






## Validation opinion

### Revision of the monitoring plan

Title of project activity:			
Enercon Wind Farms in Karnataka Bundled Project – 73.60 MW			
CDM reference number:		DNV project No.:	
1286		PRJC-331758-2011-CCS-IND	
Type of revision:	<input type="checkbox"/> Proposed revision only includes the request by the CDM EB <input type="checkbox"/> Proposed revision includes not only the request by the CDM EB but also additional revisions proposed by the PP/DOE <input checked="" type="checkbox"/> Proposed Revision includes revisions proposed by the PP/DOE		
Date	Work carried out by:	Work verified by:	Approved by:
28 November 2011	 K V Raman, TL K V Sudarshan Preeti Jolad	 Agnes Dudek	 Michael Lehman

## 1 Description of the changes to the monitoring plan

The project activity comprises of 101 wind energy generators (WEGs). The 101 WEGs in clusters are connected to 37 numbers of transformers (33kV) which in turn are connected to 4 substations of 66 kV transformers. The electricity from the 66 kV substations is uploaded to the grid. As per the original monitoring plan in the registered PDD, the parameter to be monitored is “Net Electricity supplied to the grid by the Project (EG<sub>y</sub>)” using bidirectional meter at the sub-station.

A revision of the registered monitoring plan is proposed for the project activity to provide clarity with respect to the metering plan, monitoring and monthly recording procedures of the parameter “Net Electricity supplied to the grid by the Project (EG<sub>y</sub>)” by considering a) the metering arrangements made both at the sub project activity transformer yard (33 kV) and at the connected substation (66 kV) b) the calculation and deduction of transmission losses and c) accounting of import electricity at 115% of the monitored figure to account for transmission losses.

### 1.1 Reason for revision in Monitoring Plan (MP)

As per details provided in the table under section B.7.1 in the registered PDD<sup>①</sup>, the parameter to be monitored was EG<sub>y</sub> (expressed in MWh) “Net electricity supplied to the grid by the project”. As per the original monitoring plan, the metering system for the project activity consists of one main and one check meter. Both the meters are two-way tri-vector meters capable of recording import and export of electricity and provide output in the form of net

<sup>①</sup> “Enercon Wind Farms in Karnataka Bundled Project”, Reference number 1286, available at <http://cdm.unfccc.int/Projects/DB/SGS-UKL1186566570.26/view>

electricity supplied to the grid. The procedures for metering and meter reading will be as per the provisions of the power purchase agreement.

However, as per the Monitoring Report (MR) submitted for verification, following deviations to the monitoring plan contained in the registered PDD were noticed, which were later confirmed during site visit on 19 and 20 September 2011.

1. The project activity WEGs are connected to 37 different 33 kV transformers, which are then connected to four 66 kV substations.
2. The number of parameters to be monitored is increased to four in the revised monitoring plan from one in the original approved plan. In addition to the original parameter of net electricity supplied to the grid, parameters to be monitored are:
  - energy exported,
  - energy imported, and
  - transmission losses.

Net electricity is calculated using the above three monitored parameters. The revision of the monitoring plan makes the monitoring process more transparent and detailed.

3. Source of data on the electricity exported, imported and the transmission losses cited is changed to the Joint meter readings (JMR) contained in FORM B issued by the statutory authority, based on the monthly meter readings taken by the authorities and the project proponent at the 33 kV transformer yard to which the sub project activities are connected and at the 66 kV substation to which the entire wind farm is connected. The readings are cross checked from the invoices raised by the project participant (PP). This measure shifted the source of data to a statutory record countersigned by both parties and thus ensured better reliability. It also provided a means of further verifying the correctness of the figures.
4. The statutory authorities increase the measured electricity import by a factor of 15% (of the recorded imports) in order to account for transmission losses on account of electricity imported<sup>1</sup> from the grid as recorded in the JMR. The net electricity generated is calculated as electricity exported *minus* the sum of 115% of import as explained above and the recorded transmission losses in the JMR.

## **1.2 Other information related to monitoring:**

The monitoring plan contained in the registered PDD had clearly stated that the procedures stipulated in the power purchase agreement (PPA) need to be followed for metering and meter reading procedures as well as for QA/QC measures. By seeking approval of this revision to the approved monitoring plan, such compliance is being ensured.

It must be noted that in the case of one sub-project activity, namely, Enercon Wind Farms (Krishna) Ltd, the meter installed at the 33 kV line has been shared with 4 x 600 kW non-project activity turbines between 1 July 2010 and 25 June 2011. A separate request for deviation permitting apportioning of generated energy will be submitted for approval to the CDM Executive Board.

## **1.3 Proposed revision in Monitoring Plan (MP)**

### **1.3.1 Procedure for metering:**

Main and check meters are installed for each sub project activity in the 33 kV line. These are located in the transformer yard which receives the power generated from the wind mill(s) and steps it up to 33 kV for dispatch to the designated substation. The feeders of 33 kV metering point are further connected to 66 kV step up transformer at substation; on the high voltage

side of these step-up transformers, another set of bulk meters, both main and check, are installed. These bulk meters are not exclusive to project equipment, but instead are also connected to machines belonging to other project developers.

