

52.50 MW WIND ENERGY FARM AT MOKLA RAJASTHAN BY HZL

Document Prepared By

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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 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 90, 506 MWh annually) will displace equivalent electricity generation in grid connected power plants. The project activity will reduce the anthropogenic GHG emissions (approximately 85863 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 twenty five Suzlon make 2.1 MW Wind Electric Generators (WEGs) by Hindustan Zinc Limited (HZL) in the state of Rajasthan. Out of these 25 WEGs 17 are commissioned in February - March 2011 and 8 are commissioned in August - September 2011. The cumulative capacity of the project activity is 52.50 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 (WEGs). 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 WEGs of S-88 Suzlon make (2100 kW WEGs). The WEGs 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%.

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)

Address	Chanderiya Lead Zinc Smelter Putholi Chittorgarh-312021 Rajasthan INDIA
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1.4 Other Entities Involved in the Project

Not applicable

1.5 Project Start Date

15/02/2011, 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: 15/02/2011 (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.	Phase	WEG. No.	Latitude	Longitude
1	Phase I	MK018	N27°09'20.6"	E70°42'01.9"
2		MK019	N27°09'14.0"	E70°42'19.6"
3		MK020	N27°09'07.3"	E70°42'37.3"
4		MK038	N27°10'04.2"	E70°41'51.2"
5		MK053	N27°10'23.9"	E70°40'58.7"
6		MK049	N27°10'24.2"	E70°40'58.1"
7		MK063	N27°11'21.3"	E70°40'12.2"
8		MK064	N27°11'14.4"	E70°40'30.5"
9		MK065	N27°11'07.8"	E70°40'48.1"
10		MK087	N27°10'30.1"	E70°44'50.0"
11		MK088	N27°10'40.7"	E70°44'35.9"

v3.3

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: This project activity is voluntary initiative of HZL and it is not to meet any local laws or regulatory compliances. HZL has submitted an undertaking that they shall not claim for GHG emission reduction credits for the given period (15/02/11 – 30/11/12) under any other emission trading program.

Other Forms of Environmental Credit: The project activity generates Carbon Credits under Clean Development Mechanism (Ref.No:7895) 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 09/11/2012 but the crediting period under CDM starts only on 01/12/2012. Project proponent has submitted an undertaking to the VVB that they shall not claim for GHG emission reduction credits for the given period under any other emission trading program."

Participation under Other GHG Programs: The project activity under consideration here has already been registered under the Clean Development Mechanism of UNFCCC. The requisite details are provided below:

CDM Project Reference # - 7895

Project Title: 52.50 MW Wind energy farm at Mokla Rajasthan by HZL

Weblink: <http://cdm.unfccc.int/Projects/DB/DNV-CUK1351252642.79/view>

Project Proponent: Hindustan Zinc Limited

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

Start date is 15/02/2011 (commissioning date of first WTG)

Details of the project activity are as follows;

LOCATION No	Date of commissioning	Connected Load (MW)	Phase
MK-49,63,100,101,168	15/02/2011	10.5 MW	Ph I
MK-18,19,20,38,53,64,65,87,88,218, 219, 220	13/03/2011	25.2 MW	Ph I

MK-162	16/08/2011	2.1 MW	Ph II
MK- 32,33,34,35	01/09/2011	8.4 MW	Ph II
MK 24,25	22/09/2011	4.2 MW	Ph II
MK- 182	30/09/2011	2.1 MW	Ph II

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. EIL 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 (15/02/2011- 30/11/2012) the project activity was operated and monitored in accordance with the applicable baseline and monitoring methodology ACM0002, Version 12.3.0 and registered PDD.

All the WEGs 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 paragraph 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.'

