*Voluntary Carbon Standard 2007.1*

# VERIFICATION REPORT

M/s Yamuna Power and Infrastructure Ltd

# 2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd

**VERIFICATION PERIOD:**
**28th March 2006 to 01st August 2009**

**Project No/ Rev. No.: V-3-I-01-S-0070-Ve/01**

# Verification Report

| **Name of Verification company:** | **Date of issue:** |
|---|---|
| Perry Johnson Registrars CDM Inc. | 2011-05-13 |
| **Report Title:** | **Approved by:** |
| Verification report – "2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd" | Anjana Sharma |
| **Client:** | **Project Title:** |
| M/s Yamuna Power and Infrastructure Ltd | Monitoring report of "2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd"<br>Monitoring period: 28 March 2006 to 01 August 2009<br>Version : 05<br>Date : 2011-02-28 |

**Summary:**

M/s Yamuna Power and Infrastructure Ltd has commissioned Perry Johnson Registrars Clean Development Mechanism Inc. (PJRCDM) on behalf of the investors in WTGs for the verification of the project – "*2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd*". The verification involves independent review of the implementation of project as per VCS PD, conformance to applicable methodology, VCS 2007.1 requirements and guidelines, its monitoring plan and the verification of reduction in GHG emissions achieved by the project activity.

During verification, the implementation of the project activity as per design was checked. The project activity is installation and operation of three (3) WTGs, of which two are of 0.60 MW capacity and the third is of 1.25 MW capacity by the investor, totaling an installed capacity of 2.45 MW in Gorera and Soda Mada Villages respectively in Jaisalmer district of Indian state of Rajasthan. The WTGs are connected to Northern Eastern Western North-Eastern regional grid in India through the Rajasthan Rajya Vidhyut Prasaran Nigam Limited grid and the generated electricity is being sold to them.

In PJRCDM's opinion, the GHG emission reductions reported in the monitoring report version 05 dated 28 February 2011 are fairly stated. Based on the assessment, PJRCDM was able to certify that implementation of the project has resulted in reduction of GHG emissions of **11,901 $tCO_2$** equivalent during the period 28 March 2006 to 01 August 2009.

PJRCDM's opinion regarding the reported emission reductions for the said period is based on the review of information sought and publicly available information, where applicable.

ISO-14064 guidelines have been applied in principle to assess the key issues like accuracy, completeness and conservativeness of the information. PJRCDM's verification and certification of GHG emission reductions is limited to this information evaluation.

Issuance and utilization of certified GHG-emission reductions is beyond the scope of PJRCDM.

| **Report Number/ Revision Number** | **Number of pages** |
|---|---|
| V-3-I-01-B-0070-Ve/01 | 27 |
| **Work carried out by:** | **Work Reviewed by:** |
| Nauduri Siddhartha | Anjana Sharma |

## *Abbreviations*

| | |
|---|---|
| CAR | Corrective Action Request |
| CDM | Clean Development Mechanism |
| CL | Clarification Request |
| GHG | Greenhouse gas |
| IPCC | Intergovernmental Panel on Climate Change |
| JMR | Joint Meter Reading |
| JVVNL | M/s Jaipur Vidyut Vitaran Nigam Limited |
| kWh | Kilo Watt Hour |
| NEWNE | Northern Eastern Western North-Eastern Grid |
| PD | Project Document |
| PJRCDM | Perry Johnson Registrars Clean Development Mechanism Inc. |
| PP | Project Proponent |
| RVPNL | M/s Rajasthan Rajya Vidyut Prasaran Nigam Limited |
| SEL | M/s Suzlon Energy Limited |
| UNFCCC | United Nations Framework Convention on Climate Change |
| VCS | Voluntary Carbon Standard |
| WTG | Wind Turbine Generator |

# Table of Contents

# 1 INTRODUCTION

M/s Yamuna Power and Infrastructure Ltd (hereinafter referred to as client or project proponent (PP) and the acronym YPIL) contracted Perry Johnson Registrars Clean Development Mechanism Inc. (PJRCDM) to perform the validation and verification of their project activity *"2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd"* under the Voluntary Carbon Standard (VCS) 2007.1. The validation of the project activity was concluded and a separate VCS 2007.1 validation report dated 18 November 2009, against the VCS PD version 02 dated 05 November 2009 was issued. Verification activity was for the period 01 April 2006 to 01 August 2009. The current report describes the verification work undertaken.

## 1.1 Objective

Verification under VCS is the independent *ex-post* quantification and certification of the greenhouse gas (GHG) emission reductions achieved by a project activity which has completed validation under VCS 2007.1 or registered under a VCS approved GHG program. The current project applies the methodologies and tools under CDM, which is one of the VCS approved GHG programs.

The above work is carried out through an independent assessment and a written assurance is provided on the GHG emission reductions achieved for the period specified.

## 1.2 Scope and Criteria

The scope of the verification covers independent objective review and *ex-post* determination of the monitored GHG emission reductions by the project activity *"2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd"*.

The specific scope of the verification work involves:

- To verify that the project activity is implemented as per the project details of the project document (PD)
- To assess whether the emissions reductions determined are in conformance with the monitoring plan of the PD and the approved methodology
- To express a conclusion whether reported data are accurate, complete, consistent, and transparent with a reasonable level of assurance and free of omission or material error, based on the review of the reported data and emission reduction calculations.

