



Monitoring report form for CDM project activity
(Version 09.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT

Title of the project activity	50.4 MW Tata Wind Farm - in Maharashtra		
UNFCCC reference number of the project activity	2819 ¹		
Version number of the PDD applicable to this monitoring report	10.0		
Version number of this monitoring report	01		
Completion date of this monitoring report	03/01/2022		
Monitoring period number	Ninth Monitoring Period		
Duration of this monitoring period	01/05/2018 – 31/05/2020 (including both days)		
Monitoring report number for this monitoring period	Not Applicable		
Project participants	1) M/s The Tata Power Company Limited 2) M/s Enercon (India) Limited ² 3) Asian Development Bank as Trustee of the Future Carbon Fund (Sweden) 4) Swedish Energy Agency		
Host Party	India		
Applied methodologies and standardized baselines	ACM0002 ver. 9 - Consolidated methodology for grid-connected electricity generation from renewable sources		
Sectoral scopes	1 : Energy industries (renewable - / non-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 until 31 December 2020	Amount achieved from 1 January 2021
	0	197,995	0
Amount of GHG emission reductions or net anthropogenic GHG removals	173,323 tCO ₂ e		

¹ <https://cdm.unfccc.int/Projects/DB/DNV-CUK1249024361.28>

² With effect from 01/01/2013, name of Enercon (India) Limited has been changed to "Wind World (India) Limited)

estimated ex ante for this monitoring period in the PDD	
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SECTION A. Description of project activity

A.1. General description of project activity

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“The Tata Power Company Limited” is the project sponsor. The objective is development, design, engineering, procurement, finance, construction, operation and maintenance of “50.4 MW Tata Wind Farm - in Maharashtra” to provide reliable, renewable power to the Maharashtra state electricity grid which is part of Indian electricity grid. The Project activity lead to reduced greenhouse gas emissions because it displaces electricity from fossil fuel based electricity generation plants.

The aggregate 50.4 MW project activity comprises of total 63 numbers wind energy generators, with each WEG having a capacity of 800 kW. Enercon (India) Ltd (“Enercon”) is the equipment supplier and the operations and maintenance contractor for the Project. The Project harnesses renewable resources in the region, and thereby displacing non-renewable natural resources and thus leading to sustainable economic and environmental development. “The Tata Power Company Limited” has sponsored the Project. Project activity supplies the electricity to the Maharashtra state grid that forms part of the Western electricity grid which is part of Indian Grid and this power would be consumed by the Distribution business of The Tata Power Company Limited.

The first WEG under the project activity was commissioned on 10 Mar 2007 and last WEG under the project activity was commissioned on 15 December 2007. The expected operational lifetime of the project is for 20 years.

A.2. Location of project activity

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The Project consists of 63 numbers of E-48 WEGs of 800 kW each installed at Khandke site of Ahmednagar district of Maharashtra State in India. The longitude and latitude details of each of the wind mill are given in the table below:

WEG Sr. No.	Unique Identification Number	Location	Latitude	Longitude
1	TPCL-1	Agadgaon	N19° 10' 29.8"	E74° 50' 59.8"
2	TPCL-2		N19° 10' 37.9"	E74° 50' 54.2"
3	TPCL-3		N19° 10' 44.8"	E74° 50' 50.7"
4	TPCL-4		N19° 10' 41.0"	E74° 50' 38.7"
5	TPCL-5		N19° 10' 32.7"	E74° 50' 38.7"
6	TPCL-6	Devegaon	N19° 10' 24.5"	E74° 50' 30.4"
7	TPCL-7		N19° 10' 18.3"	E74° 50' 24.7"
8	TPCL-8		N19° 09' 41.6"	E74° 50' 43.5"
9	TPCL-9		N19° 09' 36.8"	E74° 51' 03.9"
10	TPCL-10		N19° 10' 07.1"	E74° 50' 36.2"
11	TPCL-11		N19° 09' 58.7"	E74° 50' 39.9"
12	TPCL-12		N19° 09' 49.8"	E74° 50' 41.6"
13	TPCL-13		N19° 09' 33.0"	E74° 50' 46.9"
14	TPCL-14		N19° 09' 22.4"	E74° 50' 37.7"
15	TPCL-15		N19° 09' 10.1"	E74° 50' 41.0"
16	TPCL-16		N19° 09' 01.1"	E74° 50' 44.4"

