

21 MW WIND ENERGY FARM AT PALLADAM, TAMILNADU BY HZL



Document Prepared By EKI Energy Services Limited

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Table of Contents

1	Project Details	3
1.1	Summary Description of the Implementation Status of the Project	3
1.2	Sectoral Scope and Project Type	5
1.3	Project Proponent	5
1.4	Other Entities Involved in the Project	5
1.5	Project Start Date	5
1.6	Project Crediting Period.....	5
1.7	Project Location	6
1.8	Title and Reference of Methodology	7
1.9	Other Programs.....	7
1.10	Sustainable Development.....	8
2	Implementation Status.....	9
2.1	Implementation Status of the Project Activity	9
2.2	Deviations	9
2.2.1	Methodology Deviations.....	9
2.2.2	Project Description Deviations	9
2.3	Grouped Project.....	10
2.4	Safeguards	10
2.4.1	No Net Harm	10
2.4.2	Local Stakeholder Consultation.....	10
3	Data and Parameters	10
3.1	Data and Parameters Available at Validation	10
3.2	Data and Parameters Monitored.....	12
3.3	Monitoring Plan	14
4	Quantification of GHG Emission Reductions and Removals.....	17
4.1	Baseline Emissions	17
4.2	Project Emissions.....	17
4.3	Leakage	17
4.4	Net GHG Emission Reductions and Removals	17
	ANNEXURE 1: Meter CALIBRATION Details	18
	ANNEXURE 2: BREAKDOWN DETAILS for the current Monitoring Period	18

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the 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 will reduce the anthropogenic GHG emissions (approximately 42,131 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 fourteen Suzlon make 1.5 MW Wind Turbine Generators (WTGs) by Hindustan Zinc Limited (HZL) in the state of Tamilnadu. The cumulative capacity of the project activity is 21 MW. The electricity generated from the project activity will be 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 WTGs generate 3-phase power at 400V, 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 400 V $\pm$ 20%.

The technical specifications of the WTGs are as below:

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 of high grade GRP and manufactured by using Resin Infusing Moldings (RIM) technology

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: High tensile double-row ball-bearing

Braking System: 3 independent Aero Brakes with power back up supply.

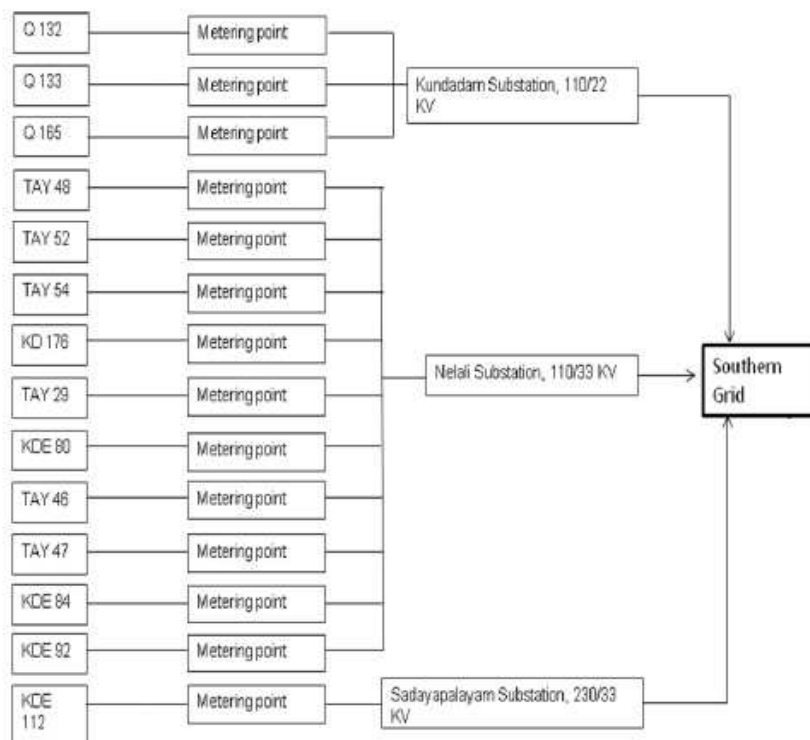
Yaw Control: Active through adjustment gears, friction damping

Tower: Steel Tubular, 76 m height

The details of the commissioning of the project is as follows:

Location	Date of Commissioning	Load
U 2176, U 2177, U 2178	20/10/2011	4.5 MW
U 2180	26/12/2011	1.5 MW
TZA-11,12,13,14,15,16,17,18,19,20	10/02/2012	15 MW

The schematic diagram of project activity and its interconnection with state electricity board is depicted below:



The total GHG emission reduction in this monitoring period 1st Dec 2012 to 8th Dec 2016 (inclusive of both dates) is 129,912 tCO₂e.

