8 MW each in Samana location and 55 numbers of WTGs of E-53 model with a capacity of 0.8 MW each in Saundatti location. 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 is 23-June-2010 when a set of 20 WTGs in the project activity were commissioned on the same day at Saundatti site in Karnataka.

The purchase orders for the Samana sub-project were placed on 17-Aug-2007 and for the Saundatti sub-project were placed on 11-Dec-2007. However, due to phased implementation, the commissioning of first set of WTGs under the project activity took place only on 23-June-2010 when 20 WTGs at Saundatti site in Karnataka were commissioned.

1.9 Project Crediting Period

The Project has started generating GHG emission reductions from 23-06-2010 i.e. from earliest date of commercial operations of these wind projects. Hence, first crediting period for VCS begins on 23-06-2010 and ends on 22-06-2020 i.e. 10 years. This is the second crediting period of the project activity.

Start date of the crediting period : 23-June-2020

End date of the crediting period : 22-June-2030

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 ₂ e)
Year 1	108,961
Year 2	108,961
Year 3	108,961
Year 4	108,961
Year 5	108,961
Year 6	108,961
Year 7	108,961
Year 8	108,961
Year 9	108,961
Year 10	108,961
Total estimated ERs	1,089,610
Total number of crediting years	10
Average annual ERs	108,961

1.11 Description of the Project Activity

The project activity involves the installation and operation of 12 WTGs at Samana, Gujarat and 55 WTGs at Saundatti, Karnataka to utilize the kinetic energy present in wind to generate electrical power for export to the grid. The WTGs are of E-53 Wind World India Limited (previously known as Enercon) make and each individual WTG has rating of 800 kW.

Some of the salient features of the E-53 turbine are:

- Gearless construction
- Continuous variable wind speed operation in sync with varying wind speeds
- Continuous variable pitch regulation of blades
- Three independent braking and lighting systems for blades
- Ability to withstand voltage fluctuations of -20% to +20% of nominal voltage
- Synchronous generator directly connected to turbine rotor

- Optimum adaptation to many grid voltages at different locations
- Maximum utilization of grid connection capacity for feeding in power.

E-53 Technical Specifications

- Rated capacity : 800 kW
- Rotor diameter : 52.9 m
- Tower height : 72-74 m (consists of both concrete and steel sections)
- Turbine concept : Gearless, variable speed, variable pitch control

Rotor

- Type : Upwind rotor with active pitch control
- Direction of rotation: Clockwise
- Number of blades : 3
- Swept area : 2,198 meter²
- Blade material : Fibreglass (epoxy resin), integrated lightning protection
- Rotation speed : Variable, 12-29 rpm
- Pitch Control : Wind World India Limited (previously known as Enercon (India) Limited) blade pitch system, one independent pitching system per rotor blade with allocated emergency supply.

The technology employed in the turbines supplied by Wind World India Limited (previously known as Enercon (India) Ltd.) is environmentally safe and sound and there is no technology transfer involved in the same.

The lifetime of the WTGs is 20 years.

At the Samana site, the WTGs are connected to several Vacuum Circuit Breakers through step-up transformers (400V to 33KV) which through feeders lead up to two step-up transformers (33KV to 220KV). The transmission lines ultimately lead up to the Sadodar substation maintained by Wind World India Limited (previously known as Enercon (India) Limited) where metering of net electricity supplied to grid takes place.

Similarly, at the Saundatti site, the WTGs are connected to several Vacuum Circuit Breakers through step-up transformers (400V to 33KV) which through six feeders lead up to two step-up transformers (33KV to 110KV). The transmission lines ultimately lead up to the Saundatti substation maintained by Wind World India Limited (earliest Enercon (India) Limited) where metering of net electricity supplied to grid takes place.

The net electricity exported by the project activity would displace an equivalent amount of electricity generated by the power plants already operational and proposed to be added in the regional electricity grid which relies predominantly on fossil fuels, thus avoiding CO₂ emissions that would have occurred in the baseline scenario.

1.12 Project Location

The first sub-project consisting of 12 WTGs is located at the Samana site

in Gujarat. Site: Samana
Taluk: Kalavad, Jamjodhpur, Upleta
District: Jamnagar, Rajkot
State: Gujarat
Host Party: India

The nearest airport and railway station are at Jamnagar city which is located at a distance of approximately 60 kms from the project activity site. The coordinates of individual WTGs are stated below:

S. No.	Unique Identification No.	GEDA Ref No.	Latitude	Longitude	Date of Commissioning
1	CLPSM-38	EIL/800/09-10/1615	22° 06' 20.1" N	70° 20' 13.1" E	12-Jul-10
2	CLPSM-39	EIL/800/09-10/1616	22° 03' 00.8" N	70° 04' 21.9" E	12-Jul-10
3	CLPSM-40	EIL/800/09-10/1695	22° 05' 45.4" N	70° 05' 46.2" E	28-Jan-11
4	CLPSM-44	EIL/800/09-10/1696	22° 05' 35.8" N	70° 05' 53.6" E	28-Jan-11
5	CLPSM-45	EIL/800/09-10/1697	22° 05' 27.8" N	70° 05' 46.6" E	28-Jan-11
6	CLPSM-47	EIL/800/09-10/1699	22° 05' 13.5" N	70° 05' 44.2" E	28-Jan-11
7	CLPSM-48	EIL/800/09-10/1700	22° 05' 04.8" N	70° 05' 40.8" E	28-Jan-11
8	CLPSM-49	EIL/800/09-10/1701	22° 04' 57.9" N	70° 05' 42.1" E	28-Jan-11
9	CLPSM-46	EIL/800/09-10/1698	22° 05' 22.0" N	70° 05' 44.3" E	31-Jan-11
10	CLPSM-50	EIL/800/09-10/1702	22° 05' 05.5" N	70° 05' 09.2" E	31-Jan-11
11	CLPSM-51	EIL/800/09-10/1703	22° 05' 00.0" N	70° 05' 06.9" E	31-Jan-11
12	CLPSM-53	EIL/800/09-10/1704	22° 04' 51.6" N	70° 05' 04.3" E	31-Jan-11

The second sub-project consisting of 55 WTGs is located at the Saundatti site in Karnataka.

Site : Saundatti

Villages: Katamalli, Hooli, Vatnal, Gorbala, Basidoni, Mallapur, Goravanakolla, Haletorga

District : Belgaum

State : Karnataka

Host Party: India

The nearest airport and railway station are in Hubli city which is located at a distance of approximately 67 kms from the project activity site. The coordinates of individual WTGs are stated below:

S. No.	Unique Identification No.	CEIG Ref. No.	Latitude	Longitude	Date of Commissioning
1	CLPSN-36	CLP-40	15° 47' 40.6" N	75° 09' 56.9" E	23-Jun-10
2	CLPSN-37	CLP-41	15° 47' 46.2" N	75° 09' 54.9" E	23-Jun-10
3	CLPSN-38	CLP-43	15° 48' 01.1" N	75° 09' 57.5" E	23-Jun-10
4	CLPSN-39	CLP-51	15° 49' 56.4" N	75° 11' 29.8" E	23-Jun-10
5	CLPSN-40	CLP-52	15° 50' 04.2" N	75° 11' 30.6" E	23-Jun-10
6	CLPSN-41	CLP-53	15° 50' 11.7" N	75° 11' 31.6" E	23-Jun-10
7	CLPSN-42	CLP-54	15° 50' 19.2" N	75° 11' 34.2" E	23-Jun-10
8	CLPSN-43	CLP-55	15° 50' 26.5" N	75° 11' 35.6" E	23-Jun-10
9	CLPSN-44	CLP-56	15° 50' 35.7" N	75° 11' 40.9" E	23-Jun-10
10	CLPSN-45	CLP-65	15° 50' 42.6" N	75° 11' 32.3" E	23-Jun-10
11	CLPSN-46	CLP-66	15° 50' 48.6" N	75° 11' 32.8" E	23-Jun-10
12	CLPSN-47	CLP-67	15° 50' 55.9" N	75° 11' 29.8" E	23-Jun-10
13	CLPSN-48	CLP-68	15° 51' 02.2" N	75° 11' 28.6" E	23-Jun-10
14	CLPSN-49	CLP-69	15° 51' 08.8" N	75° 11' 27.2" E	23-Jun-10
15	CLPSN-50	CLP-59	15° 50' 58.8" N	75° 11' 45.5" E	23-Jun-10
16	CLPSN-51	CLP-60	15° 51' 04.7" N	75° 11' 44.1" E	23-Jun-10
17	CLPSN-52	CLP-61	15° 51' 09.9" N	75° 11' 41.7" E	23-Jun-10
18	CLPSN-53	CLP-62	15° 51' 19.1" N	75° 11' 47.5" E	23-Jun-10
19	CLPSN-54	CLP-63	15° 51' 27.9" N	75° 11' 53.0" E	23-Jun-10
20	CLPSN-55	CLP-64	15° 51' 34.7" N	75° 11' 52.0" E	23-Jun-10
21	CLPSN-56	CLP - 58	15° 50' 51.7" N	75° 11' 47.4" E	03-Aug-10
22	CLPSN-57	CLP - 70	15° 51' 24.3" N	75° 12' 21.2" E	03-Aug-10
23	CLPSN-58	CLP - 71	15° 51' 17.9" N	75° 12' 34.6" E	03-Aug-10
24	CLPSN-59	CLP - 72	15° 51' 25.7" N	75° 12' 35.4" E	03-Aug-10
25	CLPSN-60	CLP - 73	15° 51' 32.0" N	75° 12' 34.2" E	03-Aug-10
26	CLPSN-61	CLP - 74	15° 51' 38.2" N	75° 12' 31.3" E	03-Aug-10
27	CLPSN-62	CLP - 75	15° 51' 46.8" N	75° 12' 36.6" E	03-Aug-10
28	CLPSN-63	CLP - 76	15° 51' 55.1" N	75° 12' 39.8" E	03-Aug-10
29	CLPSN-64	CLP - 77	15° 52' 03.0" N	75° 12' 42.8" E	03-Aug-10
30	CLPSN-65	CLP - 79	15° 51' 31.9" N	75° 13' 42.2" E	03-Aug-10
31	CLPSN-66	CLP - 80	15° 51' 38.3" N	75° 13' 40.6" E	03-Aug-10
32	CLPSN-67	CLP - 81	15° 51' 44.0" N	75° 13' 37.6" E	03-Aug-10