The Monitoring plan described in the CDM registered PDD includes parameters like X, Y, A and B. However, these parameters do not be utilised in the calculation of the emission reductions, as these are calculated from the JMR and break up energy sheet of EGexport,y, EGimport,y and the difference between the two, viz., EGfacility,y. So that these parameters has been removed from the data and parameters monitored. A monthly meter reading taken jointly by state utility and PP representative is recorded in the JMR. The net electricity exported to the grid is the difference of export and the import measured through the meter. The metered export and import of electricity in the JMR is apportioned among the various project developers based on the electricity generated at the WEG-Controller. The apportioned metered net electricity (export – import) corresponding to WEGs owned by a particular developer is then issued separately in a share certificate prepared by the O&M Service provider. The

invoices rise on the basis of share certificates and after cross verification the payment issued by DISCOM. These values are used in ER calculation which can be cross verified from invoices.

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:	tCO2/MWh	
Description:	Operating Margin emission factor for NEWNE 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:	0.9962 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) as given below:	
	Operating Margin Estimation for NEWNE Grid (tCO₂ / MWh)	
	OM, 2007-08	0.9999
	OM, 2008-09	1.0066
	OM, 2009-10	0.9777
	Net Electricity Generated (GWh), 2007-08	401642
	Net Electricity Generated (GWh), 2008-09	421803
	Net Electricity Generated (GWh), 2009-10	458043
	Average OM (EF_{grid, OM,y})	0.9962

Purpose of the data:	Baseline calculations
comment:	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 Version 6.0 for the Indian Power Sector prepared by Central Electricity Authority.
Value applied:	0.8123 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
comment:	This value is determined ex-ante and will be fixed for the crediting period.

Data / Parameter:	$EF_{grid,CM,y}/EF_{CO_2,grid,y}$
Data unit:	tCO ₂ /MWh
Description:	Combined Margin CO ₂ emission factor for NEWNE 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:	0.9487 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.'
Combined Margin Estimation for NEWNE Grid	

	(tCO ₂ /MWh)	
	Operating Margin (EF _{grid, OM, y})	0.9962
	Build Margin (EF _{grid, BM, y})	0.8123
	Combined Margin (EF _{CO2, grid, y})	0.9487
Purpose of the data:	Baseline calculations	
comment:	This value is determined ex-ante and will be fixed for the crediting period.	

3.2 Data and Parameters Monitored

Data / Parameter:	EG _{PJ, y}
Data unit:	MWh/year
Description:	Net electricity supplied by the WEGs in the project activity to the grid.
Source of data:	Statements on Break-up of Net Export Units prepared by the O&M Service provider
Description of measurement methods and procedures to be applied:	Main meter installed at the substation of the state utility (RVPN / DISCOM) measure the power delivered to the grid continuously. A monthly meter reading taken jointly by state utility and PP representative is recorded in the JMR. The meter would be a bi-directional meter measuring both the export and the import. The net electricity exported to the grid would be the difference of export and the import measured through the meter. The metered export and import of electricity in the JMR is apportioned among the various project developers based on the electricity generated at the WEG-Controller (LCS readings). The apportioned metered net electricity (export – import) corresponding to WEGs owned by a particular developer is then issued separately in a share certificate which is further used for ER calculation.
Frequency of monitoring/recording:	Measured: Continuously Reporting Frequency: Monthly (Calculated)
Value monitored:	140 079.776 MWh
Monitoring equipment:	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

Purpose of the data	Calculation of baseline emissions
Calculation method:	Main meter installed at the substation of the state utility (RVPN / DISCOM) measure the power delivered to the grid continuously. A monthly meter reading taken jointly by state utility and PP representative is recorded in the JMR. The meter would be a bi-directional meter measuring both the export and the import. The net electricity exported to the grid would be the difference of export and the import measured through the meter. The metered export and import of electricity in the JMR is apportioned among the various project developers based on the electricity generated at the WEG-Controller (LCS readings). The apportioned metered net electricity (export – import) corresponding to WEGs owned by a particular developer is then issued separately in a share certificate which is further used for ER calculation. There is also a check meter installed at the substation to measure the power delivered to the grid continuously, in case of the failure of the main meter, the readings are monitored from the check meter in a similar way as that for the main meter. The energy meters will be electronic meters of 0.2s accuracy class. Net electricity supplied by the project activity to the grid will be calculated based on the values of export and import of electricity as follows: Net Electricity = Total electricity exported by project proponent - Total electricity imported by project proponent.
Any comment:	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 _{y, Export}
Data unit:	MWh/year
Description:	Sum of electricity exported by all 25 WEGs of project activity connected to substation of the state utility
Source of data:	Statements on Break-up of Net Export Units prepared by the O&M Service provider
Description of measurement methods and procedures to be applied:	Main meter installed at the substation measure the total electricity exported to the grid continuously. A monthly meter reading taken jointly by state utility and PP representative (O&M contractor). The meter is a bi-directional meter measuring both the export and the import The metered export of electricity is apportioned among the various project developers based on the electricity generated at the WEG-Controller (LCS readings). The

