

15 MW WIND ENERGY FARM AT GOPALPURA, KARNATAKA BY HZL

Document Prepared By
Hindustan Zinc Limited

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1 PROJECT DETAILS

1.1 Summary Description of Project

Hindustan Zinc Ltd. (HZL), a vertically integrated natural resources enterprise, headquartered at Udaipur, Rajasthan having broad operations ranging from exploration, mining, ore processing to smelting of non-ferrous metals is the owner and project proponent of the proposed project activity.

The project activity primarily aims at reducing Green House Gas (GHG) emissions through utilization of renewable energy technology for generation of electrical energy. The electricity generated from the project activity (approximately 34,821 MWh annually) will displace equivalent electricity generation in grid connected power plants. The project activity will reduce the anthropogenic GHG emissions (approximately 31,875 tCO₂ annually) associated with the equivalent amount of electricity generation from the fossil fuel based grid connected power plants.

The project activity involves installation and operation of ten Suzlon make 1.5 MW Wind Electric Generators (WTGs) by Hindustan Zinc Limited (HZL) in the state of Karnataka. All the WTGs are commissioned on 31st March 2011 and 21 May 2011. The cumulative capacity of the project activity is 15 MW. The electricity generated from the project activity exported to regional Grid.

The technology employed by the project activity converts kinetic energy in wind to mechanical energy and mechanical energy to electrical energy using wind turbine generators (WTGs). In this process, there are no greenhouse gas emissions or burning of any fossil fuels. The electricity is generated through sustainable means without causing any negative effect to the environment and therefore the technology is environmentally safe and sound.

Wind turbines produce electricity by using the natural power of wind to drive a generator. Wind has considerable amount of kinetic energy when blowing at high speeds. When this kinetic energy passes through the blades of the wind turbines, it is converted into mechanical energy and rotates the wind blades. When the wind blades rotate, the connected generator also rotates, thereby producing electricity. The Project activity envisages installation of WTGs of S-80 Suzlon make (1500 kW WTGs). The WTGs generate 3-phase power at 690V, which is stepped up to 33 KV. The project can operate in the frequency range of 46–54 Hz and in the voltage range of 690 V $\pm$ 20%.

1.2 Sectoral Scope and Project Type

Sectoral Scope – Energy Industries (renewable/non-renewable sources).

Project Type: Renewable Energy projects

Project activity is not a grouped project activity.

1.3 Project Proponent

Organization name	Hindustan Zinc Limited
Contact person	Mr. Bhagwan Lal Ahuja
Title	AGM (CDM Cell)

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1.4 Other Entities Involved in the Project

No other entities other than Hindustan Zinc Limited are involved. Please ref link

<http://cdm.unfccc.int/Projects/DB/DNV-CUK1353404982.34/view>

1.5 Project Start Date

31/03/2011, date of commissioning of first WTG

1.6 Project Crediting Period

Project activity has Renewable crediting period of 21 years for the CDM project.

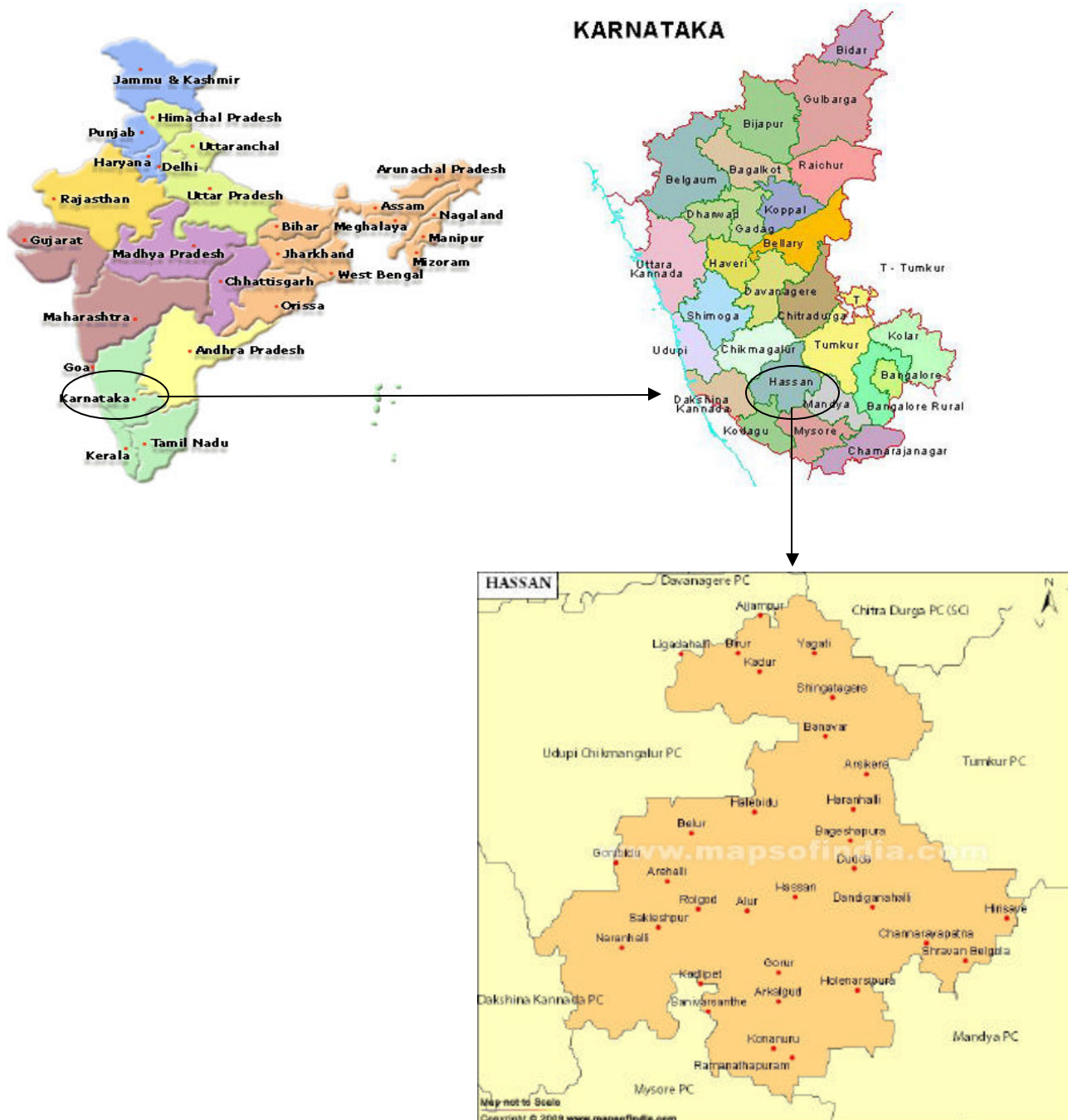
Start date of crediting period for VCS verification: 31/03/2011 (Date of commissioning of first WTG)

