# MONITORING REPORT

Prepared By (Dr. Sanjay Vashishtha and Gaurav Kumar Sharma)

Contact Information (U28A/3, DLF Phase – III, Gurgaon)

| | |
|---|---|
| **Project Title** | Aryan Coal 15 MW Wind Power Project in Maharashtra, India |
| **Version** | 6 |
| **Report ID** | 01 |
| **Date of Issue** | 22 –August - 2013 |
| **Project ID** | 298 |
| **Monitoring Period** | 01-August-2009 to 31-December-2012 |
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## Table of Contents

### CONTENTS

# 1 PROJECT DETAILS

## 1.1 Summary Description of Project

Aryan Coal 15 MW Wind Power Project at Village Ghatnandra in Sangli District of Maharashtra was commissioned during 29/09/2005 and 30/09/2005. The project activity entails generation of clean power by harnessing wind energy, a non-conventional renewable energy resource and export to the Maharashtra State Electricity Distribution Company Limited.

The project activity involves commissioning and operation of Suzlon make 12 WTGs of 1.25 MW cpacities each with aggregate capacity of 15 MW. The details of the WTGs have been tabulated as follows.

| S. No | WTG No | Capacity (MW) | Date of Commissioning | Location | Site Co-ordinates |
|---|---|---|---|---|---|
| 1 | G13 | 1.25 | 30/09/2005 | Sangli, Maharashtra | 17º 10' 10.4" N 74$^0$ 54' 23.8" E |
| 2 | G14 | 1.25 | 30/09/2005 | Sangli, Maharashtra | 17º 10' 21.5" N 74$^0$ 54' 22.1" E |
| 3 | G15 | 1.25 | 30/09/2005 | Sangli, Maharashtra | 17º 10' 34.5" N 74$^0$ 54' 12.7" E |
| 4 | G17 | 1.25 | 30/09/2005 | Sangli, Maharashtra | 17º 10' 11.8" N 74$^0$ 54' 04.7" E |
| 5 | G18 | 1.25 | 30/09/2005 | Sangli, Maharashtra | 17º 10' 21.8" N 74$^0$ 54' 59" E |
| 6 | G19 | 1.25 | 30/09/2005 | Sangli, Maharashtra | 17º 10' 33.3" N 74$^0$ 54' 56.1" E |
| 7 | G21 | 1.25 | 30/09/2005 | Sangli, Maharashtra | 17º 10' 0.1" N 74$^0$ 54' 49.4" E |
| 8 | G22 | 1.25 | 30/09/2005 | Sangli, Maharashtra | 17º 10' 11.4" N 74$^0$ 54' 44.2" E |
| 9 | G27 | 1.25 | 29/09/2005 | Sangli, Maharashtra | 17º 10' 22.8" N 74$^0$ 54' 24.3" E |
| 10 | G28 | 1.25 | 29/09/2005 | Sangli, Maharashtra | 17º 10' 34.1" N |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | 74$^0$ 54’ 15.0” E |
| 11 | G29 | 1.25 | 29/09/2005 | Sangli, Maharashtra | 17º 10’ 46.1” N 74$^0$ 54’ 09.6” E |
| 12 | G30 | 1.25 | 29/09/2005 | Sangli, Maharashtra | 17º 10’ 57.6” N 74$^0$ 54’ 07.3” E |
| Total | | 15 MW | | | |

Technical specifications of the WTGs are provided in Annex 3 of the MR.

### 1.2 Sectoral Scope and Project Type

Sectoral scope: 1. Energy Industries (renewable- / non-renewable)

Project is not a grouped project.

