



Monitoring report form for CDM project activity
(Version 06.0)

MONITORING REPORT

Title of the project activity	Enercon Wind Farm (Hindustan) Ltd in Karnataka	
UNFCCC reference number of the project activity	1259	
Version number of the PDD applicable to this monitoring report	6	
Version number of this monitoring report	3	
Completion date of this monitoring report	04/10/2017	
Monitoring period number	08	
Duration of this monitoring period	01/06/2016 - 30/06/2017; including first and last days of monitoring period.	
Monitoring report number for this monitoring report	NA	
Project participants	M/s Wind World (India) Limited ¹ Numerco Limited Statkraft Markets GmbH ACT Commodities B.V. First Climate Markets A.G.	
Host Party	India	
Sectoral scopes	Sectoral Scope: 1: Energy industries (renewable - / non-renewable sources)	
Applied methodologies and standardized baselines	Applied Methodology: ACM0002, Version 06 Consolidated baseline methodology for grid-connected electricity generation from renewable sources	
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
	NA	105,751
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	161,093	

¹ With effect from 01/01/2013 name of Enercon (India) Limited has been changed to 'Wind World (India) Limited'

SECTION A. Description of project activity**A.1. General description of project activity**

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The project activity is installation of 68.8 MW wind power project ("Project") by Enercon Wind Farm (Hindustan) Ltd. in Karnataka state of India to provide reliable, renewable power to the Karnataka state electricity grid which is part of the Southern regional electricity grid. The Project will lead to reduced greenhouse gas emissions because it displaces electricity from grid connected fossil fuel based electricity generation plants.

The project activity consists of 86 WEGs of Enercon make E-48 and each machine capacity is of 800 kW (E-48) totaling to the capacity of 68.8 MW. The WEGs generates 3-phase power at 400V, which is stepped up to 33 kV and connected to 33kV metering points. From 33 kV metering point electricity transmitted to Wind World (India) Limited (hereafter referred as "WWIL") Sub-station. At sub-station electricity is step-up to 220 kV. From WWIL substation electricity is further evacuated to the state electricity grid at 220kV. 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 first machine under the project activity was commissioned on 29/09/2006 and last machine under the project activity was commissioned on 28/12/2006. The expected operational lifetime of the project is for 20 years.

The total emission reductions achieved under current monitoring period (01/06/2016 – 30/06/2017) is 105,751 tCO₂.

A.2. Location of project activity

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Project activity is located in Karnataka state of India. The turbines are uniquely identified as EWHPL-01 to EWHPL-86. The details of the physical location are as follows:

S.No.	District	Taluka	Village	No. of WEG's
1	Tumkur	Chikkanayakanahalli	Dasudi	20
		Chikkanayakanahalli	Nelenuru	5
		Chikkanayakanahalli	Ganadu	6
		Gubbi	Annenhalli	6
		Gubbi	Siddapura	9
2	Chitradurga	Hosadurga	Chikkabyaledaker e	16
		Hosadurga	Kanubehalli	11
		Hosadurga	Arasinagundi	8
		Hosadurga	Elladakere	5
			Total	86

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

S.No	WEG Unique Identification Number	Location No.	Latitude (N)			Longitude (E)		
			Degree	Minutes	Seconds	Degree	Minutes	Seconds
1	EWHPL 01	1	13	43	20.9	76	31	3.9
2	EWHPL 02	2	13	43	25.4	76	31	1.5
3	EWHPL 03	3	13	43	30.0	76	30	59.0
4	EWHPL 04	4	13	43	34.6	76	30	57.2
5	EWHPL 05	5	13	43	39.3	76	30	55.6
6	EWHPL 06	6	13	43	43.8	76	30	53.1
7	EWHPL 07	7	13	43	50.0	76	30	50.5

8	EWHPL 08	8	13	43	54.5	76	30	48.0
9	EWHPL 09	9	13	44	3.9	76	30	44.9
10	EWHPL 10	10	13	45	33.0	76	31	5.9
11	EWHPL 11	11	13	45	28.2	76	31	6.4
12	EWHPL 12	12	13	45	23.4	76	31	7.0
13	EWHPL 13	13	13	45	18.9	76	31	7.7
14	EWHPL 14	14	13	45	14.3	76	31	8.3
15	EWHPL 15	15	13	45	10.2	76	31	9.5
16	EWHPL 16	16	13	44	54.0	76	31	12.3
17	EWHPL 17	17	13	44	49.2	76	31	13.1
18	EWHPL 18	18	13	44	44.5	76	31	14.7
19	EWHPL 19	19	13	44	39.8	76	31	16.7
20	EWHPL 20	20	13	44	35.4	76	31	19.9
21	EWHPL 21	21	13	44	30.5	76	31	19.8
22	EWHPL 22	22	13	44	25.6	76	31	20.2
23	EWHPL 23	23	13	44	21.7	76	31	26.4
24	EWHPL 24	24	13	44	16.9	76	31	27.7
25	EWHPL 25	25	13	44	12.0	76	31	28.2
26	EWHPL26	26	13	44	8.0	76	31	29.8
27	EWHPL 27	27	13	43	57.6	76	31	53.8
28	EWHPL 28	28	13	43	54.1	76	31	55.1
29	EWHPL 29	29	13	43	49.5	76	31	57.1
30	EWHPL 30	30	13	43	44.8	76	31	58.6
31	EWHPL 31	31	13	43	40.0	76	31	59.5
32	EWHPL 32	32	13	43	35.4	76	32	1.9
33	EWHPL 33	33	13	43	30.6	76	32	4.8
34	EWHPL 34	34	13	43	0.6	76	32	22.1
35	EWHPL 35	35	13	42	54.7	76	32	19.9
36	EWHPL 36	36	13	42	50.3	76	32	23.0
37	EWHPL 37	37	13	42	45.6	76	32	24.7
38	EWHPL 38	38	13	42	40.9	76	32	26.3
39	EWHPL 39	39	13	42	36.3	76	32	28.5
40	EWHPL 40	40	13	42	31.1	76	32	31.4
41	EWHPL 41	41	13	40	57.2	76	35	58.1
42	EWHPL 42	42	13	40	52.4	76	35	59.4
43	EWHPL 43	43	13	40	47.7	76	36	0.9
44	EWHPL 44	44	13	40	43.1	76	36	2.6
45	EWHPL 45	45	13	40	38.4	76	36	4.2
46	EWHPL 46	46	13	40	33.7	76	36	5.8
47	EWHPL 47	47	13	40	13.7	76	36	10.7
48	EWHPL 48	48	13	40	9.1	76	36	12.6
49	EWHPL 49	49	13	40	4.7	76	36	15.7
50	EWHPL 50	50	13	39	2.8	76	36	34.8
51	EWHPL 51	51	13	38	58.7	76	36	36.8
52	EWHPL 52	52	13	38	54.1	76	36	38.9
53	EWHPL 53	53	13	38	49.5	76	36	41.3
54	EWHPL 54	54	13	38	44.9	76	36	43.1
55	EWHPL 55	55	13	38	40.2	76	36	44.9
56	EWHPL 56	56	13	38	35.6	76	36	46.9
57	EWHPL 57	57	13	38	30.9	76	36	48.7
58	EWHPL 58	58	13	38	26.4	76	36	50.9
59	EWHPL 59	59	13	38	22.3	76	36	56.3
60	EWHPL 60	60	13	38	17.8	76	36	58.8
61	EWHPL 61	61	13	38	11.8	76	37	2.5

