



Monitoring report form for CDM project activity
(Version 06.0)

MONITORING REPORT

Title of the project activity	Wind Power Project in Tinwari, Rajasthan	
UNFCCC reference number of the project activity	6160	
Version number of the PDD applicable to this monitoring report	Registered PDD version 5	
Version number of this monitoring report	03	
Completion date of this monitoring report	23/11/2017	
Monitoring period number	02	
Duration of this monitoring period	(01/03/2013 to 31/07/2017; Inclusive of first & last dates of Monitoring Period)	
Monitoring report number for this monitoring report	Not Applicable	
Project participants	Wind World (India) Limited ¹ (India) ACT Commodities B.V. (Netherland)	
Host Party	India	
Sectoral scopes	Sectoral Scope: 1, Energy industries (renewable / non-renewable sources)	
Applied methodologies and standardized baselines	ACM0002, version 12.3.0 ("Consolidated baseline methodology for grid-connected electricity generation from renewable sources") ²	
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	126,076 tonnes of CO _{2e}
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	143,336 ³ tonnes of CO _{2e}	

¹ Previous name "Enercon (India) Limited".

² ACM0002 version 12.2.0 was the latest version of the methodology available at the time of registration. However, editorial changes are in the methodology ACM0002 version 12.3.0 is available as the latest subversion of the applied methodology on UNFCCC website at the time of verification. In accordance with the paragraph 13 of EB 61 Annex 25 "Changes of an editorial nature will be published on the public website and will become applicable upon date of publication". Therefore, the methodology as ACM0002 version 12.3.0 is applied.

³ As per registered PDD, amount of GHG emission reduction estimated per annum is 32,415 tCO_{2e}. In this monitoring period (01/03/2013 to 31/07/2017) total number of days are 1614. So, to calculate the GHG emission reductions estimated ex ante for this monitoring period as per the registered PDD, per annum estimated value of emission reduction has been extrapolated as follows = $32415 \times 1614 / 365 = 143336$ tCO_{2e} (Rounded down value). Detailed calculation has been provided in ER sheet.

SECTION A. Description of project activity

A.1. General description of project activity

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Wind world (India) Limited (hereafter referred as "WWIL") has developed 20MW wind power project at Jodhpur district of Rajasthan, India. The purpose of the project activity is to harness energy from the renewable source "wind" and generate clean electricity by utilizing Wind Energy Converters (WECs) throughout the project lifetime. In the absence of the project activity, equivalent amount of electricity would have been generated from the existing connected/ new power plants in the NEWNE grid, which are predominantly based on fossil fuels. Whereas the operation of Wind Energy Convertors (WEC's) is emission free and no emissions occur during the lifetime of the project activity.

Brief description of the installed technology and equipments:

The Project activity is consist of 25 WECs of Enercon make E-53⁴ type WECs of 800kW capacity each aggregating to the capacity of 20.0 MW. The WECs generates 3-phase power at 400V, which is stepped up to 33 kV and further transmitted to WWIL Sub-station. From WWIL substation electricity is further evacuated to the Rajasthan regional electricity grid which is part of the NEWNE (Northern, Eastern, Western and North-Eastern) grid in India. The clean and green electricity supplied by the project will aide in sustainable growth in the region. Wind world (India) Limited⁵ is the project owner and project participant for the project activity.

Wind World (India) Ltd has established a manufacturing plant at Daman in India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured.



Relevant dates for the project activity:

The first machine under the project activity was commissioned on 30/09/2011 and last machine under the project activity was commissioned on 09/11/2011. Project activity has got registered under CDM on 25/07/2012 & fixed crediting period started from 01/08/2012. The expected operational lifetime of the project is for 20 years. Details of previous verification period & issuance are as follows:

Issuance no.	Period covered	CER issued	
First Issuance	01/08/2012 to 28/02/2013 (Inclusive of both days)	12,777	(8258 from CP1)

⁴ Technolgy details has been provided in Appendix-1 of the MR

⁵ Previous name - Enercon (India) Limited

The total emission reductions achieved under current monitoring period (01/03/2013 to 31/07/2017; Inclusive of both dates) are 126,076 tCO_{2e}.

A.2. Location of project activity

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a. Host Party(ies) : India

b. Region/State/Province, : Rajasthan State
etc

c. City/Town/Community, : Salodi, Chensingh Nagar, Bari, Malunga, Bada Kotacha, Digadi
etc Dhani, Balrva & Beru villages of Jodhpur district

d. Physical / Geographical : A location map is provided in Appendix 2. The detailed individual
location WECs location numbers and coordinates of project activity are
provided below:

S.No.	WEC Loc No.	Village	Latitude (N)	Longitude (E)
1	9	SALODI	26.42828	72.80512
2	48	Chain singh Nagar/Balrva	26.45382	72.87220
3	49	Chain singh Nagar/Balrva	26.45383	72.86990
4	50	Chain singh Nagar/Balrva	26.45661	72.87060
5	51	Chain singh Nagar/Balrva	26.45580	72.86707
6	53	Chain singh Nagar/Balrva	26.45745	72.86628
7	82	Bari	26.47798	72.83214
8	83	Bari	26.47596	72.82855
9	112	Malunga	26.45374	72.77689
10	113	Malunga	26.45609	72.77677
11	114	Malunga	26.45756	72.77531
12	115	Malunga	26.46012	72.77523
13	116	Malunga	26.45891	72.77188
14	129	Digadi Dhani (Malunga)	26.49696	72.79726
15	130	Bada Kotacha	26.50309	72.80070
16	131	Bada Kotacha	26.50395	72.79868
17	133	Bada Kotacha	26.50955	72.79788
18	134	Bada Kotacha	26.51170	72.79732
19	136	Digadi Dhani (Malunga)	26.50604	72.79201
20	137	Digadi Dhani (Malunga)	26.50539	72.79512
21	501	Chain singh Nagar/Balrva	26.45836	72.86488
22	504	Beru	26.42481	72.87424
23	515	Digadi Dhani (Malunga)	26.50039	72.79619
24	516	Digadi Dhani (Malunga)	26.50245	72.79325
25	517	Digadi Dhani (Malunga)	26.50828	72.79092

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
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Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	Wind World (India) Limited (Private entity)	No
Netherland	ACT Commodities B.V. (Private entity)	No

A.4. Reference to applied methodologies and standardized baselines

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

Reference: Approved consolidated baseline methodology ACM0002 (Version 12.3.0,)

