



## Monitoring report form (Version 03.1)

### Monitoring report

<b>Title of the project activity</b>	Wind power project at Gujarat by Powerica Limited
<b>Reference number of the project activity</b>	3632
<b>Version number of the monitoring report</b>	01.1
<b>Completion date of the monitoring report</b>	31/01/2013
<b>Registration date of the project activity</b>	18/09/2010
<b>Monitoring period number and duration of this monitoring period</b>	Monitoring period number – 2 Duration of monitoring period – 01/05/2011 to 31/12/2012 (Both days included)
<b>Project participant(s)</b>	1.Powerica Limited 2.Kingdom of Spain 3.Swedish Energy Agency 4.Asian Development Bank as trustee of Asia Pacific Carbon Fund
<b>Host Party(ies)</b>	India
<b>Sectoral scope(s) and applied methodology(ies)</b>	Sectoral Scope : 1 Energy industries (renewable / non renewable sources) Methodology: AMS I.D Version 15
<b>Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD</b>	48,399 tCO <sub>2</sub> e
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>	47,267 tCO <sub>2</sub> e

**SECTION A. Description of project activity****A.1. Purpose and general description of 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 01/05/2011 to 31/12/2012 are 47,267 tCO<sub>2</sub>e.

**A.2. Location of 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.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)
India (Host)	Powerica Limited ( a private Entity)	No

Spain	Kingdom of Spain ( a public entity)	Yes
Sweden	Swedish Energy Agency (a public entity)	Yes
Spain	Asian Development Bank, as trustee of the Asia Pacific Carbon Fund (Multilateral Agency)	Yes
Sweden	Asian Development Bank, as trustee of the Asia Pacific Carbon Fund (Multilateral Agency)	Yes

#### A.4. Reference of applied methodology

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**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.5. Crediting period of project activity

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

### SECTION B. Implementation of project activity

#### B.1. Description of implemented registered project activity

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##### Technical description of the project

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.

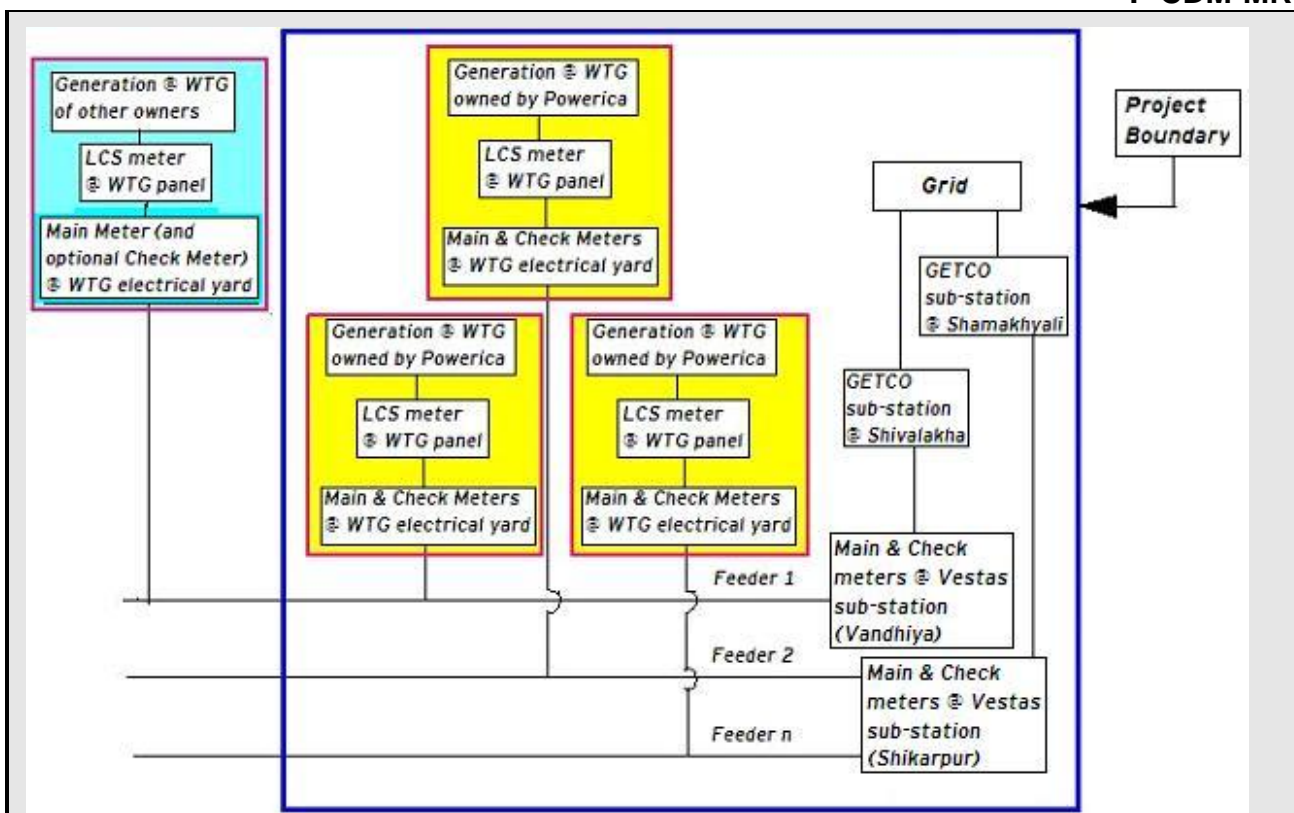
For the project activity, the project proponent has procured 9 units V82 1650 kW capacity from Vestas Limited for supply of. The salient features of the technology employed are:

**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:



The project activity involved implementation of 9 Wind Turbine Generators (WTG) of Vestas make (Model - V82). The chronology of the implementation is provided in Annex 1

## B.2. Post registration changes

### B.2.1. Temporary deviations from registered monitoring plan or applied methodology

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No deviation has been applied in this monitoring period.