	apportioned export electricity corresponding to WEGs owned by a particular developer is then issued separately in a share certificate. There is also a check meter installed at the substation to measure the total electricity exported to the grid continuously, in case of the failure of the main meter, the readings are monitored from the check meter in a similar way as that for the main meter.
Frequency of monitoring/recording:	Measured: Continuously Reporting Frequency: Monthly
Value monitored:	140 966.809 MWh
Monitoring equipment:	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
Purpose of the data	Calculation of baseline emissions
Calculation method:	Not Applicable
Any comment:	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 _{y, Import}
Data unit:	MWh/year
Description:	Sum of electricity imported by all 25 WEGs of project activity connected to substation of the state utility
Source of data:	Statements on Break-up of Net Export Units prepared by the O&M Service provider
Description of measurement methods and procedures to be applied:	Main meter installed at the substation measure the total electricity imported from the grid continuously. A monthly meter reading taken jointly by state utility and PP representative (O&M contractor). The meter is a bi-directional meter measuring both the export and the import. The metered import of electricity is apportioned among the various project developers based on the electricity generated at the WEG-Controller (LCS readings). The apportioned import electricity corresponding to WEGs owned by

	a particular developer is then issued separately in a share certificate. There is also a check meter installed at the substation to measure the total electricity imported from the grid continuously, in case of the failure of the main meter, the readings are monitored from the check meter in a similar way as that for the main meter.
Frequency of monitoring/recording:	Measured: Continuously Reporting Frequency: Monthly
Value monitored:	887.033 MWh
Monitoring equipment:	ANNEXURE – 1
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
Purpose of the data	Calculation of baseline emissions
Calculation method:	Not Applicable
Any comment:	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.

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 (EG_V).
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);

For the project activity to establish its creditable emission reduction, it has to record the actual electricity generation, which would displace equivalent units of electricity at the operating and build margin of the grid. Since, the simple OM emission factor is calculated based on a 3 year average, based on the most recent statistics available at the time of PDD preparation, its updation based on ex post monitoring is not required. For BM calculation, option 1 (refer ACM 0002) has been chosen, which is calculated ex ante based on the most recent information, hence its monitoring is also not required. Hence, under the

monitoring protocol for the project it is required to: Monitor and record the electricity generated and exported by the wind farm to the regional grid.