End date of crediting period for VCS verification: 30/11/2012 (Date one day prior to the start date of crediting period of CDM project activity)

1.7 Project Location

Details of the location of the project activity:

Sr. No.	WTG. No.	Latitude	Longitude
1	GP-02	N12° 57' 25.1"	E76° 17' 29.0"
2	GP-03	N12° 57' 10.2"	E76° 17' 28.5"
3	GP-04	N12° 57' 02.4"	E76° 17' 26.4"
4	GP-17	N12° 55' 11.6"	E76° 17' 13.6"
5	GP-23	N12° 54' 15.6"	E76° 16' 49.0"
6	GP-24	N12° 54' 07.5"	E76° 16' 48.7"
7	GP-28	N12° 53' 35.1"	E76° 16' 47.0"
8	GP-29	N12° 53' 27.1"	E76° 16' 47.0"
9	GP-30	N12° 53' 19.2"	E76° 16' 46.4"
10	GP-31	N12° 53' 11.1"	E76° 16' 46.0"



1.8 Title and Reference of Methodology

Title of the baseline methodology: "Grid connected renewable electricity generation".

Reference: AMS I D, Version 17, EB 61

1.9 Other Programs

Emissions Trading Programs and Other Binding Limits

The requirement of the VCS Monitoring Report pertaining to this section has been address as follow as:

Where projects reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading, evidence shall be provided that the GHG emission reductions or removals generated by the project have not and will not be otherwise counted or used under the program or mechanism. Such evidence may include:

- 1) A letter from the program operator designated national authority or other relevant regulatory authority that emissions allowances (or other GHG credits used in the program) equivalent to the reductions or removals generated by the project have been cancelled from the program or national cap, as applicable.
- 2) Evidence of the purchase and cancellation of GHG allowances equivalent to the GHG emissions reductions or removals generated by the project related to the program or national cap.
- 3) Evidence from the program operator, designated national authority or other relevant regulatory authority stating that the specific GHG emission reductions or removals generated by the project or type of project are not within the scope of the program or national cap.

The host country of the project activity is India, which is a non-annex country as recognized by Kyoto protocol. Hence, there are no GHG emission targets or commitment for India and it does not fall under view of any compliance driven emission trading programs. Furthermore, there are also no such voluntary emission trading programs similar to the VCS existing in the country. It confirms that, there is no emission trading programs prevalent in the host country at the time of preparation of VCS Monitoring Report.

India is Non-annex country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity.

This project activity is voluntary initiative of Hindustan Zinc Limited and it is not to meet any local laws or regulatory compliances.

Hindustan Zinc Limited will not claim for GHG emission reduction credits for the given period under any other emission trading program.

Other Forms of Environmental Credit

The project activity generates Carbon Credits under Clean Development Mechanism (Ref.No:8303) from 01/12/2012 ; however the VCUs that are claimed are from the date of commissioning till 30 /11/2012 since, the project is registered on 26/11/2012 but the crediting period under CDM starts only on 01/12/2012. We hereby confirm that the project activity does not result in creation of another form of environmental credit during the period for which VCUs are claimed.

Participation under Other GHG Programs

This is registered CDM project. The reference no. for the project is 8303 and it was registered on 26th November 2012. Please refer to the registered PDD. The web link for the same is mentioned below:
<http://cdm.unfccc.int/Projects/DB/DNV-CUK1353404982.34/view>

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The first 8 machine under the project activity was commissioned on 31 March 2011 and other two machines under the project activity was commissioned on 21 May 2011.