WEG Sr. No.	Unique Identification Number	Location	Latitude	Longitude
17	TPCL-17		N19° 08' 54.9"	E74° 50' 43.9"
18	TPCL-18		N19° 09' 56.7"	E74° 50' 07.0"
19	TPCL-19		N19° 10' 08.9"	E74° 50' 14.8"
20	TPCL-20		N19° 11' 07.7"	E74° 51' 41.8"
21	TPCL-21		N19° 11' 01.2"	E74° 51' 48.0"
22	TPCL-22		N19° 10' 54.1"	E74° 51' 52.7"
23	TPCL-23		N19° 10' 38.8"	E74° 51' 43.3"
24	TPCL-24		N19° 10' 31.6"	E74° 51' 43.6"
25	TPCL-25	Ranjani	N19° 10' 19.8"	E74° 51' 41.5"
26	TPCL-26		N19° 08' 51.1"	E74° 49' 37.4"
27	TPCL-27		N19° 08' 58.0"	E74° 49' 39.9"
28	TPCL-28	Agadgaon	N19° 09' 04.4"	E74° 49' 36.5"
29	TPCL-29		N19° 09' 10.5"	E74° 49' 34.8"
30	TPCL-30	Ranjani	N19° 09' 37.2"	E74° 49' 46.3"
31	TPCL-31	Agadgaon	N19° 08' 29.4"	E74° 49' 55.1"
32	TPCL-32		N19° 08' 21.5"	E74° 49' 52.7"
33	TPCL-33	Ranjani	N19° 08' 17.1"	E74° 49' 51.7"
34	TPCL-34		N19° 08' 06.1"	E74° 49' 59.9"
35	TPCL-35		N19° 06' 18.3"	E74° 53' 30.7"
36	TPCL-36		N19° 06' 30.0"	E74° 53' 21.7"
37	TPCL-37		N19° 06' 24.9"	E74° 53' 27.0"
38	TPCL-38	Agadgaon	N19° 06' 35.0"	E74° 53' 07.1"
39	TPCL-39		N19° 06' 42.2"	E74° 53' 06.4"
40	TPCL-40		N19° 06' 49.8"	E74° 53' 07.5"
41	TPCL-41		N19° 07' 02.2"	E74° 53' 02.2"
42	TPCL-42		N19° 07' 08.1"	E74° 52' 59.1"
43	TPCL-43		N19° 07' 16.0"	E74° 52' 59.1"
44	TPCL-44	Devegaon	N19° 09' 37.8"	E74° 53' 13.4"
45	TPCL-45		N19° 09' 30.0"	E74° 53' 13.9"
46	TPCL-46		N19° 10' 11.5"	E74° 53' 19.6"
47	TPCL-47		N19° 10' 18.1"	E74° 53' 06.8"
48	TPCL-48	Mehekari	N19° 10' 15.5"	E74° 52' 51.7"
49	TPCL-49		N19° 10' 20.6"	E74° 53' 19.1"
50	TPCL-50		N19° 10' 25.2"	E74° 53' 02.5"
51	TPCL-51		N19° 10' 21.1"	E74° 52' 44.9"
52	TPCL-52		N19° 10' 04.2"	E74° 53' 27.2"
53	TPCL-53		N19° 10' 16.5"	E74° 53' 32.5"
54	TPCL-54		N19° 10' 24.6"	E74° 53' 33.3"
55	TPCL-55		N19° 10' 32.9"	E74° 53' 33.5"
56	TPCL-56		N19° 09' 59.9"	E74° 53' 36.4"
57	TPCL-57	Agadgaon	N19° 10' 50.1"	E74° 52' 23.4"
58	TPCL-58		N19° 10' 43.9"	E74° 52' 27.2"
59	TPCL-59		N19° 10' 59.4"	E74° 52' 21.1"
60	TPCL-60		N19° 10' 35.6"	E74° 52' 33.9"
61	TPCL-61		N19° 10' 28.5"	E74° 52' 41.4"
62	TPCL-62	Ranjani	N19° 10' 38.6"	E74° 52' 51.6"
63	TPCL-63		N19° 09' 47.1"	E74° 53' 18.3"

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	M/s The Tata Power Company Limited (Private entity)	No
India (host)	M/s Enercon (India) Limited. (Private entity)	No
Sweden	Asian Development Bank as Trustee of the Future Carbon Fund	Yes
Sweden	Swedish Energy Agency	Yes

A.4. References to applied methodologies and standardized baselines

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

Reference: Approved consolidated baseline and monitoring methodology ACM0002 (Version 09, EB 45), effective from 27 February 2009.

UNFCCC web reference of methodology:

<http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

ACM0002, Version 09 draws upon the following tools which have been used in the revised PDD:

- Tool to calculate the emission factor for an electricity system – Version 01, EB 35
<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.pdf>
- Tool for the demonstration and assessment of additionality – Version 5.2, EB 39
<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf>

A.5. Crediting period type and duration

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Type of crediting period : Fixed

Length of crediting period : 01/06/2010 – 31/05/2020

SECTION B. Implementation of project activity**B.1. Description of implemented project activity**

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The first WEG under the project activity was commissioned on 10 Mar 2007 and last WEG under the project activity was commissioned on 15 December 2007. The project activity consists of total 63 WEGs (800 KWH) of Enercon make E-48. The commissioning date for all the WEGs include in the project activity is given in the table below:

WEG Sr. No.	Unique identification Number	Commissioning Dates
1	TPCL-1	22-Mar-07
2	TPCL-2	10-Mar-07
3	TPCL-3	10-Mar-07
4	TPCL-4	10-Mar-07
5	TPCL-5	10-Mar-07
6	TPCL-6	10-Mar-07