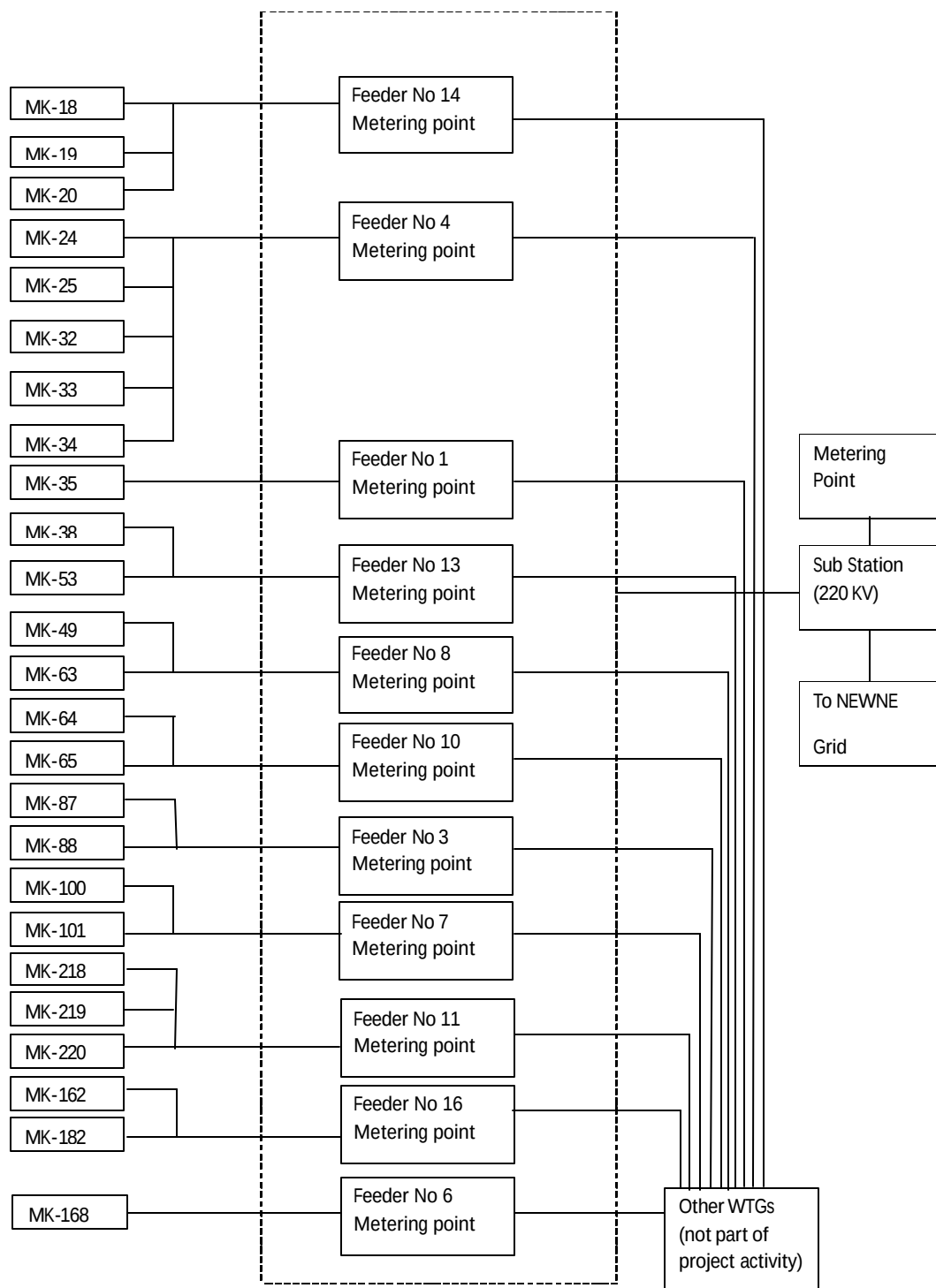
Reading and correction of meters:

The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication shall be as per the PPA (power purchase agreement). The electricity is exported to the grid sub-station from the project WTGs. A set of main and check is installed at grid-substation to monitor the electricity export and import from the project and non-project WTGs. In addition, a set of main and check meter is also installed at each feeder point of the pooling station maintained by the O&M service provider. The generation measured at WTG controller end is also recorded by the O&M service provider. Based on the measured and recorded energy at grid-substation level, feeder points at pooling station level and at WTG controller readings, O&M service provider calculates electricity export, import and net electricity supplied to the grid by the individual WTG using standard apportioning procedure accepted by the state electricity utility. A break-up sheet is prepared by the O&M service provider for each month & project owner in the wind farm. The Break up sheet is shared with the State Utility & project participant as well. On basis of this breakup sheet PP raises the invoices for payment against the net electricity supplied to grid. The break up sheet consists details of the electricity exported, electricity imported and net electricity supplied to grid.