The project is assessed against the verification requirements of VCS 2007.1 standard including the criteria that the emission reductions are real, measurable, transparent and conservative. The approach adopted by PJRCDM verification team is risk-based, drawing on an understanding of the risks associated with reporting of GHG emissions data and the controls in place to mitigate these.

The work carried out by PJRCDM is free from any conflict of interest.

Request for issuance of Voluntary Carbon Units (VCUs), verified and certified by PJRCDM, shall be made by the project proponent to the VCS registry in accordance with the most recent version of the *"VCS Guidance Document: VCS Project Registration and VCU Issuance process"*. In view of the above, PJRCDM's responsibility is limited only to verification and certification of the GHG emission reductions achieved during the specified period.

## 1.3 VCS project Description

The project activity is generation of electricity by three (3) wind turbine generators (WTGs), two (2) of 0.60 MW capacity and the third of 1.25 MW, totaling an installed capacity of 2.45 MW in Gorera and Soda Mada Villages of Jaisalmer district in the Indian state of Rajasthan. The WTGs are connected to the grid and the generated electricity is being bought by the state electricity board. The PP had signed power purchase agreements with the Rajasthan Rajya Vidyut Prasaran Nigam Limited (RVPN). The grid system in Rajasthan is connected to the Northern Eastern Western North-Eastern (NEWNE) Grid.

The 0.60 MW WTGs are M/s Enercon make E-40 make while the 1.25 MW WTG is M/s Suzlon Energy Limited make S-66 model machine. These were commissioned on 03 March 2004 and 14 March 2004 respectively.

The baseline scenario as identified during validation continued as the project activity is connected to a grid system that is supplied by the grid connected thermal power plants and by addition of new generation sources. The electricity generated by the project activity is thus expected to have displaced equivalent quantity of electricity that would have been produced by the grid mix of power plants, which are largely fired using fossil fuels.

The project location details are as follows:

**Table 1: Project Details**

| № | WEG № | Installed Capacity (MW) | Commissioning Date (yyyy/mm/dd) | Village | District, State | Longitude | Latitude |
|---|---|---|---|---|---|---|---|
| 1 | YGCL-01 | 0.60 | 2004/03/03 | Gorera | Jaisalmer, Rajasthan | 70° 51′ 20″ E | 26° 44′ 29″ N |
| 2 | YGCL-01 | 0.60 | 2004/03/03 | | | 70° 51′ 20″ E | 26° 44′ 29″ N |
| 3 | J-215 | 1.25 | 2004/03/14 | Soda Mada | | 70° 53′ 23″ E | 26° 41′ 15″ N |

The project qualified the start date requirements under VCS 2007.1 as all the WTGs were commissioned later than January 2002. Further, in line with VCS 2007.1 requirements, the monitoring period starts from 28 March 2006. Although the monitored period starts from 28 March 2006, the PP is not claiming credits till 01 April 2006, since the later is the start date of the next billing cycle.

By implementing and operating the project activity the following GHG sources of emissions were reduced/ avoided:

**Table 2: GHG Gases avoided by project activity**

| Project Equipment - Purpose | Baseline | Baseline GHG emission source reduced/ avoided |
|---|---|---|
| Wind Turbine Generators – generation of electricity by renewable means and exporting to NEWNE Regional grid in India | Generation of electricity by fossil fuel dominated grid connected power plants | $CO_2$ emissions from fossil fuels and other fuel fired grid connected |

## 1.4 Level of assurance

In line with VCS 2007.1 requirements and as per ISO 14064-3:2006 paragraph A.2.3.2, a ***"reasonable level of assurance"*** is defined for the verification of the project.

This implies that, based on the process and procedures conducted, PJRCDM **confirms** that the GHG assertion in the monitoring report

- *is materially correct and is a fair representation of the GHG data and information, and*
- *is prepared in accordance with VCS requirements, the PD and the approved methodology for information pertaining to GHG quantification, monitoring and reporting.*

The verification work was carried out as per this requirement and details are presented in the Verification statement in section 2 below.

# 2 METHODOLOGY

## 2.1 General Approach

The project activity is operation of three WTGs in Gorera and Soda Mada villages of the Indian state of Rajasthan. Of these two are of M/s Enercon India Limited (EIL) make 0.60 MW capacity machines while the third is M/s Suzlon Energy Limited (SEL) make 1.25 MW capacity. The project activity has applied approved baseline and monitoring methodology AMS-I.D (version 14) categorized under sectoral scope 01 'Energy industries (renewable - / non-renewable sources)'.

For verification of emission reductions, PJRCDM's approach involves broadly three steps:

1. Completeness check and desktop review of the monitoring report
2. Onsite inspection and issuance of findings from the audit
3. Resolution of the findings and preparation of the verification report

The following team members from PJRCDM were involved in these steps:

**Table 3: Verification Team**

| Name | Role | Areas covered |
|---|---|---|
| Nauduri Siddhartha | Verifier | Completeness check of monitoring report, desktop review, site visit, issuance and closure of findings, final report preparation. |
| Anjana Sharma | Technical Reviewer | Independent review of the verification assignment. |

## 2.2 Means of Verification

### 2.2.1 Review of Project Documentation

On receipt of the monitoring report from the client, the completeness of information made available as per VCS2007.1 standard requirements was reviewed. A desktop review was further carried out to assess the following:

- the validated VCS 2007.1 PD with the monitoring plan
- the emission reduction calculation method used in the applied methodology and the PD
- the monitoring report, including frequency of monitoring and the calculation of emission reductions for the period
- the documented operation and maintenance manual furnished by the project participant (where applicable)
- other external documents like grid emission factor, IPCC emission factor, etc. applied

A complete list of all documents reviewed is attached in Appendix I of this report.