7	TPCL-7	10-Mar-07
8	TPCL-8	10-Mar-07
9	TPCL-9	10-Mar-07
10	TPCL-10	10-Mar-07
11	TPCL-11	10-Mar-07
12	TPCL-12	10-Mar-07
13	TPCL-13	10-Mar-07
14	TPCL-14	10-Mar-07
15	TPCL-15	10-Mar-07
16	TPCL-16	10-Mar-07
17	TPCL-17	10-Mar-07
18	TPCL-18	29-Mar-07
19	TPCL-19	31-Mar-07
20	TPCL-20	22-Mar-07
21	TPCL-21	22-Mar-07
22	TPCL-22	22-Mar-07
23	TPCL-23	22-Mar-07
24	TPCL-24	22-Mar-07
25	TPCL-25	22-Mar-07
26	TPCL-26	22-Mar-07
27	TPCL-27	22-Mar-07
28	TPCL-28	22-Mar-07
29	TPCL-29	29-Mar-07
30	TPCL-30	22-Mar-07
31	TPCL-31	22-Mar-07
32	TPCL-32	22-Mar-07
33	TPCL-33	22-Mar-07
34	TPCL-34	22-Mar-07
35	TPCL-35	22-Mar-07
36	TPCL-36	22-Mar-07
37	TPCL-37	22-Mar-07
38	TPCL-38	29-Mar-07
39	TPCL-39	31-Mar-07
40	TPCL-40	29-Mar-07
41	TPCL-41	29-Mar-07
42	TPCL-42	29-Mar-07
43	TPCL-43	29-Mar-07
44	TPCL-44	29-Mar-07
45	TPCL-45	29-Mar-07
46	TPCL-46	29-Mar-07
47	TPCL-47	29-Mar-07
48	TPCL-48	10-Apr-07
49	TPCL-49	10-Apr-07
50	TPCL-50	10-Apr-07
51	TPCL-51	7-May-07
52	TPCL-52	10-Apr-07
53	TPCL-53	7-May-07
54	TPCL-54	7-May-07
55	TPCL-55	7-May-07
56	TPCL-56	7-May-07
57	TPCL-57	15-Dec-07
58	TPCL-58	15-Dec-07
59	TPCL-59	15-Dec-07
60	TPCL-60	15-Dec-07
61	TPCL-61	30-Nov-07
62	TPCL-62	30-Nov-07
63	TPCL-63	30-Nov-07

Wind World (India) Limited is the O & M contractor for the project activity and ISO 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 WEGs that are included in the project activity. As a part of regular maintenance the WEGs are stopped for mechanical and electrical maintenance for 16 to 18 hours annually and for visual inspection for 6 to 7 hours quarterly. Further the performance report of project WEGs has been added in appendix

- 1) During the monitoring period there were no events or situations occurred, which may impact the applicability of the methodology.

The Project involves 63 wind energy generators (WEGs) of Enercon make (800 kW E-48) with internal electrical lines connecting the Project with local evacuation facility. The WEGs 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:

- 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

Wind World (India) Ltd 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, 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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There are no changes to the start date of the crediting period.

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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PP has applied for change in monitoring plan to UNFCCC. PP submitted revised PDD with revised MP, version 10.0 (dated 12.04.2013) to UNFCCC which has been approved on 22 Sep 2013 by UNFCCC (PRC ref: PRC-2819-001; web - link:

<http://cdm.unfccc.int/PRCContainer/DB/prcp638052220/view>

B.2.6. Changes to project design

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Not applicable

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 consolidated baseline and monitoring methodology ACM0002 Version 09 Sectoral Scope: 1, by CDM – Meth Panel is proposed to be used to monitor the emission reductions.

This approved monitoring methodology requires monitoring of the electricity generation from the project activity.

Emission factor for the project activity as mentioned in revised PDD was determined ex-ante, which is fixed throughout the crediting period of project activity. 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 and supplied to the grid.

Procedure for Computing Net Electricity Supplied to the Grid by the Project Activity:

Line diagrams of the project activity showing all relevant monitoring points has been presented below. There are total three metering points for the project activity.

