Wind Power Project by Rajasthan Gum Private Limited (EKIESL-CDM.September-12-02)

Document Prepared By: EKI Energy Services Limited

Project Title	Wind Power Project by Rajasthan Gum Private Limited (EKIESL-CDM.September-12-02)
Version	02
Report ID	
Date of Issue	22/07/2016
Project ID	UNFCCC project ID: Project 10026
Monitoring Period	28/09/2012 to 04/01/2015 (Both days included)
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Table of Contents

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Title: Wind Power Project by Rajasthan Gum Private Limited (EKIESL-CDM.September-12-02)

CDM Registration Details:

UNFCCC Project ID:- 10026[1]
Registration Date:- 05/01/2015

VCS Monitoring Details:

Version: 01 (1st Periodic Verification)
Monitoring Period: 28/09/2012 to 04/01/2015
Total VCU for this monitoring period:45,533VCUs

Project Activity:

The proposed CDM project activity is the installation of 7 WTGs having total installed capacity of 14.7 MW. The project will generate energy through renewable source i.e. wind which is a clean energy generating technology, replaces anthropogenic emissions of greenhouse gases (GHG's), which is estimated to be approximately 24,923 tCO2e per year, thereon displaces 26,008 MWh amount of electricity from the generation-mix of power plants connected to the NEWNE regional grid, which is mainly dominated by thermal/fossil fuel based power plant.

The technology/ machines have beensupplied by Suzlon Energy Limited, India.

The project with its total capacity of 14.7 MW was commissioned onvarious dates (mentioned in Annexure- I) and the first WTG was commissioned on 28th Sep, 2012.

The project is located at Maharastra and Rajasthan state of India and the project location is depicted in the table below:

Project Promoter's Name	**WTG No.**	**Village**	**Tehsil**	**District**	**State**	**Feeder Location**
Rajasthan Gum Private	JTH-67	Yeldhari	Jath	Sangli	Maharastra	Feeder No. 1
	JTH-	Mendhgiri				Feeder No. 1

[1] http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1408957529.49/view

Limited	152					
	JTH-158					Feeder No. 1
	JTH-183	Jath				Feeder No. 2
	KD- 89	Kanod	Mohan garh-1	Jaisalmer	Rajasthan	Feeder No. 2
	KD- 86					Feeder No. 2
	KD- 84					Feeder No. 2

As per CDM registered PDD, It was estimated that project would be able to export around**26,008 MWh**of electricity (in total) per year to the NEWNE grid. It was also estimated that this project will help to mitigate climate change and lead to greenhouse gas emission reductions of **24,923 tCO_{2e}** for the crediting period of 10 years

1.2 Sectoral Scope and Project Type

Sectoral Scope: Energy Industries (renewable/non-renewable)

Project Type: According to small-scale CDM modalities the project activity falls under:

Type I – Renewable Energy Projects
Category ID – Grid connected renewable electricity generation, (Version 17, EB 61).

The project activity is not a grouped project.The details of wind mills are summarized in Table1 below:

TABLE 1: Details of Wind Turbines

Project Promoter's Name	**WTG No.**	**Site**	**Latitude**	**Longitude**	**Date of Commissioning**
Rajasthan Gum Private Limited	JTH- 67	Jath	N16 59' 28.4"	E75 12' 03.8"	11th Jan 2013
	JTH- 152		N16 58' 26.7"	E75 14' 17.8"	30th Oct 2012
	JTH- 158		N16 58' 50.7"	E75 13' 35.5"	28th Sep 2012

	JTH- 183		N17 03' 09.4"	E75 15' 15.0"	21st Mar 2013
	KD- 89	Kaladunger	N27 09' 38.2"	E71 07' 31.7"	13th Dec 2012
	KD- 86		N27 09' 17.4"	E71 07' 00.1"	24th Dec 2012
	KD- 84		N27 08' 29.2"	E71 05' 54.3"	24th Jan 2013

1.3 Project Proponent

Roles and Responsibilities of the Project Proponents:

- Overall responsibility of implementation of the VCS project
- Daily monitoring and record keeping
- Collection of credit reports

Organization name	Rajasthan Gum Private Limited
Contact person	Mr. Bheru Jain
Title	CEO
Address	S-272/342005 M.I.A II Phase, Jodhpur Rajasthan
Telephone	+91 291-2746192 / 291-2746992
Email	bherujain@rahasthangum.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Contact person	Mr. Manish Dabkara
Title	MD & CEO
Address	Office No. 201, EnKing Embassy Plot No. 48, Scheme No. 78 Part II, Vijay Nagar INDORE – 452001
Telephone	+91-731-4289086
Email	manish@enkingint.org

1.5 Project Start Date

28/09/2012[2] which is the date of commissioning of first WTG of the Project.

