



Monitoring report form for CDM project activity
(Version 09.0)

MONITORING REPORT

Title of the project activity	Enercon Wind Farm (Hindustan) Ltd in Rajasthan		
UNFCCC reference number of the project activity	1168		
Version number of the PDD applicable to this monitoring report	12		
Version number of this monitoring report	01		
Completion date of this monitoring report	28/01/2022		
Monitoring period number	Ninth (9 th)		
Duration of this monitoring period	01/09/2017 to 14/03/2020 (Inclusive of both the dates)		
Monitoring report number for this monitoring period	N/A		
Project participants	M/s Wind World (India) Limited ¹ Numerco Limited Statkraft Markets GmbH ACT Financial Solutions B.V. First Climate Markets A.G.		
Host Party	India		
Applied methodologies and standardized baselines	Sectoral Scope 1, Energy industries (renewable/ non-renewable sources). Standardized baselines: Not applicable		
Sectoral scopes	Consolidated methodology for grid-connected electricity generation from renewable sources, ACM0002, Version 6		
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013 until 31 December 2020	Amount achieved from 1 January 2021
	0	141,788	NA
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	256,355		

¹ Previously Enercon (India) Limited

SECTION A. Description of project activity

A.1. General description of project activity

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- (a) *Purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG removals by sinks;*

The purpose of the project activity is to utilize renewable wind energy for generation of electricity. The project activity replaces anthropogenic emissions of greenhouse gases (GHG's) into the atmosphere, which is estimated to be approximately 141,788 tCO_{2e} for this monitoring period, by displacing the equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansions connected to the grid. In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/new power plants in the NEWNE grid, which are/ will be predominantly based on fossil fuels. Whereas the electricity generation from operation of Wind Energy Convertors (WEC's) is emission free.

- (b) *Brief description of the installed technology and equipment;*

The Project involves 75-wind energy converters (WECs) of 800 kW E-48 with internal electrical lines connecting the Project with local evacuation facility. The WECs generates 3-phase power at 400V, which is stepped up to 33 KV. The Project can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V \pm 12.5%. The other salient features of the state-of-art-technology are referred in Annex 3. The line diagram of wind farm including metering points and substations is attached as Annex 1.

- (c) *Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.);*

The first WEC under the project activity was commissioned on 26 November 2006 and the last WEC under the project activity was commissioned on 25 December 2006. The expected operational lifetime of the project is for 20 years. The length of the Crediting period of the project activity as per registered PDD is 10 years (Fixed). As per the Registered PDD, the Crediting period Start Date is estimated 01 November 2007. However, since the Project was registered on 15 March 2010, the length of crediting period is from 15 Mar 2010 to 14 Mar 2020 (Fixed).

The time frame for this monitoring period is from 01/09/2017 to 14/03/2020.

- (d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period.

The total emission reductions achieved under this monitoring period (01/09/2017 to 14/03/2020) is 141,788 tCO₂.

A.2. Location of project activity

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- (a) Host Party(ies);
India

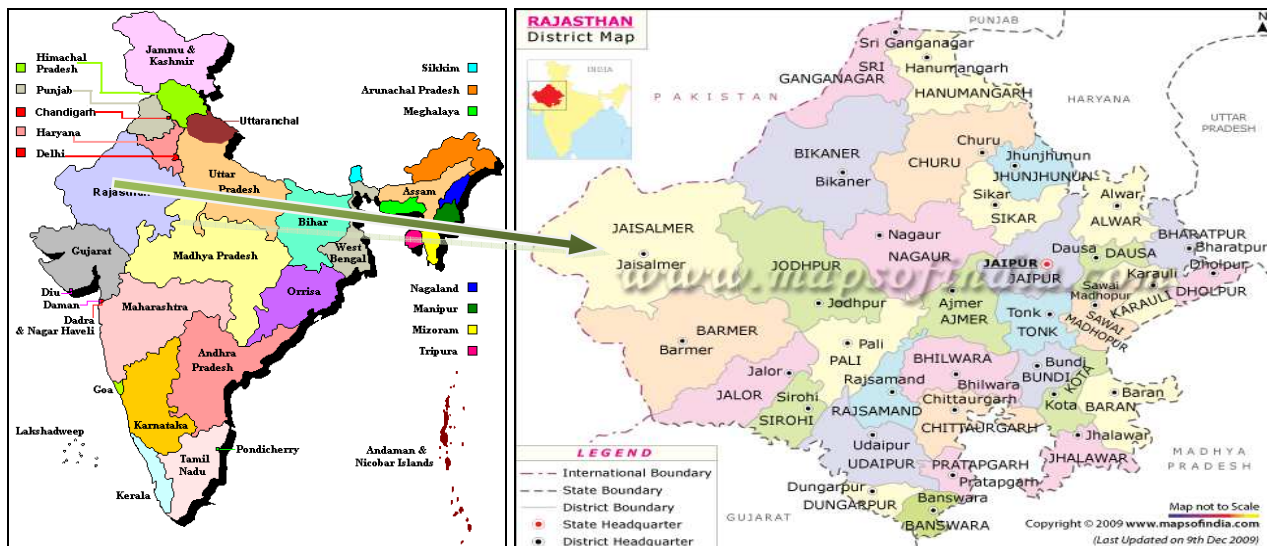
- (b) Region/State/Province, etc.;
Northern Region/Rajasthan State

- (c) City/Town/Community, etc.;

The Project is located at Kita and Pithodai Ki Dhani village, in Jaisalmer District of Rajasthan state in India.

(d) Physical/ Geographical location.

The project area extends between latitude 26° 40' 47.5" & 26° 45' 48.3" North and longitude 70° 58' 19.3" & 71° 3' 32.5" East. The Project is connected to 220kV AKAL-BHU/400kV GSS AKAL, Jaisalmer RRVPN substation. The sites are located at a distance of 25 km from Jaisalmer by road. The nearest railway station is at Jaisalmer.



