

**MONITORING REPORT FORM (CDM-MR)**  
**Version 01 - in effect as of: 28/09/2010****CONTENTS**

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**MONITORING REPORT**  
**Version 03.1 and Date 29/08/2011**

**Wind power project at Gujarat by Powerica Limited**  
**Reference number: 3632**  
**Monitoring period number: 01**  
**Monitoring Period: 18/09/2010 - 30/04/2011 (first and last days included)**

**SECTION A. General description of the project activity**

**A.1. Brief description of the project activity: >>**

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The project activity involves an installation of 9 Wind Turbine Generators (WTG) of total generating capacity of 14.85 MW (9 units of Vestas make V82 WTG). The WTG units are installed in Kutch district in the state of Gujarat.

The main purpose of the project activity is to generate electrical energy through sustainable means using wind power resources and to contribute to climate change mitigation efforts. In the absence of the project activity, the electricity thus supplied would have been generated through fossil fuel based thermal power plants. The project activity thus contributes to reduction in specific emissions (emissions of pollutant) including GHG emissions. The project activity is also responsible for sustainable economic growth and conservation of environment through use of wind as a renewable source

The start date of the project activity is 12/12/2009, when the Supply agreement for the project was signed. The commissioning of all the WTGs was completed on 31/03/2010. The project has been operational since the commissioning and has contributed to reduction in greenhouse gas emissions. The total emission reductions achieved by this project activity in the first monitoring period from 18/09/2010 to 30/04/2011 are 10,872 tCO<sub>2</sub>e.

**A.2. Project Participants**

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<b>Name of Party involved (host indicates a Host Party)</b>	<b>Private and/or public entity (ies) project participants</b>	<b>Kindly indicate if the Party involved wishes to be considered as project participant (Yes/ No)</b>
India (Host)	Powerica Limited – Private Entity	No

**A.3. Location of the project activity:**

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The project activity is located in the state of Gujarat. The site details are as below:

Taluka: Bhachau  
District: Kutch  
State: Gujarat  
Country: India

The unique location information of the WTG is provided in the table below. The WTG numbers indicated in the table below are unique identification number provided by the state utility.



WTG	Village	Latitude (°N)	Longitude (°E)	Sub-station
VW42	Lakhapar	23°11'14"	70°37'49"	Shikarpur
VW43		23°11'03"	70°37'33"	
VW45		23°11'28"	70°37'02"	Vandhiya
VW46		23°11'38"	70°36'43"	
VW47		23°11'48"	70°36'25"	
JW14	Jangi	23°10'42"	70°32'44"	
JW15		23°10'44"	70°32'29"	
NM82-1	Vandhiya	23°11'36"	70°35'47"	
NM82-2		23°11'42"	70°35'33"	

#### A.4. Technical description of the project

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The project activity is a greenfield project for generation of electrical energy using wind which is a renewable source of energy. In wind energy generation, kinetic energy of the wind is converted into mechanical energy and subsequently into electrical energy. Wind turbines capture the wind's energy with three propeller-like blades, which are mounted on a rotor, to generate electricity. The turbines sit high atop towers, taking advantage of the stronger and less turbulent wind. As the wind blows through the blades of the windmill, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade towards it, causing the rotor to spin. The rotor turns the shaft that further spins the connected generator. The spinning of this generator produces the required electricity. Since power is generated from wind energy, no emissions are attributed to the project emissions and due to that equivalent amount of fossil-fuel dominated grid can be displaced due to the project activity.

Emission reductions are claimed on the net electrical energy that is supplied to grid which is metered using meters (Main & Check meters) located at the electrical yard of the respective WTGs. These electrical energy meters are electronic tri-vector meters of appropriate accuracy class. Since these meters are not designed to measure high voltages and currents as generated in the WTG, the WTG output is connected to these meters via transformers (CT/PT) for stepping down the generated voltage and current to ranges which the meters can record. As such, these meters have a multiplying factor which when multiplied to the meter reading provides the actual amount of electricity generated. The technology providers for the project have additionally installed an LCS meter at the WTG controller.