1.6 Project Crediting Period

The project crediting period shall be a maximum of ten years which will be renewed at most twice. 28/09/2012 is the start date and 27/09/2022will be the end date of the crediting period.

1.7 Project Location

Host Party : India
Region : Western
State : Maharastra and Rajasthan
District : Sangli and Jaisalmer
Village : Yeldhari and Kanod
Taluka : Jath and Mohangarh

The project is located at Maharastra and Rajasthan state of India and the project location is depicted in the table below:

Project Promoter's Name	**WTG No.**	**Village**	**Tehsil**	**District**	**State**	**Latitude**	**Longitude**
Rajasthan Gum Private Limited	JTH-67	Yeldhari	Jath	Sangli	Maharastra	N16 59' 28.4"	E75 12' 03.8"
	JTH-152	Mendhgiri				N16 58' 26.7"	E75 14' 17.8"
	JTH-158					N16 58' 50.7"	E75 13' 35.5"
	JTH-183	Jath				N17 03' 09.4"	E75 15' 15.0"
	KD- 89	Kanod	Mohangarh-1	Jaisalmer	Rajasthan	N27 09' 38.2"	E71 07' 31.7"
	KD- 86					N27 09' 17.4"	E71 07' 00.1"

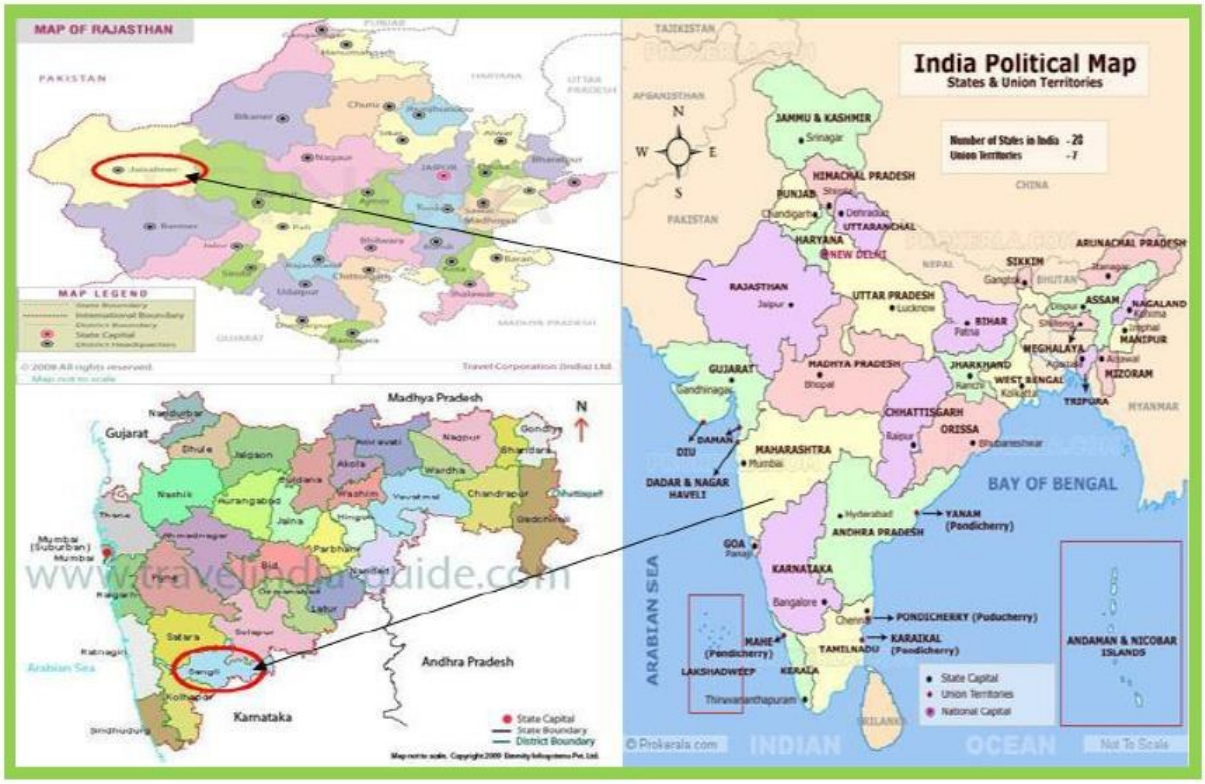
[2] FirstWTGs commissioned on 28/09/2012 and Commissioning Certificate by MSEDCL dated 10/10/2012.