UNFCCC web reference of methodology:

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

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

- Tool to calculate the emission factor for an electricity system – Version 02.2.1⁶
- Tool for the demonstration and assessment of additionality – Version 05.2⁷

A.5. Crediting period type and duration

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Type of crediting period : Fixed
 Start date of crediting period : 01/08/2012
 Length of crediting period : 10 years

⁶ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf>

⁷ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf>

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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The project activity consists of 25 machines (800 kW each) of WWIL make E-53. The commissioning dates for all the machines include in the project activity are given in the table below:-

S.No.	WEC Loc No.	Village	Date of Commissioning
1	9	Salodi	30 Sep 2011
2	48	Chain singh Nagar/Balrva	09 Nov 2011
3	49	Chain singh Nagar/Balrva	09 Nov 2011
4	50	Chain singh Nagar/Balrva	09 Nov 2011
5	51	Chain singh Nagar/Balrva	09 Nov 2011
6	53	Chain singh Nagar/Balrva	09 Nov 2011
7	82	Bari	30 Sep 2011
8	83	Bari	30 Sep 2011
9	112	Malunga	09 Nov 2011
10	113	Malunga	09 Nov 2011
11	114	Malunga	09 Nov 2011
12	115	Malunga	09 Nov 2011
13	116	Malunga	09 Nov 2011
14	129	Digadi Dhani (Malunga)	30 Sep 2011
15	130	Bada Kotacha	30 Sep 2011
16	131	Bada Kotacha	30 Sep 2011
17	133	Bada Kotacha	30 Sep 2011
18	134	Bada Kotacha	30 Sep 2011
19	136	Digadi Dhani (Malunga)	30 Sep 2011
20	137	Digadi Dhani (Malunga)	30 Sep 2011
21	501	Chain singh Nagar/Balrva	09 Nov 2011
22	504	Beru	09 Nov 2011
23	515	Digadi Dhani (Malunga)	30 Sep 2011
24	516	Digadi Dhani (Malunga)	30 Sep 2011
25	517	Digadi Dhani (Malunga)	30 Sep 2011

Wind world (India) Limited operation and maintenance activities are ISO 9001:2008 certified. 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 few hours annually and for visual inspection for 6 to 7 hours quarterly. Furthermore, the consolidated performance report of project WECs during the monitoring period including the down time, machine availability, grid availability, etc. has been provided in Appendix 4. During the monitoring period there were no events or situations occurred, which may impact the applicability of the methodology.

The WECs generates 3-phase power at 400V, which is stepped up to 33 kV and electricity transmitted to WWIL Sub-station. At WWIL sub-station electricity is step-up to 132 kV. From Wind World substation metering point electricity is further evacuated to the state electricity grid at 132kV. 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 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 WEC with voltage fluctuation of -20 to +20%.
- Less Wear & Tear since the system eliminates mechanical brake, which are not needed due to low speed generator which runs at maximum speed of 32 rpm and uses Air Brakes.
- Three Independent Braking Systems.
- Generator achieving rated output at only 32 rpm.
- Incorporates lightning protection system, which includes blades.
- Starts generation of power at wind speed of 3 m/s

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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Wind World (India) Limited is O&M contractor for the project activity and will be responsible for the maintaining all the monitoring data in respect of the project activity. Wind World (India) Limited has implemented the management structure for managing the monitored data.

This approved monitoring methodology requires monitoring of the following:

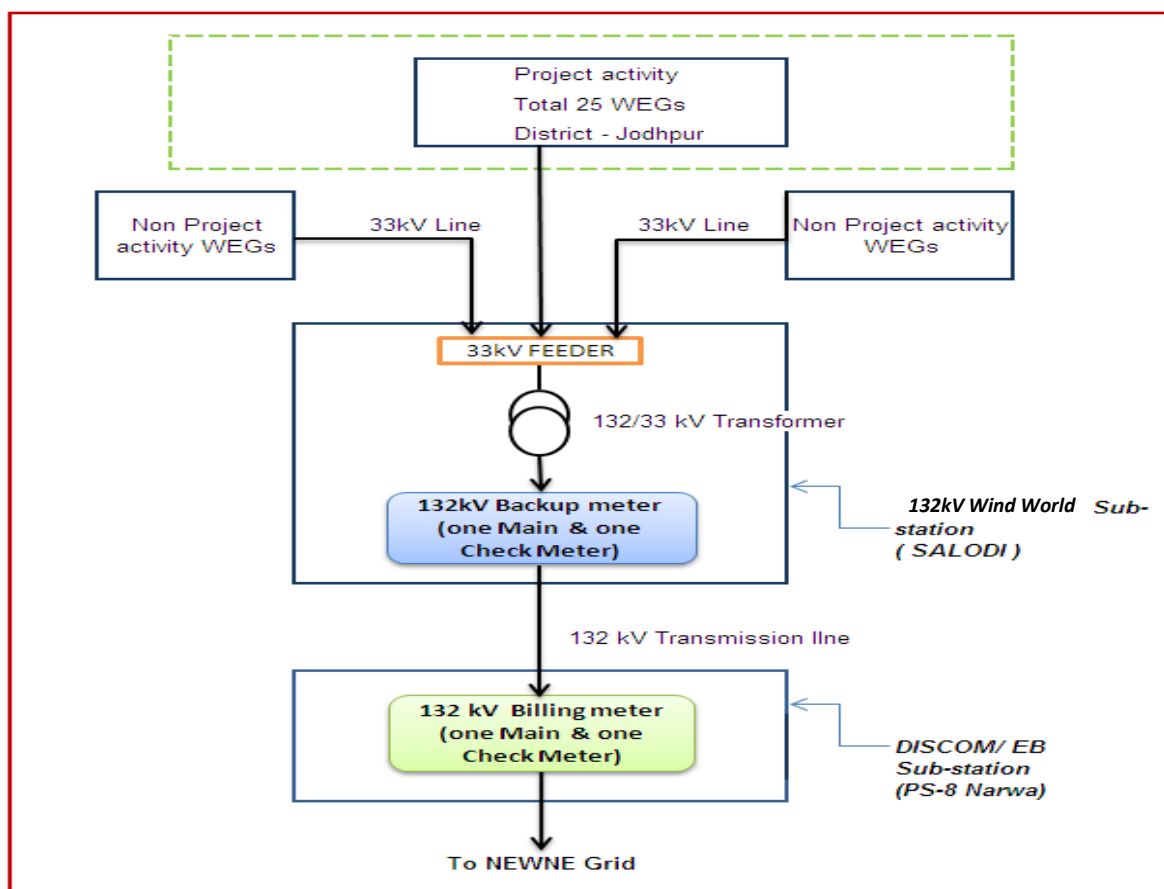
- Net electricity supplied from the project activity;

Emission factor of NEWNE electricity grid of the project activity is fixed ex-ante hence no further monitoring of this parameter is required. As per ACM0002 leakage need not be considered hence leakage has not been considered for the project activity. Hence, the sole parameter for monitoring is the net electricity supplied by the project activity to the grid.