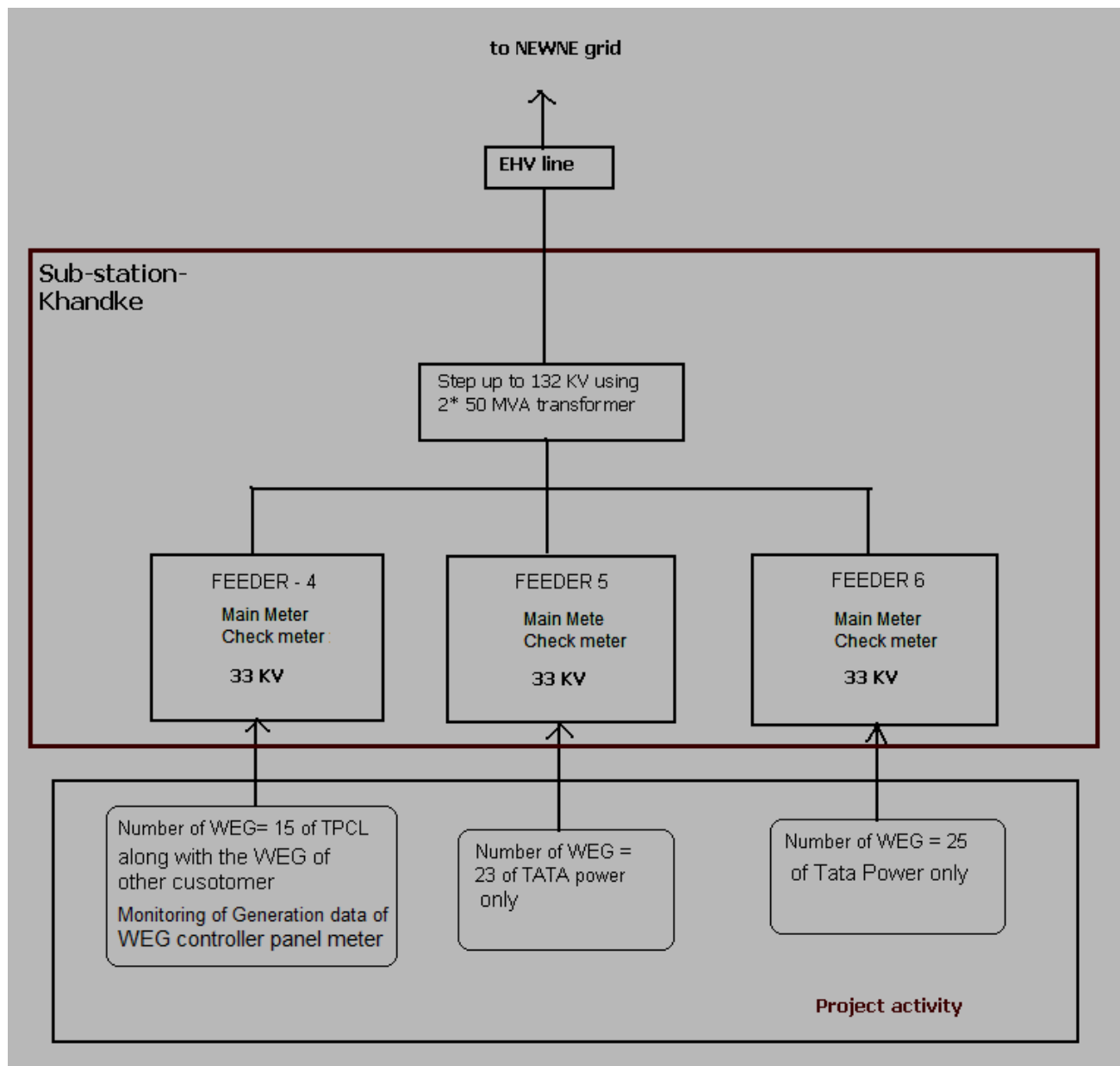


Figure: Line diagram of the project activity in current situation

As shown in the above line diagram, the project activity is connected to feeder 4, 5 and 6. Each feeder has one set of main & check meter. The main and check meters that are connected to feeder 5 and 6 are dedicated meters for the project activity i.e. no WEGs of other customer(s) are connected to these meters. Feeder 5 is dedicated to 23 WEGs of the project activity while Feeder 6 dedicated to 25 WEGs of the project activity. However the main and check meters for feeder 4 is connected to 15 WEGs of the project activity and 09 WEGs of the non-project activity.

The sharing of any feeder among WEGs is being done by the state utility, based on the load carrying capacity of that particular feeder and also based on the load profile at connected substation. Each feeder has one set of main & check meter. In the actual project scenario, the main and check meters at feeder 5 and feeder 6 are connected to 23 and 25 WEGs respectively which are dedicated to the project activity. In other words, no other WEGs of different customer(s) are being connected to feeder 5 and feeder 6 considering the present load carrying capacity of

these feeders. As there are no WEGs of other customers(s) are connected to the meters at feeder 5 and feeder 6, the apportioning procedure to arrive at electricity generated by WEGs with respect to their customer(s), has not been applied here. However the main and check meters for feeder 4 are connected to 15 WEGs of the project activity and 09 WEGs of the non-project activity, considering the load carrying capacity of this feeder. Therefore for feeder 4, the apportioning procedure is applied to compute the electricity that can be allocated to 15 WEGs of the project activity. The apportioning procedure is done by Wind World and certified by MSEDCL, where the customers do not have any control. These apportioning calculations are as per the standard procedures & guidelines of MSEDCL, who authorises JMR reports and issuing the same to the customers. Based on the apportioning, the apportioned values of electricity export and import by WEGs connected to feeder 4 are noted in the credit certificate (credit notes) which is being issued to the individual customers with respect to their WEGs connected to the feeder 4.

Further, the above mentioned configuration of any feeder may change in future depending upon the load carrying capacity of the feeder and also the load profile at connected sub-station. The same apportioning procedure, as explained below, will be followed for all the feeders if required (in the case where the common metering is done for the WEGs of project activity and non-project activity, for any of the feeder).

Procedure of apportioning in case of common metering (both project activity & non project activity WEGs are connected to same feeder meter):-

The generated electricity is measured through a two-step procedure, wherein the first metering is carried out at the controller of each WEG at the project site. The monitoring of all these WEGs is done from a common monitoring station as a part of central monitoring system (CMS). $EG_{gross,y}$ is the electricity generated from an individual WEG measured through its controller panel meter and connected to common feeder meter. The summation of total Electricity generated from WEGs of the project proponent from individual meters (controller panel meter) in MWh is presented as:

$$\sum_{y=0}^n EG_{gross,y}$$

where n = No of WEGs of project proponent connected at common MSEDCL meter at feeder

and the summation of total Electricity generated (controller panel meter) from the other WEGs (total number of WEGs = m) attached to the common MSEDCL feeder meter connected to substation in MWh is presented as:

$$\sum_{y=0}^m EG_{gross,y}$$

where m = No of WEGs of other customers connected at common MSEDCL meter at feeder (this value is not under the control of project proponent and cannot be monitored by project proponent).