	KD- 84					N27 08' 29.2"	E71 05' 54.3"

Project Boundary:

As per Para 9 of AMS I.D., Version 17, the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

Hence, all the WTG equipments, metering arrangements, connected sub-station & NEWNE grid, along with all the power plants connected to it, constitute the project boundary.



1.8 Title and Reference of Methodology

Title: Grid connected renewable electricity generation

Sectoral Scope: 01-Energy Industries (renewable/non renewable sources)

Type: I-Renewable Energy Projects

Category: D

Reference: AMS.I.D, Version 17, EB 61

Tool to calculate the emission factor for an electricity system, version 04.

The monitoring of Emission Reductions generated by the project follows the same principles that have been adopted for the monitoring of emission reductions under the Clean Development Mechanism.

In accordance with the AMS I.D methodology, the Monitoring shall consist of the metering of electricity generated by renewable technology. As per monitoring plan in the PDD, the data to be monitored is net electricity exported to the grid.

1.9 Other Programs

Project has been registration with UNFCCC under Clean Development Mechanism program, Registration reference number is 10026[3]. Hence PP will be availing carbon credits accrued from the project for the period 05/01/2015 to 04/01/2022 under Clean Development Mechanism.

During the current monitoringperiod, the PP is not availing any form of GHG-related environmental credit, including renewable energy certificates. The project is eligible for CDM mechanism after the current VCS monitoringperiod.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The project activity is in operation since 28/09/2012 (Date of commissioning of first WTG).

No changes / modifications in the plant equipment taken place as on date.

Downtime / Running Hours

The downtime and running hours for the project activity during the monitoring period, along with the dominant causes of shutdown, have been submitted to DOE.

Further detailed Month wise Breakdown for all the WTG's during the current monitoring period has been explained in Annexure- 2.

2.2 Deviations

2.2.1 Methodology Deviations

No Deviations in Methodology from the registered project to actual scenario

2.2.2 Project Description Deviations

Not Applicable.

[3] http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1408957529.49/view

2.3 Grouped Project

Not Applicable.

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3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 Emission factor
Source of data	Calculated from CEA database, Version 08, January 2013
Value applied:	0.9723
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04.0" as 3-year generation weighted average using data for the years 2009-2010, 2010-2011, & 2011 2012. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 8.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of the data	For calculating baseline emissions
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 08, January 2013
Value applied:	0.9164
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04.0" as 3-year generation weighted average using data for the years 2009-2010, 2010-2011, & 2011 2012. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 8.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of the data	For calculating baseline emissions
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor in the year y
Source of data	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04.0" as 3-year generation weighted average using data for the years 2009-2010, 2010-2011, & 2011 2012. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 8.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Value applied:	0.9582
Justification of choice of data or description of measurement methods and procedures applied	Calculated using the CM approach as per "Tool to calculate the emission factor for an electricity system, version 04.0" The data reflects the Combined Margin Emission Factor of the NEWNE Grid for the year 2011-12
Purpose of the data	For calculating baseline emissions
Comments	This parameter is fixed ex-ante for the entire crediting period.

3.2 Data and Parameters Monitored

Data / Parameter	**$EG_{BL,y,RJ}$**
Data unit	MWh/Yr
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh).
Source of data	1) Breakup of Net Export as per Monthly Generation Report and Joint Meter Reading authorized by R.R.V.P.N.L. 2) The quantity of net electricity supplied to the grid (i.e. Net Export in kWh) by the project activity will be taken from the break-up sheet prepared by Suzlon India Limited on the basis of monthly Joint Meter Reading (JMR) certificate certified by Rajasthan Rajya Vidyut Prasaran Nigam Limited (RRVPNL). 3) The value for net electricity supplied to the grid will be cross verified from the monthly invoice raised by the project participant.
Description of measurement methods and procedures to be applied	**Metering at 33 kV/220 kV level:** The electricity generated by the project activity WTG/s is evacuated to the pooling station at 33 kV/220 kV level. The project activity WTG/s along with other WTGs, are connected to the feeder-wise metering point/s, where each metering point consists of both main & check meters. These energy meters (type: tri-vector) are having accuracy class of 0.2s. The joint meter reading is taken on monthly basis at these metering point/s by the representatives of PP