The Project activity is operated and managed by the Wind World (India) Limited. The operational and maintenance activity is taken care by the service department of Wind World, which is an ISO 9001 certified company. Wind World 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.

Calculation of Net Electricity Supplied to the grid by project activity:

Layout of Metering arrangement for project activity is as follows:-



From the above layout it is clear that project activity WECs (25Nos) along with WECs of other customers, who are not the part of project activity are connected to Wind World Sub-stations which are further connected to EB sub-station through EHV line. The 25WECs of project activity installed

in Jodhpur district is connected through 132kV Wind World (India) Limited pooling sub-station (132kV SALODI sub-station), through 33kV feeder lines. At Wind World pooling sub-station SALODI electricity is stepped up to 132kV, wherein the backup meter (one main & one check meter) connected. From Wind World pooling sub-station electricity is transmitted to state utility (DISCOM) sub-station (PS-8 Narwa Sub-station) through 132kV transmission line/ EHV line wherein billing meter (one main & one check meter) is connected. At EB sub-station metering is done at 132kV billing meter. From state utility sub-station electricity is further transmitted to NEWNE grid.

The net electricity supplied to the grid will be calculated on monthly basis at the EB/DISCOM substations (PS-8 Narwa) wherein the billing meter is connected. The monthly joint meter readings are taken by the representatives of DISCOM and WWIL (PP's representative) who also signs the JMR. Simultaneously, the monthly joint meter reading of backup meters available at WWIL pooling sub-station (SALODI) is also taken by representatives of RVPN/DISCOM and WWIL. The copy of JMR at backup meters is available with Wind World.

Since, the project activity WECs are connected through common metering system along with non-project activity WECs of other customers at the main meter, apportioning of electricity export & import as recorded in JMR is being done to calculate the electricity export & import by individual WECs/ customers. Apportioning is being done based on the net electricity generation (Gross Export – Gross Import) recorded at LCS meter installed in individual WECs.

Based on the monthly JMR reading, which is signed by representative of DISCOM and PP's representative (WWIL); WWIL prepares the monthly breakup generation sheets, which indicate export, import & the net electricity supplied by individual customers to the grid. An apportioning procedure is used by PP's representative to arrive at net electricity supplied to the grid by individual investors.

The monthly generation sheet is submitted to both, DISCOM as well as individual investors. PP raises the invoice based on the monthly breakup sheet corresponding to the net electricity generation value indicated in the monthly breakup sheet. DISCOM based on the JMR reading along with monthly breakup sheet prepared by WWIL and the invoice raised, conduct the audit to cross check the net electricity values and in case all the values are found to be correct, DISCOM release the payment against the invoice raised by individual investors.

The values of the net electricity supplied to grid by project activity can be crosschecked with invoices raised by the PP on DISCOM and/or RTGS transaction or cheque copy.

Procedure for apportioning:-

Procedure used by PP's representative to prepare monthly breakup sheets for project activity:-

The monthly JMR reading contains the electricity export, import & net electricity supplied by all the WECs of project activity as well as non-project activity connected to the metering system at DISCOM substation. Hence in order to arrive at the electricity export, import & net electricity supplied by WECs of the project activity based on the net electricity generation (Gross Export – Gross Import) recorded at LCS meter, following procedure is used by O&M contractor (WWIL):-

Net electricity generation (Gross Export – Gross Import) by WECs of project activity,

$$\sum EG_{\text{Controller, j}} = \sum_{j=1}^n EG_{\text{Controller, j}}$$

Where, n is the number of WECs (n = 1 to 25) in project activity.

Net electricity generation (Gross Export – Gross Import) by all WECs (Project activity & non project activity) connected to Discom substation,

$$\sum EG_{\text{Controller}, i} = \sum_{i=1}^{j+k} EG_{\text{Controller}, i}$$

Where, $j+k$ is the number of WECs (project activity & non-project activity) connected to sub-station.

As LCS meter measures the net electricity generation (Gross Export – Gross Import) by individual WEC, which is the difference of export and import and doesn't provide individual reading of Export & Import; the apportioning of electricity export & import at recorded at billing meter as indicated in JMR sheet is done based on net electricity generation (Gross Export – Gross Import) of WECs. This is a standard procedure that is followed in the state of Rajasthan and is accepted by the state DISCOM for payment of tariff invoices.

Electricity exported by all WECs of project activity is apportioned on the basis of summation of net electricity generation (Gross Export – Gross Import)⁸ (by all the WECs (j number of WECs) of project activity, as measured at the controller (LCS meter) at project site and the electricity export recorded at the main meter mentioned in the JMR. The formula used for computing electricity export to the grid by the project activity is as follows:-

Electricity Export to the grid by the Project activity,

$$EG_{\text{Export}, y} = \frac{EG_{\text{JMR}, \text{Export}} * \sum EG_{\text{Controller}, j}}{\sum EG_{\text{Controller}, i}} \dots\dots\dots(1)$$

As LCS meter measures the net electricity generation (Gross Export – Gross Import) by WECs and doesn't provide individual reading of Export & Import. Therefore apportioning of export as well as import for all WEC of the project activity is also apportioned on the basis of summation of net electricity generation (Gross Export – Gross Import) by all the WECs (j number of WECs) of project activity, as measured at the controller (LCS meter) at project site and the electricity import recorded at the main meter mentioned in the JMR. The formula used for computing electricity import from the grid by the project activity is as follows

Electricity Import from the grid by the Project activity,

$$EG_{\text{Import}, y} = \frac{EG_{\text{JMR}, \text{Import}} * \sum EG_{\text{Controller}, j}}{\sum EG_{\text{Controller}, i}} \dots\dots\dots(2)$$

Wherein,

$\sum EG_{\text{Controller}, j}$ = Summation of net electricity generation (Gross Export – Gross Import) by all the WECs (j number of WECs) of project activity, as measured at the controller (LCS meter) at project site

$\sum EG_{\text{Controller}, i}$ = Summation of net electricity generation (Gross Export – Gross Import) by all WEC (i number of WECs) of project activity or non-project activity, as measured at the controller (LCS meter) at project site

⁸ LCS meter installed in individual WEGs control panel measures the net/ gross electricity generation (Export- Import) by WEG and therefore $\sum EG_{\text{Controller}, j}$ is used by developer to calculate electricity export & import by individual developer (project activity & non project activity WEGs).