### 1.3.2 Procedures for meter reading:

Individual WEGs (or a set of WEGs constituting a project activity) are connected to meters on the high voltage side of 33 kV transformers; these together with other subproject activities or non-project activities are further connected to 66 kV substation meters. The 33 kV meter monitors the generation of import and export for the set of WEGs connected to it. The readings are recorded monthly by the project proponent and the representative from the statutory authority (KPTCL, HESCOM) and are recorded in Form B (also known as Joint Meter Reading - JMR). The 66 kV line bulk meters record the net quantity contributed by all connected project activities after transmission losses, which is available for onward transmission through the grid. Summation of all the 33 kV meter readings gives aggregated sum of electricity generated by the project activity.

### 1.3.3 The following procedure is adopted in the revised monitoring plan to calculate the net electricity exported to the grid by the project activity.

1. Export/import ( $x / i_n$ ) from the 37 sub project activities is monitored at the 33 kV transformer yards of each sub project activity. The difference of meter readings (present and previous meter readings) for export and import gives energy exported / imported in kWh respectively. This is recorded in the JMR for each RR No.
2. The export and import readings at the substation (66 kV end) (comprising the export and import for the whole wind farm, consisting of both CDM & non CDM machines) is also recorded from the bidirectional tri-vector meters based on which, the total export / import at the substation end is recorded (Y) in a separate FORM B .
3. Transmission loss % (Z) is calculated as a percentage by using the formula:

$$Z = \left[ \frac{(x_1 + x_2 + x_3 + x_4 + \dots + x_n) - (Y)}{(x_1 + x_2 + x_3 + x_4 + \dots + x_n)} \right] * 100$$

Where

$x_1, x_2, \dots, x_n$  is the net electricity at each 33kV transformer yard

Y = Total net electricity exported from the wind farm comprising of several CDM wind turbines and non CDM wind turbines.

Transmission loss as calculated as above is indicated as a percentage in the FORM B for the substation.

4. The transmission loss (z) kWh for each sub project activity is calculated by applying this % transmission loss as calculated above (Z) to the net exported power (of  $x_1, x_2, x_3, x_4$ , etc., up to  $x_n$ ) and is recorded in the respective FORM B.
5. Net power generated for transmission to grid by the project activity is the summation of individual sub project activity, and calculated as being equal to,

$$[ \{ \text{Export recorded } (x_1, x_2, x_3, x_4, \dots, x_n) - z \} - 115\% \text{ import } (i_1, i_2, i_3, i_4, \dots, i_n) ]$$

The net power thus calculated is entered in the respective FORM B for the sub project activity; however step number 1, 4 and 5, as noted above, may be cross checked with the data available at the 33kV meter FORM B and step number 2 and 3 may be checked with the 66 kV meter FORM B.

DNV, during the site visit, has verified the monitoring of the data in line with this stated procedure, the calculations, and the entries of Form B both at 33 kV and at 66 kV ends and worksheets.

## **2. Assessment of the revision of the monitoring plan**

*The proposed revision of the monitoring plan ensures that the level of accuracy or completeness in the monitoring and verification process is not reduced as a result of the revisions.*

DNV confirms that the proposed revision of the monitoring plan as stated in the above section ensures the level of accuracy and completeness in the monitoring and reflects the actual monitoring practice at site. DNV confirms that the specifications of meters installed for monitoring of electricity, both at the 33 kV and at 66 kV substation, meet the requirements specified in the power purchase agreement (PPA - sections 7.1 and 7.2) and are in conformity with the calibration schedule provided under Central Electricity Authority (Installation and Operation of meters) Regulations, 2006. This ensures accuracy. The QA/QC procedure is in line with the sections 7.4, and 7.5 (i) to 7.5 (iv) of the PPA and hence found to be appropriate and acceptable.

*The proposed revision of the monitoring plan is in accordance with the approved monitoring methodology applicable to the project activity whilst ensuring the conservativeness of the emission reductions calculation.*

The methodology applied by the project activity is ACM0002 version 06, which requires the monitoring of the net electricity exported to the grid by the project activity. In the absence of a dedicated energy monitoring meter for the project activity, the net electricity is calculated from monitored readings (export, import and gross generation) in a method approved and accepted by the statutory authorities. Hence DNV confirms that, the revision of the monitoring plan is in line with the methodology applied for the project activity.

*The findings of previous verification reports, if any, have been taken into account.*

DNV confirms that this is the first verification of the project activity and hence there are no findings that need to be addressed.

## **3. Validation opinion**

Hence, it is DNV's opinion that:

- a. The proposed revision of the monitoring plan ensures that the level of accuracy and / or completeness in the monitoring and verification process is not reduced as a result of the revisions.
- b. The proposed revision of the monitoring plan is in accordance with the approved monitoring methodology applicable to the project activity whilst ensuring the conservativeness of the emission reductions
- c. The revision as proposed, adds more transparency to the method of calculating the net electricity exported to the grid from the project activity.

<sup>1</sup>Section 6.2.4 of Wheeling and Banking arrangement agreement available at <http://kerf.org/Proposed%20amendments%20to%20W%20&%20B%20agreement/Wheeling%20&%20Banking%20Agreement-approved%20by%20Commission%20vide%20its%20order%20dated%202011.7.2008.doc>

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