	&State Utility, which records parameters like export, import. The electricity (export and import) for the connected WTG/s is apportioned on monthly basis by the State Utility at 33 kV/220 kV level on the basis of generation ratio at the applicable metering point (ratio of controller reading of connected WTG to the controller reading for all WTGs connected to the applicable metering point) and the electricity (export, import etc) recorded by the energy meters at 33 kV/220 kV GSS on monthly basis. It will give export kWh & import kWh for connected WTG. The net export obtained at 33 kV/220 kV level for any given month for the connected WTG is then obtained by: **Net Export = Export kWh – Import kWh** All these metering points are further connected to the common delivery point at the 220 kV level. **Metering at 220 kV level:** The common metering point at 220 kV GSS concurrently records total electricity (total export and total import) receiving from all connected metering points. The common metering point consists of both main & check meters. These energy meters (type: tri-vector) are having accuracy class of 0.2s. The monthly JMR is taken by the representative of PP & State Utility.
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and monthly recording
Value monitored:	19,501
Monitoring equipment	Energy meters of accuracy class 0.2 s. Accuracy: 0.2 s Archiving policy: Paper & Electronic Calibration: Once in 3 years
QA/QC procedures to be applied	• The energy meter reading are taken on monthly basis • Energy meters will be calibrated once in a three year and faulty meters will be duly replaced immediately. List of calibration for the meters under the project are provided under section 3.4 below. • All the energy meters are under the control of state utility and calibration/testing of energy meters is also under the jurisdiction of state utility. • The Net electricity exported to the grid will be cross checked against the invoice raised by the PP towards the DISCOM The calibration details for the project are mentioned under section 3.4.
Purpose of the data	For Baseline calculations

Calculation method	O&M contractor apportioned the electricity export and import data based on individual WEGs controller reading, summation of all controller reading of WEGs connected under the common feeder and joint meter reading (based on billing meter) and provide month wise "Credit subdivision of Energy "which contains electricity export, import and net export by the project WEGs.
Comments	The data will be archived both in electronic and paper format for crediting period + 2 years. In case the monitoring period and the billing cycle date do not match, then a conservative approach will be adopted to monitor/calculate the net electricity supplied to the grid. For this purpose, the net electricity exported for that particular month, is being multiplied with the ratio of export value for the days covered in current monitoring to total export value taken at controller end, and will be subtracted from total electricity import of that particular month for obtaining net electricity export, hence it is conservative approach.

Data / Parameter	$EG_{BL,y,MH}$
Data unit	MWh/Yr
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh).
Source of data	Credit Report as per monthly generation report.
Description of measurement methods and procedures to be applied	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: Annually Electricity exported to the grid is in kWh. However for the calculation purpose electricity exported is converted in MWh.
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and monthly recording
Value monitored:	28,000
Monitoring equipment	Energy meters of accuracy class 0.2 s. Accuracy: 0.2 s Archiving policy: Paper & Electronic Calibration: Once in 3 years

QA/QC procedures to be applied	Annual calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The meters will be of accuracy class 0.2. The calibration details for the project are mentioned under section 3.4.
Purpose of the data	For Baseline calculations
Calculation method	O&M contractor apportioned the electricity export and import data based on individual WEGs controller reading, summation of all controller reading of WEGs connected under the common feeder and joint meter reading (based on billing meter) and provide month wise "Credit subdivision of Energy "which contains electricity export, import and net export by the project WEGs.
Comments	The data will be archived both in electronic and paper format for crediting period + 2 years. In case the monitoring period and the billing cycle date do not match, then a conservative approach will be adopted to monitor/calculate the net electricity supplied to the grid. For this purpose, the net electricity exported for that particular month, is being multiplied with the ratio of export value for the days covered in current monitoring to total export value taken at controller end, and will be subtracted from total electricity import of that particular month for obtaining net electricity export, hence it is conservative approach.