S. No.	Unique Identification No.	CEIG Ref. No.	Latitude	Longitude	Date of Commissioning
33	CLPSN-68	CLP – 82	15° 51' 50.3" N	75° 13' 35.1" E	03-Aug-10
34	CLPSN-69	CLP – 83	15° 51' 56.6" N	75° 13' 34.2" E	03-Aug-10
35	CLPSN-70	CLP – 84	15° 52' 02.1" N	75° 13' 29.8" E	03-Aug-10
36	CLPSN-71	CLP – 85	15° 52' 08.5" N	75° 13' 29.0" E	03-Aug-10
37	CLPSN-72	CLP – 86	15° 52' 15.4" N	75° 13' 29.2" E	03-Aug-10
38	CLPSN-73	CLP-92	15° 52' 22.9" N	75° 13' 40.0" E	03-Aug-10
39	CLPSN-74	CLP-91	15° 52' 18.3" N	75° 13' 46.5" E	03-Aug-10
40	CLPSN-75	CLP-90	15° 52' 13.4" N	75° 13' 51.8" E	03-Aug-10
41	CLPSN-76	CLP-95	15° 52' 42.3" N	75° 13' 42.6" E	15-Sep-10
42	CLPSN-77	CLP-96	15° 52' 51.0" N	75° 13' 44.7" E	15-Sep-10
43	CLPSN-78	CLP-97	15° 52' 56.5" N	75° 13' 44.3" E	15-Sep-10
44	CLPSN-79	CLP-98	15° 53' 03.1" N	75° 13' 46.0" E	15-Sep-10
45	CLPSN-80	CLP-99	15° 53' 10.3" N	75° 13' 46.1" E	15-Sep-10
46	CLPSN-81	CLP-57	15° 50' 45.3" N	75° 11' 49.2" E	15-Sep-10
47	CLPSN-82	CLP-103	15° 53' 19.3" N	75° 14' 02.9" E	03-Dec-10
48	CLPSN-83	CLP-102	15° 53' 12.6" N	75° 14' 05.0" E	03-Dec-10
49	CLPSN-84	CLP-2	15° 49' 15.8" N	75° 06' 31.1" E	03-Dec-10
50	CLPSN-85	CLP-3	15° 49' 23.5" N	75° 06' 47.8" E	03-Dec-10
51	CLPSN-86	CLP-4	15° 49' 17.1" N	75° 06' 49.1" E	03-Dec-10
52	CLPSN-87	CLP-5	15° 49' 10.4" N	75° 06' 49.8" E	03-Dec-10
53	CLPSN-88	CLP-8	15° 48' 50.9" N	75° 06' 48.4" E	03-Dec-10
54	CLPSN-89	CLP-9	15° 48' 43.7" N	75° 06' 46.6" E	03-Dec-10
55	CLPSN-90	CLP-10	15° 48' 46.3" N	75° 06' 40.2" E	03-Dec-10

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 17, EB 100).

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 2.4 below.

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

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)

Both sites of the Project are also registered as a separate CDM Project activity. Details of these CDM projects are as follows:

Site 1: Samana Site

Project Title: Wind based renewable energy project by CLP Wind Farms India Private Limited in Gujarat

UNFCCC Registration Number: 8955¹

Crediting period start date: 01/01/2013

Renewal Status: Renewal of crediting period of the CDM has been successfully registered

Duration of 2nd crediting period: 01 Jan 2020 - 31 Dec 2026

CLP has not issued any CERs from this project

Site 2: Saundatti Site

Project Title: Wind Energy Project in Saundatti, Karnataka

CDM Registration Number: 6794²

Crediting Period Start Date: 24/09/2012

CLP has issued CERs for the duration of 01/01/2013 to 01/10/2016

Renewal Status: Renewal of crediting period of the CDM has been successfully registered

Duration of 2nd crediting period: 24 Sep 2019 to 23 Sep 2026

¹ <https://cdm.unfccc.int/Projects/DB/RWTUV1355987533.33/view>

² <https://cdm.unfccc.int/Projects/DB/BVQI1343049611.03/view>

Further, the net GHG Emission reductions or removals generated by the project activity will not be used for compliance with an emission trading program or to meet binding limits on GHG Emissions

1.15.2 Projects Rejected by Other GHG Programs

The project activities have 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 for GHG emission reductions claimed under the VCS Program for this particular project activity.

1.17 Additional Information Relevant to the Project

Leakage Management

As per the applied methodology ACM0002 Version 20.0.0, 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.

Sustainable Development

The National CDM Authority (NCDNA) which is the Designated National Authority (DNA) for the Government of India (GoI) in the Ministry of Environment and Forests (MoEF) has stipulated four indicators for sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India³. The contribution of this project activity towards in terms of these four indicators is provided below:

- **Social well-being:** The project would help in generating employment opportunities during the construction and operation phases. The project activity will lead to development in

³ http://cdmindia.nic.in/host_approval_criteria.htm

infrastructure in the region like development of roads and also may promote business with improved power generation.

- **Economic well-being:** 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 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 well-being:** 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.

The project activity is generating electricity through a technology that is environmentally safe and sound.

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

There is no harm identified from the project and hence no mitigations measures are required.

2.2 Local Stakeholder Consultation

The project proponent organized a stakeholder meeting to clarify any queries or misgivings the local inhabitants in the region may have about the project.

CLP conducted a consultation meeting with the local stakeholders at the project sites at the time of project registration. Stakeholders comprised of villagers from nearby villages, employees of CLP Wind Farms (India) Pvt. Ltd. and those of O&M contractor working at the site. The stakeholders were invited by letters sent and through public notice. Evidence of the consultation meeting (signed attendance of the stakeholders and photographs) was presented to DoE. Details of the stakeholders consultations at each sites are mentioned below:

Samana, Gujarat

The meeting for the wind power project at Samana site, Gujarat was held in Jamnagar on 25 Oct 2007. The meeting was well attended, by various stakeholders, including Representatives from Gram Panchayat (mostly village heads - Sarpanches), local residents, and representatives of Equipment suppliers. The stakeholders were invited through personal invitation letters dated 01.10.2007 with the help of representatives of WWIL (Enercon), well in advance of the planned meeting.

The meeting was initiated by a representative of the project proponent giving a brief on the project activity. This was followed by an introduction to climate change and its local as well as global effects. The relation of anthropogenic GHG emissions and climate change was also addressed and the contribution of the said project activity in mitigating these threats was explained.

In an open house session that followed the speeches, two of the Sarpanchs came forward on behalf of all the villagers and other Sarpanchs to thank the project proponent and offered continuous support in the development of the project.

These queries were duly acknowledged by the project proponent and the answers given in response to these queries are presented below:

Queries raised by Participants	Clarifications by CLPWFL & WWIL
Is the project proponent going to implement any new technology in Samana?	The project proponent clarified that they have bought WEGs from WWIL India Limited and are implementing the wind farm project.
What kind of employment opportunities does this project offer to the local villagers?	Local villagers are given preference for the manpower requirement of construction work as well as requirements during the operational life of the project.
Village roads near to the wind farm are getting damaged due to heavy vehicles and what is the corrective action planned?	Maintenance of roads at periodic intervals will be done by WWIL

The stakeholders present were satisfied with these responses and were appreciative of the efforts by the project proponent in undertaking the said project.