Individual WEG location numbers and coordinates are detailed out in below Table 1: -

S. No	EWHPL UNIQUE ID	Loc No	Latitude			Longitude		
			Deg.	Minute	Second	Deg.	Minute	Second
1	EWHPL 01	322	26	40	47.5	70	58	58.2
2	EWHPL 02	323	26	40	55.3	70	58	54.6
3	EWHPL 03	145	26	41	2.5	70	58	49.5
4	EWHPL 04	146	26	41	7.7	70	58	43.9
5	EWHPL 05	147	26	41	12.8	70	58	38.4
6	EWHPL 06	148	26	41	18	70	58	32.8
7	EWHPL 07	150	26	41	27	70	58	48.3
8	EWHPL 08	151	26	41	32.1	70	58	42.7
9	EWHPL 09	152	26	41	37.3	70	58	37.2
10	EWHPL 10	153	26	41	38.5	70	59	8.6
11	EWHPL 11	154	26	41	43.6	70	59	3.1
12	EWHPL 12	155	26	41	48	70	58	57.5
13	EWHPL 13	156	26	41	54.1	70	58	52.1
14	EWHPL 14	157	26	41	56.6	70	58	41.5
15	EWHPL 15	307	26	42	12	70	58	24.8
16	EWHPL16	306	26	42	17.2	70	58	19.3
17	EWHPL 17	300	26	42	47.4	70	58	24.4
18	EWHPL 18	301	26	42	43.9	70	58	30.7
19	EWHPL 19	304	26	42	26.8	70	58	46.6

20	EWHPL 20	305	26	42	21.7	70	58	52.2
21	EWHPL 21	161	26	42	16.5	70	58	57.7
22	EWHPL 22	160	26	42	9	70	59	2.2
23	EWHPL 23	159	26	42	1.3	70	59	6.7
24	EWHPL 24	324	26	42	5.7	70	59	23.9
25	EWHPL 25	167	26	42	38.3	70	59	0.2
26	EWHPL 26	168	26	42	42.9	70	58	56.3
27	EWHPL 27	169	26	42	49.6	70	58	54.4
28	EWHPL 28	170	26	42	56.5	70	58	52.7
29	EWHPL 29	326	26	43	22.4	70	58	50.2
30	EWHPL 30	177	26	42	54.5	70	59	29.3
31	EWHPL 31	178	26	42	49.4	70	59	34.9
32	EWHPL 32	179	26	42	44.2	70	59	40.5
33	EWHPL 33	181	26	42	32.2	70	59	50.9
34	EWHPL 34	183	26	42	59	70	59	50.6
35	EWHPL 35	184	26	43	5.8	70	59	45.8
36	EWHPL 36	186	26	43	17.8	70	59	35.4
37	EWHPL 37	190	26	43	25.1	70	59	50.1
38	EWHPL 38	191	26	43	18.3	70	59	54.9
39	EWHPL 39	192	26	43	13.2	71	0	0.5
40	EWHPL 40	193	26	43	8	71	0	6.1
41	EWHPL 41	194	26	43	2.9	71	0	11.6
42	EWHPL 43	218	26	45	31.3	71	0	32
43	EWHPL 42	219	26	45	17.2	71	0	23.1
44	EWHPL 44	220	26	44	52.6	71	0	38.2
45	EWHPL 45	221	26	44	52.5	71	0	47.2
46	EWHPL 46	222	26	44	45.9	71	0	55.9
47	EWHPL 47	223	26	44	56.1	71	1	5.4
48	EWHPL 48	224	26	45	1.9	71	1	16.3
49	EWHPL 49	225	26	44	43.9	71	1	23
50	EWHPL 50	226	26	44	38.8	71	1	35.9
51	EWHPL 51	230	26	44	24.9	71	1	55.5
52	EWHPL 52	232	26	44	19.9	71	2	1.7
53	EWHPL 53	233	26	44	14.1	71	2	7.3
54	EWHPL 54	329	26	44	30.1	71	2	16
55	EWHPL 55	234	26	44	20.5	71	2	27.9
56	EWHPL 56	236	26	43	57.4	71	2	22.2
57	EWHPL 57	237	26	43	55.8	71	2	30.9
58	EWHPL 58	238	26	43	56.9	71	2	39.7
59	EWHPL 59	328	26	44	8.9	71	2	56.5
60	EWHPL 60	241	26	43	58.7	71	2	59.9
61	EWHPL 61	242	26	43	51.8	71	3	5.1
62	EWHPL 62	245	26	44	30.5	71	3	32.5

63	EWHP 63	246	26	44	32.5	71	3	22.5
64	EWHP 64	249	26	45	9.4	71	3	14.1
65	EWHP 65	302	26	44	51.4	71	2	56.1
66	EWHP 66	250	26	44	58.1	71	2	52.3
67	EWHP 67	251	26	45	0.4	71	2	44.6
68	EWHP 68	252	26	45	0.8	71	2	32.4
69	EWHP 69	253	26	45	4.3	71	2	25.6
70	EWHP 70	254	26	45	14.2	71	2	15.9
71	EWHP 71	256	26	45	23.8	71	2	25.8
72	EWHP 72	257	26	45	39.3	71	2	47.5
73	EWHP 73	258	26	45	42.8	71	2	37.2
74	EWHP 74	259	26	45	46.6	71	2	26.5
75	EWHP 75	260	26	45	48.3	71	2	18.7

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (Host)	M/s Wind World (India) Limited	No
United Kingdom of Great Britain and Northern Ireland	Numerco Limited	No
Switzerland	Statkraft Markets GmbH	No
Netherlands	ACT Financial Solutions B.V.	No
Germany	First Climate Markets A.G.	No

A.4. References to applied methodologies and standardized baselines

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*Consolidated methodology for grid-connected electricity generation from renewable sources, **ACM0002, Version 06***

1. Tool for the demonstration and assessment of additionality
2. Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion

Further information with regards to the methodology / tools can be obtained at
<http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT>

A.5. Crediting period type and duration

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The length of the Crediting period of the project activity as per registered PDD is 10 years (Fixed). The crediting period start date is 15/03/2010 and length of crediting period is 10 years (from 15/03/2010 to 14/03/2020).

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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The Project involves 75-wind energy converters (WECs) of 800 kW E-48 with internal electrical lines connecting the Project with local evacuation facility. The WECs generates 3-phase power at 400V, which is stepped up to 33 KV. The Project can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V \pm 12.5%. The other salient features of the state-of-art-technology are referred in Annex 3.



For project activities that consist of more than one site, the report shall clearly describe the status of implementation and starting date of operation for each site. For CDM project activities with phased implementation, the report shall indicate the progress of the proposed CDM project activity achieved in each phase.

The starting date of operation of the project activity

The first WEC under the project activity was commissioned on 26th November 2006 and last WEC under the project activity was commissioned on 25th December 2006. The commissioning date for all the WECs included in the project activity is given in the table below.