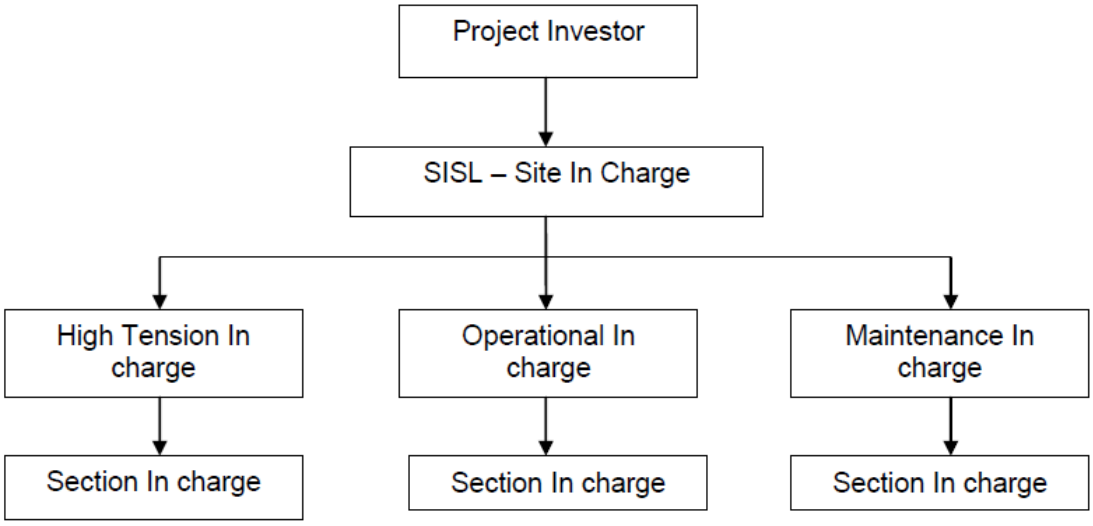
3.3 Monitoring Plan

Organisational Structure for data recording and monitoring

Monitoring Plan at Rajasthan State

A detailed description of metering measurements methods procedures to be applied to the project activity has been well incorporated in section B.7.1, favouring Rajasthan-sites.

The organizational hierarchy of Project Proponent & Suzlon Infrastructure Services Ltd. (SISL) Project management is as follows:



Monitoring Plan:

QA/QC Procedures:

The main and backup meter installed at connected substations for monitoring of the project activity are electronic tri-vector energy meters of 0.2 accuracy class. Each meter is jointly inspected and sealed on behalf of project proponent and RRVPNL, in the presence of its authorized representatives. All main and backup meter are calibrated annually by RRVPNL or its representatives.

Description of calibration of WTG Controller

The controller used for the WTGs which is an SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multifunction Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current / voltage is converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed / stored. Woodward relay is having no display and needs special protocol to view energy readings as this relay is communicating digital signal through special communication protocol. Moreover, turbine cannot run without this relay hence it cannot be removed for calibration, hence, it is not possible to calibrate.

Data Management and Data Archiving:

Copies of the break-up sheet, invoices raised on Discom and sales receipts will be retained and archived for the entire crediting period plus two years by the project proponent.

Procedures for Data Adjustments/Uncertainties:

Data uncertainty in the project activity monitoring could occur under the following circumstances:

1. During the monthly joint meter reading at connected substations, the reading of the main meter and backup meter are cross checked to insure that the meters are working within the permissible limit. If during the cross checking the reading is found to be outside the permissible limit of

accuracy, then calibration is done to identify the meter with the error and the faulty meter is replaced immediately. The meter reading for that month is to be taken from the correct meter.
2. During the monthly joint meter reading at the connected substations, if the display defect is in the main meter than in that case the backup meter reading are considered for the purpose of preparation of the break-up sheet and billing purpose. Defective main meter will be replaced immediately.
3. During the monthly joint meter reading at the connected substation, if the display defect is in the check meter than in that case the main meter reading are considered for the purpose of preparation of the break-up sheet and billing purpose. Defective check meter will be replaced immediately.
4. If during the annual calibration of the meters at the connected substations, the main meter is found to be outside the permissible limit of accuracy and if the main meter reading have been used to prepare the break-up sheet, then the identified error would be applied to all the measured value since the date of last calibration. Further the main meter would be replaced immediate.
5. If during the annual calibration of the meters the connected substations, the check meter is found to be outside the permissible limit of accuracy and if the check meter reading have been used to prepare the break-up sheet, then the identified error would be applied to all the measured value since the date of last calibration. Further the check meter would be replaced immediate.

Procedure for data apportioning:

Apportioning of net electricity generation from each WTG located at Rajasthan determined by SEB is as follows:

The apportioning of the electricity is the responsibility of the State Utility. The sample apportioning procedure adopted for any given WTG for any given month is given below:

Generation Ratio at metering point (33 kV/220 kV level GSS): The generation ratio is the ratio of electricity generated by installed WTG of PP to the total generation by all the connected WTGs to the applicable metering point.

$$GR_{, metering\ point} = EG_{Controller, WTG} / EG_{Controller, metering\ point} \quad (a)$$

Where,
$GR_{, metering\ point}$: Generation Ratio at metering point
$EG_{Controller, WTG}$: Electricity generated by installed WTG of PP connected to the applicable metering point
$EG_{Controller, metering\ point}$: Total generation by all the connected WTGs to the applicable metering point

Calculation of net electricity exported at applicable metering point:

The Main and Check meters at the applicable metering point measure a number of parameters including export and import for all the connected WTGs.

The import, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{Import, metering\ point} = GR_{, metering\ point} \times EG_{Total\ Import, metering\ point} \quad (b)$$

Where,
EG Import, metering point: Import, kWh by the WTG at the metering point
GR, metering point: Generation Ratio at metering point
EG Total Import, metering point: Total Import, kWh by all the WTGs at the metering point

The export, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{Export,\ metering\ point} = G_{R,\ metering\ point} \times EG_{Total\ Export,\ metering\ point} \quad (c)$$

Where,
EG Export, metering point: Export, kWh by the WTG at the metering point
GR, metering point: Generation Ratio at metering point
EG Total Export, metering point: Total Export, kWh by all the WTGs at the metering point

The net electricity exported by the WTG at the 33 kV/220 kV level metering point is calculated by subtracting equation (b) from (c).