1.2 Sectoral Scope and Project Type

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

Project Type: I- Renewable Energy Projects

1.3 Project Proponent

Organization name	Hindustan Zinc Limited
Contact person	Mr. V. Jayaraman
Title	VP & Head (EOHS)
Address	CPP-CLZS Chanderiya Lead Zinc Smelter, Putholi Chittorgarh-312021, Rajasthan INDIA
Telephone	91-1472-257950
Email	v.jayaraman@vedanta.co.in

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Mr. Manish Dabkara
Title	MD & CEO
Address	Enking Embassy, Office no. 201, Plot 48, Scheme 78 part 2, Vijay Nagar, Indore-452010 (M.P, India)
Telephone	+91 99 07 53 4900
Email	manish@enkingint.org

1.5 Project Start Date

20/10/2011, date of commissioning of first WTG

1.6 Project Crediting Period

This is the second monitoring under VCS and covers the activity from 01/12/2012 to 8/12/2016 (inclusive of both dates).

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

VCS crediting period is 20/10/2011 to 19/10/2021 (first crediting period) and it will be renewed twice till end date of CDM crediting period.

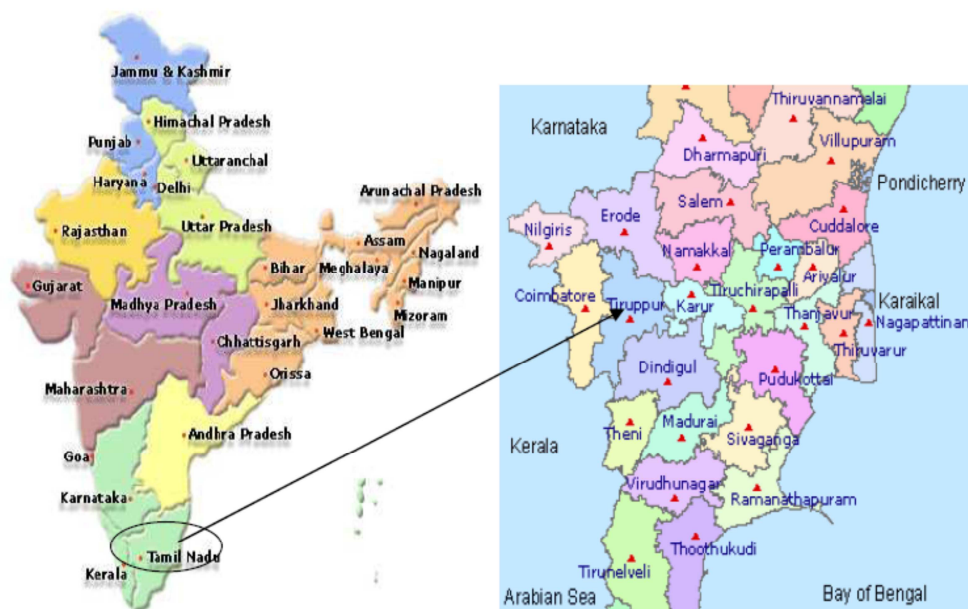
Start date of crediting period for VCS verification: 20/10/2011 (Date of commissioning of first WTG)

1.7 Project Location

The project activity consists of fourteen 1.5 MW wind turbines in the state of Tamil Nadu. Details of the location of the project activity:

Sr No.	WTG No.	Village	Latitude	Longitude
1	KD 176	Suriyanallur	N10°52'02.9"	E77°27'31.8"
2	KDE 80	Suriyanallur	N10°54'07.8"	E77°29'11.2"
3	TAY 52	Karukkanpalayam	N10°56'12.0"	E77°29'07.2"
4	TAY 54	Nelali	N10°55'34.0"	E77°28'46.5"
5	KDE 84	Nelali	N10°54'35.0"	E77°29'27.6"
6	TAY 29	Kozhumankuli	N10°52'26.0"	E77°29'30.2"
7	Q 165	Kundadam	N10°51'43.3"	E77°25'52.6"
8	Q 132	Kundadam	N10°52'57.4"	E77°24'51.9"
9	Q 133	Kundadam	N10°52'58.2"	E77°25'11.3"
10	KDE 92	Uthiyur	N10°54'21.7"	E77°30'22.5"
11	TAY 46	Nelali	N10°55'38.7"	E77°29'38.1"
12	TAY 48	Nelali	N10°55'38.5"	E77°29'59.3"

13	TAY 47	Nelali	N10°51'9.5"	E77°23'57.6"
14	KD 112	Nandavanampalayam	N10°55'18.7"	E77°30'2.1"



1.8 Title and Reference of Methodology

Title of the baseline methodology: "Consolidated Baseline Methodology for grid connected electricity generation from renewable sources".

Reference: ACM0002, Version 12.3.0 (EB 66), Sectoral Scope: 01

The following tools and guidance's have been followed (References):

1. Tool to calculate the emission factor for an electricity system (Version 02.2.1)
2. Tool for the demonstration and assessment of additionality (Version 06.0.0)

1.9 Other Programs

- Emission Trading Programs and Other Binding Limits: The PP has not applied this project in any Emission Trading Programs and other Binding Limits.
- Other Forms of Environmental Credit: The PP has not applied this project in any other form of environmental credits.
- Participation under Other GHG Programs: The PP has participated under CDM mechanism of UNFCCC. The UN reference id 8198¹ of program with this project activity.

¹ <http://cdm.unfccc.int/Projects/DB/DNV-CUK1352807242.64/view>

The PP would not consider the credit from any other mechanism for the current monitoring period. The undertaking is provided to confirm that there is no any double accounting for current monitoring period. Also it can be crosschecked that PP is not claiming REC benefits, the same can be verified with the REC accreditation body of India².

1.10 Sustainable Development

The National CDM Authority (NCDMA), which is the Designated National Authority (DNA) for the Government of India (GOI) under the Ministry of Environment and Forests (MoEF), has mentioned four indicators for the sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India³. Thus the project's contribution towards sustainable development has been addressed based on the following sustainable development aspects:

Social well being

- Contribution to the development of an otherwise underdeveloped area.
- Generation of employment opportunities for local people during various phases of the project activity.

Economical well being

- The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity will also help to reduce the demand supply gap in the state.
- Due to generation of employment opportunities, the economic condition of project activity region will be improved.

Environmental well-being:

- The project activity generates clean and green power thus causing negligible emissions of greenhouse gases. In the absence of the project activity, equivalent power would have been generated based on the fossil fuels resulting in more Green House Gas emissions into the atmosphere.
- The project activity has reduced the dependence on fossil fuels for power generation thus conserving the natural reserves. The project has led to greenhouse gas emission reduction and hence contributed in mitigating climate change.

Technological well being

² https://recregistryindia.nic.in/index.php/general/publics/accredited_regens_pdf

³ http://www.cdmindia.in/approval_process.php

- The technology selected for the power project would use well established Horizontal Pelton type turbines and the project activity would promote the use of such technology.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

Start date is 20/10/2011 (commissioning date of first WTG)

Details of the project activity are as follows;

Location No	Date of commissioning	Connected Load (MW)
U2176, U 2177, U2178	20/10/2011	4.5 MW
U 2180	26/12/2011	1.5 MW
TZA 11,12,13, 14, 15, 16, 17, 18, 19, 20	10/02/2012	15 MW

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.

All the WTGs are in operation and No abnormal circumstance occurred during this monitoring period. Suzlon operation and maintenance activities are ISO 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

No methodology deviation is applied during the monitoring period.

2.2.2 Project Description Deviations

No project description deviation is applied during the monitoring period.

2.3 Grouped Project

Not applicable as the project is not a group project.

2.4 Safeguards

2.4.1 No Net Harm

The project activity does not cause any harm to the local ecology. It primarily requires the installation of the wind power project, interfacing the generators with the State Electricity Board by setting up HT transmission lines and installation of other accessories.