62	EWHP 62	62	13	38	7.2	76	37	4.6
63	EWHP 63	63	13	38	2.6	76	37	6.8
64	EWHP 64	64	13	37	58.0	76	37	9.2
65	EWHP 65	65	13	37	53.5	76	37	11.5
66	EWHP 66	66	13	37	48.9	76	37	13.7
67	EWHP 67	67	13	37	44.3	76	37	16.0
68	EWHP 68	68	13	37	39.8	76	37	18.4
69	EWHP 69	69	13	37	35.1	76	37	20.3
70	EWHP 70	70	13	37	30.5	76	37	22.3
71	EWHP 71	71	13	37	25.9	76	37	24.7
72	EWHP 72	72	13	32	25.1	76	43	45.2
73	EWHP 73	73	13	32	30.0	76	43	44.4
74	EWHP 74	74	13	32	34.8	76	43	44.7
75	EWHP 75	75	13	32	39.7	76	43	44.5
76	EWHP 76	76	13	32	44.6	76	43	43.9
77	EWHP 77	77	13	32	49.5	76	43	42.5
78	EWHP 78	78	13	32	54.4	76	43	42.1
79	EWHP 79	79	13	33	6.1	76	43	33.2
80	EWHP 80	80	13	33	11.0	76	43	34.1
81	EWHP 81	81	13	33	15.9	76	43	34.6
82	EWHP 82	82	13	33	20.8	76	43	34.5
83	EWHP 83	83	13	34	19.9	76	44	0.8
84	EWHP 84	84	13	34	27.5	76	44	2.3
85	EWHP 85	85	13	34	50.5	76	44	14.8
86	EWHP 86	86	13	34	54.9	76	44	14.8

A.3. Parties and project participants

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

A.4. Reference to applied methodologies and standardized baselines

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Title: Consolidated methodology for grid-connected electricity generation from renewable sources

Reference: Approved consolidated methodology ACM0002 (Version 06, EB 24, Annex 7)

UNFCCC web reference of methodology: http://cdm.unfccc.int/EB/024/eb24_repan07.pdf ; (Refer page no. 1 & 14 for title of baseline & monitoring methodology)

Baseline Methodology: Consolidated baseline methodology for grid-connected electricity generation from renewable sources

Monitoring Methodology: Consolidated baseline methodology for grid-connected electricity generation from renewable sources

Tool: Tool for the demonstration and assessment of additionality, version 3.0 (weblink: <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v3.pdf>)

A.5. Crediting period type and duration

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Type of crediting period : Fixed

Start date of crediting period : 27/10/2008

Length of crediting period : 10 years

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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The project activity consists of 86 machines (800 kW) of Enercon make E-48. The first machine under the project activity was commissioned on 29/09/2006 and last machine under the project activity was commissioned on 28/12/2006. Project activity WEGs were commissioned in three phases between 29/09/2006 & 28/12/2006. 56 WEGs under phase-I were commissioned on 29 Sep 2006, 9 WEGs under phase-II were commissioned on 26/10/2006 & 21 WEGs under phase-III were commissioned on 28/12/2006. The commissioning dates for all the machines included in the project activity are given in the table below.

Loc. no.	Unique Identification Number	Date of Commissioning
1	EWHPHPL 01	26/10/2006
2	EWHPHPL 02	26/10/2006
3	EWHPHPL 03	26/10/2006
4	EWHPHPL 04	28/12/2006
5	EWHPHPL 05	28/12/2006
6	EWHPHPL 06	28/12/2006
7	EWHPHPL 07	28/12/2006
8	EWHPHPL 08	28/12/2006
9	EWHPHPL 09	28/12/2006
10	EWHPHPL 10	29/09/2006
11	EWHPHPL 11	29/09/2006
12	EWHPHPL 12	29/09/2006
13	EWHPHPL 13	29/09/2006
14	EWHPHPL 14	29/09/2006
15	EWHPHPL 15	29/09/2006
16	EWHPHPL 16	29/09/2006
17	EWHPHPL 17	29/09/2006
18	EWHPHPL 18	29/09/2006
19	EWHPHPL 19	29/09/2006
20	EWHPHPL 20	29/09/2006
21	EWHPHPL 21	29/09/2006
22	EWHPHPL 22	29/09/2006
23	EWHPHPL 23	29/09/2006
24	EWHPHPL 24	29/09/2006
25	EWHPHPL 25	29/09/2006
26	EWHPHPL26	26/10/2006