For the project activity, the project proponent has procured 9 units V82 1650 kW capacity from Vestas Limited for supply of. The salient features of the technology employed are:

#### V82 1.65 MW 50Hz

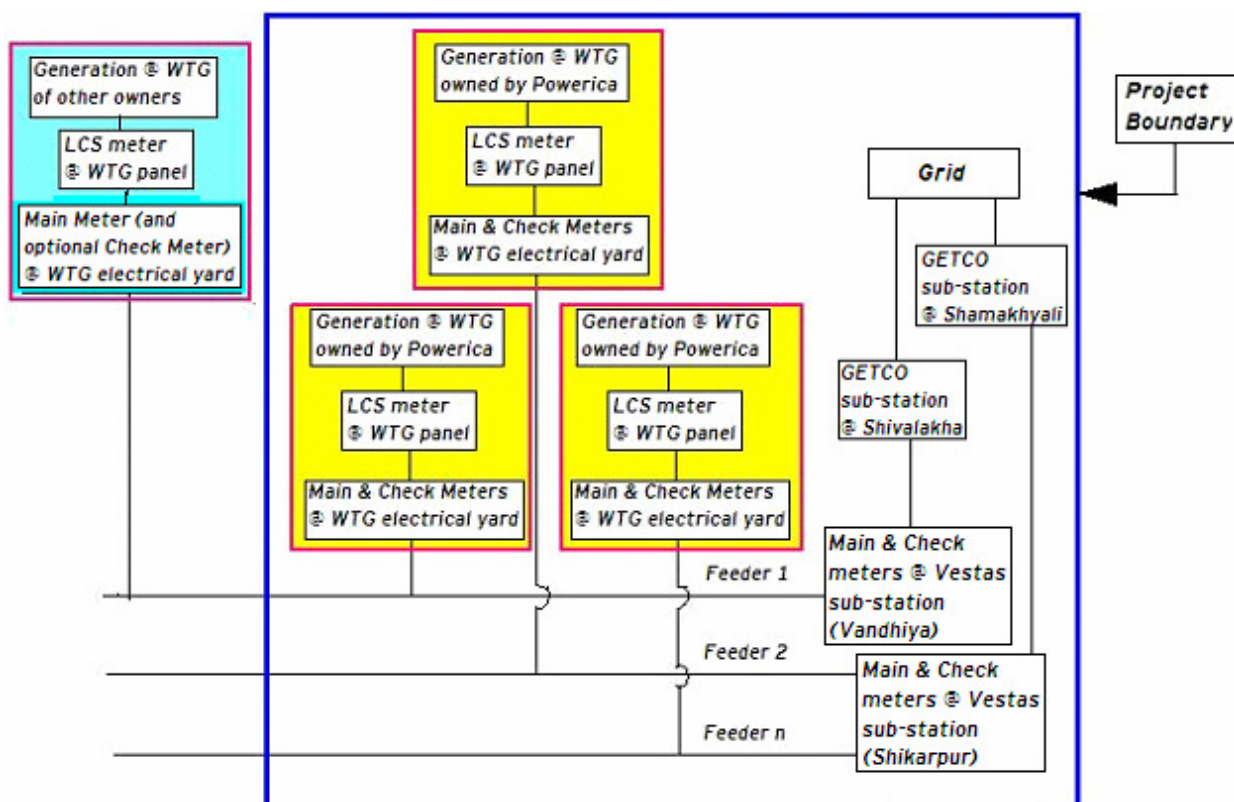
Parameter	Specification
Rated Power	1,650 kW
Rotor diameter	82 m
Swept area	5,281 m <sup>2</sup>
No. of blades	3



Cut in wind speed	3.5 m/s
Cut out wind Speed	20 m/s
Rated wind speed	14.4 rpm
Regulation	Active Stall
Tower Height	78 m
Insulation	Class F/B

The electricity generated is monitored using electrical meters (Main & Check meters) which provide a measure of the actual electrical energy that would have been sourced from a fossil-fuel based power plants in the absence of the project activity. Hence, the fossil-fuel power based grid is the baseline for the project activity.