The second metering is carried out at grid interconnection point (i.e. substation) wherein the Joint Meter Reading (JMR) is carried out on first day of every month in presence of the representatives of the project proponent & the state electricity utility (MSEDCL). JMRs for all the feeders include electricity exported and imported by the project activity (along with WEGs of non-project activity, if any). The JMR report gives both the "export" ($EG_{JMR,export}$) and "import" ($EG_{JMR,import}$) of the electricity to/from the Indian grid based on common MSEDCL meter readings. This JMR is used for calculation of the amount of net electricity supplied to the grid. MSEDCL also provides the credit certificate to the project proponent that provides data on electricity export and import.

The apportioning of electricity generated from the various WEGs which are connected to one feeder meter, is done by Wind World based on the power generation from the individual WEGs connected to this MSEDCL feeder meter. Operation and maintenance personnel from Wind World prepare a monthly report on generation and consumption. This report (named as 'Energy Break-up

This apportioned value is then submitted to MSEDCL and on the basis of this Break-up Report and JMR, MSEDCL issues the credit certificates to the individual customers with respect to their WEG(s) connected to the feeder.

EG_{export} the electricity export to the grid by the project activity WEGs connected at common MSEDCL feeder meter is calculated as follows:

$$EG_{\text{export}} = \frac{EG_{\text{JMR, export}} \times \sum_{y=0}^n EG_{\text{gross,y}}}{\sum_{y=0}^n EG_{\text{gross,y}} + \sum_{y=0}^m EG_{\text{gross,y}}} \quad \dots\dots\dots(1)$$

EG_{import} the electricity import from the grid by the project activity WEGs connected at common MSEDCL meter is calculated as follows:

$$EG_{\text{import}} = \frac{EG_{\text{JMR, import}} \times \sum_{y=0}^n EG_{\text{gross,y}}}{\sum_{y=0}^n EG_{\text{gross,y}} + \sum_{y=0}^m EG_{\text{gross,y}}} \quad \dots\dots\dots(2)$$

Where,

$E_{\text{JMR,export}}$ is electricity exported, as recorded by the main meter at common MSEDCL feeder meter at substation.

$E_{\text{JMR,import}}$ is electricity imported, as recorded by the main meter at common MSEDCL feeder meter at substation.

The above method of apportioning is as per the standard procedures & guidelines of MSEDCL and authorised by the MSEDCL.

Further formula (1) & (2) is used to calculate the electricity export & import of project activity connected at common feeder at MSEDCL sub-station.

While in case of dedicated feeder meters $EG_{\text{export}} = EG_{\text{JMR,export}}$ & $EG_{\text{import}} = EG_{\text{JMR,import}}$.

EG_y , the net electricity supplied to the grid by the project activity WEGs connected to all the feeders (common as well as dedicated feeder meter) at MSEDCL substation, is calculated as follows:

$$EG_y = \sum EG_{\text{export}} - \sum EG_{\text{import}} \quad \dots\dots\dots(3)$$

Where,

$\sum EG_{\text{export}}$ is summation of electricity export values of project activity as recorded at all the feeders at MSEDCL sub-station (sourced from monthly JMR reports along with the break-up reports).

$\sum EG_{\text{import}}$ is summation of electricity import values of project activity as recorded at all the feeders at MSEDCL sub-station (sourced from monthly JMR reports along with the break-up reports).

The apportioning procedure is described in details only to provide the clear description of entire procedure by relevant authority. Further the apportioning procedure requires the generation data of other project proponents as mentioned in above formula. Since project participant is not authorized to access the generation data of other project proponents, the value of electricity export & import is sourced directly from JMR/credit note as provided by the state utility and the apportioning procedure is done by Wind World officials only where the project proponent has no control.

Following parameters are to be monitored by the project proponent:-

S. No.	Parameter	Description	Source of Data
1	$\sum EG_{JMR,export}$	Summation of Electricity exported to the grid, as recorded by the main meter at each feeder at MSEDCL substation.	Joint Meter Reading
2	$\sum EG_{JMR,import}$	Summation of electricity imported from the grid, as recorded by the main meter at each feeder at MSEDCL substation.	Joint Meter Reading
3	$\sum EG_{gross,y}$	The summation of total electricity generated from WEGs of the project proponent from individual meters (i.e. WEG controller panel meter) attached to the each feeder connected to MSEDCL substation	WEG controller panel meter(Online SCADA system)
4	$\sum EG_{export}$	Summation of Electricity exported by the project activity to the grid as recorded at JMR at each feeder at MSEDCL substation.	Joint Meter Reading along with the Energy Break-up Report
5	$\sum EG_{import}$	Summation of electricity imported by the project activity from the grid as recorded at JMR at each feeder at MSEDCL substation	Joint Meter Reading along with the Energy Break-up Report
6	EG_y	Net electricity supplied to the grid by project activity	Joint Meter Reading along with the Energy Break-up Report