Saundatti, Karnataka

The meeting for the wind power project at Saundatti site, Karnataka was held in in Hubli on 12 Mar 2009. The meeting was well attended, with a turnout of around forty five stakeholders, including representatives from Gram Panchayat (mostly village heads - Sarpanches), Local residents, representatives of KPTCL and equipment supplier. The stakeholders were invited through personal invitation letters dated 24 Feb 2009 with the help of representatives of WWIL, well in advance of the planned meeting.

The meeting was initiated by a representative of the project proponent giving a brief on the project activity. This was followed by an introduction to climate change and its local as well as global effects. The relation of anthropogenic GHG emissions and climate change was also addressed and the contribution of the said project activity in mitigating these threats was explained.

In an open house session that followed the presentation, the Superintending Engineer of Karnataka Power Transmission Limited, Mr. R.P. Chavate, gave a detailed lecture on the power scenario in India (deficit status of Karnataka), subsidies, energy theft and contribution of renewables in capacity additions to the grid. Further, Mr. Chavate enlightened the audience on transmission losses, significance of carbon credits and benefits that would accrue, once the project activity is in place. All the stakeholders encouraged the upcoming of the project activity and provided their responses in writing in the questionnaires provided to them.

The issues and concerns raised by the stake holders and the clarifications provided by CLPWFPL and Wind World India Limited (previously known as Enercon India Limited) are summarized below:

Queries raised by Participants	Clarifications by CLPWFPL & WWIL
How is the project useful for the local villagers?	The project proponent clarified that the implementation of the project activity would entail direct and indirect employment opportunities. Further small business opportunities would lead to overall development of the villages. Furthermore, the local grid would be strengthened thereby ensuring availability of reliable power in the villages.
Will there be employment opportunities for skilled labour available locally?	The project proponent clarified that Local villagers will be given preference for the manpower requirement of construction work as well as requirements during the operational life of the project. However, they would have to go through a proper selection procedure.
Will the installation of machines create noise and disturb the surroundings?	The WWIL personnel clarified that they have already implemented WEGs in various villages in the neighbouring Gadag district Area and no such problem has been reported anywhere owing to advanced machine design that ensures minimal noise.
Will the implementation of the project activity have any impact on grazing of animals 4-5 years down the line?	The project proponent clarified that there will be no impact of the wind farm on the grazing activity in the area.

The stakeholders present were satisfied with these responses and were appreciative of the efforts by the project proponent in undertaking the said project.

On the whole, the stakeholders were appreciative of the project being undertaken and were in agreement the beneficial effects of the said project activity. There were no adverse comments received and the above mentioned queries were addressed by the project participant.

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 (MoEF), 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, 1986⁴ (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 (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.

⁴ <http://envfor.nic.in/legis/eia/so1533.pdf>

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The approved consolidated baseline and monitoring methodology ACM0002 (Version 20, EB105)⁵, has been used to determine the baseline emissions and emission reduction due to the project activity. The title of this baseline methodology is “Grid-connected electricity generation from renewable sources”. The other UNFCCC documents referred are as below:

- Tool for the demonstration and assessment of additionality (Version 07.0.0)
- Tool to calculate the emission factor for an electricity system (Version 7.0, EB 100)
- Guidance on assessment of investment analysis (05, EB 62)
- Guidelines on demonstration of and assessment of prior consideration of the CDM (Version 04, EB 62)
- Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (ver 3.0.1, Annex 47 of EB 66)

3.2 Applicability of Methodology

The methodology being applied for the said project, ACM0002 (Version 20), 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 methodology. This methodology has certain specific applicability criterion, which are stated and accordingly addressed below:

S.N.	Applicability conditions of ACM0002	Project under consideration
1.	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;	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

⁵ <https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG>

S.N.	Applicability conditions of ACM0002	Project under consideration
	d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s). /unit(s)	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.
2.	The methodology is applicable under the following conditions: a) 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; 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.	The proposed project activity involves the installation of a new greenfield wind power generation plant. Therefore, the project activity is satisfying the said criteria.
3.	In case of hydro power plants, one of the	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

S.N.	Applicability conditions of ACM0002	Project under consideration
	following conditions shall apply⁶: a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or b) 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 c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m²; or d) 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/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 (8), 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	project, therefore, the said criteria are not applicable.

⁶ 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
	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	
4.	In the case of integrated hydro power projects, project proponent shall: a) 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 b) 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.

S.N.	Applicability conditions of ACM0002	Project under consideration
5.	The methodology is not applicable to: a) 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; b) 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.
6.	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.
7.	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.

Applicability Criteria	Project Case
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 2: Procedures related to off-grid power generation” should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively 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 in section 3.4 of the PD 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 bio fuels.

Hence, it has been justified that the methodology ACM0002 (Version 20.0.0) is applicable to the project activity. This baseline methodology has been used to determine suitable baseline scenario. This methodology is used in conjunction with the approved monitoring methodology ACM0002 ("Consolidated baseline methodology for grid-connected electricity generation from renewable sources"), in order to monitor the emission reductions from the project activity during the crediting period.

3.3 Project Boundary

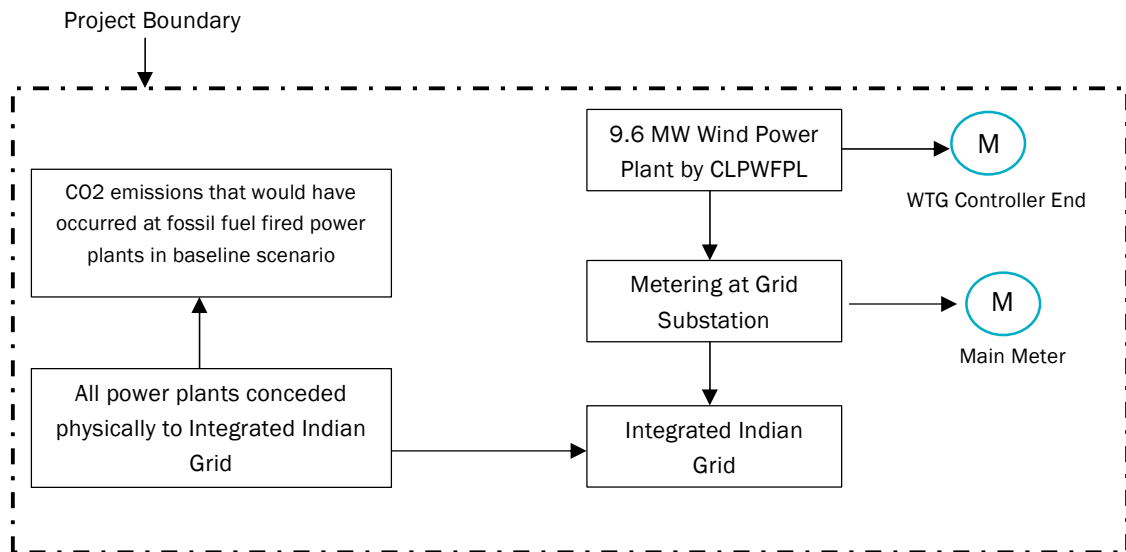
According to ACM0002, for the baseline emission factor, the spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

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.

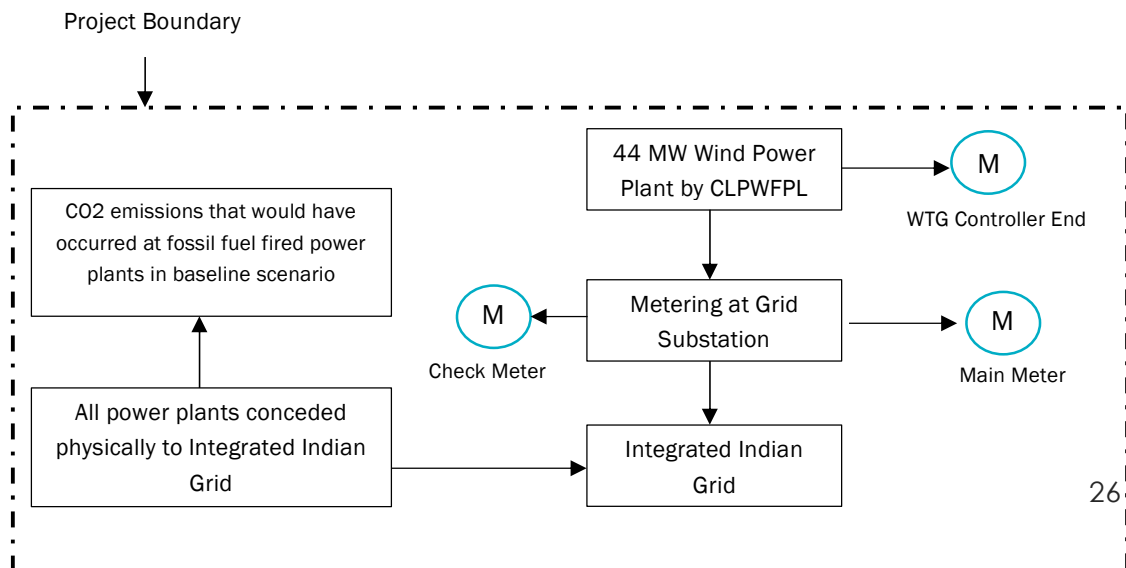
Thus all the power generation facilities connected to the respective grid form the project boundary for the purpose of baseline estimation. For conservative and accurate estimation, the imports of electricity from other regional grids have been included in the baseline calculation.