The project boundary includes the electricity generation equipment at the site and the transport through the electricity grid to the substation. Hence, project boundary is considered within these terminal points. The project boundary, as per monitoring layouts involving the project activity, is portrayed as follows:



**A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:**

&gt;&gt;

The methodology followed for this project activity is “AMS I.D Version 15 (Valid from 30 Oct 09 onward) Approved methodology for Small Scale Projects” under the sectoral scope “Grid connected renewable electricity generation” which is most appropriate for this Project and is listed as per the UNFCCC norms.

**Project Type** : I – Renewable energy project  
**Project category** : D – Grid connected renewable electricity generation  
(AMS I.D. Version 15 (Valid from 30 Oct 09 onward))  
Methodology AMS I.D. also refers to:-  
**Tool to calculate the emission factor for an electrical system**  
EB 50, Version 02  
**Reference** : Appendix B of simplified M&P for small scale project activities  
(UNFCCC, Recent norms)

**A.6. Registration date of the project activity:**

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Project Title: Wind power project at Gujarat by Powerica Limited  
Project Reference number: 3632  
UNFCCC Registration Date: 18/09/2010

**A.7. Crediting period of the project activity and related information (start date and choice of crediting period):**

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Choice of Crediting Period: Renewable Crediting period; 7 Years  
Crediting period start date: 18/09/2010 (Date of Registration)

**A.8. Name of responsible person(s)/entity(ies):**

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Name of Person Responsible: Mr. Pradeep Gupta  
Head of Wind Energy, Powerica Limited

Detailed contact address of the project participant is given in Annex I.

**SECTION B. Implementation of the project activity****B.1. Implementation status of the project activity**

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The project activity involved implementation of 9 Wind Turbine Generators (WTG) of Vestas make (Model -V82).The chronology of the implementation is provided in the table below:

WTG No.	Date of Commissioning	Substation	Feeder No.	Main Meter No.	Check Meter No.	Date of Calibration
VW42	18/03/2010	Shikarpur	Feeder – VI	GJB03625	208320448	12/03/2010
VW43	18/03/2010	Shikarpur	Feeder – VI	GJU56186	208320620	12/03/2010
VW45	18/03/2010	Vandhiya	Feeder – II	GJU56185	208320616	12/03/2010
VW46	18/03/2010	Vandhiya	Feeder – II	GJU56184	208320647	12/03/2010
VW47	18/03/2010	Vandhiya	Feeder – II	GJU56180	208320686	11/03/2010
JW14	31/03/2010	Vandhiya	Feeder – II	GJB03623	208320447	11/03/2010
JW15	31/03/2010	Vandhiya	Feeder – II	GJB03624	208190837	11/03/2010
NM82-1	20/03/2010	Vandhiya	Feeder – II	GJU56183	208200823	12/03/2010
NM82-2	20/03/2010	Vandhiya	Feeder – II	GJU56178	208320646	12/03/2010

The last calibration for all the meters has been conducted on 11/07/2011. The summary of the shut down/overhaul times during the current monitoring period for the project activity are as below:

WTG	Downtime Hours					
	Manufacturer	Grid	Owner	Environmental	Scheduled Maintenance	Categorised
VW42	23.3	110.4	0	8.7	16.75	159.17
VW43	17.5	127.1	0	10.3	14.85	169.82
VW45	22.5	52.3	0	11.1	14.32	100.17
VW46	11.3	47.9	0	9.4	14.05	82.67
VW47	40.8	60.5	0	12.4	13.65	127.32
JW14	27.6	59.8	0	13	13.65	114.09
JW15	37.2	60.6	0	7.3	13.21	118.26
NM82-1	114.5	53	0.7	9.6	14.85	192.62
NM82-2	29.3	56.6	0.6	9.4	11.04	106.91

There have been no events or situations during the monitoring period, which may impact the applicability of the methodology.