### 1.3 Project Proponent

At the time of development of project activity project proponent name was Aryan Coal Beneficiation Private limited. On 18/09/2009, project proponent has changed company name to ACB (India) Private Limited, hereafter referred as ACBIL, and in this regards Project proponent has received certificate from Government of India- Ministry of Corporate Affairs. ACBIL is the sole project proponent and project participant in the project activity. The contact details are

| | |
|---|---|
| Organization | ACBIL |
| Address | Rao Tula Ram Marg 18, Vasant Enclave, New Delhi-110057 |
| Telephone/ Fax | +91-11-46013427 / +91-11-16151327 |
| E-mail / URL | corp@acbindia.com/www.acbindia.com |
| Contact Person | Mr. Ramesh Khanna |
| Roles and responsibilities | Project developer |
| Designation | Advisor |
| Telephone/ Fax | +91-124-2719020 / +91-124-2719185 |
| E-mail | ramesh.khanna@acbindia.com |

Detailed description of the roles and responsibility of the of the PP is mentioned in Annex 2 of the MR.

### 1.4 Other Entities Involved in the Project

Project activity involves only ACBIL and details of the ACBIL has already been provided in section 1.3. No other party than ACBIL is included in the project activity.

### 1.5 Project Start Date

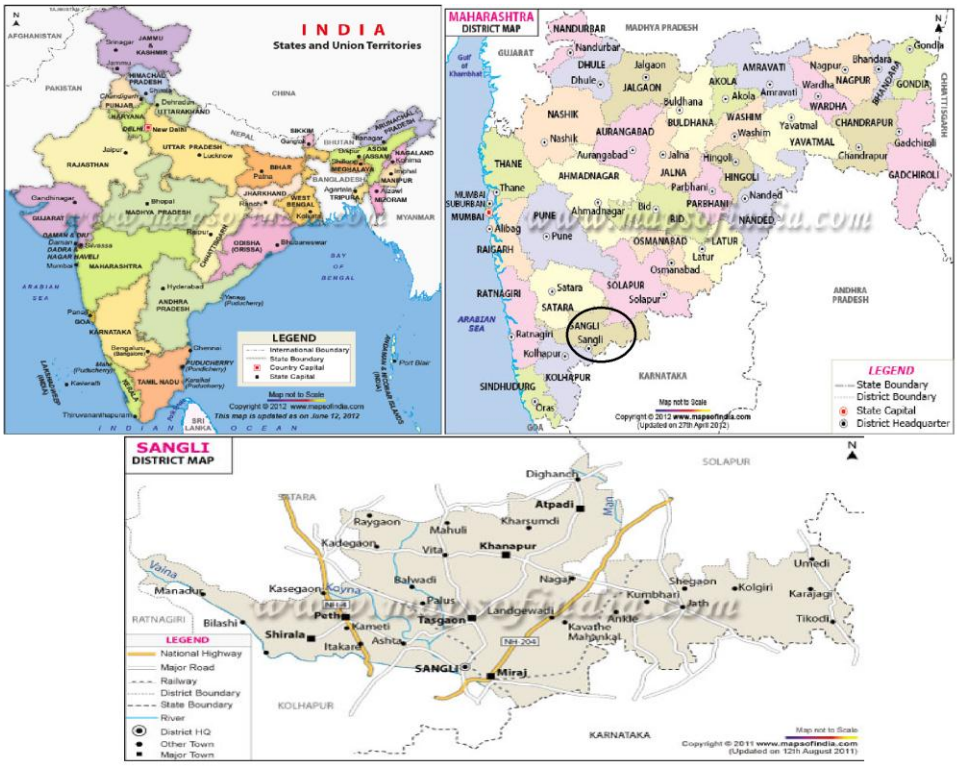
For the project activity, the project start date is the earliest date of the commissioning of any wind mill and first wind mill of the project activity had commissioned on 29/09/2005