Table 2: Commissioning details

S.No	EWHPL UNIQUE ID	Loc No	Commissioning date
1	EWHPL 01	322	20-Dec-06
2	EWHPL 02	323	20-Dec-06
3	EWHPL 03	145	20-Dec-06
4	EWHPL 04	146	20-Dec-06
5	EWHPL 05	147	20-Dec-06
6	EWHPL 06	148	20-Dec-06
7	EWHPL 07	150	20-Dec-06
8	EWHPL 08	151	20-Dec-06
9	EWHPL 09	152	20-Dec-06
10	EWHPL 10	153	20-Dec-06
11	EWHPL 11	154	20-Dec-06
12	EWHPL 12	155	20-Dec-06
13	EWHPL 13	156	20-Dec-06
14	EWHPL 14	157	20-Dec-06
15	EWHPL 15	307	21-Dec-06
16	EWHPL16	306	21-Dec-06
17	EWHPL 17	300	20-Dec-06

18	EWHPL 18	301	20-Dec-06
19	EWHPL 19	304	21-Dec-06
20	EWHPL 20	305	21-Dec-06
21	EWHPL 21	161	20-Dec-06
22	EWHPL 22	160	20-Dec-06
23	EWHPL 23	159	20-Dec-06
24	EWHPL 24	324	21-Dec-06
25	EWHPL 25	167	20-Dec-06
26	EWHPL 26	168	26-Nov-06
27	EWHPL 27	169	26-Nov-06
28	EWHPL 28	170	26-Nov-06
29	EWHPL 29	326	21-Dec-06
30	EWHPL 30	177	25-Dec-06
31	EWHPL 31	178	25-Dec-06
32	EWHPL 32	179	25-Dec-06
33	EWHPL 33	181	25-Dec-06
34	EWHPL 34	183	25-Dec-06
35	EWHPL 35	184	25-Dec-06
36	EWHPL 36	186	25-Dec-06
37	EWHPL 37	190	25-Dec-06
38	EWHPL 38	191	25-Dec-06
39	EWHPL 39	192	25-Dec-06
40	EWHPL 40	193	25-Dec-06
41	EWHPL 41	194	25-Dec-06
42	EWHPL 43	218	21-Dec-06
43	EWHPL 42	219	21-Dec-06
44	EWHPL 44	220	25-Dec-06
45	EWHPL 45	221	25-Dec-06
46	EWHPL 46	222	25-Dec-06
47	EWHPL 47	223	21-Dec-06
48	EWHPL 48	224	21-Dec-06
49	EWHPL 49	225	21-Dec-06
50	EWHPL 50	226	21-Dec-06
51	EWHPL 51	230	21-Dec-06
52	EWHPL 52	232	21-Dec-06
53	EWHPL 53	233	21-Dec-06
54	EWHPL 54	329	21-Dec-06
55	EWHPL 55	234	21-Dec-06
56	EWHPL 56	236	21-Dec-06
57	EWHPL 57	237	21-Dec-06
58	EWHPL 58	238	20-Dec-06
59	EWHPL 59	328	20-Dec-06
60	EWHPL 60	241	20-Dec-06

61	EWHP 61	242	20-Dec-06
62	EWHP 62	245	20-Dec-06
63	EWHP 63	246	26-Nov-06
64	EWHP 64	249	26-Nov-06
65	EWHP 65	302	21-Dec-06
66	EWHP 66	250	26-Nov-06
67	EWHP 67	251	21-Dec-06
68	EWHP 68	252	21-Dec-06
69	EWHP 69	253	21-Dec-06
70	EWHP 70	254	26-Nov-06
71	EWHP 71	256	26-Nov-06
72	EWHP 72	257	26-Nov-06
73	EWHP 73	258	26-Nov-06
74	EWHP 74	259	21-Dec-06
75	EWHP 75	260	21-Dec-06

The information regarding the actual operation of the project

The project activity consists of 75 WECs (800 kW) of make E-48 totalling to a capacity of 60 MW. During the monitoring period, the WECs were operating normally. Hence no major breakdown was found during this period.

A brief description of: (i) events or situations that occurred during the monitoring period (ii) how the issues resulting from these events or situations are being addressed.

Wind World Wind Farms (Hindustan) Pvt. Ltd. has appointed Wind World (India) Limited as their operation & maintenance contractor. Hence Wind World (India) Limited is responsible for operation and maintenance activities for Wind World Wind Farms (Hindustan) Pvt. Ltd. Wind World (India) Limited operation and maintenance activities are ISO 9001:2008 certified and all the events are recorded in the log book available at the project site. Referring to the data available it can be inferred that there have not been any major special events for any of the WECs that are included in the project activity. As a part of regular maintenance the WECs are stopped for mechanical and electrical maintenance for 16 to 18 hours annually and for visual inspection for 6 to 7 hours quarterly.

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

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Not Applicable

B.2.2. Corrections

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Not Applicable

B.2.3. Changes to the start date of the crediting period

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Not Applicable

B.2.4. Inclusion of monitoring plan

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Not Applicable

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

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During this monitoring period no permanent changes or permanent deviation occurred from the registered monitoring plan², applied methodologies or applied standardized baseline. However, there was a permanent change to the registered monitoring plan (PRC-1168-002) approved on 21/03/2014. The revision has been requested via Revised PDD version 12.0; dated 14/11/2013, which was approved by UNFCCC on 21/03/2014. (Link: <http://cdm.unfccc.int/PRCContainer/DB/prcp430495431/view>)

B.2.6. Changes to project design

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During this monitoring period, no permanent changes occurred to project design of registered project activity.

B.2.7. Changes specific to afforestation or reforestation project activity

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Not Applicable

SECTION C. Description of monitoring system

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Approved monitoring methodology ACM0002 / Version 06 Sectoral Scope: 1, "Consolidated monitoring methodology for grid-connected electricity generation from renewable sources.", by CDM - Meth Panel has been used to monitor the emission reductions.

This approved monitoring methodology requires monitoring of the following:

- Electricity generation from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where *ex post* determination of grid emission factor has been chosen

Since the baseline methodology is based on *ex ante* determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required.

Wind World (India) Limited is managing the project operation.

EG_y for the project activity is being derived as follows:-

The electricity generated from the project activity is transmitting to Bhu substation through 4 feeders. The WECs of the project activity and WECs of other power producers are connected to Bhu Substation which is further connected to Akal substation. In addition to the project activity, the WECs located at Kita, Jodha, Pithoda Ki Dhani are connected to Bhu substation which are further connected to the Akal substation.