The project activity consist of 10 Machines of Suzlon make each having capacity of 1.5 MW. Hence the total capacity of the project is 15 MW.

Project Start date is 31/03/2011 (commissioning date of first WTG)

Details of the project activity are as follows;

LOCATION No	Date of commissioning	Capacity (MW)
GP-2,3,4,17,23,24,28,31	31/03/2011	12 MW
GP-29,30	21/05/2011	3 MW

The WTGs generate 3-phase power at 690V, which is stepped up to 33 KV. The project can operate in the frequency range of 46–54 Hz and in the voltage range of 690 V $\pm$ 20%. Average life of the WTG is around 20 years as per the information provided by supplier. The silent features of the technology are:

WTG (S82 , 1.5 MW, 50 Hz) TECHNICAL DATA

Rated capacity : 1500 kW
Rotor diameter : 82 m
Hub height : 78.5 m

Rotor with Pitch Control

Type : Upwind rotor with active pitch control
Number of blades : 3
Swept area: 5281 m²
Blade material : The rotor blades are made epoxy bonded fibre glass
Rotor speed : 16.30 rpm
Tip speed : 70 m/s

Generator

Type: Single fed Induction Generator with slip-rings, variable rotor resistance with Suzlon –flexi-slip control system.

Hub : Cast spherical hub
Bearings : Spherical roller bearing
Tower : Steel Tubular, 76 m height

The project has supplied 45189.82 MWh electricity to the grid in the monitoring period which indicated that the project has performed reasonably well during the monitoring period.

The project promoter signed operation and maintenance agreements with the O & M contractor of the wind turbines. The performance of the turbines, safety in operation and scheduled / breakdown maintenances is the responsibility of O & M contractor and are organized and monitored by them, hence

the authority and responsibility of project management on site lies with the O & M contractor will maintains all the data / records for the project monitoring. Suzlon is the O&M contractor for the project activity. During the monitoring period no such events or situations occurred which will cause impact on the actual operation of the project activity.

During the monitoring period (31/03/2011- 30/11/2012) the project activity was operated and monitored in accordance with the applicable baseline and monitoring methodology AMS I D, Version 17 and registered PDD.

All the WTGs are in operation and No abnormal circumstance occurred during this monitoring period. Suzlon operation and maintenance activities are ISO 9001:2008 certified and all the events are recorded in the log book available at the project site. As a part of regular maintenance the machines are stopped for mechanical and electrical maintenance.

As per the VCS guidelines 'if the energy generating equipment is transferred from another activity, leakage is to be considered'. In the project activity, there is no transfer of energy generating equipment and therefore the leakage from the project activity is considered as zero
There are no changes like project proponent or other entities during the monitoring period.

2.2 Deviations

2.2.1 Methodology Deviations

There is no methodology deviation involved in the monitoring plan.

2.2.2 Project Description Deviations

According to point 2 of para 3.6.1 of the VCS Standard Version 3.4, 'Where the deviation does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario, and the project remains in compliance with the applied methodology, the deviation shall be described and justified in the monitoring report. This shall include a description of when the changes occurred and the reasons for the changes.'

As per registered project description, all meters should be calibrated annually. However, in this monitoring period, calibration frequency of the meters is not maintained annually. There was a delay in year 2012 for the metering points GP17, GP23 and GP31. Hence, according to point 2 of para 3.6.1 of VCS standards Version 3.4, it is considered as deviation in the project description.

As per para 253 section 9.5.1 of the CDM validation and verification standard Version 05.0, PP is supposed to apply conservative assumptions or discount factor to the calculation extent required to ensure that emission reductions will not be over-estimated as a result of the deviation. PP has considered this point while preparing monitoring report. Using section 3.3.4 of VCS Validation and Verification Manual, version 3.1 and para 238 under 9.4.4.2 of the CDM validation and verification standard Version 05.0, PP has applied an error equivalent to the accuracy class of the meter for the months of the year 2012 for the metering points GP17, GP23 and GP31 where there was a delay in calibration. It is because the meters were working within the permissible limit as per the calibration certificates.

This is a project description deviation. However, as per 3.6.1.2 of VCS standard 3.4, this deviation is not impacting the applicability of the methodology, additionality or the appropriateness of the baseline scenario, and the project remains in compliance with the applied methodology. This deviation is also specifically related to this monitoring period and will not impact the subsequent monitoring periods.

2.3 Grouped Project

There is no grouping involved in the project activity.

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 emission factor for Southern grid
Source of data:	Referred from CO ₂ Baseline Database for the Indian Power Sector prepared by Central Electricity Authority Version 6.0.
Value applied:	0.9661 tCO ₂ /MWh
Justification of choice of data or description of measurement methods and procedures applied	The operating margin emission factor has been published by CEA in accordance with the 'Tool to calculate the emission factor for an electricity system.' The option of ex ante calculation based on Simple Operating Margin Method have been applied using three years vintage data (2007-08, 2008-09 and 2009-10).
Purpose of the data:	Baseline calculations
comments:	This value is determined ex-ante and will be fixed for the crediting period.