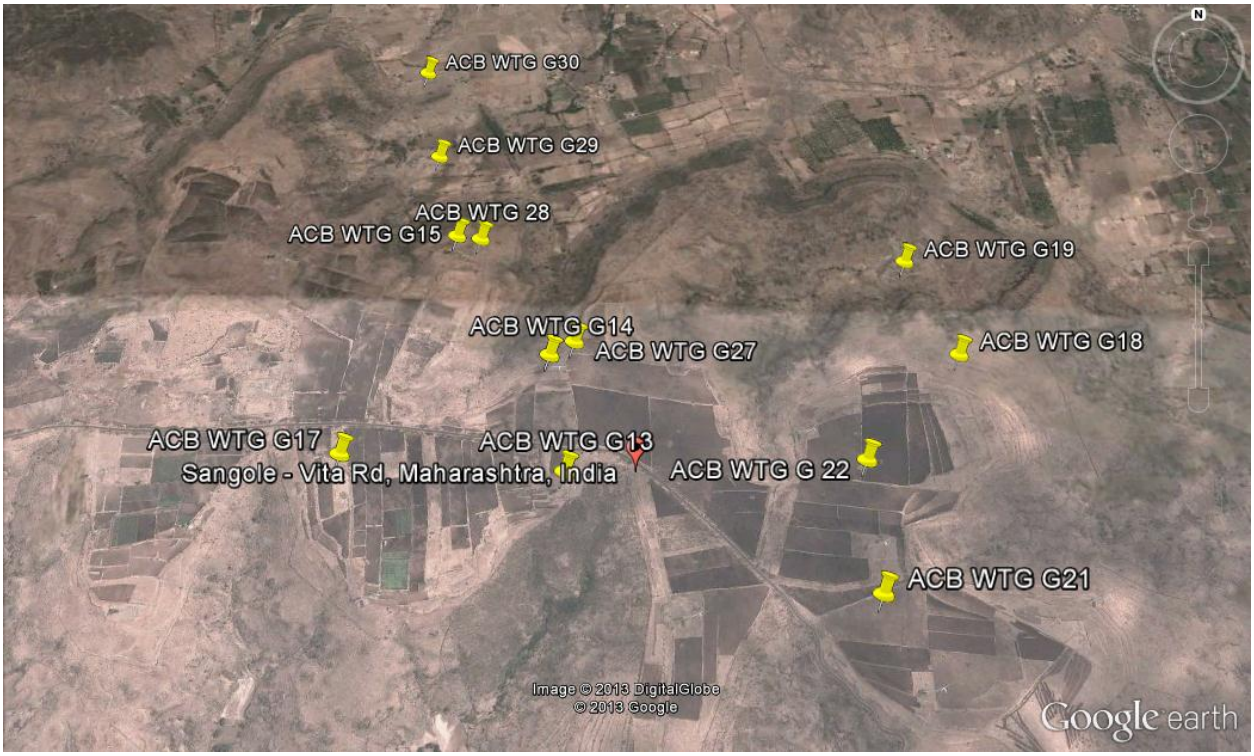
### 1.6 Project Crediting Period

Project has fixed crediting period of 10 years starting from 28/03/2006 to 27/03/2016.

### 1.7 Project Location

Project activity is located in Village Ghatnandare, Taluka Kavathe Mahankal, District Sangli in the state of Maharashtra. Nearest railway station is located in Satara city and airport at Pune. Geographical boundaries are






### 1.8 Title and Reference of Methodology

**Title:** AMS-I.D.: Grid connected renewable electricity generation

**Reference:** Appendix B of the Simplified modalities and procedures for small-scale CDM project activity i.e. 'indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories version' 10

**Version:** 14.0

## 2 IMPLEMENTATION STATUS

### 2.1 Implementation Status of the Project Activity

- Project activity contains 12 WTGs and all the WTG are commissioned now. First WTG was commissioned on 29/09/2005.
- Operation of the project activity is same as in the registered project document (PD). WTG use wind potential of the project site to generate electricity generated and same has been injected into Maharashtra State Electricity Distribution Company Limited (MSEDCL). There is no further information on any event is available, which can impact the GHG emission removal and monitoring.
- Project activity doesn't come under AFOLU

### 2.2 Project Description Deviations

There is no deviation in the project description from the registered PD

### 2.3 Grouped Project

Project activity is not a grouped project activity.