### 2.2.2 Onsite Inspections

PJRCDM visited the sites of WTGs installation on 03 August 2009 and followed up with interviews and desk meetings with project participants. During these meetings, PJRCDM verified the actual operation of the project as described in the PD; checked the Joint Meter Reading (JMR) sheets, energy break-up sheets, and controller data at Central Monitoring Stations; the calibration records available with the PP; and discussed the issues identified during desk review of submitted documents and observations on site visit.

The following table lists the personnel interviewed and issues discussed during the site visit:

**Table 4: Personnel Interviewed**

| Name / Designation / Company | Interviewed on |
|---|---|
| Mr. Gaurav Jain<br>Customer Relations<br>M/s Suzlon Energy Limited | Project technical details, monitoring system, calibration practice and frequency, maintenance of records including JMR sheets, and calibration |
| Mr. Suman Kumar Shah<br>EISD<br>M/s Enercon India Limited | |
| Mr. G. S. Chawla<br>GM Finance and Accounts<br>M/s Yamuna Power and Infrastructure Ltd | |
| Ms. Poulomy Bhattacharjee<br>Consultant<br>Deloitte Touche Tohmatsu India Pvt. Ltd | Monitoring Report, Emission reduction calculations |

### 2.2.3 Review of Monitoring Results and Correct Application of Monitoring Methodology

Based on the site inspection and review of records including the monitoring plan and other documentation submitted, a list of non conformities Corrective Action Requests (CARs) and Clarification Requests (CLs) were raised. The non conformities, *inter-alia*, were related to lack of adherence to the VCS 2007.1 requirements, non-conformance to the monitoring plan of as defined in the PD or where evidence provided was found insufficient to prove conformity, mistakes in applying data/ assumptions and in calculation of emission reductions.

If information made available was insufficient to transparently arrive at the stated conclusion, a Clarification request (CL) was raised and communicated to the project proponent.

Observations may also be raised which are for the benefit of future verification period. These, however, have no impact upon the completion of the current verification activity.

On receipt of response from the project developer, the adequacy with compliance with VCS and CDM requirements was checked along with a revised monitoring report. Closure of comments raised occurred only when the response provided and correction made fully complied with the relevant requirements.

The list of CARs/ CLs raised and the response provided and reasons for closure are provided Appendix-1.

### 2.2.4 Determinations of the reductions in GHG Emissions

As per the applicable methodology, AMS-I.D., version 14, the emission reductions achievable by the project activity are calculated as a difference of baseline emissions ($BE_y$) project emissions ($PE_y$) and emissions due to leakage ($L_y$) determined as follows.

**Baseline emissions:** The baseline emissions were determined as a multiple of net electricity generated and supplied to the grid by the renewable energy technology ($EG_y$ in MWh), and the electricity grid emission factor calculated as per CDM EB guidance.

As per the VCS PD, the emission factor had been fixed *ex-ante* for the crediting period. PJRCDM was able to verify the grid emission factors used for NEWNE grid of India at 0.906 $tCO_2$/MWh. This was taken from the source indicated at the time of Validation, the Central Electricity Authority (CEA) database Version 04.

**Project emissions**: As the project activity is wind power based power generation, the methodology does not require estimation of project emissions and hence they have been considered as zero.

**Leakage**: Similarly, no leakage has to be considered for the proposed project activity.

**Emission reductions**: $ER_y = BE_y - PE_y - L_y = BE_y$

During the current monitoring period, i.e. from 28 March 2006 to 01 August 2009, the project activity has delivered approximately 13,151 MWh of net electricity to the M/s Rajasthan Rajya Vidyut Prasaran Nigam Limited (RVPNL) / NEWNE regional grid. This was checked against the Joint Meter Reading (JMR) sheets jointly signed by RVPNL, the PP's representative, which in the present case are M/s Suzlon Energy Limited and M/s Enercon (India) Limited; and the state transmission company M/s Jaipur Vidyut Vitaran Nigam Limited (JVVNL). These JMR sheets record the monthly energy measured by the "Bulk Energy Meters" located at each substation. These bulk energy meters measure the total electricity delivered at the substation by all the WTGs connected to it, including from those not forming part of the project activity. Electricity delivered by the WTGs is also measured at each WTG by it's in-built microprocessor based controller and this data is then used by RVPNL to apportion the net energy measured by each energy meter. The source of data was confirmed against the validated monitoring plan in VCS PD. Although the start date of the crediting period is from 28 March 2006, as it fell between the dates of JMR exercises, the PP has chosen to account for energy delivered only from the next immediate JMR date, which is from 01 April 2006. On the few occasions where the JMR sheets were not submitted, the PP has chosen to ignore the generation.

Owing to non calibration of energy measurement devices, or unavailability of records, the PP has corrected the net energy delivered value in accordance to CDM EB guidelines given under EB 52, Annex 60. The assessment of project activity's compliance to calibration have been discussed in section 3.4. Hence the corrected net energy delivered for calculating emission reductions has been determined at 13,133 MWh. The net reduction in GHG emissions achieved by the project activity during the said monitoring period, based on the corrected value of net energy delivered to grid and rounding down, is equivalent to **11,901 $tCO_2e$**.

The above value of GHG emission reductions is based on completely monitored data, transparently presented, accurately measured and calculated, conservatively estimated and independently verified by PJRCDM.