An Energy meter at 220 kV (accuracy Class-0.2) at Bhu Substation is termed secondary 'Back up meter' and Energy meters at 220 kV/400kV (accuracy Class-0.2) at Akal substation has one 'Main Meter' & one back up meter. Net Electricity supplied by the WECs is being metered at a common metering/delivery point. The common metering/delivery point comprises of one main meter that is installed at 220 kV/400kV metering point at the GSS Akal substation and one backup meter which

² <http://cdm.unfccc.int/PRCContainer/DB/prcp430495431/view>

is also installed at 220kV/400kV at Akal substation. Consequently, the main meter reading reflects the aggregate electricity supplied by all these WECs, including the project activity. The net electricity supplied by individual WEC is being determined by following a process of allocating the total electricity recorded at the main meter to the individual WEC in proportion of the electricity generation recorded by the LCS meters at the individual WEC. The apportioning for electricity export and import is done by Wind World (India) Limited based on which invoices are raised for individual customers. These invoices can be cross-verified by cheque copies by the DOE.

The procedure for allocation is detailed below:

$E_{MR,Export}$ = Gross Electricity exported, as recorded by the main meter at the substation. This data represents the total gross electricity exported by all the WECs (project and non project) at substation point.

$E_{MR,Import}$ = Gross Electricity imported, as recorded by the main meter at the substation. This data represents the total gross electricity imported by all the WECs (project and non project) at substation point.

$E_{Controller,Export,i}$ = Gross Electricity exported (at WEC point at the site) by a WEC (project or non project), as measured at the LCS meter. Each WEC has exclusive LCS meter that records gross electricity export from the WEC (project or non project). This gross electricity exported by the WEC (at WEC point at the site)

$E_{Controller,Export,j}$ and $E_{Controller,Export,k}$ are subsets of $E_{Controller,Export,i}$

where i is any value between 1 to j+k

j represents WECs of the project activity (1 to 75) connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.

k represents WECs of the non project (76 to 290) connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.

$\sum E_{Controller,Export,i}$ = Summation of gross electricity exported (at WEC point at the site) by all the WECs (project and non project) connected to the main meter at the substation, measured at the LCS meter of each WEC. This is summation of gross electricity exported by the WECs (at WEC point at the site) including WECs of the project and non project.

$E_{WEC,Export,j}$ = Gross Electricity exported (at substation point) by an individual WEC of the project to the grid that is connected to main meter & backup meter. Thus this data can be used to compute electricity export (at substation point) for individual WEC.

$E_{WEC,Import,j}$ = Gross Electricity imported (at substation point) by an individual WEC of the project from the grid that is connected to main meter & backup meter. Thus this data can be used to compute electricity import (at substation point) for individual WEC.

$\sum_{Project} E_{WEC,Export,j}$ = Summation of gross electricity exported (at substation point) by all the WECs of the project activity.

$\sum_{Project} E_{WEC,Import,j}$ = Summation of gross electricity imported (at substation point) by all the WECs of the project activity.

Gross Electricity exported by each WEC is apportioned on the basis of gross electricity export recorded at the LCS meter of each WEC and the gross electricity export recorded at the main meter mentioned in the JMR. The export multiplication factor is calculated as follows-

$$\text{Export Multiplication factor} = \frac{E_{\text{JMR Export}}}{\sum E_{\text{Controller Export } i}} \dots\dots\dots(1)$$

Thus the energy exported by an individual WEC of the project activity to the grid is given by the equation-

$$E_{\text{WEC Export } j} = \text{Export Multiplication factor} \times E_{\text{Controller Export } j} \dots\dots\dots(2)$$

As the LCS meter doesn't record import, the apportioning of energy import by each WEC is also done on the basis of electricity export recorded at the LCS meter of each WEC and the electricity import recorded at the main meter and mentioned in the JMR. The import multiplication factor is calculated as follows-

$$\text{Import Multiplication factor} = \frac{E_{\text{JMR Import}}}{\sum E_{\text{Controller Export } i}} \dots\dots\dots(3)$$

Thus, the energy imported by an individual WEC of the project activity to the grid is given by the equation-

$$E_{\text{WEC Import } j} = \text{Import Multiplication factor} \times E_{\text{Controller Export } j} \dots\dots\dots(4)$$

The net electricity supplied by the WECs of the project is given by the equation-

$$EG_y = \sum_{\text{Project}} E_{\text{WEC Export } j} - \sum_{\text{Project}} E_{\text{WEC Import } j} \dots\dots\dots(5)$$

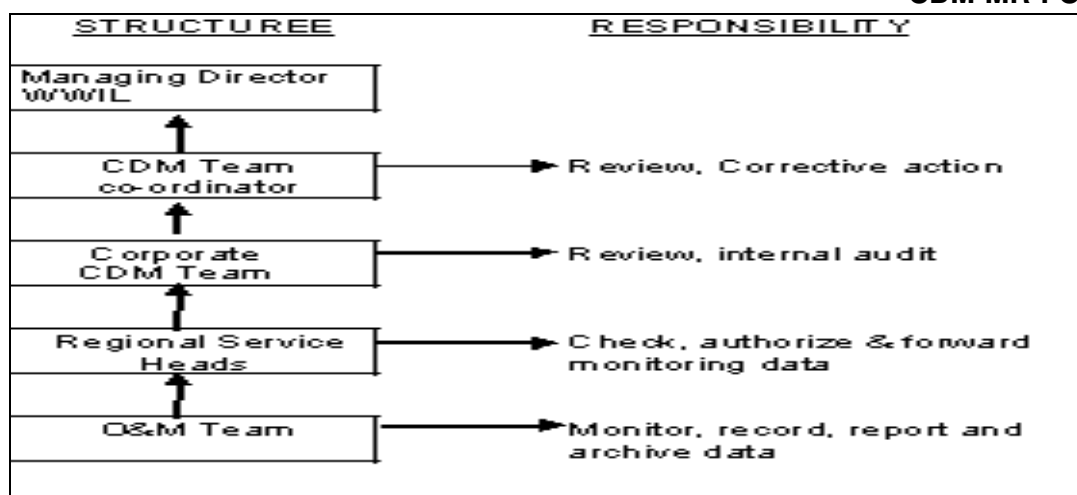
The summation is done on the WECs belonging to the project activity.

The apportioning for electricity export and import is done by Wind World (India) Limited based on which invoices are raised for individual customers. These invoices can be cross verified by the cheque copies by the DOE.