The project activity has a distinctive physical demarcated boundary as shown below:

Samana site, Gujarat



Saundatti, Karnataka:



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	CO ₂ 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 CO ₂ .
		CH ₄	No	This is a minor emission source because the emission of CH ₄ from the combustion of fossil fuels is low.
		N ₂ O	No	This is a minor emission source because the emission of N ₂ O from the combustion of fossil fuels is low.
Project	For geothermal power plants, fugitive emissions of CH ₄ and CO ₂ from non-condensable gases contained in geothermal steam.	CO ₂	No	The project activity is a wind power project and not a geothermal project. Thus, these emission sources are not applicable to the proposed project.
		CH ₄	No	
		N ₂ O	No	
	For geothermal power plants, CO ₂ emissions from combustion of fossil fuels required to operate the geothermal power plant.	CO ₂	No	The project activity is a wind power project and not a geothermal project. Thus, these emission sources are not applicable to the proposed project.
		CH ₄	No	
		N ₂ O	No	
	For hydro power plants, emissions of CH ₄ from the reservoir.	CO ₂	No	The project activity is a wind power project and not a hydro power project. Thus, these emission sources are not applicable to the proposed project.
		CH ₄	No	
		N ₂ O	No	

3.4 Baseline Scenario

The proposed project is located in the state of Karnataka, which is a part of Integrated Indian 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 20 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 CDM 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 16.0) .

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.

As such and in accordance with above Tool and ACM0002 version 20, 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 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

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.

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 16, 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 16, 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 20) 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 source⁷. (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:

⁷<http://cea.nic.in/tpeandce.html>

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

Where:

BE_y = Baseline emissions in year y; (t CO₂)

$EG_{PJ,y}$ = 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 20))

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-20, para 39, 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- 16) 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	0.9568	Operating margin CO ₂ emission factor for the project electricity system. The value is calculated for year 2017-18, 2018-19 and 2019-20
2.	$EF_{grid,BM,y}$	tCO ₂ /MWh	0.8682	Build margin CO ₂ emission factor for the project electricity system. The value is calculated for year 2019-20

3.	$EF_{grid,CM,y}$	tCO ₂ /MWh	0.9346	Combined margin CO2 emission factor for the project electricity system
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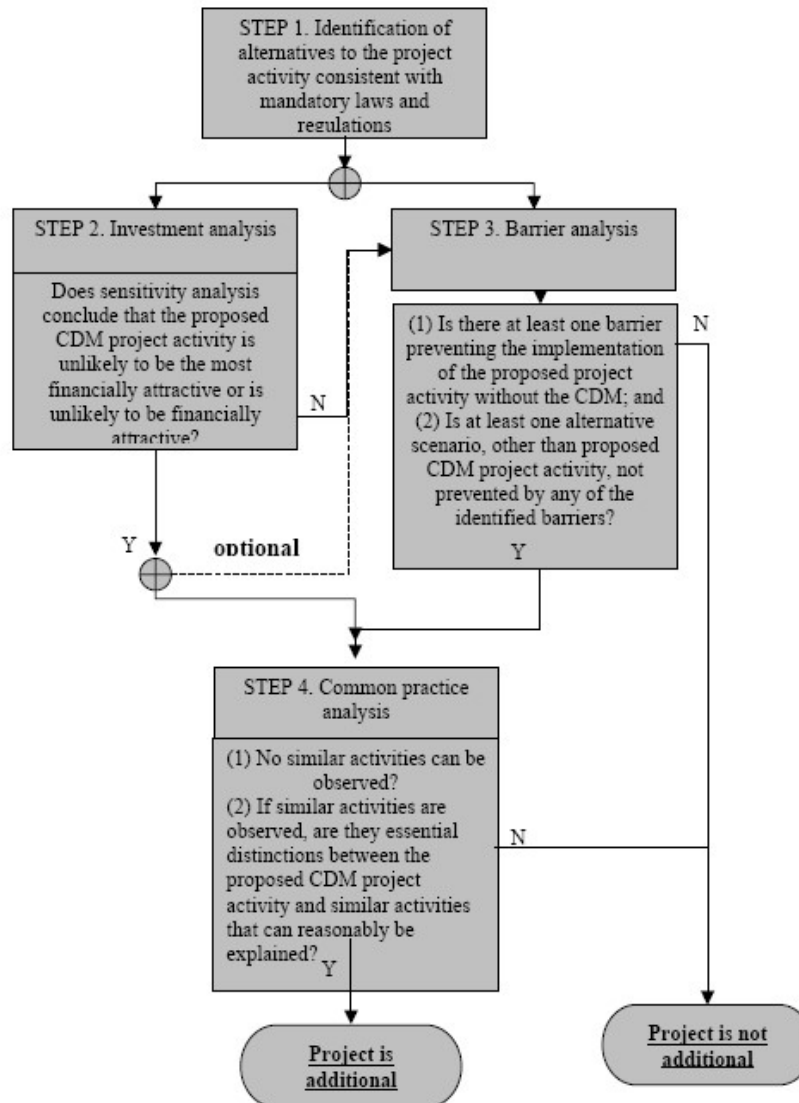
The steps to calculate the combined margin emissions factor is detailed in section B.6.1 Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system” described step wise under section B.6.

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 16.0) 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 0.9346 tCO₂e/MWh.

3.5 Additionality

Demonstrate and assess the additionality of the project, in accordance with the applied methodology and any relevant tools, taking into account of the following:

In accordance with the methodology, the additionality of the project activity is being demonstrated and assessed using the Methodological Tool “Demonstration and assessment of additionality” Version 06.0.0. The step-wise approach to establish additionality of the project activity as per the additionality tool is as follows:



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

Define realistic and credible alternatives to the project activity(s) through the following Sub-steps:

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.

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

The proposed project activity is a wind power project involving supply of electricity to Integrate Indian grid. Hence, according to baseline methodology ACM0002 Version 20, since 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”.

According to paragraph 115 of the Clean Development Mechanism Validation and Verification Standard Version 02.0 (Annex 4, EB 65), “Where the baseline scenario is prescribed in the approved methodology, no further analysis is required.” Since, the methodology has already prescribed the baseline scenario as discussed above, therefore there is no requirement of identification of alternatives to the project activity and Step 1 can be skipped.

Step 2: Investment analysis

Determine whether the proposed project activity is not:

- (a) The most economically or financially attractive; or
- (b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

The Methodological Tool “Demonstration and assessment of additionality” (Version 06.0.0) states that project participants may choose to apply Step 2 (Investment analysis) or Step 3 (Barrier analysis) to demonstrate the additionality of the project. In the present scenario, only Step 2 is used to demonstrate the additionality of the project.

Sub-step 2a: Determine appropriate analysis method

Benchmark analysis has been chosen as the appropriate analysis method since the baseline for the project activity is supply of electricity from the grid. This is also in accordance with Paragraph 19 of the Guidance on the Assessment of Investment Analysis Version 5 that says “If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate.”

Sub-step 2b: Option III. Apply benchmark analysis

The Equity IRR was found to be the most appropriate financial indicator for assessment of the feasibility of the project activity. The internal rate of return (IRR) is a very common capital budgeting metric used by firms to decide whether they should make investments in a particular project activity. It is defined as the annualized effective compounded return rate which can be earned on the invested capital or the discount rate that makes the net present value of the investment's income stream total to zero. Hence it is an indicator of the efficiency or quality of an investment.

The project proponent had carried out an estimation of the costs involved in the project activity and the revenues that it would be expected to generate over its operational lifetime. Based on these estimates, the Equity IRR for the project activity was found to be very low, indicating it to be not economically or financially attractive for the project proponent. However, the project proponent decided to implement the project only after taking carbon credit revenue into

consideration that improves the Equity IRR. The investment decision for the Samana sub-project was taken on 25 Jun 2007 and for the Saundatti sub-project was taken on 24 Sep 2007.