### 2.2.5 Review of Additional Data from other Sources if appropriate

No pending issues that were to be considered during verification were identified in the validation report.

The other source of information was the CEA Database Version 04, available from the website, from which the emission factor for the grid was determined at the Validation and fixed *ex-ante*.

## 2.3 Internal Quality Control

On completion of the assessment by the GHG assessment team, the complete verification package including the verification report, monitoring report and supporting documents was sent to the Technical Reviewer. In this stage, the Technical Reviewer independently assessed the project with the VCS requirements before accepting/ rejecting the recommendation from the GHG assessment team.

# 3 VERIFICATION FINDINGS

## 3.1 Remaining issues, including any material discrepancy, from previous validation

No pending issues were identified from the discussion, findings and conclusions drawn from the VCS 2007.1 Validation Report (version 01) issued dated 18 November 2009 against the PD Version 02 dated 05 November 2009.

## 3.2 Project Implementation

The project activity involves the installation and operation of three WTGs, two of 0.60 MW in Gorera village and the third of 1.25 MW capacity in Soda Mada village of Jaisalmer district of Rajasthan state, India. The generated electricity is being sold to the state electricity grid.

The implementation of the project activity as described in the PD was checked against supportive documents presented and also available at the project site. PJRCDM was able to verify that the there was no change in project design compared to the design presented in the VCS PD.

## 3.3 Completeness of Monitoring

The GHG emission reductions are calculated based on the net electricity exported by the project activity to the grid. The client is monitoring the complete data and is available with them in the form of break-up and JMR sheets. Where unavailable, the client has chosen to ignore the month's generation.

In Rajasthan multiple WTGs are connected to single energy metering device located at the substation which also measures energy delivered by WTGs not forming part of the project activity. The WTGs also measure the energy delivered to the grid with

in-built microprocessor based controllers and JVVNL uses the data to apportion the quantity of electricity delivered by each WTG. Representatives of all the interested parties, PP, JVVNL and RVPNL note the readings which are then jointly authorized.

During the current monitored period it was observed that the WTGs belonging to the client were connected to different transformers at different periods of time. The client clarified that the technology provider varied the connections based on new loads of WTGs commissioned in the preceding year. As this change was affected at the start of each new financial year, which for India starts from 01 April each year, and there was continuous monitoring of energy delivered, this was accepted by PJRCDM.

The transposition errors in the spreadsheet submitted were intimated and corrected by the client. The formulae and conversions were correctly applied.

## 3.4 Accuracy of Emission Reduction Calculations

Net electricity supplied to the grid: The energy delivered by the WTGs was measured continuously and monitored daily. In Rajasthan a set of two-way tri-vector energy meter is located at the substation to which the WTGs are connected to. This measures the net energy exported to and imported from the grid by all the WTGs connected to it. The energy meters are of 0.5 accuracy class.

The following table correlates the WTGs with the energy meters.

**Table 5: WTGs, HT Sc. Energy Meter Numbers and Dates of Calibration**

| Period | Energy Meter Numbers | | | | | | Date of calibration |
|---|---|---|---|---|---|---|---|
| **Suzlon 1.25 MW \| J-215** | | | | | | | |
| | **Transformer 1** | | **Transformer 2** | | **Transformer 3** | | |
| | **MM** | **CM** | **MM** | **CM** | **MM** | **CM** | |
| Apr 2006 – Jun 2007 | RJU01579 | APU1000 | - | - | - | - | - |
| Jul 2007 - May 2008 | - | - | TNU00956 | TNU00957 | RJU00327 | RJU01580 | - |
| Jun 2008 – Dec 2008 | RJB00316 | RJB00317 | TNU00956 | RJU00327 | TNU00957 | RJU01580 | 16-Feb-08 |
| Jan 2009 – Aug 2009 | RJB00316 | RJB00317 | TNU00956 | RJU00327 | TNU00957 | RJU01580 | 29-Jan-09 |
| | | | | | | RJB00318 | 30-Jan-09 |
| **Enercon 2 X 0.60 MW = 1.20 MW \| YGCL-01 & YGCL-02** | | | | | | | |
| Apr 2006 - Dec 2006 | Main Meter: TNU00946 | | | Check Meter: TNU00945 | | | - |
| Jan 2007 - Dec 2007 | | | | | | | - |
| Jan 2008 - Dec 2008 | | | | | | | - |
| Jan 2009 - Aug 2009 | | | | | | | 30-Jan-09 |

Metering accuracy: The accuracy of measurement of electricity delivered is determined by the equipment accuracy and the frequency of its calibration. The energy meters are 0.5s class. The calibration frequency was defined as once in year.

Calibration of energy meters is not under the purview of the PP as all the energy meters are under the control of RVPNL. For the WTGs of SEL make, there were multiple energy meter changes during the current monitored period as indicated in Table 5 above. There were periodical calibrations done for few energy meters. As these records did not indicate any error in measurement, the PP has applied the

correction factor based on the accuracy class of the equipment, following the guidelines of EB 52, annex 60 Version 01 of "Guidelines for Assessing Compliance with the Calibration Frequency Requirements." The PP has applied the correction factor for the following months:

**Table 6: Period of applying correction factor**

| № | WEG № | Period |
|---|---|---|
| 1 | J-215 | April 2006 – February 2008 |
| 2 | YGCL-01 | April 2006 – February 2009 |
| 3 | YGCL-02 | |

The correction factor was applied such that the error decreased the quantity of energy exported to the grid and increased the quantity of energy imported from the grid, thereby resulting in conservative measured value of net electricity delivered to the grid.