Joint Meter Reading is generated on 1st day of every month. Representatives of RRVPN/Ajmer & Jaipur DISCOM and Wind World (India) Limited jointly take the main & backup reading and sign the meter reading on the first day of every month. Simultaneously, the joint meter reading at the 220 kV level of the secondary backup metering system at Akal substation is also being taken by representatives of RRVPN/Ajmer & Jaipur DISCOM and Wind World (India) Limited.

The line diagram of wind farm including metering points and substations is provided in Annex 1.

The operational and management structure implemented and roles and responsibility by Wind World (India) Limited is as follows:



Metering system details:

The details of meters installed at the site for measuring export and import by project activity are provided below in the table:

Meter Type	Meter Sr. No.	Sub-station	Accuracy class	Make	Calibration Details
Main Meter	15624843	Akal	0.2	L & T	09-03-2017 14-05-2018
	15624842				25-09-2019 20-01-2020 15-03-2021
Backup Meter	15624844	Akal	0.2	L & T	09-03-2017 14-05-2018 20-01-2020 15-03-2021
Secondary Backup Meter	15197055	Bhu	0.2	L & T	25-05-2017 10-05-2018 20-01-2020 15-03-2021

The Main meter (15624843) & check meter (15624844) has got calibrated on 9th March 2017 & due date of calibration was 9th March 2018, but the same was done on 14th May 2018. Similarly, the calibration was due on 14th May 2019, but on 25th Sep 2019 Main meter has got replaced by new calibrated ABT meters (Main meter – 15624842).

However, delay in calibration has been observed and therefore, as per guideline provided under paragraph 366(a) of VVS PAs version 03, the PP has applied maximum permissible error for all measured values of “ $EG_{Export,y}$ ” & “ $EG_{Import,y}$ ” taken during the period between the scheduled date of calibration and the actual date of calibration conservatively.

As detailed in the above table, delay in meter calibration has been observed from the month of March-2018 as the scheduled date of meter calibration was 9th March 2018 and meters have been calibrated on 14 May 2018. Similarly, there was delay in calibration in the month of May 2019, as the scheduled date of meter calibration was 14th May 2019 but on 25th Sep 2019 Main meter has got replaced by new calibrated ABT meters (Main meter – 15624842) and back up meters were calibrated on 20th January 2020. Meter calibration activity is carried out by state utility and beyond the control of PP. So, following the conservative approach PP has considered delay for the month

of March 2018 to May 2018 and May 2019 to January 2020 to apply the maximum permissible error of “0.2%” to all measured values of “EG_{Export,y}” & “EG_{Import,y}” Please refer Sheet “ER calculation sheet” for detailed calculation. Moreover, PP has submitted latest calibration certificates for year 2017, 2018, 2019, 2020 and 2021 to DOE.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	$EF_{OM,y}$								
Unit	tCO _{2e} /MWh								
Description	Operating Margin Emission Factor of Northern Regional Electricity Grid								
Source of data	“CO ₂ Baseline Database for Indian Power Sector” published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO ₂ Baseline Database for Indian Power Sector” is available at www.cea.nic.in								
Value(s) applied	<table border="1"> <tr> <td>2002 – 03</td><td>0.9993</td></tr> <tr> <td>2003 – 04</td><td>0.9869</td></tr> <tr> <td>2004 – 05</td><td>0.9756</td></tr> <tr> <td>Average Operating Margin of last three years</td><td>0.9873</td></tr> </table>	2002 – 03	0.9993	2003 – 04	0.9869	2004 – 05	0.9756	Average Operating Margin of last three years	0.9873
2002 – 03	0.9993								
2003 – 04	0.9869								
2004 – 05	0.9756								
Average Operating Margin of last three years	0.9873								
Choice of data or measurement methods and procedures	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002								
Purpose of data/parameter	Baseline Emission Calculations								
Additional comments	None								

Data/Parameter	$EF_{BM,y}$
Unit	tCO _{2e} /MWh
Description	Build Margin Emission Factor of Northern Regional Electricity Grid
Source of data	“CO ₂ Baseline Database for Indian Power Sector” published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO ₂ Baseline Database for Indian Power Sector” is available at www.cea.nic.in
Value(s) applied	2004-05 - 0.5335
Choice of data or measurement methods and procedures	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.
Purpose of data/parameter	Baseline Emission Calculations
Additional comments	None

Data/Parameter	$EF_{CM,y}$
Unit	tCO _{2e} /MWh
Description	Combined Margin Emission Factor of Northern Regional Electricity Grid

Source of data	<p>"CO₂ Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO₂ Baseline Database for Indian Power Sector" is available at www.cea.nic.in</p>
Value(s) applied	0.87387
Choice of data or measurement methods and procedures	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.
Purpose of data/parameter	Baseline Emission Calculations
Additional comments	None

D.2. Data and parameters monitored

Data/Parameter	EGy
Unit	MWh (Mega-Watt hour)
Description	Net electricity supplied to the grid by the Project
Measured/calculated/default	Calculated by applying apportioning procedure better described in section C.
Source of data	Electricity supplied to the grid as per monthly breakup sheet prepared by Wind World (India) Limited and the same will cross verified by the tariff invoices raised on RRVPNL/Ajmer & Jaipur DISCOM (State Utility).
Value(s) of monitored parameter	Annual electricity supplied to the grid by the Project 161114.80 MWh (This is a calculated value. Please refer ER sheet)
Monitoring equipment	Calculated as per formulae better described under section C.
Measuring/reading/recording frequency	Monthly: The apportioning is done as per the procedure described in section C.
Calculation method (if applicable)	The WECs of the project activity and WECs of other power producers are connected to Bhu Substation which is further connected to Akal substation. In addition to the project activity, the WECs located at Kita, Jodha, Pithoda ki Dhani are also connected to Bhu substation which are further connected to the Akal substation. Net Electricity supplied by all these WECs is metered at a common metering/delivery point. The common metering/delivery point comprises one main meter and one backup meter that are installed at 220 kV/400 kV metering/delivery point at the Akal substation. Consequently, the main meter reading reflects the aggregate electricity supplied by all these WECs, including the project activity. The net electricity supplied by individual WEC is determined by a process of allocating the total electricity recorded at the main meter to the individual WEC in proportion to the electricity generation recorded by the LCS meters at the individual WEC. Allocation plan for calculating net electricity supplied to the grid is explained in section C above.
QA/QC procedures	This is a calculated procedure. However, the values can be cross checked from the invoices.
Purpose of data/parameter	Baseline Emissions calculations
Additional comments	Not Applicable

