



**Monitoring report form
(Version 05.1)**

MONITORING REPORT

| | | |
|--|--|---|
| Title of the project activity | Vaayu India Wind Power Project in Andhra Pradesh | |
| UNFCCC reference number of the project activity | 4677 | |
| Version number of the monitoring report | 1.0 | |
| Completion date of the monitoring report | 19/12/2016 | |
| Monitoring period number and duration of this monitoring period | Fifth monitoring period, 26/09/2014 to 25/09/2016 (Including first and last day) | |
| Project participant(s) | 1. M/s Vaayu (India) Power Corporation Private Limited (Private Entity) 2. Kingdom of Spain (Withdrawn) 3. Swedish Energy Agency (Withdrawn) | |
| Host Party | India | |
| Sectoral scope(s) | Sectoral Scope: 1 Energy industries (renewable/ non-renewable sources) | |
| Selected methodology(ies) | "Consolidated methodology for grid-connected electricity generation from renewable sources – ACM0002 - Version 11" | |
| Selected standardized baseline(s) | Not Applicable | |
| Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD | 186,197 tonnes of CO ₂ e | |
| Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period | GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012 | GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards |
| | NA | 157,704 tonnes of CO ₂ e |

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Purpose of the project activity and the measures taken to reduce greenhouse gas emissions:

The purpose of the project activity is to utilize renewable wind energy for generation of electricity. In the absence of the project activity equivalent amount of electricity would have been generated from the existing grid connected power plants and planned capacity additions which are also largely fossil fuel based. Thus electricity generation from the project displaces the electricity generated from existing and planned power plant capacities in the southern grid whose emission intensities are represented by the Combined Margin Emission Factor of the Southern Grid, which predominantly uses fossil fuels and has grid emission of ~ 0.94515 tCO₂/MWh of electricity produced.

Vaayu (India) Power Corporation Private Limited (VIPCPL) has installed 50.4 MW wind farm in the state of Andhra Pradesh in India. Wind World (India) Limited ("Wind World") is the equipment supplier and the operations and maintenance contractor for the Project. The Project is owned by VIPCPL. There are 63 Wind Energy Convertors ("WEC's") of Wind World WW-53 make with rated capacity 800 KW each. The generated electricity is supplied to Electricity Distribution Company (DISCOM) under a long-term power purchase agreement (PPA). The expected operational lifetime of the project is for 20 years.

Brief description of the installed technology and equipment:

The technical specifications of the Wind World WW-53 make WECs with rated capacity 800 KW are given below:

| Main Specifications E-53 | |
|----------------------------|---|
| Turbine model | Wind World WW-53 |
| Rated power | 800 KW |
| Rotor diameter | 53 m |
| Hub height | 75 m |
| Turbine Type | Gearless horizontal axis wind turbine with variable rotor speed |
| Power regulation | Independent electromechanical pitch system for each blade. |
| Cut in wind speed | 2.5 m/s |
| Rated wind speed | 12 m/s |
| Cut out Wind speed | 28-34 m/s |
| Extreme Wind Speed | 59.5 m/s |
| Rated rotational speed | 32 rpm |
| Operating range rot. speed | 12-29 rpm |
| Orientation | Upwind |
| No of Blades | 3 |
| Blade Material | Fibre Glass Epoxy reinforced with integral lightning protection |
| Gear box type | Gear less |
| Generator type | Synchronous generator |
| Braking | Aerodynamic |
| Output Voltage | 400 V |

| | |
|------------|--|
| Yaw System | Active yawing with 4 electric yaw drives with brake motor and friction bearing |
| Tower | 74 m concrete |

Wind World (India) Ltd has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH, has established a manufacturing plant at Daman in India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured.



Technology Diagram

Relevant dates for the project activity:

The first machine under the project activity was commissioned on 02/08/2010 and last machine was commissioned on 04/05/2011. The expected operational lifetime of the project is for 20 years. The details of issuance of CERs for the previous monitoring periods are as follows:

| Monitoring Period No. | Monitoring Period | CER Issued |
|-----------------------|---|----------------------------|
| First Issuance | 25/04/2011 to 25/03/2012 (Inclusive of both days) | 93,324 |
| Second issuance | 26/03/2012 to 25/12/2012 (Inclusive of both days) | 96,662 |
| Third issuance | 26/12/2012 to 25/12/2013 (Inclusive of both days) | 104,621 |
| Fourth issuance | 26/12/2013 to 25/09/2014 (Inclusive of both days) | Verification under process |