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO ₂ /MWh
Description:	Build Margin emission factor for NEWNE grid
Source of data:	Referred from CO ₂ Baseline Database for the Indian Power Sector prepared by Central Electricity Authority Version 6.0.
Value applied:	0.7634 tCO ₂ /MWh
Justification of choice of data or description of measurement methods and procedures applied	The build margin emission factor has been published by CEA in accordance with the 'Tool to calculate the emission factor for an electricity system.' The build margin is calculated as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation. The build margin has been taken corresponding to the year 2009-10, the latest year for which data is available
Purpose of the data:	Baseline calculations

comments:	This value is determined ex-ante and will be fixed for the crediting period
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Data / Parameter:	$EF_{grid,CM,y}/EF_{CO2,grid,y}$
Data unit:	tCO ₂ /MWh
Description:	Combined Margin CO ₂ emission factor for Southern grid
Source of data:	Estimated figure based on 75% of OM and 25% of BM values
Value applied:	0.9154 tCO ₂ /MWh
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emission factor has been determined based on data published by the CEA, applying a 75% weightage for $EF_{grid,OM,y}$ and 25% for $EF_{grid,BM,y}$ in accordance with the 'Tool to calculate the emission factor for an electricity system.'
Purpose of the data:	Baseline calculations
comments:	This value is determined ex-ante and will be fixed for the crediting period

3.2 Data and Parameters Monitored

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh/annum
Description:	Net Electricity supplied to the grid by the project activity in year y
Source of data:	Joint Meter Reading statements
Description of measurement methods and procedures to be applied:	For measurement of electricity exported and imported, electronic trivector energy meters of accuracy class 0.2 has been installed. The details metering measurement are also elaborated in section 3.3 below
Frequency of monitoring/recording:	Measured: Continuously Reporting Frequency: Monthly (Calculated)
Value monitored:	45 173.779 MWh

Monitoring equipment:	Sr.No	Metering Point	Connected WTGs
	1	GP04	GP02,GP03 & GP04
	2	GP17	GP17
	3	GP23	GP23 & GP24
	4	GP31	GP28,GP29,GP30 & GP31
QA/QC procedures to be applied:	The values of electricity export, import, and transmission loss would be cross-verified from the Pro Forma Invoices (statements on payment towards power purchased). QA/QC procedures are described in detail under section 3.3		
Purpose of the data	Calculation of baseline emissions		
Calculation method:	The net electricity supplied to the grid calculated as: $EG_{BL,y} = EG_{EXP,y} - (1+15\%) EG_{IMP,y} - EG_{TL,y}$ The WTGs generate 3-phase power at 690V, which is stepped up to 33 KV. On a monthly basis, joint meter readings (JMRs) of the energy meters at 33kV metering points taken by representatives of the project promoters and the KPTCL/CESC. Transmission losses computed by KPTCL and reported in the JMR statements. WTG controller data may also be used for proportioning of electricity generation data if billing cycles do not match with the monitoring period as described in section 3.3. Reporting Frequency: Monthly Calibration frequency: Yearly		
comments:	The data will be kept for two years after the crediting period or from last issuance. The values shall be monitored ex-post and CERs will be calculated at actual.		

Data / Parameter:	EG_{EXP,y}
Data unit:	MWh
Description:	Electricity exported from the project activity in year y
Source of data:	Joint Meter Reading statements and Bills/receipts (statements on payment towards power purchased)

Description of measurement methods and procedures to be applied:	Electronic trivector energy meters of accuracy class 0.2 will be used for measurement of electricity exported from the project activity. On a monthly basis, joint meter readings (JMRs) of the energy meters at metering points would be taken by representatives of the project promoters and KPTCL/CESC.																	
Frequency of monitoring/recording:	Continuous measurement and monthly recording																	
Value monitored:	46 153.656 MWh																	
Monitoring equipment:	<table><tr><td>Sr.No</td><td>Metering Point</td><td>Connected WTGs</td></tr><tr><td>1</td><td>GP04</td><td>GP02,GP03 & GP04</td></tr><tr><td>2</td><td>GP17</td><td>GP17</td></tr><tr><td>3</td><td>GP23</td><td>GP23 & GP24</td></tr><tr><td>4</td><td>GP31</td><td>GP28,GP29,GP30 & GP31</td></tr></table>			Sr.No	Metering Point	Connected WTGs	1	GP04	GP02,GP03 & GP04	2	GP17	GP17	3	GP23	GP23 & GP24	4	GP31	GP28,GP29,GP30 & GP31
Sr.No	Metering Point	Connected WTGs																
1	GP04	GP02,GP03 & GP04																
2	GP17	GP17																
3	GP23	GP23 & GP24																
4	GP31	GP28,GP29,GP30 & GP31																
QA/QC procedures to be applied:	The values of electricity exported would be cross-verified from the Pro Forma Invoices (statements on payment towards power purchased). QC procedures are described in detail under section 3.3.																	
Purpose of the data	Calculation of baseline emissions																	
Calculation method:	Not applicable																	
comments:	The data will be kept for two years after the crediting period or from last issuance.																	