Data/Parameter	E_{JMR Export}
Unit	MWh (Mega-Watt hour)

Description	Gross Electricity exported (at substation point), as recorded by the main meter & backup meter at the Akal substation. This data represents the total gross electricity exported by all the WECs (project and non project) at substation point.
Measured/calculated/default	Measured: The Export reading is jointly noted from the main meter installed at the Akal substation.
Source of data	Export value from Joint meter reading taken at Akal Substation in the presence of representatives of Wind World (India) Limited and state utility.
Value(s) of monitored parameter	Please refer ER sheet for month wise details.
Monitoring equipment	Please refer section C.
Measuring/reading/recording frequency	The monitoring of the data is on continuous basis and recorded monthly. The reading is jointly noted by the representatives of state utility and Wind World (India) Limited on monthly basis.
Calculation method (if applicable)	NA
QA/QC procedures	Meters were calibrated annually. Please refer section C above.
Purpose of data/parameter	Baseline Emissions calculations
Additional comments	Not Applicable

Data/Parameter	$E_{JMR,Import}$
Unit	MWh (Mega-Watt hour)
Description	Gross Electricity imported (at substation point), as recorded by the main meter at the Akal Substation. This data represents the total gross electricity imported by all the WECs (project and non project) at substation point
Measured/calculated/default	Measured: The import reading is jointly noted from the main meter installed at the Akal substation.
Source of data	Import value from Joint meter reading taken at Akal Substation in the presence of representatives of Wind World (India) Limited and state utility
Value(s) of monitored parameter	Please refer ER sheet for month wise detail.
Monitoring equipment	Please refer section C.
Measuring/reading/recording frequency	The monitoring of the data is on continuous basis. The reading is jointly noted by the representatives of state utility and Wind World (India) Limited on monthly basis
Calculation method (if applicable)	NA
QA/QC procedures	Meters were calibrated annually. Please refer section C above.
Purpose of data/parameter	Baseline Emissions calculations
Additional comments	Not Applicable

Data/Parameter	$E_{Controller,Export,i}$
Unit	MWh (Mega-Watt hour)

Description	<p>Gross Electricity export (at WEC point at the site) by a WEC (project or non project), as measured at the LCS meter. Each WEC has exclusive LCS meter that records gross electricity export from the WEC (project or non project). This represents gross electricity export by individual WEC (at WEC point at the site)</p> <p>where i is any WEC between 1 to j+k</p> <p>j is any WEC between 1 to 75 of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.</p> <p>k is any WEC between 76 to 290 of the non project connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.</p>
Measured/calculated/default	Measured: The value is monitored continuously by the online monitoring station. This value can also be checked from the electronic panel installed inside the WEC tower.
Source of data	This reading is monitored continuously by the online monitoring station (online monitoring station is located at the project site where all the data [historical and instantaneous] from the LCS meters of all WECs is retrieved) at the project site.
Value(s) of monitored parameter	Please refer ER sheet for the individual WEC panel generation
Monitoring equipment	<p>Meter Type: NZR</p> <p>Meter Serial No: Refer Annex 2</p> <p>The LCS meters are 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 WECs. 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 WEC will stop working and generate the error report.</p>
Measuring/reading/recording frequency	The value is monitored continuously by the online monitoring station. This value can also be checked from the electronic panel installed inside the WEC tower.
Calculation method (if applicable)	NA
QA/QC procedures	During the monitoring period there is no mismatch found in the electricity generated at the LCS meter & the inverting system. Therefore there is no data uncertainty.
Purpose of data/parameter	Baseline Emissions calculations
Additional comments	Not Applicable

Data/Parameter	$\sum E_{\text{Controller.Export } i}$
Unit	MWh (Mega-Watt hour)

Description	<p>Summation of gross electricity exported (at WEC point at the site) by all the WECs (project and non project) connected to the main meter at the substation, measured at the LCS meter of each WEC. This is summation of gross electricity exported by the WECs (at WEC point at the site) including WECs of the project and non project.</p> <p>where i is any WEC between 1 to j+k</p> <p>j is any WEC between 1 to 75 of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.</p> <p>k is any WEC between 76 to 290 of the non project connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.</p>
Measured/calculated/default	Measured: The value is monitored continuously by the online monitoring station. This value can also be checked from the electronic panel installed inside the WEC tower.
Source of data	This reading is monitored continuously by the online monitoring station (online monitoring station is located at the project site where all the data [historical and instantaneous] from the LCS meters of all WECs is retrieved) at the project site.
Value(s) of monitored parameter	170033.234 MWh
Monitoring equipment	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 WECs. 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 WEC will stop working and generate the error report.
Measuring/reading/recording frequency	The value is monitored continuously by the online monitoring station. This value can also be checked from the electronic panel
Calculation method (if applicable)	NA
QA/QC procedures	During the monitoring period there is no mismatch found in the electricity generated at the LCS meter & the inverting system. Therefore there is no data uncertainty.
Purpose of data/parameter	Baseline Emissions calculations
Additional comments	Not Applicable

Data/Parameter	E_{WECExport,j}
Unit	MWh (Mega-Watt hour)
Description	<p>Gross Electricity exported (at substation point) by an individual WEC (j of the project activity) to the grid that is connected to main meter & backup meter at Akal substation.</p> <p>Where j is any WEC between 1 to 75 of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.</p>
Measured/calculated/default	E_{WECExport,j} denotes the electricity exported by individual WEC of the project activity to the grid. The value is calculated based on the formula mentioned in Section C
Source of data	Calculated using formula mentioned in Section C
Value(s) of monitored parameter	Please refer ER sheet for the individual WEC export value.