Following parameter is not under the control of project proponent and recorded by Wind World (India) Ltd only:-

S. No.	Parameter	Description
1.	$m \sum EG_{gross,y} \quad y=0$	The summation of total Electricity generated (recorded at controller panel meter) from the non-project activity WEGs (total number of WEGs = m) attached to the each feeder connected to MSEDCL substation

The net electricity supplied to the grid which is the summation of net electricity supplied by project activity as recorded at all the feeder meters and sourced from JMRs along with Energy Break-up Report, which can be cross checked from the credit notes provided by the MSEDCL.

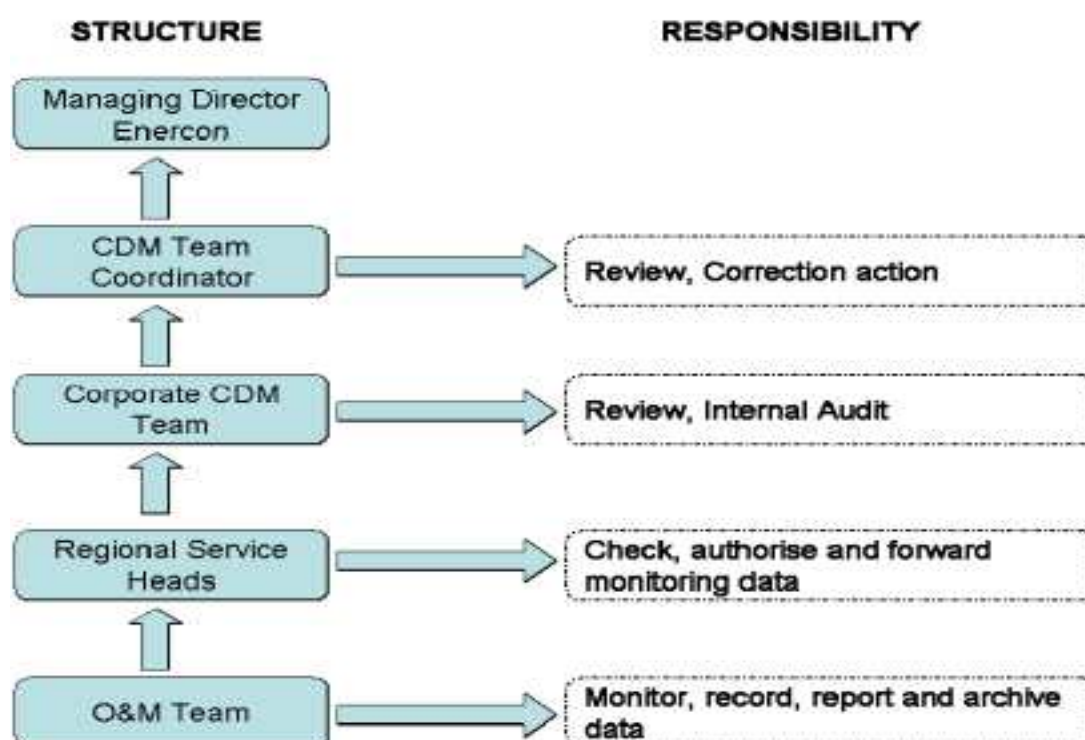
The Project is operated and managed by Wind World (India) Ltd. Wind World (India) Limited is an ISO certified Quality Management system. Wind World (India) Limited follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project.

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure. The project adheres to all the mandatory regulatory and statutory requirements at the state as well as national level.

Training and maintenance requirements:

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

The operational and management structure implemented by Wind World is as follows:



Procedure for data uncertainty:-

The metering equipment is tested by State Utility on annual basis. The main and check meters are tested annually by state utility. Procedure to deal with metering equipment failure:-

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. 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 meter and the corresponding check meter are found to be beyond the permissible limits of error, both the main meter & check meter shall be immediately calibrated and the correction applied to the reading registered by the main meter to arrive the correct reading of energy supplied for metering electricity supplied to the grid for the period from the last month's meter 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.
- If during any of the monthly meter readings, the variation between the main meter and the check meter is more than the permissible limit for meters of 0.2% accuracy class, all the meters shall be re-tested and calibrated immediately
- The controller meters do not require calibration as the energy readings of electricity generated at the controller meter is cross verified by the energy calculated by inverting system installed in the WEGs. In case there is any mismatch in the energy values recorded by the controller meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. The operations and maintenance staff will attend to the problem immediately in order to identify the error and correction factor will be determined
- If during any of the monthly meter readings, the variation between the main meter and the check meter is more than the permissible limit for meters of 0.2% accuracy class, all the meters shall be re-tested and calibrated immediately.