⁹ The report detailing the value of $\sum EG_{\text{Controller}}$ provided to the verifying DOE.

$EG_{JMR,Export}$	=	Electricity export by project and non-project recorded at respective billing meters located at DISCOM sub-station. This can be checked from JMR certificates.
$EG_{JMR,Import}$	=	Electricity import by project and non-project recorded at respective billing meters located at DISCOM sub-station. This can be checked from JMR certificates.
$EG_{Export,y}$	=	Electricity export by project activity calculated as per formula 1 above
$EG_{import,y}$ above.	=	Electricity import by project activity calculated as per formula 2 above.

Therefore net electricity supplied to grid by 25 WECs of the project activity is calculated as the difference of equation (1) & (2),

$$EG_{Facility,y} = EG_{Export,y} - EG_{Import,y}$$

Even though the above mentioned of apportioning is done by the PP's representative and submitted to respective DISCOM, the same undergoes the series of audit by the hierarchy of auditors (Asst. Auditors, divisional auditors & account auditors) and then finally authorised by the Superintending engineer (SE) of the circle office of respective DISCOMs.

The above method of apportioning is not conducted by the PP but is described in details only to provide the clear description of entire procedure by relevant authority.

Procedure to deal with data uncertainty:

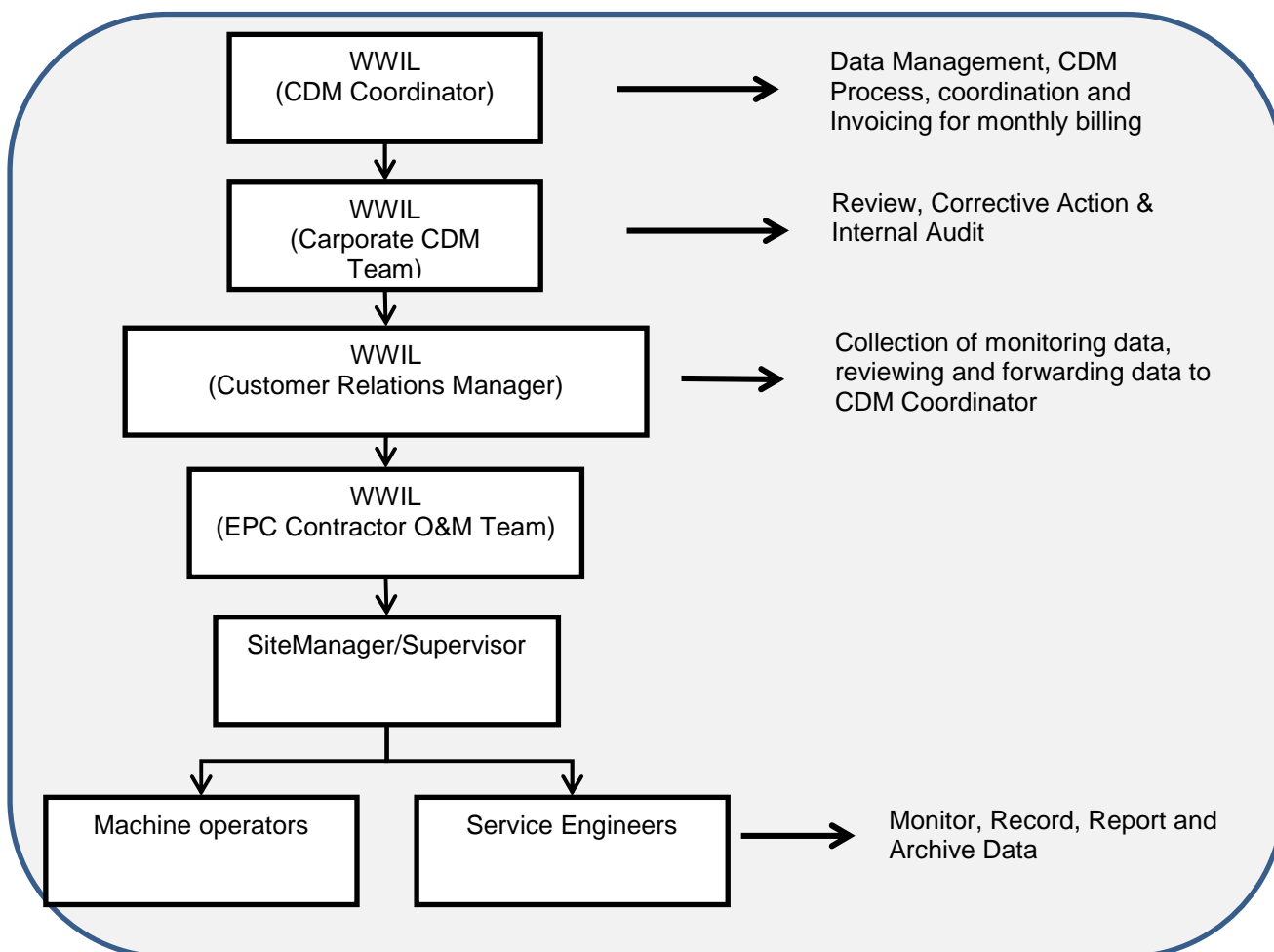
During the annual calibration, if the meter is found to be outside the permissible limits of the error and if that meter readings have been used in JMR, the (–ve) error value would be applied to electricity export and (+ve) error value will be applied to import of electricity from grid to all the JMR values since the date of last calibration. The meter would be replaced immediately with new calibrated meter.

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 Converters (WECs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that Enercon's service staffs 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 Enercon Training Academy provides need-based training to meet the training requirements of Enercon 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.