The Main and check meter of 0.2s accuracy class are also installed at the sub-station of the state utility (RVPN / DISCOM) and also at feeder points. On a monthly basis, a joint meter reading will be carried out in the presence of the state utility officials and representatives of the project promoters.

Sealing and maintenance of meters:

- i. The AVVNL meter sealed in the presence of representatives of HZL / Suzlon and AVVNL.
- ii. Any meter seal(s) broken only by the AVVNL representative in the presence of Suzlon/HZLs representative whenever the main metering system or the 33kV metering system is to be inspected, tested, adjusted, repaired or replaced.
- iii. The AVVNL meter at the substation calibrated yearly.



Note: Arrangement of HZL WTG's connected with different feeders and then 220 KV substation of AVVNL.

Records:

Suzlon maintain an accurate and up-to-date operating log at the project site with records of:

- i. 24 Hours logs of Main meter and other meter readings and any other data mutually agreed.
- ii. Any unusual conditions found during operation/inspections
- iii. All the records preserved for 2 years beyond the crediting period.

Training and maintenance:

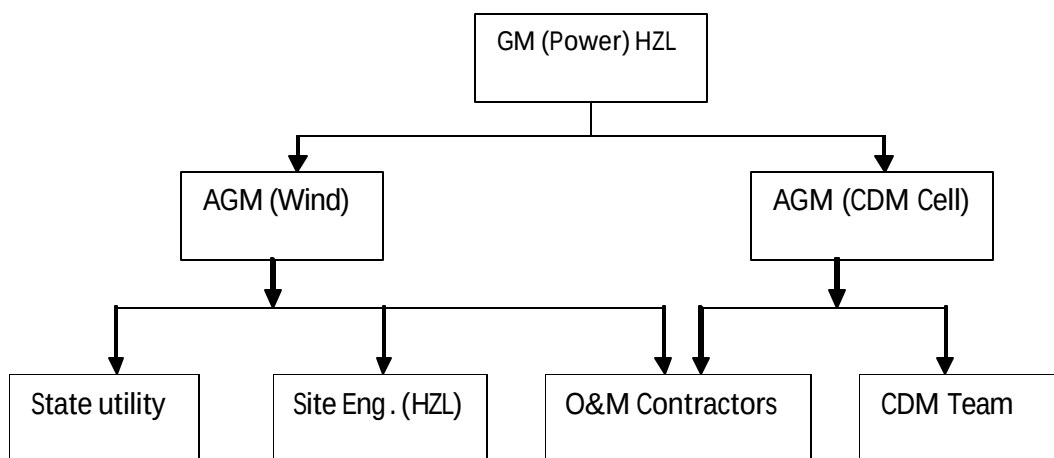
Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Energy Converters (WECs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In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

Authority and Responsibility:-

The responsibility of project management as well as 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 WEGs. The O&M personnel are qualified engineers and are trained at the WEG 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:



Net Electricity Exported = Total Electricity Exported - Total Electricity Imported

Baseline Emission Calculation: -

$$BE_y = EF_y \times EG_y$$

BE_y baseline emissions, tCO₂e

EG_y Net Quantity of Electricity supplied to AVVNL facility

EF_y grid emission factor, i.e. 0.9487 tCO₂/MWh (it has been fixed ex-ante)

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.

Emission Reduction Calculation: -

$$ER_y = BE_y - PE_y - Ly$$

ER_y Emission Reduction

BE_y baseline emissions

PE_y project emissions

Ly leakage emissions

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 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 Net Quantity of Electricity exported to AVVNL facility

EF_y grid emission factor, i.e. 0.9487 t CO₂/MWh (it has been fixed ex-ante)