**B.2. Revision of the monitoring plan**

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There is no revision in the monitoring plan

**B.3. Request for deviation applied to this monitoring period**



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No deviation has been applied for.

<b>B.4. Notification or request of approval of changes</b>
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&gt;&gt;

There has been no notification or request of approval of changes from the project activity as described in the registered CDM-PDD.

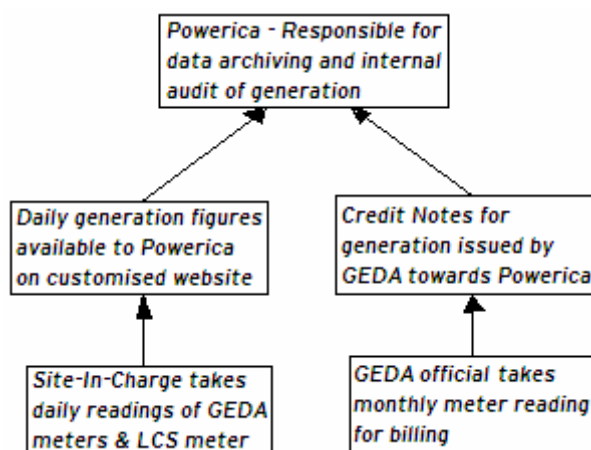
**SECTION C. Description of the monitoring system**

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The project activity is in accordance with approved small scale methodology AMS I.D, and therefore, uses the monitoring methodology for type I.D of 'Appendix B of the simplified M&P for small-scale CDM project activities-Version 15, - Grid connected renewable electricity generation.

The monitoring methodology requires that the project-monitoring plan to consist of metering the electricity generated by the renewable technology. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to grid by the project activity multiplied by emission factor for regional grid, forms the baseline for the project activity.

Since the baseline emission factor is based on an ex-ante determination, this parameter is not monitored. The sole parameter for monitoring is the electricity exported to the grid. The Project is operated and managed by Vestas Wind Technology India Private Limited (Vestas). Vestas has a designated Site-In-Charge (O&M) on site who is responsible for monitoring the electricity exported from the project activity. The overall flow of information has been depicted using the following hierarchical structure:

**Monitoring Process at Gujarat**

Metering of wind power is done as under:

- Joint meter reading is taken at Vandhiya/Shikarpur substation meter by representative of GETCO (Gujarat Electricity Transmission Company) and O&M service provider (on behalf of individual wind farm owners). Let the total generation recorded for particular month is 'X' units in sub-station meter.
- Joint meter reading is taken at Local Meter-(transformer yard meter of each WTG) by representative of GETCO (Gujarat Electricity Transmission Company) and O&M service provider (on behalf of individual wind farm owners). Let us assume total generation of Powerica recorded for particular month is ' $Y_1$ ' units.
- Similarly joint meter reading for other wind farm owners is also taken. Let the generation of individual owner recorded for particular month are ' $Y_2, Y_3, \dots, Y_n$ ' units.
- GETCO distributes 'X' to individual wind farm owners using following formula and issues monthly certificates.





- For Powerica, net units calculated for billing =  $X * Y_1 / \Sigma Y_n$
- It must be noted here that the meter readings as mentioned above are calculated as the product of meter multiplication factor and the difference of the current and previous meter readings

Additionally, all the WTGs at the site are connected to a central monitoring system located at that site only. This system captures daily generation figures which are later made available to Powerica on the customized website of Vestas. This is used to check the generation figures.

**SECTION D. Data and parameters****D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors**

<b>Data / Parameter:</b>	<b>EF<sub>Grid,CM,y</sub></b>
Data unit:	tCO <sub>2</sub> /MWh
Description:	Combined Margin Grid emission factor for NEWNE Grid
Source of data used:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value(s) :	0.9224
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for the calculation of the Baseline emissions
Additional comment:	The weights used for calculating combined margin emission factor are 0.75 and 0.25 for operating margin and build margin respectively. Data will be kept for crediting period + 2 Years.