Data Unit / Parameter:	EG_{IMP,y}
Data unit:	MWh
Description:	Electricity imported by the project activity in year y
Source of data:	Joint Meter Reading statements and Bills/receipts (statements on payment towards power purchased)
Description of measurement methods and procedures to be applied:	Electronic trivector energy meters of accuracy class 0.2 will be used for measurement of electricity imported by the project activity. On a monthly basis, joint meter readings (JMRs) of the energy

	meters at metering points would be taken by representatives of the project promoters and the respective government authorities.		
Frequency of monitoring/recording:	Continuous measurement and monthly recording		
Value monitored:	271.559 MWh		
Monitoring equipment:			
	Sr.No	Metering Point	Connected WTGs
	1	GP04	GP02,GP03 & GP04
	2	GP17	GP17
	3	GP23	GP23 & GP24
	4	GP31	GP28,GP29,GP30 & GP31
QA/QC procedures to be applied:	The values of electricity imported would be cross-verified from the Pro Forma Invoices (statements on payment towards power purchased). QA/QC procedures are described in detail under section 3.3. The main and check meters shall be tested for accuracy every calendar year with reference to a portable standard meter.		
Purpose of the data	Calculation of baseline emissions		
Calculation method:	Not applicable		
comments:	The data will be kept for two years after the crediting period or from last issuance.		

Data / Parameter:	EG_{TL,y}
Data unit:	MWh
Description:	Transmission losses in year y
Source of data:	Joint Meter Reading statements
Description of measurement methods and procedures to be applied:	The value of transmission losses would be calculated by KPTCL/CESC officials as per the equations described in the PPA and official notifications. The value would be determined from the bulk meter readings at the substation (from where electricity is exported to grid) and from all metering points connected to the substation. The value would be reported in the JMR statements.

Frequency of monitoring/recording:	Continuous measurement and monthly recording		
Value monitored:	708.319 MWh		
Monitoring equipment:			
	Sr.No	Metering Point	Connected WTGs
	1	GP04	GP02,GP03 & GP04
	2	GP17	GP17
	3	GP23	GP23 & GP24
	4	GP31	GP28,GP29,GP30 & GP31
QA/QC procedures to be applied:	The values of transmission losses would be cross-verified from the Pro Forma Invoices (statements on payment towards power purchased). QA/QC procedures are described in detail under section 3.3.		
Purpose of the data	Calculation of baseline emissions		
Calculation method:	$Z = \left\{ \frac{(X_1 + X_2 + X_3 + X_4 + \dots) - Y}{(X_1 + X_2 + X_3 + X_4 + \dots)} \right\} \times 100$ Where Z = percentage of transmission losses (X1+X2+X3+X4+...) = sum of electricity export from energy meters connected to the receiving substation Y = electricity export from bulk energy meter installed at the receiving substation		
comments:			

3.3 Monitoring Plan

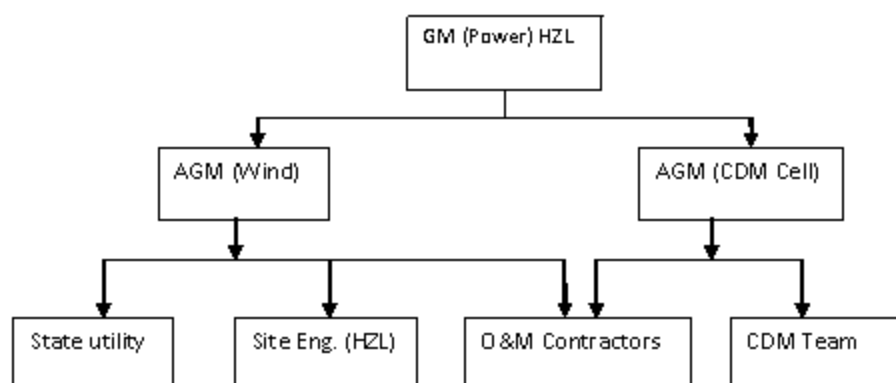
The purpose of the monitoring plan is to define the organizational structure of the monitoring team, monitoring practices, QA / QC procedures and archiving procedures. The monitoring plan aims to ensure that the emission reductions from the project activity are reported accurately and transparently.

Roles and Responsibilities of the Monitoring Team

The authority and responsibility of project management as well as registration, monitoring, measurement and reporting lies with HZL. The project proponent has formulated a Monitoring Team to ensure proper and continuous monitoring of the emission reductions as well as performance of turbines and generation of power.

To ensure trouble free operation of all the wind turbines, HZL has entered into a comprehensive Operation and Maintenance agreement with the manufactures of the turbines. The contractor, Suzlon Infrastructure Limited, would be responsible for the operation and maintenance of the WTGs. The O&M personnel are qualified engineers and are trained at the WTG manufacturing facility of Suzlon Infrastructure Limited.