Also as per the Central Pollution Control Board of India notification⁴ wind project falls under White Category and are practically non-polluting.

However, there are no negative impacts on air, water, soil quality and ambience are envisaged due to the project activity.

2.4.2 Local Stakeholder Consultation

The project proponents organized stakeholders meeting during CDM registration on 12/09/2011 in order to take into account the concerns of the nearby villagers regarding the project implementation. As a part of continuous feedback from stakeholders, there were no other major comments or protest raised by the stakeholders and they were totally in support for setting up of these kinds of projects in the region. The PP also placed a grievance register onsite in where the stakeholder can put down his/her complain and the same if found genuine will be addressed immediately.

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 Version 6.0 for the Indian Power Sector prepared by Central Electricity Authority.						
Value applied	0.9671						
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) as given below: <table><tr><td>Operating</td><td>Margin</td><td>Estimation</td><td>for</td><td>Southern</td><td>Grid</td></tr></table>	Operating	Margin	Estimation	for	Southern	Grid
Operating	Margin	Estimation	for	Southern	Grid		

⁴ http://envfor.nic.in/sites/default/files/Latest_118_Final_Directions.pdf

	(tCO₂/MWh)	
	OM 2007-08	0.9909
	OM 2008-09	0.9729
	OM 2009-10	0.9415
	Net Electricity Generated (GWh), 2007-08	114634
	Net Electricity Generated (GWh), 2008-09	121471
	Net Electricity Generated (GWh), 2009-10	134717
	Average OM (EF_{grid, OM,y})	0.9671
Purpose of the data	For the calculation of the Baseline Emission	
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 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	0.7634
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	For the calculation of the Baseline Emission
Comments	This value is determined ex-ante and will be fixed for the crediting period

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	Calculated based on values given in the CO ₂ Baseline Database Version 6.0 for the Indian Power Sector prepared by Central Electricity Authority
Value applied	0.9161
Justification of choice of data or description of measurement methods	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

and procedures applied	the emission factor for an electricity system.”								
	<table border="1"> <tr> <th colspan="2">Combined Margin Estimation for southern Grid (tCO₂/MWh)</th></tr> <tr> <td>Operating Margin (EF_{grid}, OM, y)</td><td>0.9671</td></tr> <tr> <td>Build Margin (EF_{grid}, BM, y)</td><td>0.7634</td></tr> <tr> <td>Combined Margin (EF_{CO2,grid}, y)</td><td>0.9161</td></tr> </table>	Combined Margin Estimation for southern Grid (tCO ₂ /MWh)		Operating Margin (EF _{grid} , OM, y)	0.9671	Build Margin (EF _{grid} , BM, y)	0.7634	Combined Margin (EF _{CO2,grid} , y)	0.9161
Combined Margin Estimation for southern Grid (tCO ₂ /MWh)									
Operating Margin (EF _{grid} , OM, y)	0.9671								
Build Margin (EF _{grid} , BM, y)	0.7634								
Combined Margin (EF _{CO2,grid} , y)	0.9161								
Purpose of the data	For the calculation of the Baseline Emission								
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} (EG _{y,export} - EG _{y,import})
Data unit	MWh
Description	Net electricity exported to the southern grid by the project
Source of data	Statements issued by TNEB to the project proponent on electricity generation
Description of measurement methods and procedures to be applied	Statements issued by TANGEDCO earlier known as TNEB to the project proponent on electricity generation will report the net electricity export, EGBL, y. Energy meters of 0.2 accuracy class provided at each WTG continuously measure the export as well as the import from the turbine at the project site. The net electricity exported shall be calculated by subtracting import from the export values measured for each WTG. The total net electricity exported by the project activity will be calculated as the sum of the net electricity exported from each WTG. Meter readings will be taken monthly by the representative of the TANGEDCO earlier known as TNEB.
Frequency of monitoring/recording	Measured: Continuously Reporting Frequency: Monthly (Calculated)
Value monitored	141,810
Monitoring equipment	Energy meter installed on each WTG. Details of the meters mentioned in Annexure 1.
QA/QC procedures to be applied	The quantity of net electricity supplied will be cross-verified from the invoices/sales receipts raised to the state utility. The conservative values of net electricity exported would be considered for emission reductions As per the registered monitoring plan, the energy meters has to be calibrated once in 3 years. Please refer Annexure 1 for detailed schedule of meter calibration during current monitoring period.
Purpose of the data	Calculation of Baseline emissions

Calculation method	The net electricity exported calculated by subtracting import from the export values measured for each WTG. Also for few WTGs distribution losses are subtracted based on JMR values as per state electricity rule.
Comments	The data will be kept for two years after the end of the crediting period or from last issuance. The values shall be monitored ex-post and VERs will be calculated at actual.