<b>Data / Parameter:</b>	<b>EF<sub>Grid,OM,y</sub></b>
Data unit:	tCO <sub>2</sub> /MWh
Description:	Weighted average of 3 years (2006-07, 2007-08, 2008-09) CO <sub>2</sub> Operating Margin emission factor of the NEWNE grid
Source of data used:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value(s) :	1.0049
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for the calculation of the Baseline emissions
Additional comment:	Data will be kept for crediting period + 2 Years.

<b>Data / Parameter:</b>	<b>EF<sub>Grid,BM,y</sub></b>
Data unit:	tCO <sub>2</sub> /MWh
Description:	CO <sub>2</sub> Build Margin emission factor of the NEWNE grid
Source of data used:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value(s) :	0.6752
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for the calculation of the Baseline emissions
Additional comment:	Data will be kept for crediting period + 2 Years

**D.2. Data and parameters monitored**

<b>Data / Parameter:</b>	<b>EG<sub>y</sub></b>
Data unit:	MWh/year
Description:	Electricity exported to grid
Measured /Calculated /Default:	Measured and calculated



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Source of data:	Invoices for sale of power
Value(s) of monitored parameter:	11,945
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for the calculation of Baseline emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<u>Monitoring Equipment:</u> Monitored through the main meter and check meter readings. Both the energy meters are bi-directional tri-vector meters. <u>Meter accuracy:</u> 0.2s of the meter at respective substations that are used for the exported electricity metering. <u>Calibration Frequency:</u> The meters are calibrated on an annual basis <u>Date of Last calibration:</u> 12/03/2010 (Latest Calibration available: 11/07/2011)
Measuring/ Reading/ Recording frequency:	<u>Data type:</u> Measured continuously and recorded monthly <u>Archiving:</u> Electronic <u>Recording Frequency:</u> Monthly <u>Responsibility:</u> The plant management is responsible for the regular recording of data.
Calculation method (if applicable):	-
QA/QC procedures applied:	Meter calibration is conducted annually in accordance with the local calibration standards and internal audit system is in place as described in the registered PDD.

<b>Data / Parameter:</b>	<b>EC<sub>v</sub></b>
Data unit:	MWh/year
Description:	Electricity imported from grid
Measured /Calculated /Default:	Measured & Calculated
Source of data:	Invoices for sale of power
Value(s) of monitored parameter:	158
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for the calculation of Baseline emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<u>Monitoring:</u> Monitored through the main meter and check meter readings. <u>Meter accuracy:</u> 0.2s of the meter at respective substations that are used for the electricity metering. <u>Calibration Frequency:</u> The meters are calibrated annually <u>Date of Last calibration:</u> 12/03/2010 (Latest Calibration available: 11/07/2011)
Measuring/ Reading/ Recording frequency:	<u>Data type:</u> Measured continuously and recorded monthly <u>Archiving:</u> Electronic <u>Recording Frequency:</u> Monthly <u>Responsibility:</u> The plant management is responsible for the regular recording of data.

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Calculation method (if applicable):	-
QA/QC procedures applied:	Meter calibration is conducted annually by GETCO in accordance with the local calibration standards and internal audit system is in place as described in the registered PDD.

**SECTION E. Emission reductions calculation****E.1. Baseline emissions calculation**

&gt;&gt;

The monitoring period begins from 18/09/2010. However, since the crediting period falls in between the billing cycle, the emission reductions are claimed only for the period that falls entirely in the billing cycle. Thus, emission reductions are claimed from the start date of the next billing cycle i.e. 1/10/2010.

The emission factor value has been fixed Ex-ante and the same shall be used for the monitoring period. Net Electricity Generated is obtained by deducting total import (from grid) from total export (to grid). These values are taken from the “Certificate for Share of Electricity Generated by Wind Farm” issued by Gujarat Energy Transmission Corporation Limited (GETCO). This statement is issued on a monthly basis.