The monitoring team will interact with the O&M contractors as well as the State Utility officials for executing the monitoring plan. The structure of the Monitoring Team is as follows:

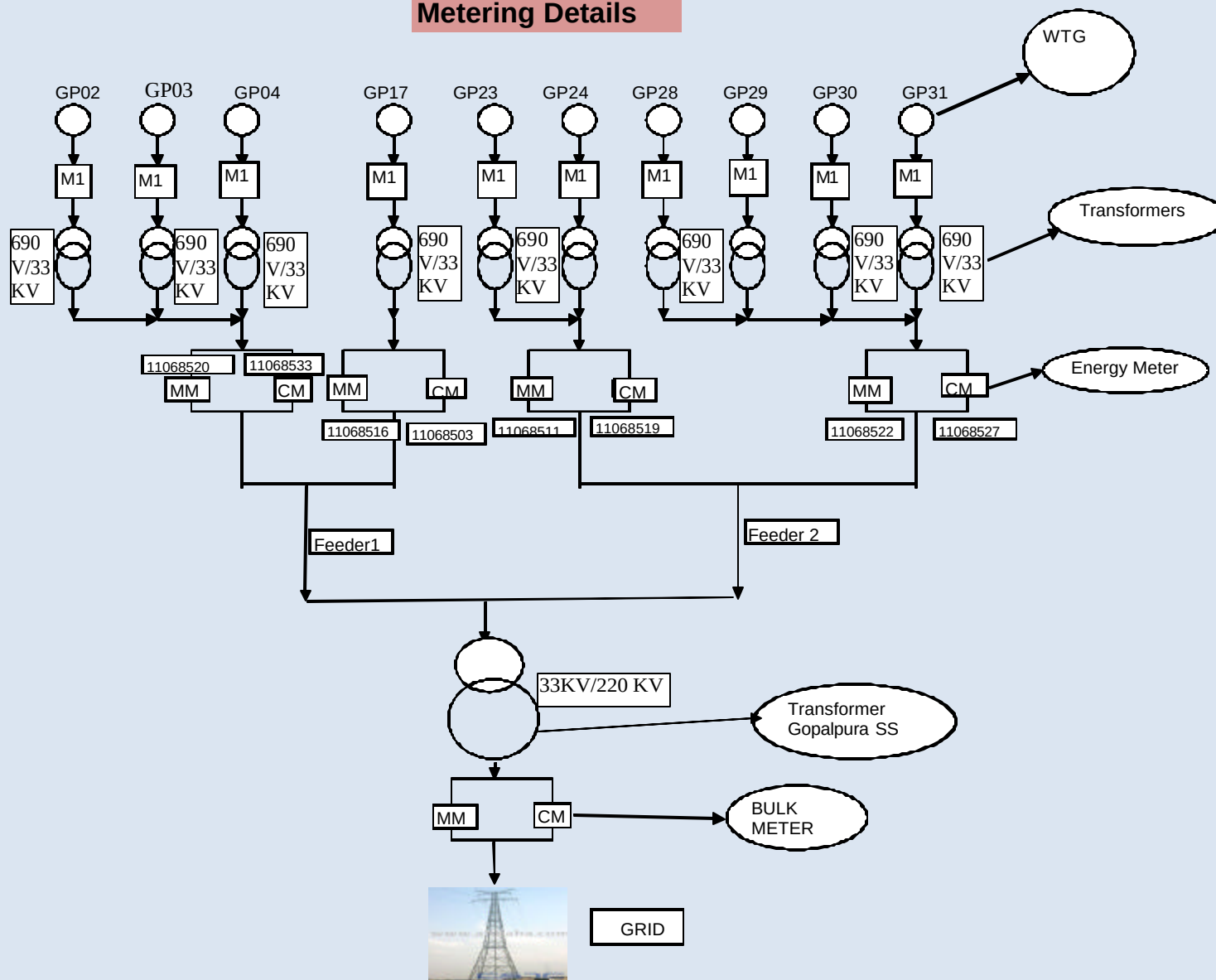


Monitoring Team	Roles & Responsibilities
General Manager (Power), HZL	- Communication with CDM EB - Communication with State utility
AGM (CDM Cell), HZL	- Overall coordination with monitoring team and DOE for verification activities - Maintaining data records, documentation and archiving
AGM (Wind) HZL	Coordinating with Site Engineer, O&M operators and State Utility.
Site Engineer, HZL	- Overseeing monitoring, operation and maintenance activities at site - Interacting with State Utility and O&M contractors for JMRs and calibration

O&M contractors	- Carrying out operation & maintenance of WTGs - Carrying out joint meter readings with state utility
State Utility	- Carrying out joint meter readings with representative of project proponent (O&M contractors) - Calibration of energy meters
CDM Team	Assisting the AGM (CDM Cell) with coordination and maintaining data records, documentation, archiving, etc.

Metering Arrangements and Procedures

Metering Details



HZL have 10 WTGs of 1.5 MW capacity each, all the WTGs are connected to four feeders. The WTGs generate 3-phase power at 690V, which is stepped up to 33 kV, For power evacuation GP-02,03,04 are connected to feeder 1, GP-17 connected to Feeder 2, GP-23,24 are connected to Feeder 3 and GP 28,29,30,31 are connected to Feeder 4 as shown in the metering diagram above.

The electricity exported and imported from the sub-station metered using electronic trivector meters. A main and check meter is installed at every metering point/feeder for the project activity. There are four metering points/feeders for the project activity, the details of which as tabulated below:

Sr.No	Metering Point	Connected WTGs	Total Capacity	Type of Meter	Accuracy Class
1	GP04	GP02,GP03 & GP04	3X1.5 = 4.5MW	ER300 P	0.2S
2	GP17	GP17	1X1.5 = 1.5MW	ER300 P	0.2S
3	GP23	GP23 & GP24	2X1.5 = 3MW	ER300 P	0.2S
4	GP31	GP28,GP29,GP30 & GP31	4X1.5 = 6MW	ER300 P	0.2S

All the four feeders are connected to Gopalpura substation, where the power is stepped up to 220kV level and feeded to Grid. A bulk meter installed at Gopalpura substation, which is used for calculation of the transmission loss.