Monitoring equipment	Calculated using the formulae better described under section C. Please refer equation 2 under section C of the MR.
Measuring/reading/recording frequency	Calculated using the formulae better described under section C.
Calculation method (if applicable)	Refer to Section C for details and description of the above variables.
QA/QC procedures	Value is calculated.
Purpose of data/parameter	Baseline Emissions calculations
Additional comments	Not Applicable

Data/Parameter	$E_{WEC,Import,j}$
Unit	MWh (Mega-Watt hour)
Description	Gross Electricity imported (at substation point) by an individual WEC of the project activity to the grid that is connected to main meter & backup meter at Akal substation. Where j is any WEC between 1 to 75 of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.
Measured/calculated/default	$E_{WEC,Import,j}$ denotes the gross electricity imported by individual WEC of the project activity from the grid. The value is calculated based on the formula mentioned in section C.
Source of data	Calculated using formula mentioned in Section C.
Value(s) of monitored parameter	Please refer ER sheet for the individual WEC import value.
Monitoring equipment	Calculated using the formulae better described under section C. Please refer equation 4 under section C of the MR.
Measuring/reading/recording frequency	Calculated using the formulae better described under section C.
Calculation method (if applicable)	Refer to Section C for details and description of the above variables.
QA/QC procedures	Value is calculated.
Purpose of data/parameter	Baseline Emissions calculations
Additional comments	Not Applicable

Data/Parameter	$\sum_{Project} E_{WEC,Export,j}$
Unit	MWh (Mega-Watt hour)
Description	Summation of gross electricity exported (at substation point) by all the WECs of the project activity. Where j is any WEC between 1 to 75 of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.
Measured/calculated/default	$\sum_{Project} E_{WEC,Export,j}$ denotes summation of the gross electricity exported (at substation point) to the grid by a WECs included in the project activity. The value is calculated based on the formula mentioned in section C.
Source of data	Summation of data values of $E_{WEC,Export,j}$ for all the WECs included in the project activity.
Value(s) of monitored parameter	162533.165 MWh

Monitoring equipment	Calculated using the formulae better described under section C.
Measuring/reading/recording frequency	Calculated using the formulae better described under section C.
Calculation method (if applicable)	$\sum_{\text{Project}} E_{\text{WEC,Export},j}$ denotes summation of the gross electricity exported (at substation point) to the grid by a WECs included in the project activity. Refer to Section C for details and description.
QA/QC procedures	The value is calculated and can be cross checked from the invoices raised on the state utility.
Purpose of data/parameter	Baseline Emissions calculations
Additional comments	Not Applicable

Data/Parameter	$\sum_{\text{Project}} E_{\text{WEC,Import},j}$
Unit	MWh (Mega-Watt hour)
Description	Summation of electricity imported (at substation point) by all the WECs of the project activity. Where, j is any value between 1 to 75 representing WECs of the project activity connected to main meter & backup meter at Akal substation and secondary backup meter at Bhu substation.
Measured/calculated/default	$\sum_{\text{Project}} E_{\text{WEC,Import},j}$ denotes summation of the gross electricity imported (at substation point) to the grid by a WECs included in the project activity. The value is calculated based on the formula mentioned in section C.
Source of data	Summation of data values of $E_{\text{WEC,Import},j}$ for all the WECs included in the project activity.
Value(s) of monitored parameter	280.093 MWh
Monitoring equipment	Calculated using the formulae better described under section C.
Measuring/reading/recording frequency	Calculated using the formulae better described under section C.
Calculation method (if applicable)	$\sum_{\text{Project}} E_{\text{WEC,Import},j}$ denotes summation of the gross electricity imported (at substation point) to the grid by a WECs included in the project activity. Refer to Section C for details and description.
QA/QC procedures	The value is calculated and can be cross checked from the invoices raised on the state utility.
Purpose of data/parameter	Baseline Emissions calculations
Additional comments	Not Applicable

D.3. Implementation of sampling plan

>>

No sampling plan is followed by PP.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

>>

The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO₂e/kWh) calculated in a transparent and conservative manner as the weighted average emissions (in kg CO₂e/kWh) as described in registered PDD.

$$BE_y = EG_y * EF_y$$

Where,

BE_y is baseline emissions in year y, tCO₂e

EG_y is the net electricity supplied to the grid in year y and is applied directly from the invoice certified by state utility. This value can also be cross checked from the invoice.

EF_y is the CO₂ emission factor of the grid (0.87387 tCO₂e/MWh fixed ex-ante).

Emission reduction calculation for the period 01/09/2017 to 14/03/2020:

$$\begin{aligned}\text{Baseline Emissions (BE}_y\text{)} &= 161114.80 \text{ (MWh)} * 0.87387 \text{ (tCO}_2\text{e /MWh)} \\ &= 141,788 \text{ tCO}_2\text{e}\end{aligned}$$

E.2. Calculation of project emissions or actual net removals

The project activity is a renewable energy project which generates electricity using wind power and hence does not result in project emissions.

E.3. Calculation of leakage emissions

No leakage is considered from the project activity as per approved methodology ACM0002.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)			
				Before 01/01/2013	From 01/01/2013 until 31/12/2020	From 01/01/2021	Total amount
Total	141,788	0	0	0	141,788	0	141,788

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO ₂ e)	Amount estimated ex ante for this monitoring period in the PDD (t CO ₂ e)
141,788	256,355

E.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the PDD”

As per CDM registered PDD, 101,047 tCO₂e is the amount of CERs generated annually. Therefore, following unitary method, the amount of estimated ex ante for this monitoring period is identified. The total number of days in this monitoring period is 926 = (101,047/365)* 926 = 256,355 tCO₂e