Meter Test Checking Details:

The WEGs of the project activity are connected to three meters and therefore in total there are six meters including main and check meters. Meter details for the all the feeder meters is given below:

Meter details:-

Feeder No.	Main/ Check meter	Meter Serial No.	Make	Accuracy	Meter Testing Details		
					Previous calibrating	2018	Validity
Feeder 4	Main meter	14796479	Elster	0.2s	20/12/2017	28/06/2018	27/06/2019
	Check meter	14796480	Elster	0.2s	20/12/2017	8/06/2018	27/06/2019
Feeder 5	Main meter	14796481	Elster	0.2s	20/12/2017	28/06/2018	27/06/2019
	Check meter	14796482	Elster	0.2s	20/12/2017	28/06/2018	27/06/2019
Feeder 6	Main meter	14796483	Elster	0.2s	20/12/2017	28/06/2018	27/06/2019
	Check meter	14796484	Elster	0.2s	20/12/2017	28/06/2018	27/06/2019

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
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”, version 1.1 is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value(s) applied	0.94022
Choice of data or measurement methods and procedures	CEA is an official source of Govt of India. The values are calculated as perCDM guidelines.
Purpose of data/parameter	Calculation of Baseline Emissions
Additional comments	Value is fixed ex-ante for entire crediting period.

Data/Parameter	EF_{OM,y}						
Unit	tCO ₂ e/MWh						
Description	Operating Margin Emission Factor						
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” version 1.1 is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm						
Value(s) applied	<table border="1"> <tr> <td>2002-03</td><td>0.9814</td></tr> <tr> <td>2003-04</td><td>0.9903</td></tr> <tr> <td>2004-05</td><td>1.0119</td></tr> </table>	2002-03	0.9814	2003-04	0.9903	2004-05	1.0119
2002-03	0.9814						
2003-04	0.9903						
2004-05	1.0119						
Choice of data or measurement methods and procedures	CEA is an official source of Govt of India. The values are calculated as perCDM guidelines.						
Purpose of data/parameter	Calculation of Baseline Emissions						
Additional comments	Value is fixed ex-ante for entire crediting period.						

Data/Parameter	EF_{BM,y}		
Unit	tCO ₂ e/MWh		
Description	Build Margin Emission Factor		
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” version 1.1 is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm		
Value(s) applied	<table border="1"> <tr> <td>2004-05</td><td>0.7772</td></tr> </table>	2004-05	0.7772
2004-05	0.7772		

Choice of data or measurement methods and procedures	CEA is an official source of Govt of India. The values are calculated as per CDM guidelines.
Purpose of data/parameter	Calculation of Baseline Emissions
Additional comments	Value is fixed ex-ante for entire crediting period.

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 activity in year y
Measured/calculated/default	Calculated
Source of data	'JMR reports' along with the 'energy break-up reports'
Value(s) of monitored parameter	210,625.91
Monitoring equipment	Not applicable, since it is calculated value
Measuring/reading/recording frequency	Monthly
Calculation method (if applicable)	<p>Summation of 'net export of electricity to the grid' as recorded in monthly 'JMR reports' along with the 'energy break-up reports' for all the feeder meters at MSEDCL sub-station.</p> <p>Where,</p> $EG_y = \sum EG_{\text{export}} - \sum EG_{\text{import}}$ <p>Net electricity supplied to the grid by the project activity is calculated as per formula (3) given in section C</p>
QA/QC procedures	The value of net electricity supplied to the grid can be cross checked from the credit certificates (credit notes) provided by MSEDCL. QA/QC procedures are implemented by MSEDCL pursuant to the provisions of the power purchase agreement.
Purpose of data/parameter	Calculation of Baseline Emissions
Additional comments	The data is archived for crediting period + 2 years.

Data/Parameter	$\sum EG_{\text{JMR,export}}$
Unit	MWh (Mega-watt hour)
Description	Summation of Electricity exported to the grid, as recorded by the main meter at each feeder meters at MSEDCL substation
Measured/calculated/default	Measured
Source of data	The value of electricity exported to the grid is taken from the monthly JMR reports.
Value(s) of monitored parameter	210,679.45
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	Monthly.

Calculation method (if applicable)	Please refer section 'C' for calculation procedure
QA/QC procedures	The meters are calibrated once in a year by the state utility.
Purpose of data/parameter	Calculation of Baseline Emissions
Additional comments	The data is archived for crediting period + 2 years.

Data/Parameter	$\sum EG_{JMR,import}$
Unit	MWh (Mega-watt hour)
Description	Summation of electricity imported from the grid, as recorded by the main meter at each feeder meter at MSEDCL substation.
Measured/calculated/default	Measured
Source of data	The value of electricity imported from the grid is taken from the monthly JMR reports
Value(s) of monitored parameter	53.54
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	Monthly.
Calculation method (if applicable)	Please refer section 'C' for calculation procedure
QA/QC procedures	The meters are calibrated once in a year by the state utility.
Purpose of data/parameter	Calculation of Baseline Emissions
Additional comments	The data is archived for crediting period + 2 years.