On a monthly basis, a joint meter reading carried out in the presence of the KPTCL/CESC officials and representatives of the project promoters. Each of the metering points connected to the nearest KPTCL/CESC sub-station from where electricity will be exported to the grid. For the purpose of calculating transmission losses, KPTCL/CESC will monitor electricity export from the sub-station through the sub-station bulk meter, and also electricity export from all metering points connected to the sub-station. The transmission loss percentage is computed by KPTCL/CESC in accordance with equations specified in the PPAs and official KPTCL /CESC circulars as follows:

$$Z = \left\{ \frac{(X_1 + X_2 + X_3 + X_4 + \dots) - Y}{(X_1 + X_2 + X_3 + X_4 + \dots)} \right\} \times 100$$

Where

Z = percentage of transmission losses

(X₁+X₂+X₃+X₄+...) = sum of electricity export from energy meters connected to the receiving substation

Y = electricity export from bulk energy meter installed at the receiving substation

For each metering point, transmission losses are computed each month as the product of the electricity export from the metering point (eg: X₁) and the transmission loss percentage (Z).

Quality control and Quality Assurance procedures:

Calibration Procedures:

Main meters and check meters are installed for monitoring the energy exported and imported. The main and check meters shall be tested for accuracy every calendar year with reference to a portable standard meter. The meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2 accuracy class. The data registered by the main meter alone will be adopted for the purpose of calculation as long as the error in the main meter is within permissible limits. If during the annual accuracy tests, the main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the limits, the main meter reading shall be considered as usual. However, the check meter shall be calibrated immediately. If the main meter is found to be beyond the permissible limits of error, but corresponding check meter is within limits, then the check meter reading shall be adopted for that period. The main meter shall be calibrated immediately.

Apportioning Procedures in case the dates of monitoring period do not match with billing cycle dates

The monitoring period for the project activity may start from a date that does not coincide with the date of the initial reading of the respective JMR statement. For instance the monitoring period may start on the 20th of the month whereas the JMR Statement may report the net electricity generation data from the first of the month to the first of the next month. In such a scenario, the net electricity generation data from the start of the monitoring period to the first date of the next month (the apportioning period) would be determined as follows:

$$\text{Apportioned Net Electricity Generation} = \text{Apportioning Ratio} \times \text{Net Electricity Generation as per JMR Statement}$$

The apportioning ratio would be determined as the ratio of the electricity generation at the WTG for the apportioning period to the electricity generation at the WTG for the entire period covered under the JMR statement. This procedure would only have to be followed for the first and last month of the monitoring period if the start and end dates do not coincide with the date of the joint meter readings of the energy meters.

Data collection and archiving

The daily data on electricity generation from WTGs at the site is collected in electronic form. Monthly JMR statements are collected and maintained in hard copy, and archived electronically. The project proponent shall keep complete and accurate records of all the data as a part of monitoring for at least a period of 2 years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions (BE_y in tCO₂e) are the product of the baseline emissions factor (EF_y in tCO₂/MWh) times the Net electricity supplied by the project activity to the grid (EG_y in MWh) as described in registered PDD.

$$BE_y = EF_y \times EG_y$$

Where,

BE_y baseline emissions, tCO₂e

EG_y = EG_{BL,y} Net Quantity of Electricity exported to CESC facility

EF_y grid emission factor, i.e. 0.9154 t CO₂/MWh (it has been fixed ex-ante)

$$EG_{BL,y} = EG_{EXP,y} - (1+15\%) EG_{IMP,y} - EG_{TL,y}$$

= 46 153.656 – 271.559 - 708.319 =45 173.779 MWh

Month	Adjusted Electricity Exported	Import adjusted as per KERC (115% of imported electricity)	Adjusted Transmission losses	Adjusted Net electricity exported (EG _y)	Emission Factor (EF _y)	Emission Reductions (ER _y)
	EG _{y, Export} (kWh)	EG _{y, Import} (kWh)	kWh	kWh	tCO ₂ e/MWh	tCO ₂ e
31 Mar 11- 31 Mar 11	1185	0	21	1164	0.9154	1
01 Apr11 -30 Apr 11	325350	15353	7035	302962		277
01 May 11 - 31 May 11	1469760	13386	12816	1443558		1321
01 Jun 11- 30 Jun 11	4359420	1639	86055	4271726		3910
01 July 11- 31 July 11	4480440	414	69209	4410817		4038
1 Aug11- 31 Aug 11	3573795	4037	53250	3516509		3219
1 Sept 11- 30 Sept 11	3103395	5313	44648	3053434		2795
1 oct 11- 31 Oct 11	841020	25754	17095	798170		731
1 Nov 11- 30 Nov 11	1523355	17216	24799	1481341		1356
1 Dec 11- 31 Dec 11	2117925	16077	31034	2070814		1896
1 Jan 12- 31 Jan 12	710790	29791	14992	666007		610
1 Feb 12- 29 Feb 12	1410645	16146	21869	1372630		1257
1 mar 12- 31 mar 12	1040550	26686	21493	992372		908
01 Apr12 -30 Apr 12	954360	25185	19355	909820		833
01 May 12 - 31 May 12	2412075	15128	34301	2362646		2163
01 Jun 12- 30 Jun 12	4354650	2156	55045	4297449		3934
01 July 12- 31 July 12	4173296	3386	59618	4110292		3763
1 Aug12- 31 Aug 12	3686143	5182	50660	3630302		3323
1 Sept 12- 30 Sept 12	2647941	9414	36046	2602481		2382
1 oct 12- 31 Oct 12	1462470	17602	22795	1422074		1302
1 Nov 12- 30 Nov 12	1505091	21696	26183	1457212		1334
Total	46153656	271559	708319	45173779		41352.08