Benchmark

Since benchmark approach is being applied, the section on Selection and Validation of Appropriate Benchmarks of Guidelines on the Assessment of Investment Analysis Version 5 has been referred which states that “Required/expected returns on equity are appropriate benchmarks for an equity IRR”. Therefore, expected return on equity is being used as a benchmark.

Further, the guideline 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 could be developed by an entity other than the project participant, the benchmark is calculated based on parameters that are standard in the market.

Additionally, the guideline also states that “If the benchmark is based on parameters that are standard in the market, the cost of equity should 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.”

Accordingly, the cost of equity is being determined as the value provided in Appendix A. However, as per paragraph 7 of the appendix to the guidelines, the default values provided in the appendix are real term values that can be converted to nominal values by adding the inflation rate.

The default value for expected return on equity for energy industry in India in real term rates as per appendix to the Guidelines on the assessment of investment analysis is 11.75%.

The medium-term inflation forecast from Reserve Bank of India which is the central bank of the host country is 4.25%⁸.

Therefore, the expected return on equity in nominal terms is 11.75% + 4.25% = 16.00%.

IRR Analysis

The IRR analysis carried out in accordance with the Guidance on the Assessment of Investment Analysis Version 05.

The assumptions used for the carrying out the IRR analysis of Samana sub-project are as shown below:

Particulars	Value	Unit	Source/Remarks
No. of wind turbines	12	nos	Installed capacity

⁸ <http://rbidocs.rbi.org.in/rdocs/notification/PDFs/76972.pdf> - Page No.34, Para No.98

Particulars	Value	Unit	Source/Remarks
Capacity of each wind turbine	0.8	MW	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 27 March 2007
Capacity of the project	9.6	MW	Calculated
Net generation	20.9952	GWh	HTC Wind Assessment Report dated 27.06.2007
Plant Load Factor (PLF)	24.97	%	Calculated based on HTC Wind Assessment Report dated 27 June 2007
Project cost	516.00	INR Million	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 27 March 2007
Land lease charges per annum	0.006	INR Million/WTG	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 27 March 2007
Debt	70	%	GERC Tariff Order dated 11 Aug 2006 (http://geda.gujarat.gov.in/policy_files/wind_final_or_der.pdf)
Equity	30	%	GERC Tariff Order dated 11 Aug 2006 (http://geda.gujarat.gov.in/policy_files/wind_final_or_der.pdf)
Debt	361.20	INR Million	Calculated
Equity	154.80	INR Million	Calculated
Interest rate	13.00	%	RBI Prime Lending Rate (http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/78814.pdf)
Debt Repayment tenure	10	years	GERC Tariff Order dated 11 Aug 2006 (http://geda.gujarat.gov.in/policy_files/wind_final_or_der.pdf)
Operation and Maintenance(1st year) per WTG	0.60	INR Million/WTG	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 27 March 2007
Operation and Maintenance(1st year)	7.2	INR Million	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 27 March 2007
Escalation in O & M (from 2nd Year onwards)	6	%	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 27 March 2007
Service tax on O & M fees	12.36	%	As per prevailing tax rates for FY 07-08 (http://www.servicetax.gov.in/st-proc-home.htm)
Insurance premium	0.47	INR Million / Yr	Quotation for insurance premium dated 03 May 2007
Tariff	3.37	Rs/kWh	GERC Tariff Order dated 11 Aug 2006 (http://geda.gujarat.gov.in/policy_files/wind_final_or_der.pdf)
Depreciation Rate (Book)	5.28	%	Schedule XIV of the Companies Act, 1956 (Referred from "Guide to the Companies Act" by A.Ramaiya,

Particulars	Value	Unit	Source/Remarks
			Seventeenth Edition)
IT Depreciation Rate	80.00	%	Appendix IA of Income Tax Act Rules (http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITRU&schT=rul&csId=4a23cee1-1818-45d6-ab19-155e08ed789&rNo=&sch=&title=Taxmann-DirectTaxLaws)
Income tax rate	33.99	%	Income Tax Act for FY 07-08 (Page 3 of http://www.incometaxindia.gov.in/Archive/Filing_Your_Tax_Return.pdf)
MAT rate	11.33	%	Income Tax Act for FY 07-08 (Page 3 of http://www.incometaxindia.gov.in/Archive/Filing_Your_Tax_Return.pdf)
Salvage Value	10	%	GERC Tariff Order dated 11 Aug 2006 (http://geda.gujarat.gov.in/policy_files/wind_final_order.pdf)

The assumptions used for carrying out the IRR analysis of Saundatti sub-project are as shown below:

Particulars	Value	Unit	Source/Remarks
No. of wind turbines	55	nos	Installed capacity
Capacity of each wind turbine	0.8	MW	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 21 June 2007
Capacity of the project	44	MW	Calculated
Net generation	95.59	GWh	HTC Wind Assessment Report dated 08 Nov 2007
Plant Load Factor (PLF)	24.80	%	Calculated based on HTC Wind Assessment Report dated 08 Nov 2007
Project cost	2365.00	INR Million	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 21 June 2007
Land lease charges per annum	0.006	INR Million/WTG	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 21 June 2007
Debt	70	%	Karnataka Tariff of Renewable Sources of Energy dated 18 Jan 2005 (http://www.kerc.org/order2005/Order%20on%20NCE%20Tariff%20(FINAL).doc)
Equity	30	%	Karnataka Tariff of Renewable Sources of Energy dated 18 Jan 2005 (http://www.kerc.org/order2005/Order%20on%20NCE%20Tariff%20(FINAL).doc)
Debt	1655.50	INR Million	Calculated
Equity	709.50	INR Million	Calculated
Interest rate	13.00	%	RBI Prime Lending Rate (http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/80494.pdf)

Particulars	Value	Unit	Source/Remarks
			f)
Debt Repayment tenure	10	years	Karnataka Tariff of Renewable Sources of Energy dated 18 Jan 2005 (http://www.kerc.org/order2005/Order%20on%20NCE%20Tariff%20(FINAL).doc)
Operation and Maintenance (1st year) per WTG	0.60	INR Million/WTG	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 21 June 2007
Operation and Maintenance (1st year)	33.0	INR Million	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 21 June 2007
Escalation in O & M (from 2nd Year onwards)	6	%	Offer Letter from Wind World India Limited (previously known as Enercon (India) Limited) dated 21 June 2007
Service tax on O & M fees	12.36	%	As per prevailing tax rates for FY 07-08 (http://www.servicetax.gov.in/st-proc-home.htm)
Insurance premium	2.16	INR Million / Yr	Quotation for insurance premium dated 03 May 2007
Tariff	3.4	Rs/kWh	Karnataka Tariff of Renewable Sources of Energy dated 18 Jan 2005 (http://www.kerc.org/order2005/Order%20on%20NCE%20Tariff%20(FINAL).doc)
Depreciation Rate (Book)	5.28	%	Schedule XIV of the Companies Act, 1956 (Referred from "Guide to the Companies Act" by A.Ramaiya, Seventeenth Edition)
IT Depreciation Rate	80.00	%	Appendix IA of Income Tax Act Rules (http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITRU&schT=rul&csId=4a23cee1-1818-45d6-ab19-f155e08ed789&rNo=&sch=&title=Taxmann-Direct Tax Laws)
Income tax rate	33.99	%	Income Tax Act for FY 07-08 (Page 3 of http://www.incometaxindia.gov.in/Archive/Filing_Your_Tax_Return.pdf)
MAT rate	11.33	%	Income Tax Act for FY 07-08 (Page 3 of http://www.incometaxindia.gov.in/Archive/Filing_Your_Tax_Return.pdf)
Salvage Value	10	%	Karnataka Tariff of Renewable Sources of Energy dated 18 Jan 2005 (http://www.kerc.org/order2005/Order%20on%20NCE%20Tariff%20(FINAL).doc)

Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III):

The Equity Internal Rate of Return for the Samana sub-project works out to 6.44% and for the Saundatti sub-project works out to 6.50%. Hence it can be clearly observed that the returns from the project activity do not exceed the benchmark of 16.00%. Thus the project activity on its own

is clearly not a financially viable option and hence the revenue from carbon credits is essential to make the project activity a financially viable venture.