Data / Parameter	EG _{y,export}
Data unit	MWh
Description	Electricity exported to the state electricity board by the project activity
Source of data	Statements issued by TANGEDCO earlier known as TNEB to the project proponent on electricity generation
Description of measurement methods and procedures to be applied	Statements issued by TANGEDCO earlier known as TNEB to the project proponent on electricity generation will report the electricity exported EG _y export. Energy meters of 0.2 accuracy class installed at each WTG will continuously measure the electricity exported by the WTG. TANGEDCO earlier known as TNEB officials will take down monthly reading of the energy meters
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and monthly recording
Value monitored	145,710
Monitoring equipment	Energy Meters of Accuracy class 0.2s. Please refer Annex 1 for detailed schedule of Calibration
QA/QC procedures to be applied	In order to ensure the optimum accuracy levels the monitoring equipments used for measuring the parameter will be calibrated at least once in three years. Please refer Annexure 1 for detailed schedule of meter calibration during current monitoring period.
Purpose of the data	Calculation of Baseline emissions
Calculation method	-
Comments	The data will be kept for two years after the end of the crediting period

Data / Parameter	EG _{y,import}
Data unit	MWh
Description	Electricity imported from the southern grid. This is a monitored parameter.
Source of data	Statements issued by TANGEDCO earlier known as TNEB to the project proponent on electricity generation
Description of measurement methods and procedures to be applied	Statements issued by TANGEDCO earlier known as TNEB to the project proponent on electricity generation will report the electricity imported, EG _y import. Energy meters of 0.2 accuracy class installed at each WTG will measure the electricity imported by WTG

applied	continuously. TANGEDCO earlier known as TNEB officials will take down monthly reading of the energy meters
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and monthly recording
Value monitored	1,480
Monitoring equipment	Energy Meters of Accuracy class 0.2s. Please refer Annexure 1 for detailed schedule of Calibration
QA/QC procedures to be applied	The quantity of net electricity imported will be cross-verified from the invoices/sales receipts raised to the state utility. The conservative values of net electricity exported would be considered for emission reductions Please refer Annexure 1 for detailed schedule of meter calibration during current monitoring period.
Purpose of the data	Calculation of Baseline emissions
Calculation method	-
Comments	The data will be kept for two years after the end of the crediting period

3.3 Monitoring Plan

The monitoring plan has been devised as per approved consolidated monitoring methodology ACM0002 - "Consolidated monitoring methodology for grid-connected electricity generation from renewable sources" version 12.3.0

The methodology requires monitoring of the following parameters:

1. Electricity generation from the proposed project activity (EGY).
2. Data needed to recalculate the operating margin emission factor, if needed, based on the choice of the method to determine the operating margin (OM), consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);
3. Data needed to recalculate the build margin emission factor, if needed, consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);

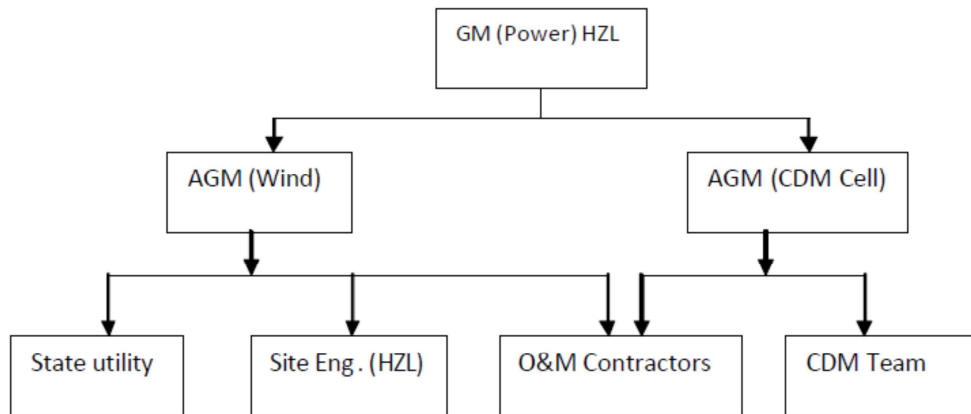
Roles and Responsibilities of the Monitoring Team

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 WEG manufacturing facility of Suzlon Infrastructure Limited.