EG_y = EG_{y,Export} – EG_{y,Import}

$$= 140\,966.809 - 887.033$$

$$= 140\,079.776 \text{ MWh}$$

So,

$$BE_y = 140\,079.776 \times 0.9487$$

$$= 132\,893.683 \text{ tCO}_2$$

$$= 132\,893 \text{ tCO}_2 \text{ (Round down to nearest integer)}$$

4.2 Project Emissions

There are no Project emissions from the project activity

4.3 Leakage

There are no leakage emissions from the project activity

4.4 Net GHG Emission Reductions and Removals

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

$$ER_y = BE_y - PE_y$$

$$= 132\,893 - 0$$

$$= 132\,893 \text{ tCO}_2\text{e}$$

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 1	54123.82	0	0	54123.82
Year 2	78769.86	0	0	78769.86
Total	132893.68	0	0	132893.68

APPENDIX 1: VER ESTIMATION SHEET

Month	Quantity of Electricity exported by HZL to AVVNL facility (Ph I)	Quantity of Electricity imported by HZL from AVVNL facility (Ph I)	Quantity of Electricity exported by HZL to AVVNL facility (Ph II)	Quantity of Electricity imported by HZL from AVVNL facility (Ph II)	Net Electricity Exported (Phase-I)	Net Electricity Exported (Phase-II)	Net Quantity of Electricity Exported to AVVNL facility(EGy)	Emission Factor	Baseline Emissions
	kWh	kWh	kWh	kWh	MWh	MWh	MWh	tCO ₂ e/MWh	tCO ₂ e
01 Feb 11 - 28 Feb 11	135458	1413	0	0	134.05	0	134.05	0.9487	127.17
01 Mar 11- 31 Mar 11	1372345	22176	0	0	1350.17	0	1350.17		1280.91
01 Apr 11- 30 Apr 11	5162827	30797	0	0	5132.03	0	5132.03		4868.76
01 May 11 - 31 May 11	9647911	11711	0	0	9636.20	0	9636.20		9141.86
01 Jun 11- 30 Jun 11	11775920	11912	0	0	11764.01	0	11764.01		11160.51
01 July 11- 31 July11	7500796	15803	0	0	7484.99	0	7484.99		7101.01
01 Aug 11- 31 Aug 11	5359912	22504	182691	825	5337.41	181.866	5519.27		5236.14
01 Sept 11- 30 Sept 11	5320558	15202	1686705	5501	5305.36	1681.204	6986.56		6628.15
01 Oct 11 - 31 Oct 11	3005008	50404	1337292	23160	2954.60	1314.132	4268.74		4049.75
01 Nov 11 - 30 Nov 11	1029553	62994	520394	29852	966.56	490.542	1457.10		1382.35
01 Dec 11- 31 Dec 11	2460379	47273	922759	18470	2413.11	904.289	3317.40		3147.21
01 Jan 12- 31 Jan 12	2569174	36274	1153211	15451	2532.90	1137.76	3670.66		3482.36
01 Feb 12 - 29Feb 12	2881827	31912	1281276	13712	2849.92	1267.564	4117.48		3906.25
01 Mar 12- 31 Mar 12	4521031	41307	2048768	18648	4479.72	2030.12	6509.84		6175.89
01 Apr 12- 30 Apr 12	3827246	32051	1747123	14312	3795.20	1732.811	5528.01		5244.42
01 May 12 - 31 May 12	6339504	16002	2872115	6258	6323.50	2865.857	9189.36		8717.94
01 Jun 12- 30 Jun 12	13327242	5842	6005228	2951	13321.40	6002.277	19323.68		18332.37
01 July 12- 31 July12	11700546	10419	5627112	4708	11690.13	5622.404	17312.53		16424.40
01 Aug 12- 31 Aug 12	5909638	28139	2692299	11341	5881.50	2680.958	8562.46		8123.20
01 Sept 12- 30 Sept 12	3209546	39387	1437513	17063	3170.16	1420.45	4590.61		4355.11
01 Oct 12 - 31 Oct 12	1962285	59127	866544	27137	1903.16	839.407	2742.57		2601.87
01 Nov 12 - 30 Nov 12	1070871	59613	496202	25382	1011.26	470.82	1482.08		1406.05
Total	110089577	652262	30877232	234771	109437.32	30642.46	140079.78		132893.683