Total emission reductions achieved in this monitoring period

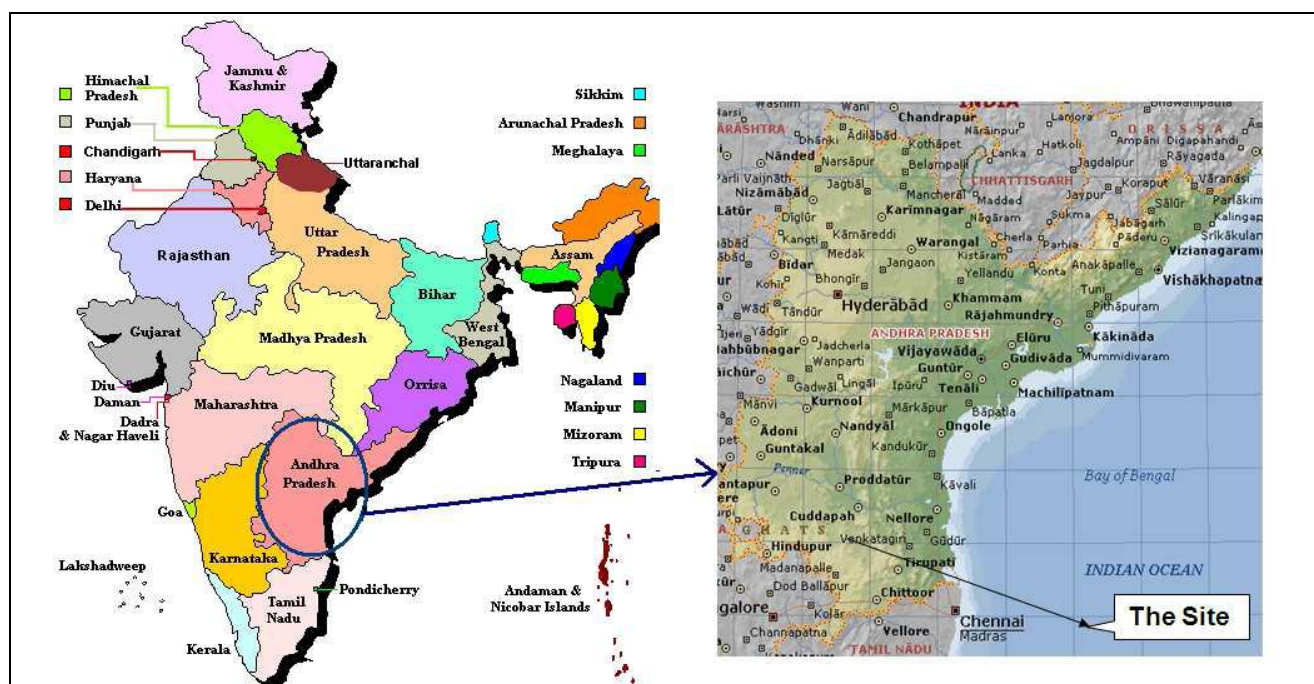
This is the fifth monitoring report for the project activity. The total emission reductions achieved under the monitoring period 26/09/2014 to 25/09/2016 (Including first and last day) is 157,704 tCO₂e.

A.2. Location of project activity

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- (a) Host Party(ies); India
- (b) Region/State/Province, etc.; Andhra Pradesh State
- (c) City/Town/Community, etc.; Petnikota, Tummalapenta, Abdullapuram, Chintalayapalli villages in Kurnool district and Venkatampalli & Bhogasamudram villages in Anantapur district in Indian State of Andhra Pradesh.
- (d) Physical/ Geographical location.

The detailed individual WECs location numbers and coordinates of project activity are provided in Appendix 1.



A.3. Parties and project participant(s)

| Party involved (host) indicates a host Party) | Private and/or public entity(ies) project participants (as applicable) | Indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|--|---|
| Government of India (host) | Vaayu (India) Power Corporation Private Limited (Private Entity) | No |
| Spain (Withdrawn) | Kingdom of Spain | Yes |
| Sweden (Withdrawn) | Swedish Energy Agency | Yes |

A.4. Reference of applied methodology and standardized baseline

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Title: “Consolidated methodology for grid-connected electricity generation from renewable sources – Version 11”

Reference: Approved consolidated baseline and monitoring methodology ACM0002

Version: 11.0, EB 52

ACM0002 draws upon the following tools which have been used in the PDD:

- Tool to calculate the emission factor for an electricity system – Version 02
- Tool for the demonstration and assessment of additionality – Version 5.2

Further information with regards to the methodology / tools can be obtained at

<http://cdm.unfccc.int/UserManagement/FileStorage/HGY3TLRFPQVM016WA4I7XCZD92KE5S>

A.5. Crediting period of project activity

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The length of the Crediting period of the project activity as per registered PDD is 10 years (fixed) starting from 25/04/2011 to 24/04/2021(including first and last day).

A.6. Contact information of responsible persons/entities

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Vaayu (India) Power Corporation Private Limited
Plot No. 33, Daman Patalia Road
Bhimpore, Daman (UT)
Daman (UT) - 396210
India

The detailed contact information has been provided in Annex 1. The above mentioned person/entity is also a project participant.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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The project start date is 05th December 2009. The first machine under the project activity was commissioned on 02/08/2010 and last machine was commissioned on 04/05/2011. During the monitoring period the project activity was operated and monitored in accordance with the applicable baseline and monitoring methodology ACM0002 (ver.11) and registered PDD approved by the EB on 22/11/2012.

The commissioning schedule of all the WECs under the project activity has been provided in Appendix 2.

There are no changes that have happened in project activity which may impact the applicability of the methodology. The operation and maintenance activities of Wind World are ISO certified and all the events are recorded in the log book available at the project site. Referring to the data available it can be inferred that there have not been any major special events for any of the machines that are included in the project activity. As a part of regular maintenance the machines are stopped for mechanical and electrical maintenance for 16 to 18 hours annually and for visual inspection for 6 to 7 hours quarterly. During the monitoring period there were no events or situation occurred, which may impact the applicability of the methodology.

Description of maintenance intervals:

There is a pre-defined maintenance schedule for annual maintenance for all the WECs at project site. There are four types of maintenance activity have been executed for all the WECs. During maintenance, WEC needs to stop for defined time period which are as follows:

- 1) Visual maintenance : Average 3 to 4 hr stoppage of WEC
- 2) Grease maintenance : Average 3 to 4 hr stoppage of WEC
- 3) Electrical maintenance : Average 16 to 20 hr stoppage of WEC

4) Mechanical maintenance: Average 16 to 20 hr stop of WEC

Other than the above mentioned maintenance activity, WEC were generating electricity continuously without any technical fault. Hence no break down has been noted during the monitoring period.