Monitoring roles and responsibilities

The operational and management structure implemented for data monitoring is as follows:



Meter Test Checking Details:

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

Location of meter		PS-8 Sub-station (Electricity Board) (Billing metering point)		Salodi Sub-station (Enercon) (Back metering point)	
Type of meter		Main Meter	Check Meter	Main meter	Check Meter
Meter Sr. No.		RJB 00354	RJB 00356	RJB 00358	RJB 00357
Meter Make		Secure	Secure	Secure	Secure
Accuracy class		0.2%	0.2%	0.2%	0.2%
Type		All the meters are two-way Tri-vector meters capable of recording import and export of electricity.			
Calibration Dates					
	2012	20-Dec-12	20-Dec-12	20-Dec-12	20-Dec-12
Due Date of calibration		20-Dec-13	20-Dec-13	20-Dec-13	20-Dec-13
	2014	11-Mar-14	11-Mar-14	11-Mar-14	11-Mar-14
Due Date of calibration		11-Mar-15	11-Mar-15	11-Mar-15	11-Mar-15
	2015	21-Feb-15	21-Feb-15	21-Feb-15	21-Feb-15
Due Date of calibration		21-Feb-16	21-Feb-16	21-Feb-16	21-Feb-16

	2017	16-Jun-17	16-Jun-17	16-Jun-17	16-Jun-17
Due Date of calibration		15-Jun-18	15-Jun-18	15-Jun-18	15-Jun-18

Further, during the annual meter testing, all the meters were under the permissible limit of error and accordingly none of the meter was replaced during the current monitoring period. However, delay in calibration has been observed and therefore, as per guideline VVS (CDM-EB93-A05-STAN) para 369 (a) & VVS APPENDIX – CALIBRATION para 2 Table 1, PP has applied maximum permissible error for all measured values of “EG_{Export,y}” & “EG_{Import,y}” taken during the period between the scheduled date of calibration and the actual date of calibration conservatively.

As detailed in the above table, the scheduled date of meter calibration was 20th Dec 2013 & meter calibration done on 11th Mar 2014. The monthly billing cycle starts from the 00.00 hrs of 1st day of the month to last day of the month i.e. 30th or 31st. JMR values represents the total net energy exported to the grid for the whole month.. Therefore, being conservative PP has considered the whole month of Dec 13, Jan – Mar 14 to apply the maximum permissible error of “0.2%” to all measured values of “EG_{Export,y}” & “EG_{Import,y}” taken during this period.

In addition, delay in meter calibration has been observed in the Feb 2016 as well (16months delay) as the scheduled date of meter calibration was 21st Feb 2016 & meter calibrated on 16th June 2017. So, following the same approach pp has considered delay for the month of Feb 2016 to July 2017 to apply the maximum permissible error of “0.2%” to all measured values of “EG_{Export,y}” & “EG_{Import,y}” Please refer Sheet “ER calculation sheet” for detailed calculation.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data / Parameter	$EF_{CM,y}$		
Unit	tCO _{2e} /MWh		
Description	Combined Margin Emission Factor of NEWNE Electricity Grid		
Source of data	<p>Combined Margin Emission Factor ($EF_{grid,CM,y}$) is calculated as the weighted average of Operating Margin Emission Factor ($EF_{grid,OM,y}$) and Build Margin Emission Factor ($EF_{grid,BM,y}$).</p> <p>The “CO₂ Baseline Database for Indian Power Sector”, version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The “CO₂ Baseline Database for Indian Power Sector” is available at http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver6.pdf</p>		
Value(s) applied:	<p>“CO₂ Baseline Database for Indian Power Sector”, version 6.0 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <table border="1"> <tr> <td>Combined Margin Emission Factor ($EF_{grid,CM,y}$)</td><td>0.94881</td></tr> </table> <p>Refer Appendix 3 for comprehensive calculation of Combined Margin Emission Factor.</p>	Combined Margin Emission Factor ($EF_{grid,CM,y}$)	0.94881
Combined Margin Emission Factor ($EF_{grid,CM,y}$)	0.94881		
Choice of data or measurement methods and procedures	Database - Central Electricity Authority, Ministry of Power, Government of India.		
Purpose of data:	Calculation of Baseline Emissions		
Additional comment:	This value is calculated on ex-ante basis and will remain fixed for the entire crediting period.		

Data / Parameter	$EF_{OM,y}$
Unit	tCO _{2e} /MWh
Description	Operating Margin Emission Factor of NEWNE Electricity Grid
Source of data	<p>“CO₂ Baseline Database for Indian Power Sector”, version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The “CO₂ Baseline Database for Indian Power Sector” is available at http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver6.pdf</p>
Choice of data or measurement methods and procedures	Database - Central Electricity Authority, Ministry of Power, Government of India.
Value(s) applied	0.99431

Purpose of data	Calculation of Baseline Emissions
Additional comment	This value is calculated on ex-ante basis and will remain fixed for the entire crediting period.

Data / Parameter	$EF_{BM,y}$
Unit:	tCO _{2e} /MWh
Description:	Build Margin Emission Factor of NEWNE Electricity Grid
Source of data	<p>"CO₂ Baseline Database for Indian Power Sector", version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO₂ Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver6.pdf</p>
Choice of data or measurement methods and procedures	Database - Central Electricity Authority, Ministry of Power, Government of India.
Value(s) applied	0.81231
Purpose of data	Calculation of Baseline Emissions
Additional comment	This value is calculated on ex-ante basis and will remain fixed for the entire crediting period.

D.2. Data and parameters monitored

Data / Parameter:	$EG_{facility,y}$
Unit:	MWh (Mega-watt hour)
Description:	Net electricity generation supplied to the grid by the Project activity.
Measured/ Calculated / Default:	Calculated
Source of data:	Generation break-up sheets prepared by the developer (WWIL), which is based on monthly JMR reading recorded at main meter installed at DISCOM sub-station and the LCS controller meter (panel meter) reading.
Value(s) of monitored parameter:	132,878.683
Monitoring equipment:	Since, it is calculated value, hence not applicable.
Measuring/ Reading/ Recording frequency:	<p>Frequency of recording data: Monthly</p> <p>Refer section 'C' (Description of monitoring system) for an illustration of the provisions for measurement methods.</p>
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:	Value of $EG_{\text{facility},y}$ can be cross checked with the tariff invoices raised on the DISCOM and/or RTGS transaction or cheque copy. All the billing (Main & Check) & Backup (Main & Check) meters are calibrated by DISCOM annually and the records are available with the representative of PP (WWIL)
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	$EG_{\text{Export},y}$
Unit:	MWh (Mega-watt hour)
Description:	Electricity export to the grid by the Project activity.
Measured/ Calculated / Default:	Calculated
Source of data:	Generation break-up sheets prepared by the developer (WWIL), which is based on monthly joint meter reading recorded at main meter installed at DISCOM sub-station and the LCS controller meter (panel meter) reading.
Value(s) of monitored parameter:	133,056.436
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' for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	-
QA/QC procedures:	Value of $EG_{\text{Export},y}$ can be cross checked with the tariff invoices raised on the DISCOM and/or RTGS transaction or cheque copy. All the billing & Back meters are calibrated by DISCOM annually and the records are available with the representative of PP (WWIL)
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	$EG_{\text{Import},y}$
Unit:	MWh (Mega-watt hour)
Description:	Electricity Import from grid by the Project activity.
Measured/ Calculated / Default:	Calculated
Source of data:	Generation break-up sheets prepared by the developer (WWIL), which is based on monthly meter reading recorded at main meter installed at DISCOM sub-station and the LCS controller meter (panel meter) reading.
Value(s) of monitored parameter:	177.753