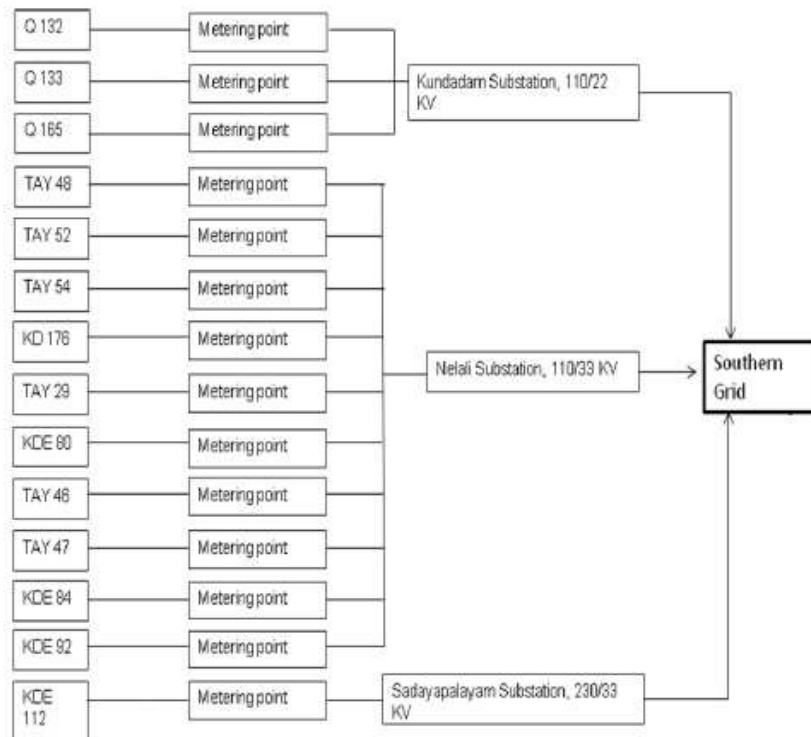
The monitoring will interact with the O&M contractors as well as the State Utility officials for executing the monitoring plan. The structure of the Monitoring Team is as follows:

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
CDM Team	Assisting the General Manager (Wind) with overall coordination and with maintaining data records, documentation, archiving etc.
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

The schematic line diagram is being represented below:



Quality control and Quality Assurance procedures:

Calibration Procedures:

Energy meters are installed at each WTG for monitoring the energy exported and imported. The energy meters shall be tested for accuracy at least once in three years 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 energy meter will be adopted for the purpose of emission reduction calculation as long as the error in the main meter is within permissible limits. If the energy meter is found to be beyond the permissible limits of error, TANGEDCO earlier known as TNEB officials shall be notified for rectification or replacement of the meter. The rectified / replaced energy meter would be calibrated.

Data collection and archiving

Monthly data is collected and maintained in hard copy (copies of TANGEDCO earlier known as TNEB statements). 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 tCO_2e) are the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO_2/MWh) times the electricity supplied by the project activity to the grid ($EG_{BL,y}$ in MWh) as described in registered PD.

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

Where,

BE_y baseline emissions, tCO_2e

$EG_{BL,y}$ Net Quantity of Electricity exported to TANGEDCO

$EF_{grid,CM,y}$ grid emission factor, i.e. $0.9161 t CO_2/MWh$ (it has been fixed ex-ante)

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

$$BE_y = 141,329 \times 0.9161 = 129,912 tCO_2e$$

4.2 Project Emissions

There are no Project emissions from the project activity

4.3 Leakage

Leakage emission is neglected as per the requirement of the methodology-

4.4 Net GHG Emission Reductions and Removals

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

$$ER_y = BE_y - PE_y$$

Where,

ER_y = Emission Reduction in $tCO_2/year$

BE_y = Baseline emission in $tCO_2/year$

PE_y = Project emissions in $tCO_2/year$

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2012	75	0	75
2013	31,797	0	31,797
2014	33,839	0	33,839
2015	25,423	0	25,423
2016	38,778	0	38,778

Total	129,912	0	129,912
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It is to be noted here that as per the registered PD, the emission reductions during the current monitoring period was estimated to be 169,563 tCO₂e, whereas actual emission reductions achieved are 129,912 tCO₂e, which is approximately 23.38% lower than the estimated emission reductions. The generation of electricity depends upon the wind flow, which is influenced by natural phenomena and not within the control of the project participant.