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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There is no deviation from registered monitoring plan or applied methodology during this monitoring period.

B.2.2. Corrections

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There are no corrections from the registered PDD during this monitoring period.

B.2.3. Changes to start date of crediting period

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There are no changes to the start date of the crediting period.

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

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The monitoring plan has been revised.

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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The monitoring plan has been revised. The revision in monitoring plan was done to change in calibration/testing frequency from once each year to once in five years as calibration frequency for monitoring equipment which is not under control of PP. Revised PDD version 5.0, dated 22/05/2012 was approved by UNFCCC on 22/11/2012. (Link: <http://cdm.unfccc.int/Projects/DB/DNV-CUK1302613748.83/view>).

B.2.6. Changes to project design of registered project activity

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There are no permanent Changes to project design of registered project activity.

B.2.7. Types of changes specific to afforestation or reforestation project activity

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Not applicable to the project activity.

SECTION C. Description of monitoring system

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Approved methodology ACM0002 Version 11, "Consolidated methodology for grid connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

Monitoring System of Project Activity:

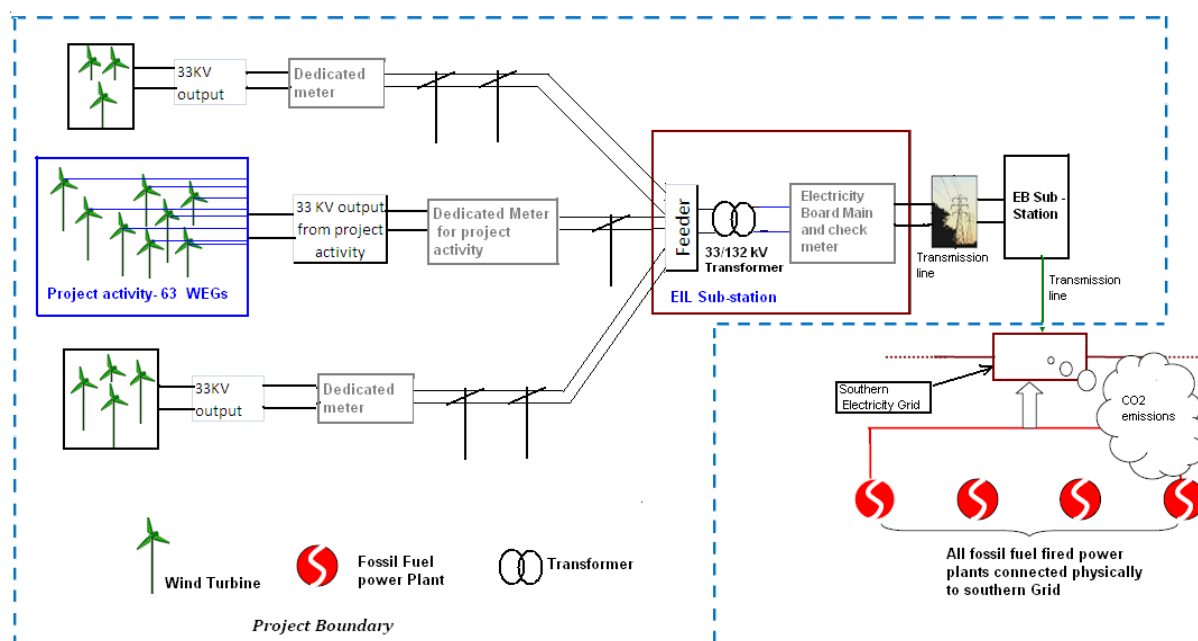
The PP has made clusters of Wind Energy Convertors (WEC's) at the project site for the purpose of metering. Each cluster has main and the check meter at 33 kV. All the clusters are exclusively connected to WECs of the project activity and no WECs of other project owners are connected to these clusters. Summations of meter reading for all the clusters (connecting 63 machines) provide total electricity generated by the project activity.

The electricity supplied to the grid is metered from main and check meters at 33kV that are connected to the 63 turbines of the project activity. The electricity export and import for the project activity has been taken from the summation of the joint meter readings noted from the cluster meters (dedicated meters) connecting 63 turbines of the project activity.

In addition to this there are main and check meters at Wind World pooling substation (132kV). Transmission loss between metering point at 33kV and the metering point at 132kV at Wind World pooling substation is applied to the meter reading taken at meters connected at 33 KV for the project activity. Wind World pooling substation is connected to the machines of the project activity and the machines commissioned by the other project owners. Therefore transmission loss is applied to the project activity by the state utility as reflected in the JMR taken at 33kV level. The JMR is signed by the representatives of Wind World and the state utility.

METERING ARRANGEMENT:

A detailed line diagram of project activity is shown in below picture. Layout of Metering arrangement for project activity is as follows:-



Wind World is contracted for Operation and Maintenance of the project activity and provides the daily generation report to the Project participant. The project participant also maintains the records of daily generation report and joint meter report. The meter readings are noted in the form of joint meter report and are signed jointly by the representatives of Wind World and the state utility. From the above layout it is clear that the clusters meters (dedicated meters/ individual meters) of project activity and other customers are connected to the Wind World pooling sub-station (bulk metering point at 132 kV). Since the main and check meters (bulk meter) at 132 kV metering point at the WIND WORLD pooling substation is connected to the machines of the project activity and the machines commissioned by the other project developers, therefore in order to determine the net

electricity supplied to the grid at 132 kV at the WIND WORLD substation, the state utility apply the apportioning of transmission loss to the meter reading recorded at the 33 KV. The total % of transmission loss for export between 132kV metering point at Wind World sub-station and all the WECs connected to sub-station is calculated by the state utility is endorsed / confirmed jointly by the representatives of Wind World and the state utility. The transmission loss applied to the project activity by the state utility is reflected in transmission loss calculation sheet signed by the representatives of Wind World and Discom.