## 3 DATA AND PARAMETERS

### 3.1 Data and Parameters Available at Validation

| Data Unit / Parameter: | $EF_{GRID}$ |
|---|---|
| Data unit: | $tCO_2/MWh$ |
| Description: | Grid Emission Factor |
| Source of data: | Co2 baseline database, version 4, date: October 2008, Published by Central Electricity Authority |
| Value applied: | 0.906 |
| Purpose of the data: | Data is used for calculation of baseline emission calculation. |
| Any comment: | Ex- ante calculated and will remain constant for the entire crediting period |

### 3.2 Data and Parameters Monitored

| Data Unit / Parameter: | $EG_Y$ |
|---|---|
| Data unit: | kWh/year |
| Description: | Net Electricity exported by all WTGs to the grid in year y |
| Source of data: | Monthly electricity Invoice raised to MSEDCL |
| Description of measurement methods and procedures to be applied: | - Monthly joint meter reading is carried out at the metering point by the MSEDCL official and representative of the PP or the O&M contractor employed by the PP. |

| | |
|---|---|
| | - Net electricity supplied to NEWNE grid is calculated based on the difference between values of Export and Import on MSEDCL meter.<br>- The invoice raised by PP for the net electricity exported to the grid.<br>- The data is archived electronically |
| Frequency of monitoring/recording: | Monitoring : continuously<br>Recording: Monthly |
| Value monitored: | For year 2009 : 8390912.4 kWh<br>For year 2010 : 22155701 kWh<br>For year 2011: 21837295.53 kWh<br>For year 2012 : 21440857.66 kWh<br>Total for the second monitoring period: 73, 824, 766 |
| Monitoring equipment: | Type: Electronic Tri-vector meter<br>Accuracy class: 0.2s<br>Serial number:<br>04725792 (Main meter of Feeder 5)<br>04725787 (Check meter of feeder 5)<br>04725802 (Main meter of feeder 6)<br>04725800 (Check meter of feeder 6) |
| QA/QC procedures to be applied: | All the meters has been calibrated on the regular interval of 1 year, however, for some the time period, there was delay in calibration frequency. For this period, PP has conservatively applied correction factor. Same has been explained in section 3.3 of the MR under section "*Measures to ensure the results and uncertainty*" |
| Calculation method: | Not applicable |
| Any comment: | The relevant data will be recorded electronic form along with the electricity bills and will be archived for two years beyond the crediting period. |

### 3.3 Description of the Monitoring Plan

**Monitoring plan**

- Suzlon Wind farms service Ltd. (SWFSL) is responsible for monitoring of electricity generation at the WTGs and in this regards SWFSL appoint its representatives to ensure constant and reliable monitoring of the all WTGs.
- The gross electricity generation by the WTGs is recorded continuously and maintained through Management Information System (MIS) system. Meters are installed at the WTGs itself to measure and record gross electricity generation.
- The electricity from the WTGs is transmitted to the substation maintained by SWFSL. Substation is connected to WTGs other than considered in the project activity. Energy meters are installed at substation and collective electricity from all the WTGs is metered here.
- Difference in the collective metered energy at Substation and at WTG level is Transmission losses. These losses are calculated by the SWFSL and equally distributed to each of the WTG connected to the grid sub-station.
- Joint Meter Reading (JMR) is carried out by the representatives MSEDCL and the project Participant. JMR includes the details of Import and Export of electricity by WTGs and difference of the both (Export- Import) is Net electricity. Based on this Net electricity generation, PP raise invoice to Maharashtra State Electricity Board Distribution Company Ltd.

The entire monitoring is done in a very transparent manner. As an emergency preparedness plan, check meters are installed with the main meters, so that the data can be continuously monitored in case of malfunctioning of the main mater. To ensure the reliability and accuracy of the data, the energy meter are calibrated at least once in a year and accuracy class of the energy meter is maintained.