Sub-step 2d: Sensitivity analysis (only applicable to Options II and III):

As per Step 2d of the Methodological Tool “Demonstration and assessment of additionality” Version 06.0.0, a sensitivity analysis is to be carried out to show whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions. The results of the sensitivity analysis for Samana sub-project are detailed below:

Base case	6.44%		Comments
Variable	Decrease	Increase	
Parameter	10%	10%	
Energy Generation	3.80%	9.09%	The energy generation has been determined based on the analysis conducted by third party engineering consultants, Hydro Tasmania. Any significant increase in energy generation is not envisaged, however, even in the extreme case of an increase of 10% in energy generation, it can be observed that the IRR does not cross the benchmark.
Project Cost	8.85%	4.50%	The project cost primarily comprises of the cost of civil works and plant and machinery which is unlikely to decrease significantly. Even with a decrease of 10% in the project cost, it can be observed that the IRR does not cross the benchmark.
Tariff	3.80%	9.09%	The Tariff has been fixed as per the GERC Tariff Order dated 11 Aug 2006. The project proponent has also signed a Power Purchase Agreement with GUVNL for this purpose and any change in the tariff is unlikely.
O&M Cost	6.92%	5.96%	The variation in the cost of Operations and Maintenance does not affect the Equity IRR by a significant margin due to its low value.

The results of the sensitivity analysis for Saundatti sub-project are detailed below:

Base case	6.50%		Comments
Variable Parameter	Decrease	Increase	
	10%	10%	
Energy Generation	3.85%	9.16%	The energy generation has been determined based on the analysis conducted by third party engineering consultants, Hydro Tasmania. Any significant increase in energy generation is not envisaged, however, even in the extreme case of an increase of 10% in energy generation, it can be observed that the IRR does not cross the benchmark.
Project Cost	8.92%	4.56%	The project cost primarily comprises of the cost of civil works and plant and machinery which is unlikely to decrease significantly. Even with a decrease of 10% in the project cost, it can be observed that the IRR does not cross the benchmark.
Tariff	3.85%	9.16%	The Tariff has been fixed as per the Karnataka Tariff Order for Renewable Sources of Energy dated 18 Jan 2005. The project proponent has also signed a Power Purchase Agreement for this purpose and any change in the tariff is unlikely.
O&M Cost	6.98%	6.02%	The variation in the cost of Operations and Maintenance does not affect the Equity IRR by a significant margin due to its low value.

Hence it can be clearly observed that even when the project parameters turn in favour of the project proponent, even then the returns from the project do not exceed the benchmark. Thus, the project activity on its own is clearly not a financially viable option. The revenue from carbon credits would make the project activity a financially viable venture.

Step 3: Barrier analysis

Determine whether the proposed project activity faces barriers that:

- Prevent the implementation of this type of proposed project activity; and
- Do not prevent the implementation of at least one of the alternatives.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

Establish that there are realistic and credible barriers that would prevent the implementation of the proposed project activity from being carried out if the project activity was not registered as a CDM activity.

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

Step 2 has been used to demonstrate additionality of the project.

Step 4: Common practice analysis

Since the project activity is a measure that involves use of renewable energy, as per paragraph 47 of the methodological tool “Demonstration and assessment of additionality” version 06.0.0, the following steps have been followed for common practice analysis:

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

Since the proposed project activity has an installed capacity of 53.6 MW, the applicable output range for common practice analysis will be 26.8 MW to 80.4 MW ($\pm 50\%$ of 53.6 MW).

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 and projects activities undergoing validation shall not be included in this step;

N_{all} = All the power plants in the applicable output range in the applicable geographical area (India). Thus for the proposed project activity this will include all the power plants in the range from 26.8 MW to 80.4 MW commissioned in India before the start date of the proposed project activity (06 July 2007 as per definition in the CDM guidelines) and not registered / under validation under any GHG program. Further the technology considered in the project activity is not specific to India. Project is located in India and boundary is not expected beyond India.

The total number of power plants in the applicable area, which in case is India, for the applicable output range = 371. The sources for each value have been provided in a consolidated excel sheet to the DOE.

Category of Power plants	No. of Projects
Thermal	149
Hydro	218
Wind	1
Nuclear	0
Solar	0

Category of Power plants	No. of Projects
Biomass	3
Total (N_{all})	371

Therefore N_{all} =371.

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}.

N_{diff} = All the power plants with technologies different from that of the proposed project activity in the applicable output range in the applicable geographical area. Hence for the proposed project activity, this will include all the power plants in the range from 26.8 MW to 80.4 MW commissioned in India before the start date of the proposed project activity and use technologies different from wind energy technology for power generation as will be used by the proposed project activity.

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

Category of Power plants	No. of Projects
Thermal	149
Hydro	218
Wind	0
Nuclear	0
Solar	0
Biomass	3
Total (N_{diff})	370

The sources for each value have been provided in a consolidated excel sheet to the DOE.

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.

$$\text{Therefore, } F = 1 - \frac{N_{diff}}{N_{all}} = \frac{N_{all} - N_{diff}}{N_{all}} = 0.002$$

and, (N_{all} - N_{diff}) = 1

Since the factor F is less than 0.2 and N_{all}-N_{diff} is less than 3, the proposed project activity is not a common practice within the power sector in the applicable geographical area.

Hence as per Methodological Tool “Demonstration and assessment of additionality” Version 06.0.0, it can be concluded that the project activity is additional.

Further, there is now regulatory surplus applicable for this project as per VCS Standard v4.2

3.6 Methodology Deviations

There are no deviations from the applied baseline and monitoring methodology ACM0002 Version 20 “Grid-connected electricity generation from renewable sources”

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

As per para 39 of ACM0002 version 20.0, 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:

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

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 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 ₂ e/MWh)

Calculation of $EG_{PJ, y}$

The methodology ACM0002 (Version 20) 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 CDM project activity are Greenfield plants, option (a) as provided in the methodology ACM0002 (Version 20) 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 20.0) 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:

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 16.0⁹ (Mar’21). 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

⁹ <http://cea.nic.in/tpeandce.html>

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, 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
Integrated Indian Grid	15.1%	14.6%	14.3%	14.5%	17.0%

Ref: CO2 Baseline Database for the Indian Power Sector – CEA, Version 16

In Indian Grid, the low-cost/must run resources vary from 14.3% to 17% 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 16, Mar'21) the percentage of total grid generation by low-cost/must-run plants (on the basis of average of five 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-PD 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 CO₂ emission factor for each power unit, as follows:

$$EF_{grid,OM,simple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,y}}{\sum_m EG_{m,y}}$$

Where:

- EF_{grid,OMsimple,y} = Simple operating margin CO₂ emission factor of in year y (tCO₂/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} = CO₂ emission factor of fuel type i in year y (tCO₂/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)		
2017-18	2018-19	2019-20
960,693	995,957	965,009

Simple Operating Margin Emission Factors (tCO ₂ /MWh) (incl. Imports)		
2017-18	2018-19	2019-20
0.9543	0.9685	0.9555

Therefore, weighted OM average for Indian grid comes out to be 0.9568 tCO₂/MWh

i.e. $EF_{\text{grid,OM,y}} = 0.9568 \text{ tCO}_2/\text{MWh}$

In this PD ex-ante vintage has been fixed and will not be changed during the crediting period.

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. 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 ($AEG_{SET\geq 20\%}$, in MWh);

(c) From SET_{5-units} and SET_{≥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_{≥20%} to be larger than the generation from SET_{5-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_{≥20%} started to supply electricity to the grid more than 10 years ago.

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

The build margin emissions factor is the generation-weighted average emission factor (tCO₂/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 $EF_{grid, BM, y}$ 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_{≥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 2019-20 is 0.8682 tCO₂/MWh.

$$EF_{grid, BM, y} = 0.8682 \text{ tCO}_2\text{e/MWh}$$

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 2019-20) has been used and the build margin thus calculated is 0.8682 (tCO₂e/MWh)

Therefore, EF_{grid,BM,y} = 0.8682 (tCO₂e/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 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 (%)
- 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:

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

$$EF_{grid, CM, y} = 0.75 * 0.9568 + 0.25 * 0.8682 \text{ (tCO}_2\text{/MWh)}$$

$$EF_{grid, CM, y} = 0.9346 \text{ tCO}_2\text{/MWh}$$

4.2 Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 20, there will be no project emissions in the project activity
 $PE_y = 0$

4.3 Leakage

As per ACM0002 Version 20, 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). These emissions sources are neglected.