27	EWHPL 27	29/09/2006
28	EWHPL 28	29/09/2006
29	EWHPL 29	29/09/2006
30	EWHPL 30	29/09/2006
31	EWHPL 31	29/09/2006
32	EWHPL 32	29/09/2006
33	EWHPL 33	29/09/2006
34	EWHPL 34	29/09/2006
35	EWHPL 35	29/09/2006
36	EWHPL 36	29/09/2006
37	EWHPL 37	29/09/2006
38	EWHPL 38	29/09/2006
39	EWHPL 39	29/09/2006
40	EWHPL 40	29/09/2006
41	EWHPL 41	29/09/2006
42	EWHPL 42	29/09/2006
43	EWHPL 43	29/09/2006
44	EWHPL 44	29/09/2006
45	EWHPL 45	29/09/2006
46	EWHPL 46	29/09/2006
47	EWHPL 47	29/09/2006
48	EWHPL 48	29/09/2006
49	EWHPL 49	29/09/2006
50	EWHPL 50	26/10/2006
51	EWHPL 51	26/10/2006
52	EWHPL 52	29/09/2006
53	EWHPL 53	29/09/2006
54	EWHPL 54	29/09/2006
55	EWHPL 55	29/09/2006
56	EWHPL 56	29/09/2006
57	EWHPL 57	29/09/2006
58	EWHPL 58	29/09/2006
59	EWHPL 59	26/10/2006
60	EWHPL 60	26/10/2006
61	EWHPL 61	26/10/2006
62	EWHPL 62	29/09/2006
63	EWHPL 63	29/09/2006
64	EWHPL 64	29/09/2006
65	EWHPL 65	29/09/2006
66	EWHPL 66	29/09/2006
67	EWHPL 67	29/09/2006
68	EWHPL 68	29/09/2006
69	EWHPL 69	29/09/2006
70	EWHPL 70	29/09/2006
71	EWHPL 71	29/09/2006
72	EWHPL 72	28/12/2006
73	EWHPL 73	28/12/2006
74	EWHPL 74	28/12/2006
75	EWHPL 75	28/12/2006
76	EWHPL 76	28/12/2006
77	EWHPL 77	28/12/2006
78	EWHPL 78	28/12/2006
79	EWHPL 79	28/12/2006
80	EWHPL 80	28/12/2006

81	EWHPPL 81	28/12/2006
82	EWHPPL 82	28/12/2006
83	EWHPPL 83	28/12/2006
84	EWHPPL 84	28/12/2006
85	EWHPPL 85	28/12/2006
86	EWHPPL 86	28/12/2006

WWIL 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 machines that are included in the project activity. As a part of regular maintenance the machines are stopped for mechanical and electrical maintenance for 16 to 18 hours annually and for visual inspection for 6 to 7 hours quarterly.. During the monitoring period there were no events or situations occurred, which may impact the applicability of the methodology.

The project activity consists of 86 WEGs of Enercon make E-48 and each machine capacity is of 800 kW (E-48) totalling to the capacity of 68.8 MW. The WEGs generates 3-phase power at 400V, which is stepped up to 33 kV and connected to 33kV metering points. From 33 kV metering points electricity transmitted to WWIL Sub-station. At sub-station electricity is step-up to 220 kV. From WWIL substation electricity is further evacuated to the state electricity grid at 220kV. 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:-

- 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 drawal (less than 1% of kWh generated) of Reactive Power from the grid.
- No voltage peaks at any time.
- Operating range of the WEG 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

WWIL has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH, has established a manufacturing plant at Daman in India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured. Diagram of main component of Enercon make E-48 is shown in below picture:-

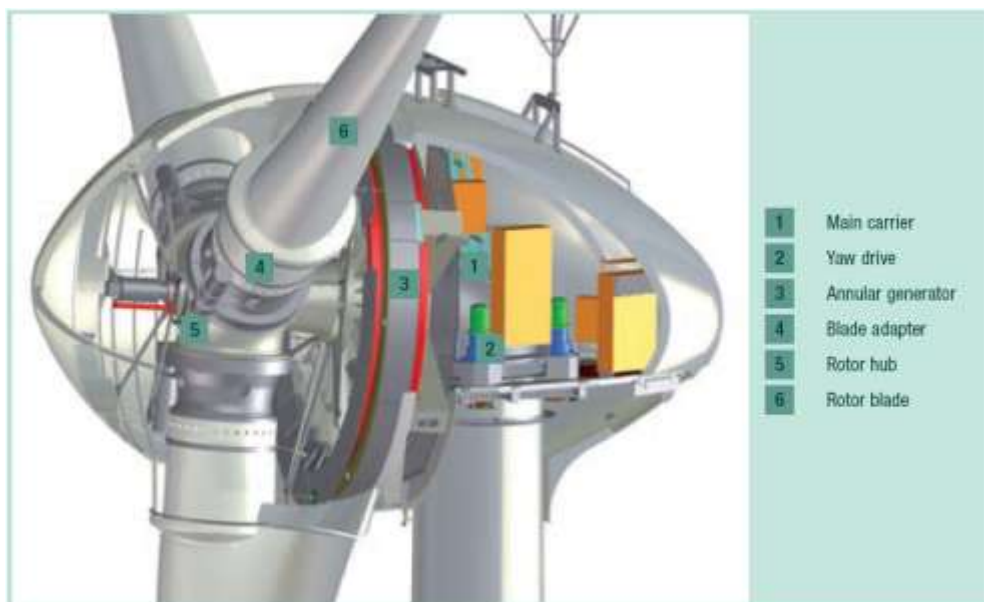


Figure: Enercon make E-48 Diagram.