So,

$$BE_Y = 45\,173.779 \times 0.9154$$

$$= 41\,352.08 \text{ tCO}_2$$

$$= 41\,352 \text{ tCO}_2 \text{ (Round down to nearest integer)}$$

Emission Reduction

Month	Baseline Emissions (tCO ₂)	Project Emissions (tCO ₂)	Leakages (tCO ₂)	Emission Reduction (tCO ₂)	
31 Mar 11- 31 Mar 11	1.07	0.00	0.00	1.07	
01 Apr11 -30 Apr 11	277.33	0.00	0.00	277.33	
01 May 11 - 31 May 11	1321.43	0.00	0.00	1321.43	
01 Jun 11- 30 Jun 11	3910.34	0.00	0.00	3910.34	
01 July 11- 31 July 11	4037.66	0.00	0.00	4037.66	
1 Aug11- 31 Aug 11	3219.01	0.00	0.00	3219.01	
1 Sept 11- 30 Sept 11	2795.11	0.00	0.00	2795.11	
1 oct 11- 31 Oct 11	730.65	0.00	0.00	730.65	
1 Nov 11- 30 Nov 11	1356.02	0.00	0.00	1356.02	
1 Dec 11- 31 Dec 11	1895.62	0.00	0.00	1895.62	
1 Jan 12- 31 Jan 12	609.66	0.00	0.00	609.66	
1 Feb 12- 29 Feb 12	1256.51	0.00	0.00	1256.51	
1 mar 12- 31 mar 12	908.42	0.00	0.00	908.42	
01 Apr12 -30 Apr 12	832.85	0.00	0.00	832.85	
01 May 12 - 31 May 12	2162.77	0.00	0.00	2162.77	
01 Jun 12- 30 Jun 12	3933.88	0.00	0.00	3933.88	
01 July 12- 31 July 12	3762.56	0.00	0.00	3762.56	
1 Aug12- 31 Aug 12	3323.18	0.00	0.00	3323.18	
1 Sept 12- 30 Sept 12	2382.31	0.00	0.00	2382.31	
1 oct 12- 31 Oct 12	1301.77	0.00	0.00	1301.77	
1 Nov 12- 30 Nov 12	1333.93	0.00	0.00	1333.93	
Total	41352.08	0.00	0.00	41352.08	41352
					Round down the nearest integer

4.2 Project Emissions

The project activity is neither a geothermal power plant nor does it have a water reservoir, there would be no emissions due to the implementation of the project. Thus, the project emissions (*PE_y*) are estimated to be zero.

4.3 Leakage

As per the VCS guidelines 'if the energy generating equipment is transferred from another activity, leakage is to be considered'. In the project activity, there is no transfer of energy generating equipment and therefore the leakage from the project activity is considered as zero

4.4 Net GHG Emission Reductions and Removals

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

$$= 45\,173.779 * 0.9154$$

$$= 41\,352 \text{ (Value is rounded down, please refer ER calculation sheet for the same)}$$

According to the approved methodology ACM0002 Emission Reductions are calculated as:-

$$ER_y = BE_y - PE_y$$

$$= 41\,352 - 0$$

$$= 41\,352 \text{ tCO}_2\text{e}$$

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
Year 2011	19544.24	0	0	19544.24
Year 2012	21807.84	0	0	21807.84
Total	41352.08	0	0	41352.08

Appendix-1**Details of Meters:-**

Sr. no.	Serial No.	Type	Calibration date	Current calibration date
1.	11068520	ER300P (ABT)	07-10-11	06-08-12
2.	11068533	ER300P (ABT)	07-10-11	06-08-12
3.	11068516	ER300P (ABT)	25-07-11	15-12-12
4.	11068503	ER300P (ABT)	25-07-11	15-12-12
5.	11068511	ER300P (ABT)	25-07-11	15-12-12
6.	11068519	ER300P (ABT)	25-07-11	15-12-12
7.	11068522	ER300P (ABT)	25-07-11	15-12-12
8.	11068527	ER300P (ABT)	25-07-11	15-12-12

Appendix 2

Additional Information

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO ₂ e)	Project emissions or actual net GHG removals by sinks (tCO ₂ e)	Leakage (tCO ₂ e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO ₂ e)
Total	41 352	0	0	41 352