Calculation of net electricity supplied to the grid by project activity:

Net Electricity exported to the grid is calculated by applying transmission loss to the meter readings taken at 33 kV metering point of the project activity.

The procedure for calculation of the transmission loss is as follows:

Each project developer has dedicated individual metering system at 33kV. Energy export ($X_{\text{Export}, N}$) and import ($X_{\text{Import}, N}$) is recorded for the individual developers at 33 KV metering point; Where N is number of project developers connected to 132 kV metering point of the WIND WORLD substation

Total % of transmission losses for export (Lep) are calculated as per following formula:

$$Lep (\%) = \frac{\{(X_{\text{Export},1} + X_{\text{Export},2} + X_{\text{Export},3} + \dots + X_{\text{Export},N}) - EGe\} * 100}{(X_{\text{Export},1} + X_{\text{Export},2} + X_{\text{Export},3} + \dots + X_{\text{Export},N})}$$

Where, EGe = Electricity export to the grid recorded at 132 kV (bulk meter) at the WIND WORLD pooling substation.

Value of Lep is calculated by state utility and would be sourced directly from the transmission loss calculation sheet.

Hence,

Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (Cluster meter) & 132kV metering point (Bulk meter)

$$EG_{\text{export}, y} = EGpe * (1 - Lep (\%))$$

Where:

$EG_{\text{export}, y}$ = Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (Cluster meter) & 132kV metering point (Bulk metering point)

$EGpe$ = Electricity Export recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting total 63 machines of the project activity.

Lep = Total percentage of Transmission loss for export between the metering point at 33 kV metering points (sum of all the WECs connected to Bulk metering point including non-project activity as well as project activity WECs) and the metering point at 132 kV at the WIND WORLD pooling substation.

The Joint meter reading noted at 33 KV metering location contains the following data:-

1. Electricity Export
2. Electricity Import

The electricity export and import by the project activity can be cross checked from the certified statement of electricity export and import signed by Discom/State Utility.

Net Electricity supplied to the Grid is calculated as:

$$EG_{PJ,y} = EG_{\text{export}, y} - EGpi$$

Where:

$EG_{P,J,y}$ = Net electricity supplied to the grid by the Project activity

$EG_{\text{export}, y}$ = Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (Cluster meter) & 132kV metering point (Bulk metering point)

EG_{pi} = Electricity Import recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting total 63 machines of the project activity

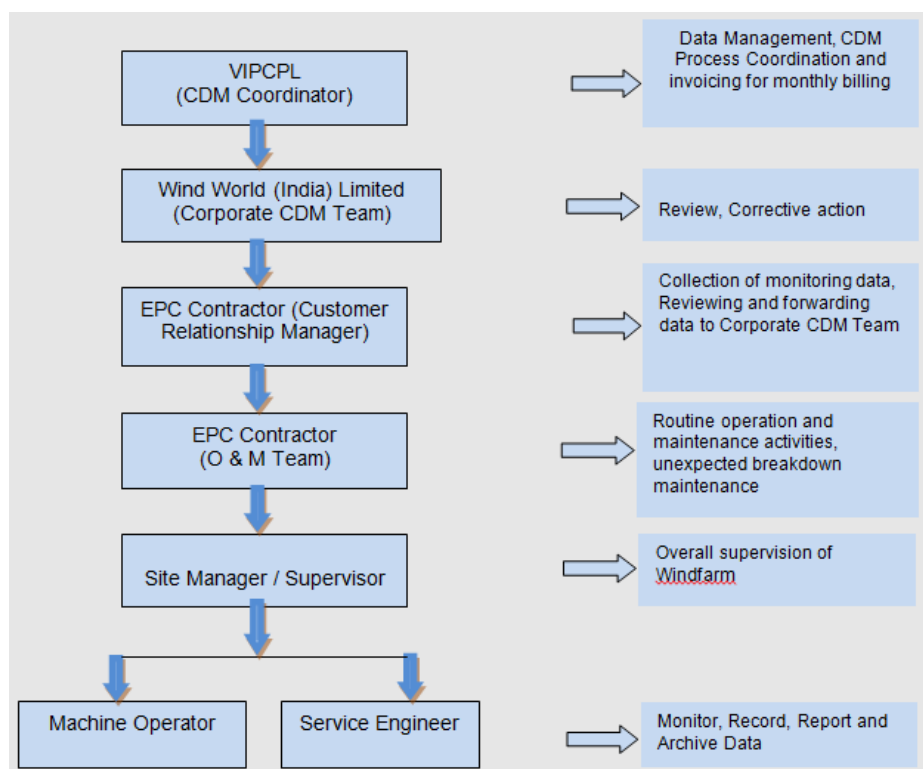
Metering Equipment: Metering system for the project activity consists of main and check meter. Both the meters are two-way trivector meters capable of recording import and export of electricity. The metering equipment is calibrated once in five years. Metering equipment is electronic trivector meter of 0.2s accuracy class.