B.2. Post-registration changes

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

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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 applied standards or tools

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Not applicable

B.2.6. Changes to project design

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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 methodology for grid-connected electricity generation from renewable sources" --- Version 6, by CDM - Meth Panel is proposed to be 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 combined margin emission factor has been fixed ex-ante in the PDD during validation, hence the monitoring of operating margin emission factor and build margin emission factor is not required. Value of operating margin, build margin & combine margin has been fixed throughout the crediting period. Further, wind based electricity generation is not associated with any kind of leakages. Hence, the sole parameter for monitoring is the electricity generated by the project activity and supplied to the state utility which is part of southern grid.

There are two main and check meters dedicated to project activity at 33 kV metering point for the project activity. The one set of main and check meter is connected to 56.8 MW and other set of the main and check meter is connected to 12 MW of the project activity. In addition to this there is one set of main and check meter (bulk meter) at 220 kV metering point at the WWIL substation is connected to the machines of the project activity and the machines commissioned by the other project developers. Therefore in order to determine the net electricity supplied to the grid by the project at 220 kV at the WWIL substation, the state utility applies the transmission loss to the meter reading recorded at the 33 kV metering point.

For the current monitoring period; at 220kV sub-station only the WEGs of project activity are connected and there is no WEGs of other customers while at the time of validation WEGs of other project activity were also connected to same 220kV sub-station that's why the generic procedure of apportion is mentioned below. Further it may be noted in future WEGs of other project activity might be connected to 220kV same sub-station depending on the requirements. Monitoring system and apportioning procedure mentioned below is given to provide the generic scenario and method of calculation to arrive the net electricity export of individual customers in case there is other project WEGs are also connected to same 220kV sub-station. This procedure of apportioning is applied by state utility only.

The transmission loss calculated by the state utility is endorsed / confirmed jointly by the representatives of WWIL and the state utility. The transmission loss applied to the project activity by the state utility is reflected in the joint meter readings (Form B) recorded at 33kV metering point. Net electricity supplied to the grid is calculated by applying transmission loss to the meter readings taken at 33 kV metering location of the project activity.

The procedure for calculation of transmission loss as given in the PPA is set-out below:-

$$Z = \frac{(X1 + X2+ X3+ X4+....+ Xn) - Y}{(X1 + X2+ X3+ X4+....+ Xn)} \times 100$$

Where,

Z = Percentage transmission loss for export incurred in transmission line between the meters located at 33 kV metering point (including the machines of the project activity and other project developers) and the meters located at 220kV metering point (bulk meter: main and check) at high voltage side of receiving sub-station. **Refer Annex 3 for schematic of the flow diagram.**

Summation of meter readings at 33 kV metering points for all the project developers connected to receiving substation (including the machines of the project activity and other project developers)

$$= (X1 + X2+ X3+ X4+....+ Xn)$$

X_i = Energy Export Reading (X_i) noted at energy meter installed at 33kV metering point where i vary from 1 to n which represents the meters connected to project activity and other project developers. $X_1, X_2, X_3, \dots, X_n$ are the meters that are installed at 33kV metering point (including the machines of the project activity and other project developers) and further connected to the receiving substation at 220 kV by internally connected lines. **Refer Annex 3 for schematic of the flow diagram.**

Y = Energy Export Reading at bulk meter installed at high voltage side of transformer of the receiving sub-station at 220 kV connecting machines of the project activity and other project developers. **Refer Annex 3 for schematic of the flow diagram.**

Energy Export by the project activity at 33 kV metering point is as follows:

$$EG_{\text{export}} = X_1 + X_2$$

Where, X_1 & X_2 is the export reading recording at 33kV metering points for project activity.

$$\text{Transmission Loss in Export (T}_E\text{)} = \text{Transmission Loss (Z)} * \text{Energy Export at 33kV metering point (EG}_{\text{Export}}\text{)}$$

Empirical Formula for Energy Export after adjustment of transmission loss (Equation 1)

$$\text{Net Energy Export after adjustment of transmission loss} = EG_{\text{export}} - \text{Transmission Loss (T}_E\text{)}$$

The transmission loss in export is generally less than 5%. However in case of Energy Import, the state utility conservatively applies adjustment of 15% to the import values noted at 33 kV metering point.

$$\text{Transmission Loss in Import (T}_I\text{)} = 15\% * \text{Energy Import at 33kV metering point (EG}_{\text{import}}\text{)}$$

Empirical Formula for Energy Import after adjustment of transmission loss (Equation 2)

$$\begin{aligned} \text{Net Energy Import after adjustment of transmission loss} &= EG_{\text{import}} + 15\% * EG_{\text{import}} \\ &= 115\% * EG_{\text{import}} \end{aligned}$$

Therefore Energy Supplied to Grid after adjustment of transmission loss is difference of equation 1 and 2 as given in the joint meter readings (Form B) signed jointly by WWIL and the state utility.

$$EG_y = EG_{\text{export}} - 115\% * EG_{\text{import}} - \text{Transmission Loss (T}_E\text{)}$$

The Joint meter reading noted at 33 kV metering location contains the following data:-

1. Electricity Export (EG_{export})
2. Electricity Import (EG_{import})
3. Transmission Loss (T_E) between 33 kV metering point and 220 kV metering point at WWIL substation
4. Net Electricity supplied to the Grid [$EG_{\text{export}} - 115\% * EG_{\text{import}} - T_E$]