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' for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	-
QA/QC procedures:	Value of $EG_{Import,y}$ can be cross checked with the tariff invoices raised on the DISCOM and/or RTGS transaction or cheque copy. All the billing & Back meters are calibrated by DISCOM annually and the records are available with the representative of PP (WWIL).
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years

Data / Parameter:	EG_{JMR, Export}
Unit:	MWh (Mega-watt hour)
Description:	Electricity export by project activity & non-project activity recorded by main meter installed at DISCOM sub-station.
Measured/ Calculated / Default:	Measured
Source of data:	Monthly JMR sheets recorded by representative of both DISCOM & WWIL
Value(s) of monitored parameter:	616743.720
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' for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	-
QA/QC procedures:	All the billing & Backup meters are calibrated by DISCOM annually and the records are available with the representative of PP (WWIL)
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years

Data / Parameter:	EG_{JMR, Import}
Unit:	MWh (Mega-watt hour)
Description:	Electricity import by project activity & non project activity recorded by main meter installed at DISCOM sub-station

Measured/ Calculated / Default:	Measured
Source of data:	Monthly JMR sheets recorded by representative of both DISCOM & WWIL.
Value(s) of monitored parameter:	816.480
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' for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	-
QA/QC procedures:	All the billing & Backup meters are calibrated by DISCOM annually and the records are available with the representative of PP (WWIL).
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years

Data / Parameter:	EG_{Controller, i}
Unit:	MWh (Mega-watt hour)
Description:	<p>Net electricity generation (Gross Export – Gross Import) by a WEC of project activity or non-project activity, as measured at the controller (LCS meter) at project site. Each WEC has exclusive LCS meter that records net electricity generation (Gross Export – Gross Import) from the WEC (project or non-project).</p> <p>Where,</p> <p>i is any WEC between 1 to j+ k.</p> <p>j is number of WEC of project activity connected to main meter at DISCOM substation and backup meter at WWIL substation.</p> <p>k is number of WEC of non-project activity connected to main meter at DISCOM substation and backup meter at WWIL substation.</p>
Measured/ Calculated / Default:	Measured
Source of data:	Monthly controller generation report (LCS) sourced from SCADA system installed at project site.
Value(s) of monitored parameter:	Please refer CER calculation sheet for the values of parameter.
Monitoring equipment:	Please refer section 'C' for details of controller meter (LCS).
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly Further all the meters have the capability of continuous measurement of data. Refer section 'C' for an illustration of the provisions for measurement methods.

Calculation method (if applicable):	-
QA/QC procedures:	All the LCS meters are auto calibrated. In case of any fault WEC stops automatically and meter is replaced immediately.
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived in electronic form for crediting period + 2 years.

Data / Parameter:	$\sum EG_{\text{Controller}, i}$
Unit:	MWh (Mega-watt hour)
Description	<p>Summation of net electricity generation (Gross Export-Gross Import) by all WEC (i number of WECs) of project activity (j number of WECs) and non-project activity (k number of WECs), as measured at the controller (LCS meter) at project site, Each WEC has exclusive LCS meter that records net electricity generation (Gross Export-Gross Import) from the WEC (project or non-project).</p> <p>Where,</p> <p>i is any WEC between 1 to j+ k and connected to main meter (JMR/billing meter) at DISCOM substation and backup meter at Enercon substation.</p> <p>j is number of WECs of project activity connected to main meter (JMR/billing meter) at DISCOM substation and backup meter at Enercon substation.</p> <p>k is number of WEC of non-project activity connected to main meter (JMR/billing meter) at DISCOM substation and backup meter at Enercon substation.</p>
Measured/ Calculated / Default:	Calculated
Source of data:	Monthly controller generation report (LCS) sourced from SCADA system installed at project site.
Value(s) of monitored parameter:	Please refer CER calculation sheet.
Monitoring equipment:	Please refer section 'C' for details of controller meter (LCS).
Measuring/ Reading/ Recording frequency:	<p>Frequency of recording data: Monthly</p> <p>Further all the meters have the capability of continuous measurement of data.</p> <p>Refer section 'C' for an illustration of the provisions for measurement methods.</p>
Calculation method (if applicable):	Please refer section 'C' for calculation procedure.
QA/QC procedures:	All the LCS meters are auto calibrated. In case of any fault WEC stops automatically and meter is replaced immediately.
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived in electronic form for crediting period + 2 years.

Data / Parameter:	$\sum EG_{\text{Controller}, j}$
Unit:	MWh (Mega-watt hour)

Description:	Summation of net electricity generation (Gross Export – Gross Import) by all the WECs (j number of WECs) of project activity, as measured at the controller (LCS meter) at project site. Each WEC has exclusive LCS meter that records net electricity generation (Gross Export – Gross Import) from the WEC (project or non -project). j is number of WEC of project activity connected to main meter at DISCOM substation and backup meter at WWIL substation.
Measured/ Calculated / Default:	Calculated
Source of data:	Monthly controller generation report (LCS) sourced from SCADA system installed at project site.
Value(s) of monitored parameter:	Please refer CER calculation sheet.
Monitoring equipment:	Please refer section 'C' for details of controller meter (LCS).
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly Further all the meters have the capability of continuous measurement of data. Refer section 'C' for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	Please refer section 'C' for calculation procedure.
QA/QC procedures:	All the LCS meters are auto calibrated. In case of any fault WEC stops automatically and meter is replaced immediately.
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived in electronic form 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

>>

"The baseline is the quantity of electricity (MWh) produced by the renewable generating unit multiplied by an emission coefficient (measured in t CO_{2e}/MWh) calculated in a transparent and conservative manner as the weighted average emissions (in t CO_{2e}/MWh) as described in registered PDD.