Meter Readings: The monthly meter reading is taken jointly by the parties (Wind World and State utility) for every last month. At the conclusion of each meter reading an appointed representative of State Utility and Wind World sign a document indicating the number of Kilowatt-hours (kWh) indicated by the meter.

QA/QC Procedure: All the meters are calibrated/ tested once in five years. The calibration is done by the officials of the state utility. The accuracy of monitoring parameter is ensured by adhering to the calibration and testing of the metering equipment once in five years. Wind World provides the daily generation report to the Project participant. In case the main meter(s) is found to operate outside the permissible limits, the main meter will be either replaced or calibrated immediately. Whenever a main meter goes defective, the consumption recorded by the Check meter will be referred.

The project participant, Vaayu (India) Power Corporation Private Limited, is monitoring the data for electricity generation and calibration reports post project implementation. Wind World (India) Limited is O&M contractor who has responsibility of maintaining electricity generation records, calibration records and maintenance of the WECs (Wind Energy Convertors). The project participant also maintains the records of daily generation report and joint meter report.

The operational and management structure implemented for data monitoring is as follows:



Calibration Details: Metering system for the project activity consists of main and check meter. The metering equipment is calibrated once in five years. The details of calibration of meters installed at 33kV for measuring export and import by WECs installed phase wise are provided below:

| SIN | Customer Name | Meter Type | Meter Serial No. | Accuracy Class | Calibration before monitoring period | Last Calibration Date | Calibration Due date |
|-----|---|-------------|------------------|----------------|--------------------------------------|-----------------------|----------------------|
| 1 | Vaayu (India) Power Corporation Private Limited (Phase-1) | Main Meter | AP900318 | 0.2s | 02/08/2010 | 04/03/2014 | 03/03/2019 |
| | | Check Meter | AP900320 | 0.2s | 02/08/2010 | 04/03/2014 | 03/03/2019 |
| 2 | Vaayu (India) Power Corporation Private Limited (Phase-2) | Main Meter | AP900327 | 0.2s | 27/09/2010 | 05/07/2014 | 04/07/2019 |
| | | Check Meter | AP900328 | 0.2s | 27/09/2010 | 05/07/2014 | 04/07/2019 |
| 3 | Vaayu (India) Power Corporation Private Limited (Phase-3) | Main Meter | AP900314 | 0.2s | 30/03/2011 | 05/03/2014 | 04/03/2019 |
| | | Check Meter | AP900315 | 0.2s | 30/03/2011 | 05/03/2014 | 04/03/2019 |
| 4 | Vaayu (India) Power Corporation Private Limited (Phase-4) | Main Meter | AP900338 | 0.2s | 27/09/2010 | 05/03/2014 | 04/03/2019 |
| | | Check Meter | AP900339 | 0.2s | 27/09/2010 | 05/03/2014 | 04/03/2019 |
| 5 | Vaayu (India) Power Corporation Private Limited (Phase-5) | Main Meter | AP900319 | 0.2s | 30/09/2010 | 05/03/2014 | 04/03/2019 |
| | | Check Meter | AP900321 | 0.2s | 30/09/2010 | 05/03/2014 | 04/03/2019 |
| 6 | Vaayu (India) Power Corporation Private Limited (Phase-6) | Main Meter | AP900329 | 0.2s | 02/12/2010 | 05/03/2014 | 04/03/2019 |
| | | Check Meter | AP900330 | 0.2s | 02/12/2010 | 05/03/2014 | 04/03/2019 |
| 7 | Vaayu (India) Power Corporation Private Limited (Phase-7) | Main Meter | AP900331 | 0.2s | 31/12/2010 | 04/03/2014 | 03/03/2019 |
| | | Check Meter | AP900332 | 0.2s | 31/12/2010 | 04/03/2014 | 03/03/2019 |

The controller meter (also known as Local Control System (LCS) meter) located in the WEC tower do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WECs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. The operations and maintenance staff will calibrate the meter immediately and correction factor will be determined.

Project participants (PP) contracted Wind World (India) Limited for operation and maintenance of all the WECs. Wind World (India) Limited has implemented the management structure for managing the monitored data. Wind World is an ISO 9001:2008 certified Quality Management system from Germanischer Lloyd.

Training and maintenance requirements:

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 WEGs, it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that Wind World's service staffs 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 Wind World Training Academy provides need-based training to meet the training requirements of Wind World 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.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

| | |
|--|---|
| Data/parameter: | $EF_{grid,OM,y}$ |
| Unit | tCO ₂ e/MWh |
| Description | Operating Margin Emission Factor of Southern Regional Electricity Grid |
| Source of data | <p>"CO₂ Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO₂ Baseline Database for Indian Power Sector" is available at www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm</p> <p>The detailed information is available in Appendix 3.</p> |
| Value(s) applied) | 0.98756 |
| Choice of data or measurement methods and procedures | Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002. |
| Purpose of data | Baseline emission calculations |
| Additional comments | None |

| | |
|--|--|
| Data/parameter: | $EF_{grid,BM,y}$ |
| Unit | tCO ₂ e/MWh |
| Description | Build Margin Emission Factor of Southern Regional Electricity Grid |
| Source of data | <p>"CO₂ Baseline Database for Indian Power Sector" version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO₂ Baseline Database for Indian Power Sector" is available at www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm</p> <p>The detailed information is available in Appendix 3.</p> |
| Value(s) applied) | 0.81792 |
| Choice of data or measurement methods and procedures | Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002. |
| Purpose of data | Baseline emission calculations |
| Additional comments | None |