**Measures to ensure the results and uncertainty:**

All the meters (Main meter and Check meter) used for the monitoring purpose are of 0.2s accuracy class. Calibration of all the meters has been done periodically. As regular practice, the representatives of state electricity board were informed for conducting the annual calibration for the meters. The calibration of certificate of all the meters for this mentoring period indicates that all the meters were working with in the permissible limit of error. However, there were delays in calibration of meters within this monitoring period. Following table shows the details of delay in calibration.

Therefore as per para 238 under section 9.4.4.2 of the CDM Validation and Verification Standard Version 04.0 ; PP has applied an error equivalent to the accuracy class of the meter for the period were delay in calibration as there identified error in the calibration certificates are less than the maximum permissible limit.

| Year | | Feeder5 | | Feeder 6 | |
|---|---|---|---|---|---|
| | | **Main meter** | **Check meter** | **Main meter** | **Check meter** |
| 2008 | | 25-Nov-08 | 25-Nov-08 | 26-Nov-08 | 26-Nov-08 |
| | *Delay* | *No* | *No* | *No* | *No* |
| 2009 | | 05-Nov-09 | 05-Nov-09 | 05-Nov-09 | 05-Nov-09 |
| | *Delay* | *No* | *No* | *No* | *No* |
| 2010 | | 04-Mar-10 | 04-Mar-10 | 04-Mar-10 | 04-Mar-10 |
| | *Delay* | *No* | *No* | *No* | *No* |
| 2011 | | 13-Mar-11 | 15-Mar-11 | 13-Jun-11 | 13-Jun-11 |
| | *Delay* | *9 days* | *11 days* | *3 months 9 days* | *3 months 9 days* |
| 2012 | | 24-Jul-12 | 24-Jul-12 | 24-Jul-12 | 24-Jul-12 |
| | *Delay* | *4 month 11 days* | *4 months 9days* | *1 month 11 days* | *1 month 11 days* |

Being conservative, PP has applied correction factor for whole the months. This reduces the emission reduction by the project activity. Emission reduction calculation has been provide in emission reduction sheet and same has been described in section 4 of the Monitoring report.

Main meter and check meter for Feeder 5 & 6 had been replaced on 18/12/2012. New meters are also of same make and accuracy class which is Elster and 0.2s respectively. So, change in meters will not affect this monitoring period emission reduction calculation. Details of new meters are as follows:

**For Feeder no 5**
Main meter: 14796421
Check meter: 14796422
**For feeder no 6**
Main meter: 14796410
Check meter: 14796411

## 4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

### 4.1 Baseline Emissions

Baseline emission are calculated as per equation (1) of the applied methodology and same has been referred as equation (1) in the MR

$$BE_y = EG_y * EF_{GRID} \quad (1)$$

Where,

$BE_y$ = baseline emission in year y ($tCO_2$)

$EG_y$ = Electricity Generated by project in year y (MWh

$EF_{GRID}$ = Combined margin emission factor (Baseline emission factor) for year y ($tCO_2$/MWh)

$EF_{GRID}$ is taken from the registered PD as this parameter is ex-ante calculated.

| Parameter | Value | Source |
|---|---|---|
| $EG_y$ | 76732974 kWh | Monthly electricity Invoice raised to MSEDCL |
| $EF_{GRID}$ | 0.906 $tCO_2$/MWh | Registered PD |
| $BE_y$ | 69520 $tCO_2$ | Calculated |

### 4.2 Project Emissions

As the project activity is a wind power project, there are no anthropogenic emissions by source of the GHGs within the project boundary. So, $PE_y = 0$

### 4.3 Leakage

There are no identified leakage emissions from the project activity within project boundary.