Based on this the net energy delivered by all the WTGs was revised from 13,151 MWh to 13,133 MWh. Furthermore client has rounded down while evaluating the emission reductions, and hence, the resulting net energy delivered, and consequently emission reductions, are conservative.

Value of grid emission factor: PJRCDM was able to confirm that this parameter was fixed *ex-ante* during the validation of the project and the same was used for ER calculations for the current monitoring period (MR Version 05 dated 28 February 2011). The parameter was derived from officially published latest database[*] from Central Electricity Authority of India, a subsidiary of Ministry of Power, Government of India, which is the authentic source of such information, at the time of validation.

The grid emission factor for the NEWNE grid was determined during validation as 0.906 $tCO_2/MWh$.

## 3.5 Quality of Evidence to Determine Emission Reductions

The source of net energy generation, as defined in the PD, were the JMR sheets and break-up sheets and the same were used by the client to determine $EG_y$. PJRCDM was able to check and verify the values against these documents. The annual value of the energy exported was the summation of these monthly readings. These are deemed to be the most appropriate source of data for net energy exported, as the values denoted were jointly measured by the representatives of the PP and Government representatives and duly signed and acknowledged by all parties.

For monitoring the energy delivered by the WTGs of Enercon make, the JMR of the net energy delivered was divided into ten different break-up sheets. The client clarified that this was done for the convenience of the technology provider and the categorization was based on the years of commissioning. This was cross checked

[*] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

against interviews with representatives of M/s EIL. As the values of net energy measured reported in these break-up sheets tallied with the net energy measured by the energy meters, this was accepted by PJRCDM.

The emission factor for NEWNE regional grid to which the project activity exports power was determined as 0.906 $tCO_2$/MWh, a value fixed *ex-ante* during validation of the project activity and sourced from the official source for grid emission factors in India.

These practices meet the requirements of the applied methodology and approved monitoring plan as per in the validated VCS PD.

## 3.6 Management and Operational System

The clients have established and implemented procedures to monitor the project activity and its operation. These procedures cover management responsibilities, data monitoring and reviewing procedures and have provided with reports.

All the daily and monthly records are archived in electronic copy and paper format.

# 4 VERIFICATION CONCLUSION AND CERTIFICATION STATEMENT

*Perry Johnson Registrars CDM Inc. (PJRCDM) has carried out verification of the emission reductions achieved by the project "2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd" against the guidelines of VCS 2007.1. The project activity is generation of electricity by a total of three (3) Wind Turbine Generators (WTGs). Of these two are M/s Enercon India Limited make 0.60 MW capacity machines which are installed in Gorera village of Jaisalmer district in the Indian state of Rajasthan. The third is M/s Suzlon Energy Limited make 1.25 MW capacity machine in Soda Mada village in the same region. The total installed capacity is 2.45 MW. Verification was sought for the emission reductions achieved by the project within the period 28 March 2006 and 01 August 2009 under VCS 2007.1.*

*The project had applied the version 14 of the small scale CDM methodology AMS-I.D "Grid connected renewable electricity generation" and the emission reductions are as reported in the version 05 of the monitoring report, dated 28 February 2011.*

*PJRCDM's approach is risk-based, drawing on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate them. The assessment was based on review of supporting evidences and information provided, including other explanations where necessary to enable PJRCDM to provide* ***reasonable assurance*** *that the reported amount of GHG emission reductions for the specified period is materially correct and fairly stated.*

## Certification statement:

*PJRCDM confirms that the project activity has been implemented as per the VCS registered PD and that the emission reductions presented in the monitoring report version 05 dated 28 February 2011 are correctly determined as per the VCS 2007.1 standard and AMS-I.D methodology, version 14. Based on the above information, PJRCDM confirms the following:*

| | |
|---|---|
| *Name of the project* | *2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd* |
| *VCS 2007.1 PD* | *Version 02 dated 2009/11/05* |
| *VCS 2007.1 Validation Report* | *Version 01 dated 2009/11/18* |
| *Methodology* | *AMS-I.D Version 14* |
| *Monitoring Report* | *Version 05 dated 2011/02/28* |
| *Reporting period* | *2006/03/28 to 2009/08/01* |

***Verified emission in the above reporting period***

*Project emissions : 0 $tCO_2$ equivalents*
*Baseline emissions : 11,901 $tCO_2$ equivalents*

*Emission reductions* : *11,901* *$tCO_2$ equivalents*

***Year-wise emission reductions***

| | | |
|---|---|---|
| *28th March 2006 to 31st December 2006* | *: 3319* | *$tCO_2$ equivalents* |
| *01st January 2007 to 31st December 2007* | *: 3392* | *$tCO_2$ equivalents* |
| *01st January 2008 to 31st December 2008* | *: 3567* | *$tCO_2$ equivalents* |
| *01st January 2009 to 15th July 2009* | *: 1623* | *$tCO_2$ equivalents* |