| | | | |
|---|---|---|---------|
| Data/parameter: | $EF_{grid,CM,y}$ | | |
| Unit | tCO ₂ e/MWh | | |
| Description | Combined Margin Emission Factor of Southern Regional Electricity Grid | | |
| Source of data | <p>The "CO₂ Baseline Database for Indian Power Sector" version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO₂ Baseline Database for Indian Power Sector" is available at www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm</p> <p>The detailed information is available in Appendix 3.</p> | | |
| Value(s) applied) | <p>In case of wind power projects default weights of 0.75 for $EF_{grid,OM}$ and 0.25 for $EF_{grid,BM}$ are applicable as per ACM0002.</p> <table border="1"> <tr> <td>Combined Margin Emission Factor (EF_y or $EF_{CM,y}$)</td><td>0.94515</td></tr> </table> | Combined Margin Emission Factor (EF_y or $EF_{CM,y}$) | 0.94515 |
| Combined Margin Emission Factor (EF_y or $EF_{CM,y}$) | 0.94515 | | |

| | |
|--|--|
| Choice of data or measurement methods and procedures | Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System. |
| Purpose of data | Baseline emission calculations |
| Additional comments | None |

D.2. Data and parameters monitored

| | |
|---------------------------------------|---|
| Data/Parameter | EG_{PJ,y} |
| Unit | MWh (Mega-watt hour) |
| Description | Net electricity supplied to the grid by the Project activity |
| Measured/Calculated /Default | Calculated |
| Source of data | Net electricity supplied to the grid by the Project activity calculated using the formula described in Section C. |
| Value(s) of monitored parameter | 166,856.509 MWh |
| Monitoring equipment | Calculated as per formulas better described under section C. |
| Measuring/Reading/Recording frequency | Monthly: The apportioning is done as per the procedure described in section C. |
| Calculation method (if applicable) | Calculated using formula $EG_{PJ,y} = EG_{export,y} - EG_{pi}$ Refer section C for details and description of the above variables. |
| QA/QC procedures | QA/QC procedures have been implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters are calibrated by state utility once in five year and records are available with PP. Refer section C for an illustration of the provisions for QA/QC procedures. |
| Purpose of data | Baseline Emissions calculations |
| Additional comment | The data has been archived both in electronic and hard paper format for crediting period + 2 years. |

| | |
|---------------------------------------|---|
| Data/Parameter | EG_{Export,y} |
| Unit | MWh (Mega-Watt hour) |
| Description | Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (Cluster meter) & 132kV metering point (Bulk metering point) |
| Measured/Calculated /Default | Calculated |
| Source of data | Electricity exported by project activity calculated using the formula described in Section C. |
| Value(s) of monitored parameter | 167,021.853 MWh |
| Monitoring equipment | Calculated as per formulas better described under section C. |
| Measuring/Reading/Recording frequency | Monthly: The apportioning is done as per the procedure described in section C. |
| Calculation method (if applicable) | Calculated using formulae $EG_{export,y} = EG_{pe} * (1 - Lep (%))$ Refer section C for details and description of the above variables. |
| QA/QC procedures | Value of EG _{Export,y} can be crosschecked from certified statement given by state utility showing cost of export and import. It may be noted that energy export by the project activity is denoted as import by the grid from the project activity and therefore electricity export by the project activity is denoted as import by the grid in the certified statement by the state utility. QA/QC procedures have been implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters are calibrated by state utility |

| | |
|--------------------|---|
| | once in five years and records are available with PP. Refer section C for an illustration of the provisions for QA/QC procedures. |
| Purpose of data | Baseline Emissions calculations |
| Additional comment | The data has been archived both in electronic and hard paper format for crediting period + 2 years. |

| | |
|---------------------------------|---|
| Data/Parameter | EGpe |
| Unit | MWh (Mega-Watt hour) |
| Description | Electricity Export recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting total 63 machines of the project activity. |
| Measured/Calculated /Default | Measured |
| Source of data | Electricity export to the grid as per the joint meter reading recorded at cluster metering points connecting 63 turbines at 33kV level. |
| Value(s) of monitored parameter | 169,018.498 MWh |
| Monitoring equipment | <p>Vaayu (India) Power Corporation Private Limited (Phase-1) Main Meter Serial Number- AP900318 Check Meter Serial Number- AP900320 Last date of Test – 04/03/2014 Validity of Test- 03/03/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-2) Main Meter Serial Number- AP900327 Check Meter Serial Number- AP900328 Last date of Test – 05/07/2014 Validity of Test- 04/07/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-3) Main Meter Serial Number- AP900314 Check Meter Serial Number- AP900315 Last date of Test – 05/03/2014 Validity of Test- 04/03/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-4) Main Meter Serial Number- AP900338 Check Meter Serial Number- AP900339 Last date of Test – 05/03/2014 Validity of Test- 04/03/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-5) Main Meter Serial Number- AP900319 Check Meter Serial Number- AP900321 Last date of Test – 05/03/2014 Validity of Test- 04/03/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-6) Main Meter Serial Number- AP900329 Check Meter Serial Number- AP900330 Last date of Test – 05/03/2014 Validity of Test- 04/03/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-7) Main Meter Serial Number- AP900331 Check Meter Serial Number- AP900332 Last date of Test – 04/03/2014 Validity of Test- 03/03/2019 (once in five years)</p> <p>Type of all the meters- Tri-vector Accuracy Class of all the meters -0.2s Frequency of Calibration of all the meters - once in five years</p> |