4.4 Estimated Net GHG Emission Reductions and Removals

Baseline emissions

Samana site, Gujarat:

Parameter	Value	Units	Source
Number of turbines installed	12	Nos.	Installed capacity
Installed Capacity	9.6	MW	Installed capacity

Parameter	Value	Units	Source
Net Generation for 12 turbines ($EG_{Samana, facility, y}$)	20,995.2	MWh	Wind Assessment Report by third party
Integrated Indian Grid Emission Factor ($EF_{Integrated, grid, CM, y}$)	0.9346	tCO ₂ e/MWh	CEA Database, Version 16.0

Saundatti site, Karnataka:

Parameter	Value	Units	Source
Number of turbines installed	55	Nos.	Installed capacity
Installed Capacity	44	MW	Installed capacity
Net Generation for 55 turbines ($EG_{Saundatti, facility, y}$)	95,587.86	MWh	Wind Assessment Report by third party
Integrated Indian Grid Emission Factor ($EF_{Integrated, grid, CM, y}$)	0.9346	tCO ₂ e/MWh	CEA Database, Version 16.0

Baseline emissions (BE_y) are calculated as follows:

$$\begin{aligned}
 BE_y &= EG_{Samana, facility, y} \times EF_{Integrated, grid, CM, y} + EG_{Saundatti, facility, y} \times EF_{Integrated, grid, CM, y} \\
 &= 20,995.2 \times 0.9346 + 95,587.86 \times 0.9346 = 108,961 \text{ tCO}_2\text{e}
 \end{aligned}$$

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.

$$\text{Hence, } PE_y = 0$$

Emission Reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

$$ER_y = \text{Emission reductions in year } y \text{ (t CO}_2\text{e)}$$

$$BE_y = \text{Baseline emissions in year } y \text{ (t CO}_2\text{)}$$

$$PE_y = \text{Project emissions in year } y \text{ (t CO}_2\text{e)}$$

$$\text{Emission Reductions: } ER_y = BE_y - PE_y \quad \mathbf{108,961} \quad \mathbf{tCO_2e}$$

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 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	108,961	0	0	108,961
Year 2	108,961	0	0	108,961
Year 3	108,961	0	0	108,961
Year 4	108,961	0	0	108,961
Year 5	108,961	0	0	108,961
Year 6	108,961	0	0	108,961
Year 7	108,961	0	0	108,961
Year 8	108,961	0	0	108,961
Year 9	108,961	0	0	108,961
Year 10	108,961	0	0	108,961
Total	1,089,610	0	0	1,089,610

5 MONITORING

5.1 Data and Parameters Available at Validation

Presently, NEWNE grid and Southern grid (which were considered at the time of project registration) have been merged and same is now known as Integrated Indian Grid

Data / Parameter	EF _{Integrated,grid,OM,y}
Data unit	tCO ₂ e/MWh
Description	Operating Margin emission factor for Integrated Indian grid
Source of data	Referred from CO ₂ Baseline Database for the Indian Power Sector prepared by Central Electricity Authority Version 16.0.
Value applied:	0.9568
Justification of choice of data or description of measurement methods and procedures applied	Calculated it as CEA sourced data 3 years vintage data (2017-18, 2018-19 and 2019-20) and option of ex ante calculation based on Simple Operating Margin Method. Computed once during PDD finalization.
Purpose of Data	To calculate the baseline emission calculation
Comments	This value is determined and fixed ex-ante.

Data / Parameter	EF _{Integrated,grid,BM,y}
Data unit	tCO ₂ e/MWh
Description	Build Margin emission factor for Integrated Indian grid
Source of data	Referred from CO ₂ Baseline Database for the Indian Power Sector prepared by Central Electricity Authority Version 16.0.
Value applied:	0.8682 tCO ₂ e/MWh
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per CEA sourced data for the year 2019-20. The build margin is calculated in this database as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation and option of ex ante calculation. Computed once during PD finalization.
Purpose of Data	To calculate the baseline emission calculation
Comments	This value is determined and fixed ex-ante.

Data / Parameter	EF _{Integrated,grid,CM,y}
Data unit	tCO ₂ e/MWh
Description	Combined Margin CO ₂ emission factor for Integrated Indian grid
Source of data	Estimated figure based on 75% of OM and 25% of BM values
Value applied:	0.9346 tCO ₂ e/MWh
Justification of choice of data or description of measurement methods and procedures applied	CEA has calculated it as per ACM0002 with 3 years vintage data and option of ex ante calculation based on 75% of OM and 25% of BM values approach. Computed once during PDD finalization.
Purpose of Data	To calculate the baseline emission calculation
Comments	This value is determined and fixed ex-ante.

5.2 Data and Parameters Monitored

Data and Parameters Monitored for Samana site:

Data / Parameter	EG _{Samana,WTG,i}
Data unit	MWh
Description	Quantity of electricity generated by <i>ith</i> WTG at Samana site

Source of data	LCS meter data
Description of measurement methods and procedures applied	The quantity of electricity generated by <i>ith</i> WTG at Samana site is measured and recorded by the LCS meter at the WTG controller end.
Frequency of monitoring/recording	Measured continuously and recorded daily
Value applied:	Data will be monitored ex-post
Monitoring equipment	LCS meter at the WTG controller end would be used for monitoring.
QA/QC procedures applied	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. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

Data / Parameter	EG _{Samana, facility, y}
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project activity to the Integrated Indian grid in year <i>y</i>
Source of data	Joint Meter Reading Sheets and WTG Controller End Data
Description of measurement methods and procedures applied	Net electricity generated by the wind farm is monitored using a main meter at the grid interconnection point in the substation maintained by Wind World India Limited (previously known as Enercon (India) Limited). There are numerous WTGs apart from those included in this project that are connected to the main meter. The net electricity delivered by the Samana sub-project would be calculated by proportionally dividing the metered net generation among the connected WTGs on the basis of the prorata readings taken at the WTG controller end. The net electricity supplied by the wind farm to the Integrated Indian grid is determined as the difference between the quantity

	of electricity supplied by the wind farm to the grid and the quantity of electricity delivered to the wind farm from the grid. Joint meter readings for the net energy generation by the wind farm are taken in the presence of Wind World India Limited (previously known as Enercon (India) Limited) and grid officials every month.
Frequency of monitoring/recording	Measured continuously and recorded monthly
Value applied:	20,995.2
Monitoring equipment	Main meter is installed at the grid interconnection point in the substation maintained by Wind World India Limited (previously known as Enercon (India) Limited). The meter is bi-directional with an accuracy class of 0.2 s.
QA/QC procedures applied	Calibration of the main meter shall be done once every three years.
Purpose of data	Calculation of baseline emissions
Calculation method	$EG_{\text{Integrated, facility, y}} = \text{Net wind farm generation} * (\text{Electricity generation by project WTGs} / \text{Electricity generation by wind farm WTGs})$
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

Data and Parameters Monitored for Saundatti site:

Data / Parameter	$EG_{\text{Saundatti, WTG, i}}$
Data unit	MWh
Description	Quantity of electricity generated by <i>ith</i> WTG at Saundatti site
Source of data	LCS meter data
Description of measurement methods and procedures applied	The quantity of electricity generated by <i>ith</i> WTG at Saundatti site is measured and recorded by the LCS meter at the WTG controller end.
Frequency of monitoring/recording	Measured continuously and recorded daily
Value applied:	Data will be monitored ex-post
Monitoring equipment	LCS meter at the WTG controller end would be used for monitoring.
QA/QC procedures applied	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. In case there is any mismatch in the energy values recorded by the

	LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

Data / Parameter	EG _{Saundatti, facility, y}
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project activity to the Integrated Indian grid in year y
Source of data	Joint Meter Reading Sheets and WTG Controller End Data
Description of measurement methods and procedures applied	Net electricity generated by the wind farm is monitored using a main meter at the grid interconnection point in the substation maintained by Wind World India Limited (previously known as Enercon (India) Limited). There are numerous WTGs apart from those included in this project that are connected to the main meter. The net electricity delivered by the Saundatti sub-project would be calculated by proportionally dividing the metered net generation among the connected WTGs on the basis of the prorata readings taken at the WTG controller end. The net electricity supplied by the wind farm to the Integrated Indian grid is determined as the difference between the quantity of electricity supplied by the wind farm to the grid and the quantity of electricity delivered to the wind farm from the grid. Joint meter readings for the net energy generation by the wind farm are taken in the presence of Wind World India Limited (previously known as Enercon (India) Limited)and grid officials every month.
Frequency of monitoring/recording	Measured continuously and recorded monthly
Value applied:	95,587.86
Monitoring equipment	Main and check meters are installed at the grid interconnection point in the substation maintained by Wind World India Limited (Enercon (India) Limited). The meters are bi-directional with an accuracy class of 0.2 s.
QA/QC procedures applied	Calibration of the main and check meters shall be done once every three years.
Purpose of data	Calculation of baseline emissions

Calculation method	$EG_{\text{Saundatti, facility, y}} = \text{Net wind farm generation} * (\text{Electricity generation by project WTGs} / \text{Electricity generation by wind farm WTGs})$
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

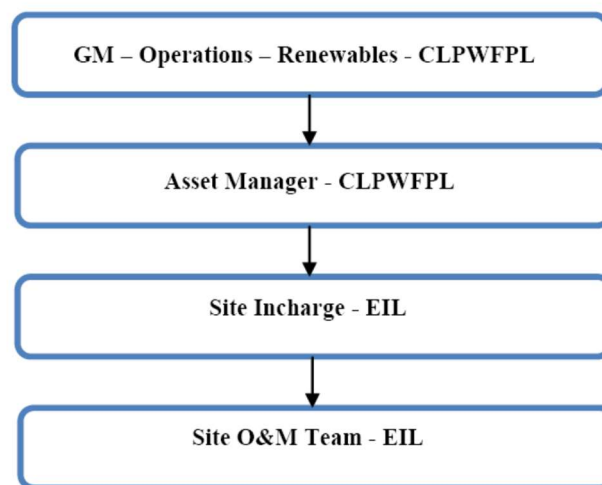
5.3 Monitoring Plan

The monitoring plan is being devised as per approved consolidated monitoring methodology ACM0002 Version 20.0.0 - “Grid-connected electricity generation from renewable sources”.