**Project Manager**
**PJRCDM**

**Site Program Manager**
**PJRCDM**

# APPENDIX I: DOCUMENTS REVIEWED

| Sl. No. | Document reference |
|---|---|
| [01] | Monitoring report: "2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd", Version 05, dated 2011/02/28, and all previous versions |
| [02] | Emission reduction spreadsheet, Version 05, dated 2011/02/28, and all previous versions |
| [03] | Project Document: "2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd" Version 02, dated 2009/11/05 |
| [04] | VCS Validation Report for "2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd" Version 01, dated 2009/11/18 |
| [05] | Approved Small-scale Methodology – Indicative baseline and monitoring methodology AMS ID, version 14: "Grid connected renewable electricity generation" |
| [06] | CDM Executive Board: Validation and Verification Manual, version 01.2 |
| [07] | Calibration records for the energy meters used to measure the energy delivered by the WTGs for the period 2006/04/01 to 2009/08/01 |
| [08] | Joint meter readings for all the months and for all WTGs for the period 2006/04/01 to 2009/08/01 |
| [09] | Version 01 of "Guidelines for Assessing Compliance with the Calibration Frequency Requirements", EB 52, Annex 60 |

# APPENDIX II : RESOLUTION OF CARs AND CLs

**Resolution of Corrective Action and Clarification Requests: - "2.45 MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd"**

| Draft report clarification requests and corrective action requests by verification team | Reference | Summary of project owner response | Verification team conclusion |
|---|---|---|---|
| **CL #1**<br>The date of submission in the monitoring report is not found correct. The header of the report reads 'VCS Project Description' | Cover page, all sections | Necessary changes have been made. | The date of submission of first and subsequent monitoring reports has been changed, hence **CL is Closed**. |
| **CL #2**<br>Details of calibration records with meter numbers are not found included in the monitoring report with references to the calibration records and results. For machine J-215, the calibration records furnished are not traceable to the machine under consideration. | 5.1 | Details of calibration records with meter numbers have been incorporated in the revised MR ver 02.<br>Calibration certificate of the available energy meters have been provided to the verifier. | The revised monitoring report includes a table providing details of the calibration records. However further questions are discussed in CL #2.1, CL is Open. |
| **CL #2.1**<br>i) For the Suzlon make WTG J 215, the table and JMR sheets provided indicate that the number of transformers installed steadily increased each year. The reason for the same and it's impact on monitoring the net energy delivered by the project is not reflected in the MR. More information is required on to | JMR sheets for all WTGs, break-up sheets issued by concerned authorities for all WTGs, MR | i) The site initially installed and started in 2001. As new installations were continuously being added to the Soda Mada Wind farm, accordingly all the infrastructure and substation capacities were also upgraded to keep up to the overall development at site. However there was continuous monitoring on the | i) Since there was continuous monitoring of energy delivered by the project activity, and the increase in transformers did not break the measurement, the explanation provided by the client was accepted, and issue is resolved. |

| Draft report clarification requests and corrective action requests by verification team | Reference | Summary of project owner response | Verification team conclusion |
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| which transformer the WTG is connected to.<br><br>ii) For the month of January 2009, there is a marked difference between the net energy used for apportioning as presented in the break-up sheet and JMR sheet.<br><br>iii) For the Enercon WTGs, the values of bulk meter reading presented in the break-up sheets and JMR sheets do not match. Even the total installed capacity of the WTGs for the same month varies between the two types of documents presented. | | net energy delivered. This can evident from the breakup sheets and JMRs generated for each month for the connected WTGs. The WTG is connected to 33 KV Mada Substation.<br><br>ii) For the month of January 2009, the net energy value presented in the break-up sheet and JMR sheet are the same i.e. 19221998.3. For reference the break-up sheet and JMR sheet for the month of January 2009 is attached herewith.<br><br>iii) For the Enercon machines regarding the mismatch of figures in the JMR Sheet and Break up Generation sheet.<br><br>The JMR sheet provided for Enercon WTGs is for the entire Wind Farm connected to 220 kV GSS at Amarsagar however the breakup sheet for the entire wind farm is divided among the various customers and capacities.<br>For your reference we are enclosing here with JMR Sheet & Breakup of Generation figures for the month of September 2009.<br>The Summary of the attached documents is | ii) The data was cross checked and found in line, hence issue is resolved.<br><br>iii) The break-up sheet for the month of September 2009 indicates a bulk HT meter reading of 3141532 kWh export and 1545 kWh import. Even though the sum of all 10 break-up sheets would be the total measured value, the basis of dividing into these 10 readings of HT bulk meter is not clear. The PP is requested to provide the source of measured values indicated in the break-up sheet, issue is not resolved, CL is OPEN, refer CL #2.2. |

| Draft report clarification requests and corrective action requests by verification team | Reference | Summary of project owner response | Verification team conclusion |
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| iv) The multiplication factor for the energy meter (TNU00945) has changed in the month of June 2007. The PP is requested to clarify on the reason for the same. | | as below:<br>1. As per JMR of 138.81 MW Wind Farm.<br>Total energy exported for the month of September 2009 is : 2,48,78,250 Kwh<br>Total Energy Import for the month of September 2009 is : 12,250 Kwh<br>Net Export for the month of September 2009 is: 2,48,66,000 Kwh<br>2. Refer to the JMR for September 2009, 10 different breakup sheets are also been provided. This can be evident as the sum total of the net export for all the 10 breakup sheet matches the total energy exported value presented in the JMR for the month of September 2009.<br>Yamuna Power wind power project was a part of break up sheet for 17.39 MW capacity from Mar 06 till May 08 and then part of 16.19 MW capacity from Jun 08 till date (as mentioned at Sr. no. 7 of the attached document).<br>The breakup sheet earlier provided was only for the 17.39 MW and 16.19 MW Customers to which Yamuna Power WTG was also a part and not for the entire wind | iv) Following the communication provided by the O&M operator, the clarification is accepted, issue is resolved. |