Data/Parameter	$\sum EG_{gross,y}$
Unit	MWh (Mega-watt hour)
Description	Summation of total electricity generated from WEGs of the project proponent from individual meters (i.e. WEG controller panel meter) attached to the each feeder meter connected to MSEDCL substation
Measured/calculated/default	Measured
Source of data	Generation value from the WEG panel meter (Online SCADA system).
Value(s) of monitored parameter	240,315.83
Monitoring equipment	Controller meter (LCS) is electronic meter is installed in individual WEGs, which does not required calibration.
Measuring/reading/recording frequency	Monthly
Calculation method (if applicable)	Please refer section 'C' for calculation procedure.
QA/QC procedures	The controller panel meters do not require calibration as the energy readings of electricity generated at the controller meter is cross verified by the energy calculated by inverting system installed in the WEGs.
Purpose of data/parameter	This parameter will be used for calculation of EGy and this will not be directly used for calculation of emission reduction.
Additional comments	The data is archived for crediting period + 2 years.

Data/Parameter	$\Sigma EG_{\text{export}}$
Unit	MWh (Mega-watt hour)
Description	Summation of electricity exported by the project activity to the grid as recorded at JMR at each feeder at MSEDCL substation
Measured/calculated/default	For Feeder 5 & 6 value of parameter is measured directly, while for feeder 4 value of parameter is calculated as per procedure mentioned under section C of MR.
Source of data	The value of electricity exported by the project activity to the grid for each feeder meter is taken from monthly JMR reports along with the break-up reports.
Value(s) of monitored parameter	210,679.45
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	Monthly
Calculation method (if applicable)	$\Sigma EG_{\text{export}}$ is summation of electricity export values of all the feeder meters at MSEDCL sub-station. For the common feeder meter EG_{export} is calculated as per equation no. (1) given under section C, while in case of dedicated feedermeters $EG_{\text{export}} = EG_{\text{JMR,export}}$
QA/QC procedures	Electricity exported by the project activity to the grid can be cross checked from the credit certificates provided by MSEDCL.
Purpose of data/parameter	Calculation of Baseline Emissions
Additional comments	The data is archived for crediting period + 2 years

Data/Parameter	$\Sigma EG_{\text{import}}$
Unit	MWh (Mega-watt hour)
Description	Summation of electricity imported by the project activity from the grid as recorded at JMR at each feeder at MSEDCL substation
Measured/calculated/default	For Feeder 5 & 6 value of parameter is measured directly, while for feeder 4 value of parameter is calculated as per procedure mentioned under section C of MR.
Source of data	The value of electricity imported by the project activity from the grid for each feeder meter is taken from monthly JMR reports along with the break-up reports.
Value(s) of monitored parameter	53.54
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	Monthly

Calculation method (if applicable)	$\sum EG_{import}$ is summation of electricity import values of all the feeder meters at MSEDCL sub-station. For the common feeder meter EG_{import} is calculated as per equation no. (2) given under section C, while in case of dedicated feeder meters $EG_{import} = EG_{JMR,import}$
QA/QC procedures	Electricity imported by the project activity from the grid can be cross checked from the credit certificates provided by MSEDCL.
Purpose of data/parameter	Calculation of Baseline Emissions
Additional comments	The data is archived for crediting period + 2 years

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

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The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient calculated in a transparent and conservative manner as the weighted average emissions as described in revised PDD.

Hence,

$$BE_y = EG_y * EF_y$$

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 JMR (Form B) certified by state utility. This value can also be cross checked from the credit notes provided by MSEDCL.

EF_y is the CO₂ emission factor of the grid (0.94022 tCO₂e/MWh fixed ex-ante).

Baseline Emission Reductions calculation for project activity:-

Duration	Electricity export to the grid by the Project activity [MWh]	Electricity import from grid by the Project activity [MWh]	Net electricity generation supplied to the grid by the Project activity [MWh]	Baseline Emission Factor (tCO ₂ e/MW h)	Baseline Emissions (tCO ₂ e)
	[$EG_{export,y}$]	[$EG_{import,y}$]	[EG_y]	[EF_y]	$BE_y = EG_y * EF_y$
01/05/2018 – 31/12/2018	79,340.40	16.03	79,324.38	0.94022	74,569
01/01/2019 – 31/12/2019	102,206.31	25.84	102,180.47	0.94022	96,053
01/01/2020 – 31/05/2020	29,132.72	11.66	29,121.06	0.94022	27,373

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

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The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 09, there will be no project emissions in the project activity

$$PE_y = 0$$

E.3. Calculation of leakage emissions

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As per ACM0002 Version 09, no leakage has been considered for the calculation of emission factor

$$LE_y = 0$$

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	197,995	0	0	0	197,995	0	197,995

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)
197,995	173,323

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

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Considering the annual average emission reductions as per the registered PDD which is 83,022 tCO₂e per year, the amount estimated ex ante emission reductions attributed to this monitoring period comes out to be 173,323 tCO₂e. The detailed calculation can be referred from the emission reduction sheet.

E.6. Remarks on increase in achieved emission reductions

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The actual amount of GHG emission reductions achieved is greater than the amount based on the ex-ante estimation in the registered PDD. It is due to the increase in the PLF of the project, which is influence by the climate conditions of the region. During present monitoring period, actual PLF of 23% has been achieved and with this 23% of PLF, project IRR is 12.27% which is well within the limits of WACC Benchmark of 13.99%. Hence, it is concluded that due to the increase in PLF there is no impact on the additionality of the project activity.

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

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Proposed project activity belongs to Type I - small-scale project & the total capacity of this project activity remained under the limit of that type every year during the crediting period.

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		