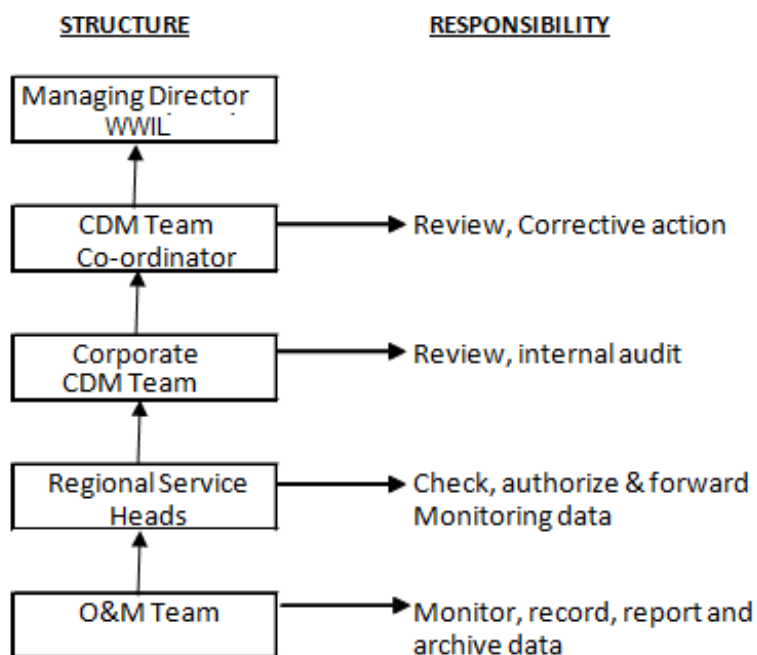
Joint meter reading (Form B) is signed by the representatives of WWIL and the state utility. The meter readings (both export and import), transmission loss and net electricity supplied to the grid are recorded in the joint meter readings (Form B) (33 kV metering point). Hence all these values will be reproduced from the joint meter readings (Form B) for calculation of emission reductions.

In addition to the joint meter readings (Form B) at 33kV metering location for the project activity, the following documents have been provided to the DoE for verification:

1. Joint Meter Readings (Form B) at 220kV metering point (bulk meters: main and check) at WWIL substation
2. Transmission loss calculation endorsed / confirmed jointly by the representatives of WWIL and the state utility.

The net electricity supplied to the grid can be cross checked from the invoices raised on the state utility for supply of net electricity supplied to the grid. Refer Annex – 2 for an illustration of the provisions for measurement methods.

The Project is operated and managed by WWIL. The operational and management structure implemented by WWIL is as follows:



Training imparted to the Personnel

Wind World (India) Limited has been instrumental in imparting training to the persons it recruits to serve in the organisation. Wind World (India) Limited has a separate training facility, called Wind World (India) Limited Training Academy, which gives training to the persons who are to be deployed On-Site to take care of all the activities starting from project construction to operation to maintenance. The training facility is located at Daman and is fully functional and equipped with qualified trainers, training equipment, classrooms and hostel facilities. The training academy has a fixed schedule which is applicable to all those who reside in the training academy. The training schedule and the training period depend upon the role the trainee has to perform. The trainers are well equipped to judge the capabilities of the trainees. All trainees, who are to be associated to the technical side of project are given six to twelve months' rigorous training on all the aspects of wind turbine installation and maintenance depending upon the requirements. Wind World (India) Limited conducts periodical test to rate the trainees and thus they are deployed as per the outcomes of their performance during the training period.

Meter Test Checking Details:

The metering equipment were inspected & tested by State Utility. Meter details for the all the main and check meters are as follows:-

Parameter	Type of meter	Meter description	Meter Serial No.	Make	Accuracy class	Meter Type
KBCWP-01 (68.8 MW)	220 kV Bulk meter	Main Meter	13191156	L&T	0.2	All the meters are two-way Tri-vector meters capable of recording import and export of electricity.
		Check Meter	14194655	L&T	0.2	
KBCWP-02 (56.8 MW)	33 kV billing meter	Main Meter	538967	L&T	0.2	
		Check Meter	5389970	L&T	0.2	
KBCWP-03 (12 MW)	33 kV billing meter	Main Meter	5463844	L&T	0.2	
		Check Meter	5463845	L&T	0.2	

Details of meter test checking during monitoring period are as follows:-

Parameter	Meter description	Meter Serial No.	Meter Test Checking Frequency	Calibration	
				2016	2017
KBCWP-01(68.8 MW)	Main Meter	13191156	Annual	22/02/2016	13/07/2017
	Check Meter	14194655		09/06/2016	
KBCWP-02(56.8 MW)	Main Meter	5389967		24/05/2016	24/05/2017
	Check Meter	5389970			
KBCWP-03(12 MW)	Main Meter	5463844		24/05/2016	24/05/2017
	Check Meter	5463845			

The main and check meters are tested for accuracy on annual basis by state utility and in case of error beyond permissible limit; meters are calibrated by state utility. Further, during the annual meter testing, all the meters were under the permissible limit of error.

As per Guideline for assessing compliance with the calibration frequency requirement, (CDM Standard : CDM validation and verification standard for project activities VVS Version 01.0 para 369 (a)) states that: "Applying the maximum permissible error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error"

In Current Monitoring Period for the meters installed, calibration was due on 09/06/2017 but the same was done on 13/07/2017. Hence, the calibration of the meters was delayed for the period from 09/06/2017 to 13/07/2017; however, the billing cycle is from 01st of every month to last day of the month, hence the correction factor is applied for month June 2017(current monitoring period ends on 30/06/2017), for transmission losses, because the export reading recorded by the mentioned meter is used to calculate the transmission loss only.