### 4.4 Summary of GHG Emission Reductions and Removals

As per equation (10) of the applied methodology emission reduction are calculated as follows:

$ER_y = BE_y – PE_y - L_y$

$ER_y$ = 69520 - 0 – 0 = 69520 $tCO_2$

Vintage wise Emission reduction are presented in Annex 1

## 5 ADDITIONAL INFORMATION

This section is left blank intentionally.

**Annex 1**

Detailed calculation of emission reduction

| Vintage (Year) | Month | Feeder 5 | Feeder 6 | Net Power Export to Grid in kWh | Grid Emission factor ($tCO_2/MWh$) | Baseline Emission in tCO2e | Project Emission in tCO2e | Leakage Emission in tCO2e | Emission Reduction in tCO2e |
|---|---|---|---|---|---|---|---|---|---|
| 2009 | August | **2324428.3** | **1379555.6** | 3703983.9 | 0.906 | 3355.81 | 0 | 0 | 3355.81 |
| | September | 1253733.6 | 705872 | 1959605.6 | 0.906 | 1775.40 | 0 | 0 | 1775.40 |
| | October | 900891.2 | 473401.8 | 1374293 | 0.906 | 1245.11 | 0 | 0 | 1245.11 |
| | November | 558557.4 | 362036.1 | 920593.5 | 0.906 | 834.06 | 0 | 0 | 834.06 |
| | December | 270850.4 | 161586 | 432436.4 | 0.906 | 391.79 | 0 | 0 | 391.79 |
| Total Emission reduction (in tCO2)of year 2009 for second monitoring period | | | | | | | | | 7,602 |
| 2010 | January | 184266.1 | 109197 | 293463.1 | 0.906 | 265.88 | 0 | 0 | 265.88 |
| | February | 335723 | 193410.2 | 529133.2 | 0.906 | 479.39 | 0 | 0 | 479.39 |
| | March | 443418 | 248424.6 | 691842.6 | 0.906 | 626.81 | 0 | 0 | 626.81 |
| | April | 854772.5 | 453060.5 | 1307833 | 0.906 | 1184.90 | 0 | 0 | 1184.90 |
| | May | 1571651.4 | 773930.1 | 2345581.5 | 0.906 | 2125.10 | 0 | 0 | 2125.10 |
| | June | 2627666.3 | 1506584.1 | 4134250.4 | 0.906 | 3745.63 | 0 | 0 | 3745.63 |
| | July | 2604097.3 | 1643897.6 | 4247994.9 | 0.906 | 3848.68 | 0 | 0 | 3848.68 |
| | August | 2251993.2 | 1360600.2 | 3612593.4 | 0.906 | 3273.01 | 0 | 0 | 3273.01 |
| | September | 1431721.7 | 885692.7 | 2317414.4 | 0.906 | 2099.58 | 0 | 0 | 2099.58 |
| | October | 560542.8 | 284162.6 | 844705.4 | 0.906 | 765.30 | 0 | 0 | 765.30 |
| | November | 665535.2 | 376816.5 | 1042351.7 | 0.906 | 944.37 | 0 | 0 | 944.37 |