Emission Reduction					
Month	Baseline Emissions (tCO ₂)	Project Emissions (tCO ₂)	Leakages	Emission Reduction (tCO ₂)	
			(tCO ₂)		
01 Feb 11 - 28 Feb 11	127.17	0	0	127.17	
01 Mar 11- 31 Mar 11	1280.91	0	0	1280.91	
01 Apr 11- 30 Apr 11	4868.76	0	0	4868.76	
01 May 11 - 31 May 11	9141.86	0	0	9141.86	
01 Jun 11- 30 Jun 11	11160.51	0	0	11160.51	
01 July 11- 31 July11	7101.01	0	0	7101.01	
01 Aug 11- 31 Aug 11	5236.14	0	0	5236.14	
01 Sept 11- 30 Sept 11	6628.15	0	0	6628.15	
01 Oct 11 - 31 Oct 11	4049.75	0	0	4049.75	
01 Nov 11 - 30 Nov 11	1382.35	0	0	1382.35	
01 Dec 11- 31 Dec 11	3147.21	0	0	3147.21	
01 Jan 12- 31 Jan 12	3482.36	0	0	3482.36	
01 Feb 12 - 29Feb 12	3906.25	0	0	3906.25	
01 Mar 12- 31 Mar 12	6175.89	0	0	6175.89	
01 Apr 12- 30 Apr 12	5244.42	0	0	5244.42	
01 May 12 - 31 May 12	8717.94	0	0	8717.94	
01 Jun 12- 30 Jun 12	18332.37	0	0	18332.37	
01 July 12- 31 July12	16424.40	0	0	16424.40	
01 Aug 12- 31 Aug 12	8123.20	0	0	8123.20	
01 Sept 12- 30 Sept 12	4355.11	0	0	4355.11	
01 Oct 12 - 31 Oct 12	2601.87	0	0	2601.87	
01 Nov 12 - 30 Nov 12	1406.05	0	0	1406.05	
Total	132,893.683	0.000	0.000	132,893.683	
				132,893	Round down to nearest integer

APPENDIX 2: ENERGY METER CALIBRATION DETAILS

Meter Details	Meter Sr. No.	Calibration frequency	Previous Calibration	Current Calibration	Next Calibration
220 KV Line 1 Main	9166170	yearly	13-03-2012	12-12-2012	11-12-2013
220 KV Line 1 Back Up	9166172	yearly	13-03-2012	12-12-2012	11-12-2013
220 KV Line 2 Main	MSB 60428	yearly	13-03-2012	17-12-2012	16-12-2013
220 KV Line 2 Back Up	MSB 60429	yearly	13-03-2012	17-12-2012	16-12-2013
SEL 74 (main)	RJB69748	yearly	16-03-2012	16-12-2012	15-12-2013
SEL 74 (back)	RJB69747	yearly	16-03-2012	16-12-2012	15-12-2013
SEL 75 Main	MSB10288	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 75 Back	MSB10287	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 86 Main	MSB10290	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 86 Back	MSB10291	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 90 Main	RJB69756	yearly	16-03-2012	15-12-2012	14-12-2013
SEL90 backup	RJB69757	yearly	16-03-2012	15-12-2012	14-12-2013
SEL91 Main	RJB69759	yearly	16-03-2012	15-12-2012	14-12-2013
SEL91 Backup	RJB69760	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 92 Main	RJB69751	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 92 Back up	RJB 69753	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 99 Main	RJB69754	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 99 backup	RJB 69755	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 103 Main	RJB72832	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 103 backup	RJB 72831	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 104 Main	RJB 72833	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 104 backup	RJB 72834	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 105 Main	RJB 72524	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 105 Backup	RJB 72525	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 113 Main	RJB 73569	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 113 back up	RJB73570	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 114 Main	RJB 73571	yearly	16-03-2012	15-12-2012	14-12-2013
SEL 114 Backup	RJB 73572	yearly	16-03-2012	15-12-2012	14-12-2013