The line diagram showing all relevant monitoring points for the project activity has been given in Annex 3.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

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

Source of data	"CO ₂ Baseline Database for Indian Power Sector", version 1.1, 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/reports/others/thermal/tpece/cdm_co2/user_guide_ver1.pdf
Value(s) applied	0.93204
Choice of data or measurement methods and procedures	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System.
Purpose of data/parameter	Calculation of Baseline Emissions
Additional comments	None

Data/Parameter	$EF_{OM,y}$								
Unit	tCO ₂ e/MWh								
Description	Operating Margin Emission Factor of Southern Regional Electricity Grid								
Source of data	"CO ₂ Baseline Database for Indian Power Sector", version 1.1, 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/reports/others/thermal/tpece/cdm_co2/user_guide_ver1.pdf								
Value(s) applied	<table border="1"> <tr> <td>2002 – 03</td><td>0.99702</td></tr> <tr> <td>2003 – 04</td><td>1.00937</td></tr> <tr> <td>2004 – 05</td><td>1.00376</td></tr> <tr> <td>Average</td><td>1.00338</td></tr> </table>	2002 – 03	0.99702	2003 – 04	1.00937	2004 – 05	1.00376	Average	1.00338
2002 – 03	0.99702								
2003 – 04	1.00937								
2004 – 05	1.00376								
Average	1.00338								
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	Calculation of Baseline Emissions								
Additional comments	None								

Data/Parameter	$EF_{BM,y}$		
Unit	tCO ₂ e/MWh		
Description	Build Margin Emission Factor of Southern Regional Electricity Grid		
Source of data	"CO ₂ Baseline Database for Indian Power Sector", version 1.1, 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/reports/others/thermal/tpece/cdm_co2/user_guide_ver1.pdf		
Value(s) applied	<table border="1"> <tr> <td>2004 – 05</td><td>0.71799</td></tr> </table>	2004 – 05	0.71799
2004 – 05	0.71799		
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	Calculation of Baseline Emissions		
Additional comments	None		

Please refer Annex 1 for combined margin calculation.

D.2. Data and parameters monitored

Data/Parameter	EG_y
Unit	MWh (Mega-Watt hour)
Description	Net electricity supplied to the grid by the Project

Measured/calculated/default	Calculated
Source of data	Electricity supplied to the grid as per two joint meter readings (Form B) taken at 33 kV metering point.
Value(s) of monitored parameter	Net electricity supplied to the grid by the Project 113463.391 MWh
Monitoring equipment	Since it is calculated value, hence not applicable.
Measuring/reading/recording frequency	Frequency of recording data: Monthly Refer section C and Annex – 2 for details.
Calculation method (if applicable)	The procedures for calculation of net electricity supplied to grid has been followed as per the provisions of the power purchase agreement and details of calculation method has been explained in monitoring plan under section C of monitoring report.
QA/QC procedures	QA/QC procedures were implemented by state utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. The values of net electricity supplied to the grid mentioned in the two joint meter readings (Form B) of the project for 56.8 MW and 12 MW at 33kV metering point can be cross checked with values mentioned in the invoice raised on the state utility. Further no inconsistency was found between the values as mentioned in Form B & invoices raised on state utility during the current monitoring period. All main & check meters connected at metering points with RR. No. KBCWP 01 (220kV metering point), KBCWP 02 (33kV metering point) & KBCWP03 (33kV metering point) (please refer project layout Annex 3) were tested for accuracy on annual basis by state utility and in case of error beyond permissible limit; meters are calibrated by either of KPTCL or BESCO. Further during the annual meter testing, all the meters were found under the permissible limit of error and accordingly none of the meter was calibrated during the current monitoring period. Refer Annex – 2 for an illustration of the provisions for QA/QC procedures. Refer Annex 3 for location of metering points at 33kV and 220 kV.
Purpose of data/parameter	Calculation of Baseline Emissions
Additional comments	The data has been archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

Data/Parameter	EG_{export}
Unit	MWh (Mega-Watt hour)
Description	Summation of electricity Export recorded at meters (two main and two check) connecting 86 machines of the project activity and can be sourced from two joint meter readings (Form B) issued by BESCO for 56.8 MW and 12 MW at 33 kV metering point
Measured/calculated/default	Measured
Source of data	Electricity export to the grid as per two joint meter readings (Form B) taken at 33 kV metering point.
Value(s) of monitored parameter	114364.500 MWh

Monitoring equipment	Please refer section 'C' (Description of monitoring system) for the details of meter type, accuracy class, serial number, meter test checking frequency, date of last meter test checking and validity under the heading 'Meter Test Checking Details'
Measuring/reading/recording frequency	Frequency of recording data: Monthly. Further all the meters have the capability of continuous measurement of data. Refer section C and Annex – 2 for an illustration of the provisions for measurement methods.
Calculation method (if applicable)	-
QA/QC procedures	QA/QC procedures were implemented by state utility and the PP except or otherwise explicitly stated in the PDD. Refer Annex – 2 for an illustration of the provisions for QA/QC procedures.
Purpose of data/parameter	Calculation of Baseline Emissions (EG_{export} is used to calculate Net electricity supplied to the grid by the Project which is used to calculate baseline emissions)
Additional comments	The data has been archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

Data/Parameter	EG_{import}
Unit	MWh (Mega-Watt hour)
Description	Summation of electricity Import recorded at the meters (two main and two check) connecting 86 machines of the project activity and can be sourced from two joint meter readings (Form B) issued by BESCO for 56.8 MW and 12 MW at 33 kV metering point.
Measured/calculated/default	Measured
Source of data	Electricity import from the grid as per two joint meter reading (Form B) taken at 33kV metering point.
Value(s) of monitored parameter	40.365 MWh
Monitoring equipment	Please refer section 'C' (Description of monitoring system) for the details of meter type, accuracy class, serial number, meter test checking frequency, date of last meter test checking and validity under the heading 'Meter Test Checking Details'
Measuring/reading/recording frequency	Frequency of recording data: Monthly Further all the meters have the capability of continuous measurement of data. Refer section C and Annex – 2 for an illustration of the provisions for measurement methods.
Calculation method (if applicable)	-
QA/QC procedures	QA/QC procedures were implemented by state utility and the PP except or otherwise explicitly stated in the PDD. Refer Annex – 2 for an illustration of the provisions for QA/QC procedures.
Purpose of data/parameter	Calculation of Baseline Emissions (EG_{import} is used to calculate Net electricity supplied to the grid by the Project which is used to calculate baseline emissions)
Additional comments	The data has been archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