| | December | 491541.4 | 296996 | 788537.4 | 0.906 | 714.41 | 0 | 0 | 714.41 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Total Emission reduction of year 2010 (in tCO2) | | | | | | | | | 20,073 |
| 2011 | January | 238221.61 | 164083.88 | 402305.49 | 0.906 | 364.49 | 0 | 0 | 364.49 |
| | February | 330859.3 | 142353 | 473212.3 | 0.906 | 428.73 | 0 | 0 | 428.73 |
| | **March** | **387955.1348** | **262477.6926** | 650432.8274 | 0.906 | 589.29 | 0 | 0 | 589.29 |
| | April | 616621.6 | **355416.5424** | 972038.1424 | 0.906 | 880.67 | 0 | 0 | 880.67 |
| | May | 1298201.6 | **695089.4352** | 1993291.035 | 0.906 | 1805.92 | 0 | 0 | 1805.92 |
| | June | 2973603.2 | **1795431.74** | 4769034.94 | 0.906 | 4320.75 | 0 | 0 | 4320.75 |
| | July | 2907609.2 | 1788800.3 | 4696409.5 | 0.906 | 4254.95 | 0 | 0 | 4254.95 |
| | August | 2255338.4 | 1378110.3 | 3633448.7 | 0.906 | 3291.90 | 0 | 0 | 3291.90 |
| | September | 2419681.7 | 1052952.3 | 3472634 | 0.906 | 3146.21 | 0 | 0 | 3146.21 |
| | October | 201737.2 | 91601.8 | 293339 | 0.906 | 265.77 | 0 | 0 | 265.77 |
| | November | 599998.6 | 267463.2 | 867461.8 | 0.906 | 785.92 | 0 | 0 | 785.92 |
| | December | 200275.4 | 107081.1 | 307356.5 | 0.906 | 278.46 | 0 | 0 | 278.46 |
| Total Emission reduction of year 2011 (in tCO2) | | | | | | | | | 20,413 |
| 2012 | January | 348457.7 | 197826.7 | 546284.4 | 0.906 | 494.93 | 0 | 0 | 494.93 |
| | February | 370324.2 | 205159.5 | 575483.7 | 0.906 | 521.39 | 0 | 0 | 521.39 |
| | March | **711188.1732** | 415847.8 | 1127035.973 | 0.906 | 1021.09 | 0 | 0 | 1021.09 |
| | April | **0** | 0 | 0 | 0.906 | 0.00 | 0 | 0 | 0.00 |
| | May | **607781.7006** | 274341.3 | 882123.0006 | 0.906 | 799.20 | 0 | 0 | 799.20 |
| | June | **3199569.637** | **1820048.009** | 5019617.646 | 0.906 | 4547.77 | 0 | 0 | 4547.77 |
| | July | **2925318.638** | **1898266.459** | 4823585.097 | 0.906 | 4370.17 | 0 | 0 | 4370.17 |
| | August | 2939164.6 | 1916321.4 | 4855486 | 0.906 | 4399.07 | 0 | 0 | 4399.07 |
| | September | 2210902.6 | 1369253.3 | 3580155.9 | 0.906 | 3243.62 | 0 | 0 | 3243.62 |
| | October | 672675 | 405103 | 1077778 | 0.906 | 976.47 | 0 | 0 | 976.47 |
| | November | 338907.2 | 201641.7 | 540548.9 | 0.906 | 489.74 | 0 | 0 | 489.74 |