| | |
|---------------------------------------|--|
| Measuring/Reading/Recording frequency | Measuring frequency: Continuous Recording frequency: Monthly |
| Calculation method (if applicable) | Not Applicable |
| QA/QC procedures | Value of EG_{pe} can be cross checked from transmission loss calculation sheet signed by the representatives of Wind World and Discom. QA/QC procedures have been implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. The meters are calibrated once in five years by the state utility. Refer Section C for an illustration of the provisions for QA/QC procedures. |
| Purpose of data | Baseline Emissions calculations |
| Additional comment | The data has been archived both in electronic and hard paper format for crediting period + 2 years. |

| | |
|---------------------------------|---|
| Data/Parameter | EG_{pi} |
| Unit | MWh (Mega-Watt hour) |
| Description | Electricity Import recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting total 63 machines of the project activity. |
| Measured/Calculated /Default | Measured |
| Source of data | Electricity import from the grid as per the joint meter reading recorded at cluster metering point connecting 63 turbines at 33kV level. |
| Value(s) of monitored parameter | 165.344 MWh |
| Monitoring equipment | <p>Vaayu (India) Power Corporation Private Limited (Phase-1) Main Meter Serial Number- AP900318 Check Meter Serial Number- AP900320 Last date of Test – 04/03/2014 Validity of Test- 03/03/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-2) Main Meter Serial Number- AP900327 Check Meter Serial Number- AP900328 Last date of Test – 05/07/2014 Validity of Test- 04/07/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-3) Main Meter Serial Number- AP900314 Check Meter Serial Number- AP900315 Last date of Test – 05/03/2014 Validity of Test- 04/03/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-4) Main Meter Serial Number- AP900338 Check Meter Serial Number- AP900339 Last date of Test – 05/03/2014 Validity of Test- 04/03/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-5) Main Meter Serial Number- AP900319 Check Meter Serial Number- AP900321 Last date of Test – 05/03/2014 Validity of Test- 04/03/2019 (once in five years)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-6) Main Meter Serial Number- AP900329 Check Meter Serial Number- AP900330 Last date of Test – 05/03/2014 Validity of Test- 04/03/2019 (once in five years)</p> |

| | |
|---------------------------------------|--|
| | <p>Vaayu (India) Power Corporation Private Limited (Phase-7) Main Meter Serial Number- AP900331 Check Meter Serial Number- AP900332 Last date of Test – 04/03/2014 Validity of Test- 03/03/2019 (once in five years)</p> <p>Type of all the meters - Tri-vector Accuracy Class of all the meters -0.2s Frequency of Calibration of all the meters - once in five years</p> |
| Measuring/Reading/Recording frequency | <p>Measuring frequency: Continuous Recording frequency: Monthly</p> |
| Calculation method (if applicable) | Not Applicable |
| QA/QC procedures | <p>Value of EGpi can be crosschecked from certified statement given by state utility showing cost of export and import. It may be noted that energy import by the project activity is denoted as export by the grid to the project activity and therefore electricity import by the project activity is denoted as export by the grid in the certified statement by the state utility.</p> <p>The meters are calibrated once in five years by the state utility.</p> <p>QA/QC procedures have been implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.</p> <p>Refer Section C for an illustration of the provisions for QA/QC procedures.</p> |
| Purpose of data | Baseline Emissions calculations |
| Additional comment | The data has been archived both in electronic and hard paper format for crediting period + 2 years. |

| | |
|---------------------------------|---|
| Data/Parameter | EGe |
| Unit | MWh (Mega-Watt hour) |
| Description | Electricity Export recorded at 132 kV meters (main and check) at wind world pooling substation connecting machines of the project activity and machines commissioned by the other project developers. |
| Measured/Calculated /Default | Measured |
| Source of data | Electricity export to the grid as per the joint meter reading recorded at 132 KV of the wind world pooling substation (Bulk metering point) connecting machines of the project activity and machines commissioned by the other project developers. |
| Value(s) of monitored parameter | 267,290.270 MWh |
| Monitoring equipment | <p>Vaayu (India) Power Corporation Private Limited (Phase-1, Phase 4 and Phase 7) Main Meter Serial Number- 02798585 Check Meter Serial Number- 02798586 Last date of Test – 06/03/2015 Validity of Test- 05/03/2020 (once in five years)</p> <p>All the Vaayu phases were connected to above mentioned single 132 KV bulk metering point at S/S. The details of second metering point is provided below:</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-2, Phase 3, Phase 5 and Phase 6) Main Meter Serial Number- 02798587 Check Meter Serial Number- 02798588 Last date of Test – 06/03/2015 Validity of Test- 05/03/2020 (once in five years)</p> <p>Type of all the meters - Tri-vector Meter</p> |

| | |
|---------------------------------------|--|
| | Accuracy Class of all the meters -0.2s Frequency of Calibration of all the meters - once in five years |
| Measuring/Reading/Recording frequency | Measuring frequency: Continuous Recording frequency: Monthly |
| Calculation method (if applicable) | Not Applicable |
| QA/QC procedures | Value of EGe can be cross checked from transmission loss calculation sheet signed by the representatives of Wind World and Discom. The meters are calibrated once in five years by the state utility. QA/QC procedures have been implemented by Discom/state utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Refer Section C for an illustration of the provisions for QA/QC procedures. |
| Purpose of data | Baseline Emissions calculations |
| Additional comment | The data has been archived both in electronic and hard paper format for crediting period + 2 years. |