Data/Parameter	T_E
Unit	MWh (Mega-Watt hour)
Description	Transmission loss for export between the metering location at 33 kV point and the metering location at 220 kV at the WWIL substation.
Measured/calculated/default	Calculated
Source of data	Transmission Loss for export has been sourced from the joint meter reading (Form B) taken at 33kV metering point for the project activity
Value(s) of monitored parameter	860.74 MWh
Monitoring equipment	Since it is calculated value, hence not applicable.
Measuring/reading/recording frequency	Frequency of recording data: Monthly Refer section C and Annex – 2 for details.
Calculation method (if applicable)	Transmission loss calculation has been done exclusively by officials of electricity board (EB) and PP has no role in calculation of transmission loss. Transmission loss value has been sourced directly from certified joint meter reading (Form B) recorded at 33kV metering point. Please refer section C of monitoring report for calculation method of transmission loss applied by EB officials as per the provision of PPA.
QA/QC procedures	QA/QC procedures were implemented by state utility and the PP except or otherwise explicitly stated in the PDD. Refer Annex – 2 for an illustration of the provisions for QA/QC procedures.
Purpose of data/parameter	Calculation of Baseline Emissions (T_E is used to calculate Net electricity supplied to the grid by the Project which is used to calculate baseline emissions)
Additional comments	The data has been archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

D.3. Implementation of sampling plan

>>

Not Applicable

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 revised 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 joint meter readings (Form B) certified by state utility. This value can also be cross checked from monthly invoice.

EF_y is the CO₂ emission factor of the grid (0.93204 tCO₂e/MWh fixed ex-ante).

Baseline Emission Reductions calculation for project activity:-

Duration	Net electricity supplied to the grid by the Project 68.8 [MWh] *	Baseline Emission Factor (tCO ₂ e/MWh)	Baseline Emissions (tCO ₂ e)
	[EGy]	[EFy]	[BEy]
01/06/2016 to 31/12/2016	73759.16	0.93204	68746
01/01/2017 to 30/06/2017	39704.23	0.93204	37005
Total	113463.391		1,05,751

* Summation of Net Export to grid as per joint meter readings (Form B) recorded at meters KBCWP 02 & KBCWP 03.

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

>>

Since 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, Version 06.

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	Total amount
01/06/2016 to 31/12/2016	68746	0	0	NA	68746	68746
01/01/2017 to 30/06/2017	37005	0	0	NA	37005	37005
Total	1,05,751	0	0	NA	1,05,751	1,05,751

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 (t CO ₂ e)
105,751	161,093

E.6. Remarks on increase in achieved emission reductions

>>

The CERs for the current monitoring period is 34.35% lower than the estimated volume in the PDD. This is primarily due to seasonal nature of wind power projects. During the monitoring period CERs are low due to considerably low monsoon availability and low wind availability leading to low PLF.

Annex 1**BASELINE INFORMATION**

The Operating Margin data for the most recent three years and the Build Margin data for the Southern Region Electricity Grid as published in the CEA database version 1.1² are as follows:

Simple Operating Margin

	tCO₂e/GWh
Simple Operating Margin - 2002-03	997.02
Simple Operating Margin - 2003-04	1,009.37
Simple Operating Margin - 2004-05	1,003.76
Average Operating Margin of last three years	1,003.38

Build Margin

	tCO₂e/GWh
Build Margin- 2004-05	717.99

Combined Margin calculations

	Weights	tCO₂e/GWh
Operating Margin	0.75	1003.38
Build Margin	0.25	717.99
Combined Margin		932.04

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver1.pdf

² www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver1.pdf

Annex 2

MONITORING INFORMATION

- **Metering:** Net electricity supplied to the grid is metered jointly by state utility and WWIL through two sets of main and check meters at 33 kV metering point connecting exclusively the machines of project activity after adjusting for transmission loss.

In addition to this there is one set of main and check meter (Bulk meter) at 220 KV metering point at WWIL substation covering machines of the project activity and machines of other project developers. The schematic diagram indicating location of meters at 33 kV and 220 kV metering points for the project activity is attached as Annex 3.

- **Metering Equipment:** Metering system for the project activity consists of two sets of main and checks meters at 33kV metering point and one set of main and check meters at 220 kV metering point. All the meters are **two-way Trivector meters capable of recording import and export of electricity**. The meters installed are capable of recording and storing half hourly readings of all electrical parameters for a minimum period of 35 days with digital output.
- **Meter Readings:** The electricity supplied to the grid is recorded by taking two joint meter readings (Form B) at 56.8 MW and 12 MW at 33kV metering point in the presence of representatives of state utility and WWIL. The joint meter readings (Form B) at 33kV metering point contains the value of energy exported, energy imported, transmission loss and net electricity supplied to the grid during the recording period. This joint meter readings (Form B) is certified by the Executive Engineer of the state utility and WWIL. These certified readings are then used to prepare the invoices to be raised on BESCOM. Thus the net electricity supplied to the grid as mentioned in the joint meter readings (Form B) can be crosschecked with the value mentioned in the invoices. Further no inconsistency was found between the values as mentioned in Form B & invoices raised on state utility during the current monitoring period.
- **Inspection of Energy Meters:** All main and check energy meters and all associated instruments, transformers installed at the Project are of 0.2% accuracy class. Each meter is jointly inspected and sealed on behalf of the Parties and is not to be interfered with by either Party except in the presence of the other Party or its authorized representatives.