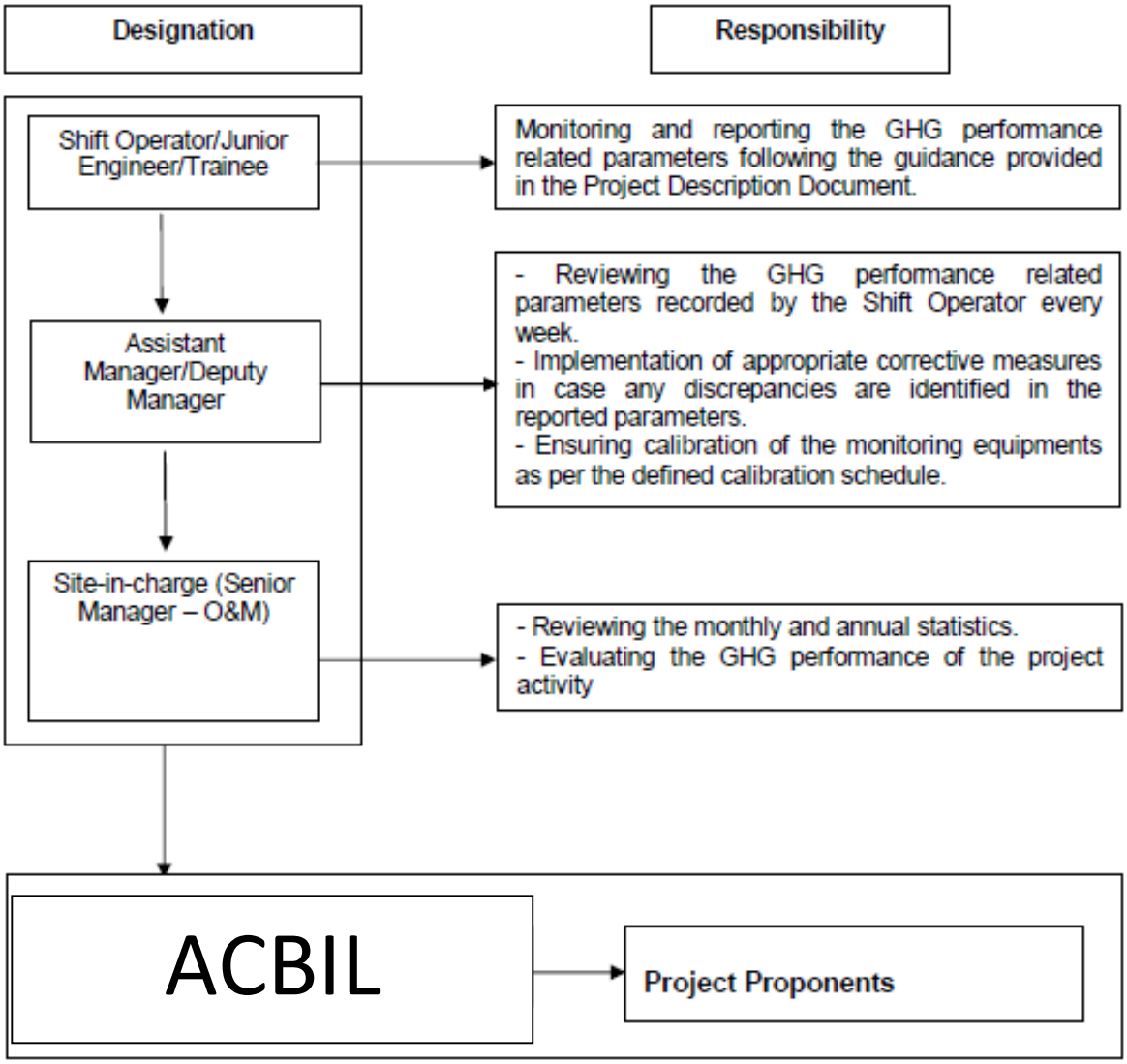
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | December | 385709.4 | 241588.9 | 627298.3 | 0.906 | 568.33 | 0 | 0 | 568.33 |
| Total Emission reduction of year 2012 (in tCO2) | | | | | | | | | 21,432 |

Total generation in the crediting period is 76732974 kWh and Total emission reductions for the second monitoring period are 69520 $tCO_2e$.

PP don't have daily Electricity import and Export data, so being conservative, PP has applied correction for the complete month net generation. Which leads to decrease in emission reduction by the project activity.

**Annex2**

Roles and responsibility of the relevant personnel involved in monitoring, reporting and verification GHG performance related parameter in project activity.



**Annex 3**

| Item | Description |
|---|---|
| Make | SUZLON |
| Model no. | S-70 |
| Rating in KW | 1250 |
| Rotor diameter (m) | 70 |
| Highest hub height (m) | 75 |
| Type of Tower (Tubular/lattice) | Tabular |
| Number of blades | 3 |
| Power regulation | Pitch |
| Type of generator | Asynchronous, dual, geared |
| Rated voltage | 690V (50MHz), 600V(60Hz) |
| Cut in wind speed (m/s) | 3 |
| Cut of wind speed (m/s) | 20 |
| Rated wind speed (m/s) | 12 |
| Survival wind speed (m/s) | 67 |