The electricity exported to and imported from the grid would be measured using bi-directional main and check meters of accuracy class 0.2s installed at the sub-station. The consumption registered by the main meter alone will hold good for the purpose of estimation of the emission reductions as long as the error in the main meter is within the permissible limits.

To ensure trouble free operations and efficient generations through all the wind turbines, CLPWFPL has entered into a comprehensive Operation and Maintenance agreement with the manufactures of the turbines. The contractor, Wind World India Limited (previously known as Enercon (India) Limited (EIL)), under the O&M contract with CLPWFPL would be responsible for the operation and maintenance of the project activity for the entire crediting period.

The responsibility of project management as well as registration, monitoring, measurement and reporting lies with CLPWFPL. CLPWFPL has envisaged a Project Team to ensure proper and continuous monitoring of the performance of turbines and generation of power. The same has been outlined as follows:



The O&M personnel are qualified engineers and are trained at the WTG manufacturing facility of Wind World India Limited (previously known as Enercon (India) Limited) at Daman for operating and ensuring best performance of the WTGs.

Metering Equipment: Metering equipment shall be bidirectional electronic meters of accuracy class 0.2s required for the Project (both main and check meter).

Meter Readings: The monthly meter readings (both main and check meters) at the sub-station shall be taken jointly by the grid authority and WWIL.

Meter Test Checking: Main and check meters shall be tested for accuracy once every three years. The meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2s accuracy class.

Records: O&M Contractor WWIL will maintain an accurate and up-to-date operating log at the wind farm. All the records will be preserved for 2 years beyond the crediting period.

Emergency procedures: The Samana site has four main meters installed at the grid interconnection point in the substation maintained by Wind World India Limited (previously known as Enercon (India) Limited). In case any meter becomes defective, the load would be switched to the other operational meters so that there is no lapse in recording of electricity generation data. The Saundatti site has two main and two check meters installed at the grid interconnection point in the substation. In case a main meter becomes defective, the readings of the check meter would be used for the purpose of billing and calculation of emission reductions.

Apportioning of electricity: In case dates of monitoring period do not match with the dates of Joint Meter Readings the following apportioning formula would be used to estimate the electricity generation for calculating emission reductions:

X = Electricity generation recorded at LCS Meter by project activity WTGs between start/end date of monitoring period and date of billing cycle

Y = Electricity generation recorded at LCS Meter by project activity WTGs in the particular month for which Joint Meter Reading has been taken

Z = Net energy exported from project activity WTGs

Electricity Generation = $(X/Y) * Z$

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	EG _{Samana,WTG,i}
Data unit	MWh
Description	Quantity of electricity generated by <i>ith</i> WTG at Samana site
Value applied:	16,763.36
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

Data / Parameter	EG _{Samana,facility,y}
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project activity to the Integrated Indian grid in year <i>y</i>
Value applied:	16,310.33
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

Data / Parameter	EG _{Saundatti,WTG,i}
Data unit	MWh
Description	Quantity of electricity generated by <i>ith</i> WTG at Saundatti site
Value applied:	66,888.082
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

Data / Parameter	EG _{Saundatti,facility,y}
Data unit	MWh

Description	Quantity of net electricity generation supplied by the project activity to the Integrated Indian grid in year y
Value applied:	65,264.48
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

6.2 Baseline Emissions

The baseline emissions are calculated as follows:

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

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 project activity in year y (MWh)

$EF_{\text{grid,CM},y}$ = Combined margin CO₂ 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:

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

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):

Duration		Net Export by Samana Wind Project ($EG_{\text{Samana,facility},y}$) (MWh)	Net Export by Saundatti Wind Project ($EG_{\text{Saundatti,facility},y}$) (MWh)	Total Net Electricity Export from Project (MWh)
From	To			
23-06-2020	30-06-2020	367.65	2,785.01	3,152.65
01-07-2020	31-07-2020	1,291.93	7,686.03	8,977.96
01-08-2020	31-08-2020	2,446.42	12,619.54	15,065.95
01-09-2020	30-09-2020	721.03	4,918.94	5,639.96

Duration		Net Export by Samana Wind Project (EG _{Samana, facility, y}) (MWh)	Net Export by Saundatti Wind Project (EG _{Saundatti, facility, y}) (MWh)	Total Net Electricity Export from Project (MWh)
From	To			
01-10-2020	31-10-2020	880.07	3,710.84	4,590.90
01-11-2020	30-11-2020	1,475.40	5,520.38	6,995.78
01-12-2020	31-12-2020	1,594.56	5,794.86	7,389.42
01-01-2021	31-01-2021	1,718.40	4,067.27	5,785.67
01-02-2021	28-02-2021	1,130.35	3,706.50	4,836.86
01-03-2021	31-03-2021	1,333.13	3,478.93	4,812.06
01-04-2021	30-04-2021	1,285.07	3,784.14	5,069.20
01-05-2021	31-05-2021	2,066.33	7,192.06	9,258.39
	Total	16,310.33	65,264.48	81,574.82

Baseline emissions (BE_y) are calculated as follows:

$$BE_y = EG_{\text{Samana, facility, y}} \times EF_{\text{Integrated, grid, CM, y}} + EG_{\text{Saundatti, facility, y}} * EF_{\text{Integrated, grid, CM, y}}$$

Baseline emissions for Samana Site:

Vintage Period	Net Electricity Export (MWh)	Emission Factor (tCO ₂ /MWh)	Baseline Emissions (tCO ₂)
2020 (23-Jun-20 to 31-Dec-20)	8,777.05	0.9346	8,203.00
2021 (01-Jan-21 to 31-May-21)	7,533.28	0.9346	7,040.00
	16,310.33		15,243.00

Baseline emissions for Saundatti Site:

Vintage Period	Net Electricity Export (MWh)	Emission Factor (tCO ₂ /MWh)	Baseline Emissions (tCO ₂)
2020 (23-Jun-20 to 31-Dec-20)	43,035.58	0.9346	40,222.00
2021 (01-Jan-21 to 31-May-21)	22,228.90	0.9346	20,775.00
	65,264.48		60,997.00

Baseline emissions for Project activity:

Vintage Period	Baseline Emissions (tCO ₂)
2020 (23-Jun-20 to 31-Dec-20)	48,425.00

2021 (01-Jan-21 to 31-May-21)	27,815.00
	76,240.00

6.3 Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 20.0.0, there will be no project emissions in the project activity $PE_y = 0$

6.4 Leakage

As per ACM0002 Version 20.0.0, no leakage has been considered for the calculation of emission factor.

6.5 Net GHG Emission Reductions and Removals

According to the approved methodology ACM0002 (Version 20) 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,

$$ER_y = 76,240 - 0 \text{ tCO}_2\text{e}$$

$$= 76,240 \text{ tCO}_2\text{e}$$

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2020 (23-Jun-20 to 31-Dec-20)	48,425.00	0.00	0.00	48,425.00
2021 (01-Jan-21 to 31-May-21)	27,815.00	0.00	0.00	27,815.00
Total	76,240.00	0.00	0.00	76,240.00

APPENDIX 1: CALIBRATION DETAILS

Calibration Details of Meters for Current Monitoring Period:

Samana Site:

Sl. No.	Meter Type	Meter Identification No	Meter Make	Accuracy Class	Calibration Date	Calibration Expiry Date
01	Main Meter	GJ-2458-A	L&T	0.2s	26/12/2019	25/12/2022
02		GJ-2459-A	L&T	0.2s	26/12/2019	25/12/2022

Saundatti Site:

Sl. No.	Transformer No	Meter Type	Meter Identification No	Meter Make	Accuracy Class	Calibration Date	Calibration Expiry Date
1	Transformer -1	Main Meter	14194656	L&T	0.2s	10/12/2019	09/12/2022
		Check Meter	14194675	L&T	0.2s	10/12/2019	09/12/2022
2	Transformer -2	Main Meter	14194483	L&T	0.2s	10/12/2019	09/12/2022
		Check Meter	14194487	L&T	0.2s	10/12/2019	09/12/2022