| | |
|---|---|
| Data/Parameter | L_{ep} |
| Unit | MWh (Mega-watt hour) |
| Description | Total percentage of Transmission loss for export between the metering point at 33 kV metering points (sum of all the WECs connected to Bulk metering point including non-project activity as well as project activity WECs) and the metering point at 132 kV at the wind world pooling substation. |
| Measured /Calculated /Default | Calculated as per formulas better described under section C. |
| Source of data | Transmission Loss is directly applied from the joint meter reading for the project activity. This value is certified by the State utility and Enercon in the transmission loss calculation sheet. |
| Value(s) of monitored parameter | Calculated as per formulas better described under section C. Monthly values of L _{ep} are provided in ER spreadsheet. |
| Monitoring equipment | Not Applicable |
| Measuring/ Reading/ Recording frequency | Monthly. Calculations are based on procedure described in section C. |
| Calculation method (if applicable) | Total % of transmission losses for export (L _{ep}) are calculated as per following formula: $L_{ep}(\%) = \frac{\{(X_{Export,1} + X_{Export,2} + X_{Export,3} + \dots + X_{Export,N}) - E_{Ge}\} * 100}{(X_{Export,1} + X_{Export,2} + X_{Export,3} + \dots + X_{Export,N})}$ Refer section C for details and description of the above variables. |
| QA/QC procedures | QA/QC procedures have been as implemented by Discom/ State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Please refer Section C for QA/QC procedures. |
| Purpose of data | Baseline Emissions calculations |
| Additional comment | The data has been archived both in electronic and hard paper format for crediting period + 2 years. |

D.3. Implementation of sampling plan

>>

As the parameter to be monitored does not require sampling approach for its determination this section is not applicable for the proposed project activity.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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

Where:

BE_y = Baseline emissions in year y (tCO₂/yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO₂e/MWh)

Accordingly:

Baseline emissions calculation for the period 26/09/2014 to 25/09/2016 (Including first and last day) is as follows:

$$\begin{aligned} BE_y &= 166,856.509 \text{ (kWh)} * 0.94515 \text{ (tCO}_2\text{e/MWh)} / 1000 \\ &= 157,704 \text{ tCO}_2 \text{ e} \end{aligned}$$

The details of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity is provided in ER spreadsheet.

Baseline Emission Reductions calculations for project activity:-

| Duration | Net electricity supplied to the grid by the Project [MWh] | Baseline Emission Factor (tCO ₂ e/MWh) | Baseline Emissions (tCO ₂ e) |
|--------------------------|---|---|---|
| | [$EG_{PJ,y}$] | [EF_y] | [BE_y] |
| 26/09/2014 to 25/09/2016 | 166,856.509 ¹ | 0.94515 | 157,704 |
| Total | 166,856.509 | | 157,704 |

E.2. Calculation of project emissions or actual net GHG removals by sinks

>>

The project activity uses wind power to generate electricity and hence, the emissions from the project activity have been taken as zero.

$$PE_y = 0$$

¹ Detailed calculations has been provided in ER spreadsheet.

E.3. Calculation of leakage

>>

No leakage has been considered from the project activity as per approved methodology ACM0002.
Hence, $L_y = 0$

E.4. Summary of calculation of emission reductions or net GHG removals by sinks

| Item | Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e) | Project emissions or actual net GHG removals by sinks (t CO ₂ e) | Leakage (t CO ₂ e) | GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period | | |
|--------------|--|---|-------------------------------|--|-----------------|--------------|
| | | | | Up to 31/12/2012 | From 01/01/2013 | Total amount |
| Total | 157,704 | 0 | 0 | 0 | 157,704 | 157,704 |

E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

| Item | Values estimated in ex ante calculation of registered PDD | Actual values achieved during this monitoring period |
|--|---|--|
| Emission reductions or GHG removals by sinks (t CO ₂ e) | 186,197 | 157,704 |

E.6. Remarks on difference from estimated value in registered PDD

>>

There is a difference of 15.30 % (downside) in the expected and actual emission reductions due to lower PLF achieved during the monitoring period under consideration.

Appendix 1. Contact information of project participants and responsible persons/entities

| | |
|--|--|
| Project participant and/or responsible person/ entity | <input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM |
| Organization name | Vaayu (India) Power Corporation Private Limited |
| Street/P.O. Box | Plot No. 33, Daman Patalia Road |
| Building | |
| City | Bhimpore |
| State/Region | Daman (UT) |
| Postcode | 396210 |
| Country | India |
| Telephone | +91-22-2671 7176 |
| Fax | +91 22 66921177 |
| E-mail | yogesh.mehra@windworldindia.com |
| Website | www.windworldindia.com |
| Contact person | |
| Title | Director |
| Salutation | Mr. |
| Last name | Mehra |
| Middle name | |
| First name | Yogesh |
| Department | Corporate |
| Mobile | +91-9820040301 |
| Direct fax | +91 22 66921177 |
| Direct tel. | +91-22-6692 4848 extn. 7111 |
| Personal e-mail | yogesh.mehra@windworldindia.com |

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Document information

| <i>Version</i> | <i>Date</i> | <i>Description</i> |
|---|-----------------|--|
| 05.1 | 4 May 2015 | Editorial revision to correct version numbering. |
| 05.0 | 1 April 2015 | Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement. |
| 04.0 | 25 June 2014 | Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement. |
| 03.2 | 5 November 2013 | Editorial revision to correct table in page 1. |
| 03.1 | 2 January 2013 | Editorial revision to correct table in section E.5. |
| 03.0 | 3 December 2012 | Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11). |
| 02.0 | 13 March 2012 | Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20). |
| 01 | 28 May 2010 | EB 54, Annex 34. Initial adoption. |
| Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report | | |