| Draft report clarification requests and corrective action requests by verification team | Reference | Summary of project owner response | Verification team conclusion |
|---|---|---|---|
| | | farm connected to 220 kV GSS at Amarsagar.<br>Hope the above is clarified to your satisfaction.<br>iv) As communicated by the technology provider, One no metering 'R' Phase CT (Current Transformer) of 132 KV Feeder 2 (Main Meter 2) located at 132 KV/220 KV Amarsagar GSS (EB) failed on 15-06-07. CT ratio of failed CT was 500:1. Therefore metering CT of all three phases (R, Y, B) were replaced for Main Meter 2 on 19-06-07 with CT ratio of 400:1 and subsequently multiplication factor (MF) of Main Meter 2 also got changed accordingly.<br><br>Undertaking for the same from the technological provider has been provided herewith. | |
| **CL #2.2**<br>The break-up sheet for the month of September 2009 indicates a bulk HT meter reading of 3141532 kWh export and 1545 kWh import. Even though the sum of all 10 break-up sheets would be the total measured | | The Purpose of giving 10 breakup sheets by Enercon for its customers is as because different customers has signed PPA with different Discom of Rajasthan & in different financial years different customer | As confirmed by telephonic interview with the service provider, and as evidenced against their letter, and as the sum of net energy delivered as reported in all the ten break-up sheets matched with the net |

| Draft report clarification requests and corrective action requests by verification team | Reference | Summary of project owner response | Verification team conclusion |
|---|---|---|---|
| value, the basis of dividing into these 10 readings of HT bulk meter is not clear. The PP is requested to provide the source of measured values indicated in the break up sheet | | has commissioned the machine with PPA signed with different Discom of Rajasthan. And thus the WTGs depending upon the above mentioned factors have been segregated in different groups. | energy measured by the equipment, the explanation was accepted and issue resolved; **CL is closed**. |
| **CL #3**<br>The end date for generation records is first day of the month. However, the end date of the monitoring report is the last date of previous month. | Cover page | The monitoring period end date has been changed to 1st August 2009. | Necessary corrections have been made to the MR, hence **CL is closed**. |
| **CL #4**<br>Formula for apportioning of power with controller data is not clearly discussed. | 4.1 | Discussion on apportioning of power has been incorporated in sec 4.1. | The formula has been incorporated in the revised MR, hence **CL is closed**. |
| **CL #5**<br>The start date of the report states 28th March 2006. However, generation data for the four days of March 2006 is not made available or elaborated for exclusion. | Cover page, 4.2 | The mentioning of 28th March 2006 was as per the VCS 2007 Program Guidelines. The same was inadvertent and now the start date of monitoring period is mentioned as 1st of April 2006. | The PP has not accounted for the four days' generation and has taken 1st April 2007 as the first day for accounting energy delivered by the project activity and emission reductions calculations. Noting that this does not impact the earlier specified period of crediting under consideration, which continues to be from 28th March 2006 till 27th March 2016, the issue is resolved and **CL is Closed**. |
| **CL #6**<br>The JMR sheet for the month of June 2007 | JMR and break-up | In case of a meter change the following | The validated PD indicates that in the case |

| Draft report clarification requests and corrective action requests by verification team | Reference | Summary of project owner response | Verification team conclusion |
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| for WTG J 215 indicates that the main energy meters were changed. The PP is requested to provide the basis for the estimation of energy delivered for that month. | sheets for Suzlon WTG J 215 for the months May, June 2007 and January 2009 | procedure is followed. For E.g. if the meter is changed on 15th of a month, then the previous meter readings from 01st to 15th (say A) shall be taken and the new meter readings from 15th to 30/31st (say B) of that month is taken. Therefore the total reading for that month would be A+B. | of main meter failure, check meter readings would be used. However, the process described by the client is in contravention to the method validated, CL is Open, refer CL #6.1. |
| **CL #6.1**<br>The validated PD indicates that in the case of main meter failure, check meter readings would be used. However, the process described by the client is in contravention to the method validated. The PP is requested to provide the correct source document for | JMR and break-up sheets for Suzlon WTG J 215 for the months May, June 2007 and January 2009 | The metering system is the same as indicated in the registered PD. The Check meter reading is referred in case the main meter is faulty. However in this case the main meter is replaced. | As the revised procedure is in line with the observations and the validated monitoring plan, the revision is accepted and **CL is Closed**. |
| **CL #7**<br>Few JMR sheets for the WTGs (e.g., March 2007) indicate that annually a quantity of energy is being deducted in energy assessment. The PP is requested to clarify the basis for this. | JMR sheets for particular months for all WTGs | As described by service provider, while calibrating a meter, it is disconnected from the line and from EB a phantom load is given to meter for testing the meter. The adjustment of this phantom load provided by EB is adjusted on account of energy assessment. | As the resulting estimation of net energy delivered by the project activity is conservative, the issue is resolved, **CL is Closed**. |
| **CL #8**<br>The MR should include the geographical coordinates of the WTGs and the PP has to | MR, geographical coordinates | Geographical coordinates of the WTGs have been incorporated in the revised MR | Necessary documents and information have been provided, hence **CL is Closed**. |