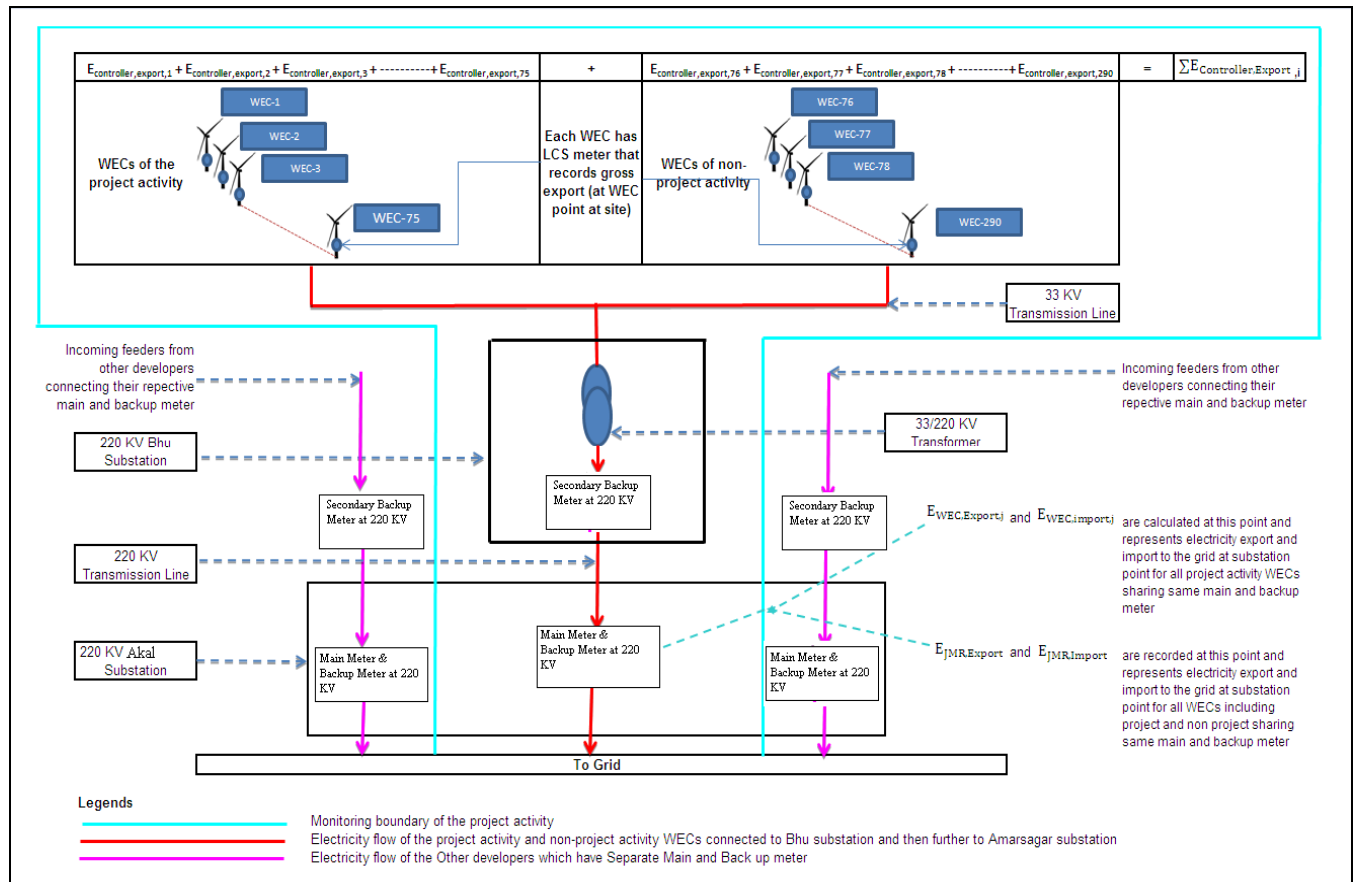
E.6. Remarks on increase in achieved emission reductions

There is decrease of 44.69% in the expected and actual emission reductions during the current monitoring period. The decrease in the total emission reduction achieved during the current monitoring period is due to the lower wind availability during this monitoring period that lead to the lower PLF as compared to the PLF considered in the registered PDD (22%).

E.7. Remarks on scale of small-scale project activity

Not Applicable

Annex 1: Line Diagram Showing Relevant Metering



Annex 2: Controller Meter Details

Equipment Name	Meter Number
EWHLPLD-01	475500
EWHLPLD-02	475330
EWHLPLD-03	475293
EWHLPLD-04	475488
EWHLPLD-05	475077
EWHLPLD-06	475557
EWHLPLD-07	1215614
EWHLPLD-08	475490
EWHLPLD-09	475512
EWHLPLD-10	475703
EWHLPLD-11	475725
EWHLPLD-12	475548
EWHLPLD-13	475483
EWHLPLD-14	475498
EWHLPLD-15	475075
EWHLPLD-16	475550
EWHLPLD-17	475292
EWHLPLD-18	475112
EWHLPLD-19	475356
EWHLPLD-20	475102
EWHLPLD-21	474937
EWHLPLD-22	475682
EWHLPLD-23	475735
EWHLPLD-24	475358
EWHLPLD-25	475024
EWHLPLD-26	474943
EWHLPLD-27	474951
EWHLPLD-28	466271
EWHLPLD-29	475099
EWHLPLD-30	475511
EWHLPLD-31	475086
EWHLPLD-32	475495
EWHLPLD-33	475496
EWHLPLD-34	475492
EWHLPLD-35	475479
EWHLPLD-36	475503
EWHLPLD-37	475738
EWHLPLD-38	475486
EWHLPLD-39	466298
EWHLPLD-40	466256
EWHLPLD-41	475513
EWHLPLD-42	475510
EWHLPLD-43	475113
EWHLPLD-44	475497
EWHLPLD-45	475518
EWHLPLD-46	475350
EWHLPLD-47	475485
EWHLPLD-48	475061
Equipment Name	Meter Number
EWHLPLD-49	475114
EWHLPLD-50	475059

EWHPDPD-51	475290
EWHPDPD-52	475329
EWHPDPD-53	475502
EWHPDPD-54	475076
EWHPDPD-55	475296
EWHPDPD-56	475332
EWHPDPD-57	475347
EWHPDPD-58	475326
EWHPDPD-59	475501
EWHPDPD-60	475593
EWHPDPD-61	475070
EWHPDPD-62	475651
EWHPDPD-63	475091
EWHPDPD-64	475621
EWHPDPD-65	475517
EWHPDPD-66	475100
EWHPDPD-67	475335
EWHPDPD-68	475064
EWHPDPD-69	475062
EWHPDPD-70	475087
EWHPDPD-71	475289
EWHPDPD-72	475321
EWHPDPD-73	475499
EWHPDPD-74	475352
EWHPDPD-75	475481

Annex 3: Other salient features of the state-of-art-technology

Wind World (India) Limited has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH and has established a manufacturing plant at Daman in India where, along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured. The other salient features of the state-of-art-technology are as follows:

- Gearless Construction - Rotor & Generator Mounted on same shaft eliminating the Gearbox.
- Variable speed function – has the speed range of 18 to 33 RPM thereby ensuring optimum efficiency at all times.
- Variable Pitch functions ensuring maximum energy capture.
- Near Unity Power Factor at all times.
- Minimum drawl (less than 1% of kWh generated) of Reactive Power from the grid.
- No voltage peaks at any time.
- Operating range of the WEC with voltage fluctuation of -20 to +20%.
- Less Wear & Tear since the system eliminates mechanical brake, which are not needed due to low speed generator, which runs at maximum speed of 33 rpm and uses Air Brakes.
- Three Independent Braking System.
- Generator achieving rated output at only 33 rpm.
- Incorporates lightning protection system, which includes blades.
- Starts Generation of power at wind speed of 3 m/s

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
09.0	8 October 2021	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 03.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN).
08.0	6 April 2021	Revision to: <ul style="list-style-type: none"> • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		