ANNEXURE 1: METER CALIBRATION DETAILS

Location	HTSC No.	Main Meter	Check Meter	Calibration Date	Validity	Calibration Date	Validity
TAY29	TZA 11	TN 901795	TN 902631	06/02/2012	05/02/2015	31/01/2015	30/01/2018
KDE 80	TZA 12	TN 901793	TN 902632	06/02/2012	05/02/2015	31/01/2015	30/01/2018
KD 176	TZA 20	HT 2110564	TN 90633	06/02/2012	05/02/2015	31/01/2015	30/01/2018
TAY 52	TZA 18	TN 901794	TN 902630	06/02/2012	05/02/2015	31/01/2015	30/01/2018
TAY 54	TZA 19	TN 901802	TN 902641	06/02/2012	05/02/2015	31/01/2015	30/01/2018
KDE 84	TZA 13	TN 901798	TN 902634	06/02/2012	05/02/2015	31/01/2015	30/01/2018
KDE 92	TZA 14	TN 901797	TN 902629	06/02/2012	05/02/2015	31/01/2015	30/01/2018
TAY46	TZA 17	TN 902614	TN 902615	06/02/2012	05/02/2015	31/01/2015	30/01/2018
TAY 48	TZA 16	TN 901801	TN 902616	06/02/2012	05/02/2015	31/01/2015	30/01/2018
TAY 47	TZA 15	TN 901803	TN 902611	06/02/2012	05/02/2015	31/01/2015	30/01/2018
Q132	U2178	HT 2110435	HT2110707	18/10/2011	17/10/2014	15/10/2014	14/10/2017
Q133	U2177	HT 2110438	HT2110688	18/10/2011	17/10/2014	15/10/2014	14/10/2017
Q165	U2176	HT 2110427	HT2110686	18/10/2011	17/10/2014	15/10/2014	14/10/2017
KD 112	U 2180	HT 2110426	TN902664	24/12/2011	23/12/2014	20/12/2014	19/12/2017

ANNEXURE 2: BREAKDOWN DETAILS FOR THE CURRENT MONITORING PERIOD

Gen. Date	Breakdown Remark	Breakdown Hrs.
21-Apr-2014	Preventive Check	0.20
29-Apr-2014	Elec SafetyChainStop	0.20
01-May-2014	Pitch BatterySurveillance2	12.30
31-May-2014	Preventive Check	0.40
01-June-2014	Line Breakdown due to Earthfault	0.40

21-June-2014	Line Breakdown due to Earthfault	0.10
02-Aug-2014	Elec FB YawCW Error	8.40
22-Aug-2014	Pitch Akku1Voltage LowStop	6.00
02-Sep-2014	Elec FB GeneratorFan	0.10
03-Oct-2014	Preventive Check	3.10
07-Nov-2014	Rep Pitch FreqConvPitch2 ErrStop	0.70
27-Nov-2014	Rep Pitch CANComFail	0.60
07-Dec-2014	Elec UPSBattChange	3.40
11-Jan-2015	Rep Pitch CANComFail	6.90
31-Jan-2015	IDRV Audit	1.10
12-Feb-2015	Theft	3.70
22-Feb-2015	Shut Down Taken By EB	24.00
02-Mar-2015	Shut Down Taken By EB	24.00
22-Mar-2015	Shut Down Taken By EB	24.00
02-May-2015	Shut Down Taken By EB	24.00
22-May-2015	Shut Down Taken By EB	10.30
02-June-2015	Shut Down Taken By EB	24.00
28-July-2015	Shut Down Taken By EB	24.00
12-Aug-2015	Shut Down Taken By EB	24.00