| Draft report clarification requests and corrective action requests by verification team | Reference | Summary of project owner response | Verification team conclusion |
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| provide the verification team with supportive documents. | | Ver. 04. Relevant document for the same is attached herewith. | |
| **CL #9**<br>The MR includes description of JMR procedure for only one of the two technology providers. The PP is requested to clarify if the other technology provider has a different procedure. | MR section 4.1 | Descriptions of JMR procedure for both the two technology providers have been incorporated in the revised MR ver. 04. | Necessary corrections have been made to the MR, hence **CL is Closed**. |
| **CL #10**<br>The table 4.3 indicates that the WTG SCS/LCS controller is microprocessor based and its accuracy class is 0.2%. The PP is requested to submit documentation in support of the same. | MR Section 4.3 | The statement has been removed in the MR Ver. 04 as it is not applicable. Calibration certificates for both main meter and back up meters indicating the accuracy class of 0.2% have been submitted to the verifier. | Since the controller has no such accuracy class level, the removal of the statement was accepted, **CL is Closed**. |
| **CAR #1**<br>The monitoring period end date is beyond the date of site visit | Cover page, 2.1. 4.2 | The monitoring period end date has been changed to 1st August 2009. | The monitoring period has been restricted to the site visit date and hence, **CAR is closed**. |
| **CAR #2**<br>Calibration certificates for some months of 2006 to 2008/2009 are not made available as per annual calibration schedule stated in the monitoring plan. The same needs to be addressed as per CDM EB 52 "Guidelines for assessing compliance with the calibration frequency requirements" | 5.1, 4.2 | Due to the unavailability of calibration certificates for the period 2006 & 2007 for WTG No. J215 and for the period 2006, 2007 and 2008 for WTG No. YGCL 01 & 02, as per the guideline "Guidelines for assessing compliance with the calibration frequency requirements" EB 52, Annex-60; Para 4(a) the net electricity exported by the | The correction factor has been applied for the apportioned import and export values for the WTGs hence **CAR is Closed**. |

| Draft report clarification requests and corrective action requests by verification team | Reference | Summary of project owner response | Verification team conclusion |
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| | | WTGs for the above mentioned year has been corrected with the percentage of error as obtained from the immediate subsequent testing report. The maximum permissible error of the instrument (0.2-class of accuracy) has been applied to the measured values.<br>Available Calibration certificates of the energy meters have been provided to the verifier. | |
| **CAR #3**<br>The MR does not describe the activities followed by the PP during the current monitoring period but discusses only about how the project would be implemented. | MR | Necessary modifications have been incorporated in the revised MR ver. 04. | The MR has been corrected to include the activities carried out by the PP during the current monitored period and hence **CAR is Closed**. |
| **CAR #4**<br>The monitoring methodology followed by PP differs from that denoted in the VCS PD. It has been claimed that the energy meters are re-calibrated if ever there is more than 0.2% difference between the main and check meters. Examination of the records indicates that there is a marked difference in the import values for all WTGs and there are occasions where the export values differ between the main and check meter readings. | JMR Sheets for all WTGs for all months | Monitoring methodology followed for the project activity is prescribed in line with the VCS PD. Mentioning of the word "between" was in advertent and the same has been removed from the revised MR ver. 04. The calibration of the meters were carried out annually as mentioned in the VCS registered PD. The records for the same have already been submitted to the verifier. | Since the reporting of the monitoring methodology was erroneous in the MR, the correction of the same was accepted, issue is resolved and **CAR is Closed**. |

| Draft report clarification requests and corrective action requests by verification team | Reference | Summary of project owner response | Verification team conclusion |
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| The PP is requested to clarify if the energy meters were re-calibrated on every occasion this occurred. | | | |
| **CAR #5**<br>The MR presents the net energy delivered by the project activity in different yearly vintages. | Annexure 1 and annexure 2 to the MR | Necessary modifications have been incorporated in the revised MR ver. 04. | The revised MR is now indicating only a single yearly vintage, **CAR is Closed**. |

# APPENDIX III: LIST OF PARAMETERS

List of parameters covered during the verification period under consideration *(mention the verification period)* and details regarding the monitoring and reporting practices.

| S.No. | Monitoring and reporting practice/Parameter | $EG_y$ |
|---|---|---|
| 1. | Monitoring and reporting frequency as verified during the site visit. | Electricity supplied by the WTGs in the project activity to NEWNE regional grid of India, $EG_y$, is monitored daily, measured and reported monthly |
| 2. | Monitoring equipment verified during the site visit. | Tri-vector energy meters<br>Accuracy of 0.2 class in Rajasthan |
| 3 | Calibration frequency and other details verified during the site visit. | Calibration frequency as defined in PD: once in a year<br>As consolidated in Table 5 of the Verification Report. The reference standard meters are of 0.1 accuracy class.<br>There were multiple energy meter changes as the technology provider changed the transformers to which the WTGs were connected to based on the loads of new WTGs installed the previous year. The testing dates are summarized in Table 5. These did not indicate the energy meters were operating beyond permissible error limits, and hence the PP has applied a correction factor corresponding to the accuracy class of the energy meters for the intervening period from export and import values and therefore, the net energy delivered values are more conservative, and consequently the emission reductions. |
| 4. | The above parameters are in line with the MP agreed in the PD. | No but net electricity delivered to grid corrected with maximum error percentage applicable for the energy meters, hence acceptable. |
| 5 | The above parameters are in line with the monitoring methodology applied for the proposed project. | No but net electricity delivered to grid corrected with maximum error percentage applicable for the energy meters, hence acceptable. |
| 6 | Calibration entity and if the same is in line with the monitoring plan as agreed in the registered PDD. | Projection Wing, Rajasthan Rajya Vidhyut Prasaran Nigam Limited<br>No specific entity was identified during validation and hence acceptable |