Thus, the net electricity exported at 33 kV/220 kV level metering point:

$$= EG_{Export,\ metering\ point} - EG_{Import,\ metering\ point} \quad (d)$$

Transmission Loss Calculation:

The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of export for all metering points at 33/220 kV level and the total reading of export for same metering points recorded at the 220 kV level. Similarly transmission loss occurred during import of the electricity is also calculated.

The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the Generation Ratio at common delivery point.

Generation Ratio at common delivery point:

It is the ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point.

$$G_{R,\ Common\ Delivery\ Point} = EG_{Controller,\ WTG}/EG_{Controller,\ Common\ Delivery\ Point} \quad (e)$$

Where,

$G_{R,\ Common\ Delivery\ Point}$: EG Controller, Common Delivery Point
$EG_{Controller,\ WTG}$: Electricity generated by installed WTG
$EG_{Controller,\ Common\ Delivery\ Point}$: Total generation by all the connected WTGs/ or connected metering points under common delivery point

Calculation of net electricity delivered to the Grid:

The values of transmission loss during export & import for the given WTG are subtracting from EG Export, metering point & EG Import, metering point respectively to get the values of export and import respectively for the given month.
The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export.

Thus,
= Export – Import (f)

These apportioned values viz., import, export and net export kWh can be referred from the Monthly Break up of net export units report.

Monitoring Plan at Maharashtra State

For Maharashtra Site – Following section includes –

1. Monitoring Methods and Procedures
2. QA/QC procedures
3. Data uncertainties and adjustments

For WTG in the project activity, the MSEDCL would report net electricity exported and imported from the grid. The net electricity supplied to the grid would be reported as the difference between the net export and import from the WTG. The electricity export and import data will be monitored via main and check meters connected to feeders at the respective sub-station. Multiple WTGs would be connected to each feeder, one of which would be part of the project activity (WTGs owned by Rajasthan Gum Private Limited) and rest of which would not be part of the project activity (WTGs owned by other entities). MSEDCL follows an apportioning procedure to account for electricity generation from individual WTGs based on data from individual WTG controllers. The electricity exported and imported from the grid is recorded on a monthly basis, jointly in the presence of Investor representatives (O&M Contractors) and MSEDCL personnel. Following the joint meter readings, the O&M Contractors provide the readings of the WTG controller to MSEDCL. Based on the monthly export and import data as per main/check meters and the WTG controller readings, MSEDCL provides a break-up of the electricity exported and imported for each WTG.

The net electricity generation from each WTG is determined by MSEDCL as follows:

$$\text{Export from WTG} = \frac{\text{Generation at WTG controller}}{\text{Total generation at all WTG controllers for the feeder}} \times \text{Export from MSEDCL main/check meter}$$

$$\text{Import from WTG} = \frac{\text{Generation at WTG controller}}{\text{Total generation at all WTG controllers for the feeder}} \times \text{Import from MSEDCL main/check meter}$$

The above calculations would be carried out solely by MSEDCL and only the final apportioned electricity export, import, and net export for each WTG would be reported by MSEDCL in the Credit Notes. The details of the joint meter readings are not reported in the credit notes issued by MSEDCL.

A monthly joint meter reading of the energy meters would be carried out by MSEDCL officials and O&M contractors (representatives of the project promoter).

Procedures to deal with Data Uncertainty

Main and check meters for the project activity are of at least 0.2 accuracy class. Accuracy tests will be carried out at least once every year to ensure that the meters are working within their accuracy class. In addition to this, on a monthly basis main meter and check meter readings would be noted by representatives of the project promoter. To check that both meters are working within their accuracy class, the electricity export measured by the main meter and the electricity export measured by the check meter would be compared. If the difference between the two values is greater than 0.2% (sum of accuracy class of the two meters), it would be established that one or both of the meters is giving erroneous readings. In such a scenario, MSEDCL would be notified and requested to check the accuracy of both the main and check meter. The erroneous meter(s) would be identified and calibrated or replaced. The following actions would be carried out for determination of emission reductions:

i. By default main meter readings are considered in the credit notes and for emission reduction calculations. If the main meter is found to be erroneous, the check meter readings would be used in the credit notes and for emission reduction calculations. The main meter would be calibrated or replaced with a new calibrated energy meter.

ii. If the check meter is found to be erroneous, the main meter readings would by default be considered. The check meter would be calibrated or replaced with a new calibrated energy meter.

iii. If both meters are found to be erroneous, and then emission reductions will be adjusted in a conservative manner to account for the error percentage reported for the respective period. Both energy meters would be calibrated or replaced with new calibrated energy meters.