The generation details for the current monitoring period are as below:

Sr. no.	Initial	Final	Electricity Exported (kWh)	Electricity Imported (kWh)	Net Electricity Exported (kWh)
1	01/10/2010	31/10/2010	1402832	28192	1374640
2	01/11/2010	30/11/2010	1161558	24444	1137114
3	01/12/2010	31/12/2010	1319225	24179	1295046
4	01/01/2011	31/01/2011	1865443	21032	1844411
5	01/02/2011	28/02/2011	1615229	22853	1592376
6	01/03/2011	31/03/2011	2246365 <sup>1</sup>	19867 <sup>2</sup>	2226498
7	01/04/2011	30/04/2011	2334840 <sup>3</sup>	17770 <sup>4</sup>	2317070
	Total		11945491	158337	11787155

Total Net Electricity Generation = 11,787 MW

Baseline Emissions (BE<sub>y</sub>) = EG<sub>BL,y</sub> \* EF<sub>CO2</sub>

Where,

EG<sub>BL,y</sub> = Energy baseline in year y; MWh

EF<sub>CO2</sub> = CO2 Emission Factor in year y; t CO2e/MWh = 0.9224 t CO2e/MWh (Fixed ex-ante)

Thus, Baseline Emissions (BE<sub>y</sub>) = 0.9224 x 11,787  
= 10,872 tCO<sub>2</sub>e

<sup>1</sup> This value has been corrected by applying the maximum permissible error of the meter conservatively as per the guidelines of Section B in EB 52, Annex 60 due to delay in calibration of the meter.

<sup>2</sup> This value has been corrected by applying the maximum permissible error of the meter conservatively as per the guidelines of Section B in EB 52, Annex 60 due to delay in calibration of the meter.

<sup>3</sup> This value has been corrected by applying the maximum permissible error of the meter conservatively as per the guidelines of Section B in EB 52, Annex 60 due to delay in calibration of the meter.

<sup>4</sup> This value has been corrected by applying the maximum permissible error of the meter conservatively as per the guidelines of Section B in EB 52, Annex 60 due to delay in calibration of the meter.

**E.2. Project emissions calculation**

&gt;&gt;

Project emissions arise due to the consumption of electricity exported from the grid.

Project Emissions for the project activity are zero.

Hence,  $PE_y = 0$

**E.3. Leakage calculation**

&gt;&gt;

The project proponents have identified no anthropogenic greenhouse gases by sources outside the project boundary that are significant, measurable and attributable to the project activity.

Hence, no leakage is considered from the project activity.

$LE_y = 0$

**E.4. Emission reductions calculation / table**

&gt;&gt;

**Emission Reduction Calculation:**

$$ER = BE_y - PE_y - LE_y$$

$$BE_y = 10,872 \text{ tCO}_2\text{e}$$

$$PE_y = 0$$

$$LE_y = 0$$

$$\begin{aligned} \text{Thus, } ER &= 10,872 - 0 - 0 \\ &= 10,872 \text{ tCO}_2\text{e} \end{aligned}$$

Total baseline emissions = 10,872 tCO<sub>2</sub>e

Total project emissions = 0 tCO<sub>2</sub>e

Total leakage = 0 tCO<sub>2</sub>e

Total emission reductions = 10,872 tCO<sub>2</sub>e

**E.5. Comparison of actual emission reductions with estimates in the CDM-PDD**

&gt;&gt;

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO <sub>2</sub> e)	17,175	10,872

**E.6. Remarks on difference from estimated value in the PDD**

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As per the registered PDD, the emission reductions estimated were 29,443 tCO<sub>2</sub>e/ annum. During the current monitoring period (18/09/2010 to 30/04/2011) of seven months, the emission reduction as per the ex-ante calculations is 17,175 tCO<sub>2</sub>e. Whereas, the actual emissions reduction achieved in this period is 10,872 tCO<sub>2</sub>e, which is lesser than the expected emission reductions.

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## History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
<b>Decision Class:</b> Regulatory <b>Document Type:</b> Guideline, Form <b>Business Function:</b> Issuance		

Annex 1

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