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

Where:

BE_y = Baseline emissions in year y (tCO₂/yr)
 EG_{PJ,y} = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
 EF_{grid,CM,y} = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO₂/MWh)

Baseline emission factor (Combined Margin) (EF_{grid,CM, y}) = 0.94881 tCO_{2e}/MWh.

Since, the project activity is the installation of a new grid connected renewable power plant the EG_{PJ,y} is calculated as :

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

EG_{facility,y} = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

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 _{2e} /MWh)	Baseline Emissions (tCO _{2e})
	[EG _{Export,y}]	[EG _{Import,y}]	[EG _{facility,y}]	[EF _y]	[BE _y] = [EG _{facility,y}] * [EF _y]
01/03/2013 to 31/07/2017	133,056.436	177.753	132,878.683	0.94881	126,076

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.

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
Total	126,076	0	0	0	126,076	126,076

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)
126,076	143,336 ¹⁰ (32,415 p.a. emission reductions estimated in the registered PDD has been extrapolated for the current monitoring period i.e. for 1614 days)

E.6. Remarks on increase in achieved emission reductions

>>

This monitoring period (01/03/2013 to 31/07/2017) covers 53 months i.e. 1614 days and the actual emission reductions achieved for this monitoring period are 126,076 tCO_{2e}. Since, the registered PDD estimated emission reduction annually, therefore emission reductions estimated in the registered PDD (i.e. 32,415tCO_{2e}/annum) has been extrapolated for the current monitoring period i.e. for 1614 days and the extrapolated emission reduction are 143336¹¹ tCO_{2e}. There is marginal change of 12.04% (downside) in the actual & expected annual emission reductions. Since the monitoring period include the low wind season leading to low plant load factor during the monitoring period i.e. 17.45%¹² in comparison to the 19.50% PLF considered at the time of registered PDD which eventually leads to the lower emission reduction as compared to the expected emission reduction.

¹⁰ Detailed Calculation is provided in ER sheet.

¹¹ Detailed Calculation is provided in ER sheet.

¹² Please refer Appendix 4 for the parameters impacting generation of electricity in this monitoring period.(Capacity factor, grid availability, machine availability & low wind hours etc)

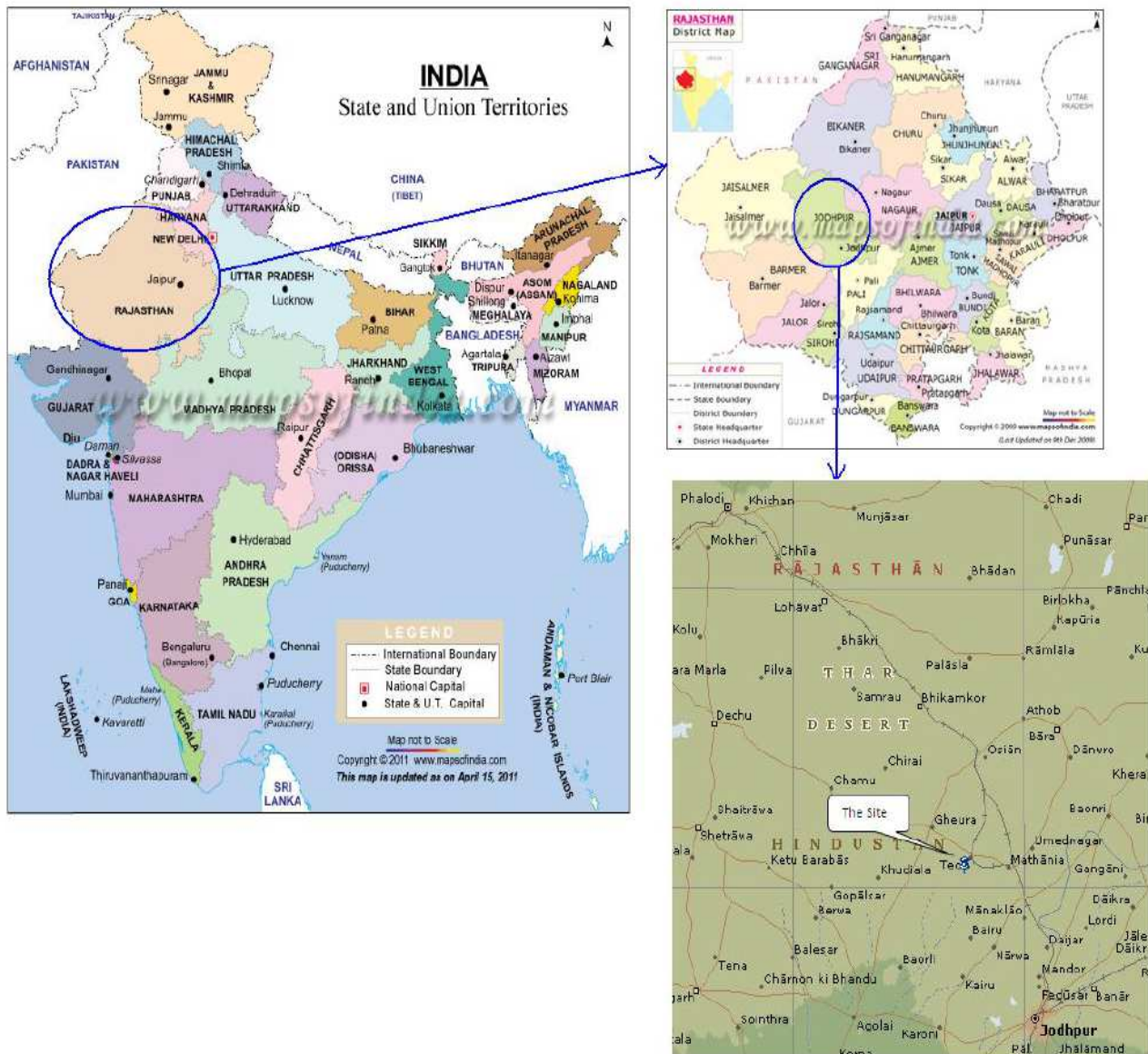
Appendix 1

WECs Technology employed in the project activity:

Turbine model	Enercon E- 53
Rated power	800 KW
Rotor diameter	53 m
Hub height	75 m
Turbine Type	Gearless horizontal axis wind turbine with variable rotor speed
Power regulation	Independent electromechanical pitch system for each blade.
Cut in windspeed	2.5 m/s
Rated wind speed	12 m/s
Cut out Windspeed	28-34 m/s
Extreme Wind Speed	59.5 m/s
Rated rotational speed	32 rpm
Operating range rot. speed	12-29 rpm
Orientation	Upwind
No of Blades	3
Blade Material	Glass Fiber reinforced Epoxy
Gear box type	Gear less
Generator type	Synchronous generator
Braking	Aerodynamic
Output Voltage	400 V
Yaw System	Active yawing with 4 electric yaw drives with brake motor and friction bearing
Tower	74 m concrete

Appendix-2

Project Geographical Location:



Appendix-3

BASELINE INFORMATION

The Operating Margin data for the most recent three years and the Build Margin data for the NEWNE Grid as published in the "CO₂ Baseline Database for Indian Power Sector"¹³, Version 6.0, 1st March, 2011, published by Central Electricity Authority (CEA), Government of India have been used for the estimation of the Baseline Emission. The Operating Margin data for the most recent three years and the Build Margin data for the NEWNE are as follows:

Simple Operating Margin

	NEWNE Grid (tCO₂e/GWh)	Net Generation Total (MWh)
Simple Operating Margin – 2007-08	0.99990	496.119
Simple Operating Margin – 2008-09	1.00655	510.693
Simple Operating Margin – 2009-10	0.97774	544.915
Weighted Average Operating Margin *		0.99431

* Calculated as per Option A, i.e. generation weighted average CO₂ emissions per unit electricity generation has been used

Build Margin

	NEWNE Grid (tCO₂e/GWh)
Build Margin- 2009-10	0.81231

Combined Margin Calculations

	Weights	NEWNE Grid (tCO₂e/GWh)
Operating Margin	0.75	0.99431
Build Margin	0.25	0.81231
Combined Margin		0.94881

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at www.cea.nic.in.

¹³ http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver6.pdf

Appendix-4

WECs Performance Report

State	RAJASTHAN	Performance Report					Date:01/03/2013-31/07/2017		
WEC No.	Lack Of Wind	Down Time					Machine Availability(%)	Capacity Factor (%)	Grid Availability(%)
		Machine		Grid		Total			
		Fault	Shutdown	Fault	Shutdown				
Site: TINWARI,RAJASTHAN	WIND WORLD (WINDFARMS) INDIA LTD							Total WEC : 25	
EILTI-01 (130)	3984:39:00	882:05:00	137:24:00	483:58:00	204:17:00	6218:10:00	97.31	16.35	97.73
EILTI-02 (131)	3525:36:00	1142:47:00	140:38:00	484:23:00	204:47:00	6151:08:00	96.62	18.52	97.73
EILTI-03 (515)	3800:03:00	890:17:00	135:02:00	488:41:00	202:28:00	6045:49:00	97.3	15.34	97.73
EILTI-04 (129)	3578:03:00	911:40:00	133:54:00	476:35:00	199:12:00	5777:45:00	97.25	17.69	97.77
EILTI-05 (516)	3782:36:00	622:04:00	133:44:00	476:25:00	202:25:00	5695:35:00	98.01	16.93	97.76
EILTI-06 (137)	3817:50:00	781:48:00	131:15:00	486:19:00	204:02:00	6163:48:00	97.6	15.97	97.73
EILTI-07 (133)	3618:56:00	802:44:00	122:02:00	486:56:00	200:46:00	5787:00:00	97.56	17.32	97.74
EILTI-08 (134)	3995:30:00	385:50:00	132:26:00	482:57:00	205:08:00	6066:44:00	98.64	16.11	97.73
EILTI-09 (136)	3503:06:00	2779:04:00	135:05:00	464:44:00	202:22:00	8525:22:00	92.32	15.4	97.79
EILTI-10 (517)	3700:22:00	1369:27:00	132:21:00	488:31:00	202:46:00	7058:17:00	96.04	15.43	97.72
EILTI-11 (82)	4108:33:00	373:45:00	140:40:00	134:08:00	169:04:00	5388:41:00	98.65	17.31	98.75
EILTI-12 (83)	4140:32:00	363:54:00	139:23:00	134:08:00	167:55:00	5390:35:00	98.68	18.1	98.75
EILTI-13 (9)	4009:44:00	720:00:00	121:47:00	272:17:00	177:13:00	6193:35:00	97.78	16.85	98.36
EILTI-14 (112)	3606:33:00	1558:23:00	137:04:00	276:43:00	176:34:00	7369:23:00	95.53	16.69	98.4
EILTI-15 (113)	3842:08:00	1626:41:00	123:23:00	260:30:00	176:01:00	6392:54:00	95.39	17.51	98.39
EILTI-16 (114)	2773:03:00	9817:07:00	90:36:00	275:57:00	176:21:00	13828:38	73.92	14.52	98.36
EILTI-17 (115)	2816:45:00	9180:02:00	107:29:00	275:57:00	174:59:00	13945:54	75.55	11.82	98.35
EILTI-18 (116)	3531:23:00	453:24:00	118:47:00	276:27:00	167:09:00	4888:31:00	98.49	18.81	98.37
EILTI-19 (504)	3840:51:00	409:50:00	135:07:00	302:23:00	208:02:00	6090:12:00	98.56	18.16	98.34
EILTI-20 (48)	3938:10:00	472:55:00	122:20:00	330:30:00	208:00:00	5317:27:00	98.43	18.1	98.28
EILTI-21 (49)	3786:40:00	715:30:00	130:30:00	328:50:00	206:33:00	5413:35:00	97.77	20.95	98.29
EILTI-22 (50)	3528:23:00	1012:52:00	129:25:00	328:54:00	200:55:00	5470:01:00	96.99	21.92	98.3

EILTI-23 (51)	2537:43:00	9308:00:00	116:46:00	299:26:00	201:12:00	13405:55	75.18	17.38	98.38
EILTI-24 (53)	3569:00:00	1175:57:00	154:43:00	325:05:00	202:41:00	5662:58:00	96.49	23.59	98.31
EILTI-25 (501)	3488:12:00	3633:48:00	145:39:00	301:06:00	196:21:00	8420:18:00	90.04	19.58	98.39
Total	90824:21	51389:54	3247:30:00	8941:50:00	4837:13:00	176668:15	94.24	17.45	98.14

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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		