Difference between Accuracy Tests and Calibration

Accuracy tests will be conducted by MSEDCL personnel on the main and check energy meters at least once every year. The accuracy tests will be carried out using a standard portable meter to verify that the error percentage in the main and check meters is within the permissible limit. Calibration is conducted by MSEDCL personnel in case the error in the main or check meter is found to be beyond the permissible limit. In such a scenario, the erroneous meter may be replaced with a new calibrated energy meter.

Description of calibration of WTG Controller

The controller used for the WTGs which is an SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multifunction Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current / voltage is converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed / stored. Woodward relay is having no display and needs special protocol to view energy readings as this relay is communicating digital signal through special communication protocol. Moreover, turbine cannot run without this relay hence it cannot be removed for calibration, hence, it is not possible to calibrate.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Formula used to calculate the net emission reduction for the project activity is

$ER_Y = BE_Y – PE_Y – LE_Y$

Where,
ER_Y = Emission Reduction in tCO_2/year
BE_Y = Baseline emission in tCO_2/year
PE_Y = Project emissions in tCO_2/year
LE_Y = Leakage Emissions in tCO_2/year

Baseline Emission (BEY)

The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$BE_Y = EG_{BL,y} * EF_{CO2,grid,y}$

Where,

$EG_{BL,y}$ = Total quantity of net electricity delivered to the NEWNE grid

$EF_{CO2,grid,y}$ = Baseline emission factor

= 0.9583 tCO_2/MWh

BE_y = 26,008* 0.9583

= 24,923

Since $ER_y = BE_y$

Therefore ER_y = 24,923

Month	Net Electricity Export from Jath Site (in MWh)	Net Electricity Export from Jaisalmer Site (MWh)	Total Net Electricity Export by the Project (MWh)
September/2012	0.51	-	0.51
October/2012	158.06	-	158.06
November/2012	284.41	-	284.41
December/2012	196.27	145	340.81
January/2013	393.05	254	647.18
February/2013	393.48	583	976.39
March/2013	494.35	568	1,062.27
April/2013	575.09	698	1,272.65
May/2013	1,330.80	1,171	2,502.18
June/2013	2,334.73	1,206	3,541.14
July/2013	2,939.02	1,333	4,271.70
August/2013	1,945.78	1,108	3,054.25
September/2013	981.71	856	1,837.28
October/2013	716.43	426	1,142.77
November/2013	707.72	304	1,011.39
December/2013	905.69	315	1,220.49

January/2014	680.19	595	1,275.14
February/2014	417.69	556	973.48
March/2014	1,167.40	554	1,721.76
April/2014	641.63	451	1,092.45
May/2014	979.75	602	1,582.10
June/2014	2,379.67	2,148	4,527.43
July/2014	2,679.15	1,625	4,303.81
August/2014	1,740.84	1,366	3,107.19
September/2014	1,385.60	1,300	2,685.85
October/2014	522.94	563	1,086.20
November/2014	489.28	321	810.50
December/2014	535.77	356	891.40
January/2015	37.96	97	134.61
Total	**28,014.96**	**19501**	**47515.46**

4.2 Project Emissions

The project activity is a wind energy project. There are no anthropogenic emissions by sources of GHGs in the equipments/ technology involved as a whole as a result of the project activity.

Thus, PEy = 0

4.3 Leakage

The project activity is a wind energy project. There are no leakage emissions involved as a whole as a result of the project activity.

Thus, LEy = 0

4.4 NetGHG Emission Reductions and Removals

Vintage wise Emission Reductions are as follows:

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
28/09/2012 to	751	0	0	751

31/12/2012				
01/01/2013 to 31/12/2013	21,599	0	0	21,599
01/01/2014 to 31/12/2014	23,054	0	0	23,054
01/01/2015 to 04/01/2015	129	0	0	129
Total	45,533	0	0	45,533