Meter Test Checking: All main and check meters are tested for accuracy with reference to a portable standard meter. The portable standard meter is owned by state utility. The main and check meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2 accuracy class. The consumption registered by the main meters alone will hold good for the purpose of metering electricity supplied to the grid as long as the error in the main meters is within the permissible limits. All main & check meters connected at metering points with RR. No. KBCWP 01 (220kV metering point), KBCWP 02 (33kV metering point) & KBCWP03 (33kV metering point) (please refer project layout Annex 3) will be tested for accuracy on annual basis by state utility and in case of error beyond permissible limit; meters are calibrated by either of KPTCL or BESCOM based on the availability of EB officials. Further during the annual meter testing, all the meters were found under the permissible limit of error and accordingly none of the meter was

calibrated during the current monitoring period. KPTCL is a transmission utility and BESCOM is distribution licensee in the state of Karnataka.

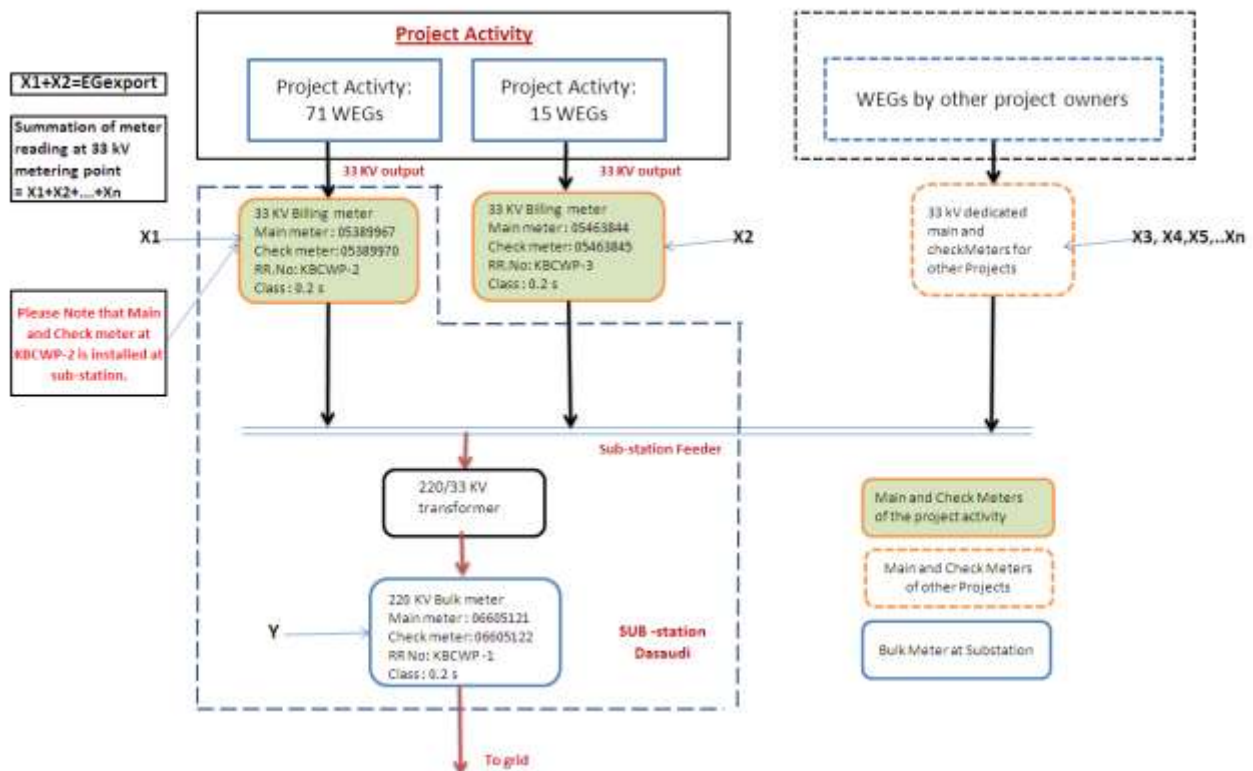
If during the meter test checking,

- The main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the permissible limits, then the meter reading will be as per the main meter as usual. The check meter shall, however, be calibrated immediately.
- The main meter is found to be beyond permissible limits of error, but the corresponding check meter is found to be within permissible of error, then the meter reading for the month up to the date and time of such test shall be as per the check meter. There will be a revision in the meter reading for the period from the previous calibration test up to the current test based on the readings of the check meter. The main meter shall be calibrated immediately and meter reading for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.
- Both the main meters and the corresponding check meters are found to be beyond the permissible limits of error, both the main meters and the corresponding check meters shall be immediately calibrated and the correction applied to the reading registered by the main meter to arrive at the correct reading of energy supplied for metering electricity supplied to the grid for the period from the last meter test reading up to the current test. Meter reading for the period thereafter till the next monthly reading shall be as per the calibrated main meter.
- During the monitoring period all the meter were found under the permissible limit of error and accordingly none of the meter was calibrated, and there was no occurrence of emergency events.

The schematic showing the location of meters for the project activity is given in Annex 3:

Annex 3

LINE DIAGRAM SHOWING RELEVANT METERING POINTS



For the current monitoring period; at 220kV sub-station only the WEGs of project activity are connected and there is no WEGs of other customers while at the time of validation WEGs of other project activity were also connected to same 220kV sub-station that's why the generic layout of monitoring system is presented in above diagram . Further it may be noted in future WEGs of other project activity might be connected to 220kV same sub-station depending on the requirements. Monitoring system shown above is given to provide the generic scenario and method of calculation to arrive the net electricity export of individual customers in case there is other project WEGs are also connected to same 220kV sub-station. This procedure of apportioning is applied by state utility only.

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
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.
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		