APPENDIX 1

Calibration Details

S.N	HTC No	Project Proponent	Main Meter No and Check Meter no Accuracy class	Make	Calibration date	Remarks
1.	WEG-Feeder- 1 (Jath)	Rajasthan Gums Pvt. Ltd	Main Meter no: 13813605 0.2 s Check Meter no: 13813606 0.2 s	Elster A1800 Elster A1800 Elster A1800	01/06/2013 01/06/2013	Replacement of CT due to change in CT Ratio Meter calibration report mentioned that meters were running satisfactorily.
2.	WEG-Feeder- 2 (Jath)	Rajasthan Gums Pvt. Ltd	Main Meter no: 14953584 0.2 s Check Meter no: 14953585 0.2 s	Elster A1800	01/06/2013 18/11/2013	Replacement of CT due to change in CT Ratio Meter calibration report mentioned that meters were running satisfactorily. Meter was found “Hanged” hence, it was replaced by meter Make- Elster, Sr No. 16268014.
3.	WEG-Feeder- 1 (Jath)	Rajasthan Gums Pvt. Ltd	Main Meter no: 13813605	Elster A1800	11/06/2014	The errors of meter was found to be within permissible limit as per the accuracy

			0.2 s Check Meter no: 13813606 0.2 s	Elster A1800	11/06/2014	class.
4.	WEG-Feeder- 2 (Jath)	Rajasthan Gums Pvt. Ltd	Main Meter no: 14953584 0.2 s Check Meter no: 16268014 0.2 s	Elster A1800 Elster A1800	11/06/2014 11/06/2014	The errors of meter was found to be within permissible limit as per the accuracy class.
5.	132 KV (Kaladungar) 33 KV (Kaladungar)	Rajasthan Gums Pvt. Ltd	Main Meter no: UPP31771 0.2 s Check Meter no: UPP31772 0.2 s Main Meter no: UPP31769	Secure Secure Secure	Calibration Test done by C & I Systems on 13/12/2012 for meters installed during commissioning Calibration Test done by C & I	Meter calibration report mentioned that meters were running satisfactorily

			0.2 s Check Meter no: UPP31770 0.2 s	Secure	Systems on 13/12/2012	
6.	132 KV (Kaladungar) 33 KV (Kaladungar)	Rajasthan Gums Pvt. Ltd	Main Meter no: UPP31771 0.2 s Check Meter no: UPP31772 0.2 s Main Meter no: UPP31769 0.2 s Check Meter no: UPP31770 0.2 s	Secure Secure Secure Secure	Calibration Test done by Yadav Measurements Pvt. Ltd on 17/01/2014 Calibration Test done by Yadav Measurements Pvt. Ltd on 18/01/2014	Meter calibration report mentioned that meters were running satisfactorily

7.	132 KV (Kaladungar) 33 KV (Kaladungar)	Rajasthan Gums Pvt. Ltd	Main Meter no: UPP31771 0.2 s Check Meter no: UPP31772 0.2 s Main Meter no: UPP31769 0.2 s Check Meter no: UPP31770 0.2 s	Secure Secure Secure Secure	Calibration Test done by C & I Systems on 25/12/2014 Calibration Test done by C & I Systems on 26/12/2014	Meter calibration report mentioned that meters were running satisfactorily

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Meters at Jath, Maharastra should have been calibrated on 01/06/2014, but PP has carried out calibration on 11/06/2014 and the meters have been working satisfactorily. Likewise delay in Calibration is observed for Kaladundar, Rajasthan site. Hence maximum permissible error factor has been applied for those particular months, as per the accuracy class of the meters in order to retain conservativeness.

APPENDIX 2

Breakdown Details

Location: Jath, Site, Maharashtra

Month	Breakdown Hrs.
Sep-12	71.50
Oct-12	435.30
Nov-12	214.60
Dec-12	99.29
Jan-13	233.90
Feb-13	626.80
Mar-13	508.40
Apr-13	1153.00
May-13	285.70
Jun-13	438.80
Jul-13	196.00
Aug-13	690.20
Sep-13	561.10
Oct-13	158.30
Nov-13	76.60
Dec-13	375.50
Jan-14	42.30
Feb-14	611.30
Mar-14	545.80
Apr-14	143.80
May-14	136.50
Jun-14	175.20
Jul-14	415.20
Aug-14	51.10
Sep-14	84.70
Oct-14	66.30
Nov-14	37.70
Dec-14	57.90
Jan 15	18.10

Total	8510.89

Location: Kaladungar Site,Rajasthan

Month	Breakdown Hrs.
Dec-12	154.80
Jan-13	394.00
Feb-13	431.00
Mar-13	217.60
Apr-13	269.50
May-13	369.70
Jun-13	817.90
Jul-13	106.40
Aug-13	93.80
Sep-13	389.00
Oct-13	234.40
Nov-13	142.90
Dec-13	251.10
Jan-14	74.70
Feb-14	34.40
Mar-14	168.00
Apr-14	111.80
May-14	329.20
Jun-14	147.50
Jul-14	93.60
Aug-14	45.70
Sep-14	15.60
Oct-14	64.10
Nov-14	99.50
Dec-14	46.20
Jan-15	4.20
Total	5106.6