### B.2.2. Corrections

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No corrections have been applied post registration.

### B.2.3. Permanent changes from registered monitoring plan or applied methodology

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No permanent change has been applied post registration.

### B.2.4. Changes to project design of registered project activity

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No change in project design has been performed post registration.

### B.2.5. Changes to start date of crediting period

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No change to the start date of crediting period.

**B.2.6. Types of changes specific to afforestation or reforestation project activity**

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Not applicable

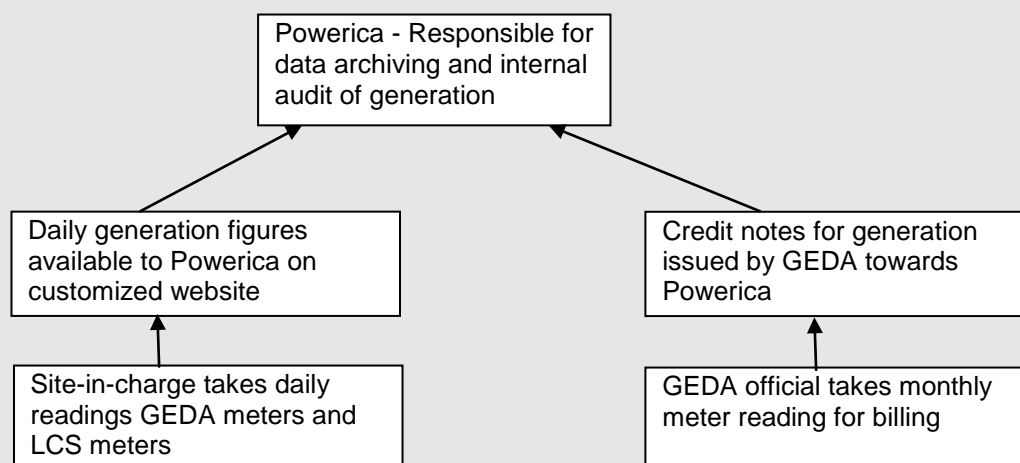
**SECTION C. Description of monitoring system**

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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<sub>1</sub>' 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<sub>2</sub>, Y<sub>3</sub>,.....Y<sub>n</sub>' units.
- GETCO distributes 'X' to individual wind farm owners using following formula and issues monthly certificates.
- For Powerica, net units calculated for billing =  $X * Y_1 / \sum Y_n$
- 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 fixed ex ante or at renewal of crediting period

<b>Data / Parameter:</b>	<b>EF<sub>Grid,CM,y</sub></b>
Unit:	tCO <sub>2</sub> /MWh
Description:	Combined Margin Grid emission factor for NEWNE Grid
Source of data:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value(s) applied:	0.9224
Purpose of data:	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>
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:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value(s) applied:	1.0049
Purpose of data:	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>
Unit:	tCO <sub>2</sub> /MWh
Description:	CO <sub>2</sub> Build Margin emission factor of the NEWNE grid
Source of data:	CEA website Version :05 (Valid from 1 <sup>st</sup> November 2009)
Value(s) applied:	0.6752
Purpose of data:	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>
Unit:	MWh/year
Description:	Electricity exported to grid
Measured/ Calculated / Default:	Measured and calculated
Source of data:	Invoices for sale of power

Value(s) of monitored parameter:	51662.156
Monitoring equipment:	<p><u>Monitoring Equipment:</u> Monitored through the main meter and check meter readings. Both the energy meters are bi-directional tri-vector meters.</p> <p><u>Meter accuracy:</u> 0.2s of the meter at respective substations that are used for the exported electricity metering.</p> <p><u>Serial numbers:</u> Please refer annex 1</p> <p><u>Calibration Frequency:</u> The meters are calibrated on an annual basis</p> <p><u>Date of Last calibration:</u></p> <ol style="list-style-type: none"> <li>12/03/2010 for 7 WTGs, (11/03/2010-V47 for JW 14, JW 15)</li> <li>07/07/2011 for 9 WTGs</li> <li>03/07/2012 for 9 WTGs</li> </ol> <p><u>Validity of calibration:</u> 1 year from last calibration</p>
Measuring/ Reading/ Recording frequency:	<p><u>Data type:</u> Measured continuously and recorded monthly</p> <p><u>Archiving:</u> Electronic</p> <p><u>Recording Frequency:</u> Monthly</p> <p><u>Responsibility:</u> The plant management is responsible for the regular recording of data.</p>
Calculation method (if applicable):	-
QA/QC procedures:	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.
Purpose of data:	The data is used for the calculation of Baseline emissions
Additional comment:	-

<b>Data / Parameter:</b>	<b>EC<sub>y</sub></b>
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:	417.918
Monitoring equipment:	<p><u>Monitoring:</u> Monitored through the main meter and check meter readings. Both the energy meters are bi-directional tri-vector meters.</p> <p><u>Meter accuracy:</u> 0.2s of the meter at respective substations that are used for the electricity metering.</p> <p><u>Serial numbers:</u> Please refer annex 1</p> <p><u>Calibration Frequency:</u> The meters are calibrated on an annual basis</p> <p><u>Date of Last calibration:</u></p> <ol style="list-style-type: none"> <li>12/03/2010 for 7 WTGs, (11/03/2010-V47 for JW 14, JW 15)</li> <li>07/07/2011 for 9 WTGs</li> <li>03/07/2012 for 9 WTGs</li> </ol> <p><u>Validity of calibration:</u> 1 year from last calibration</p>



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:	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.
Purpose of data:	This data is used for the calculation of Baseline emissions
Additional comment:	-

### D.3. Implementation of sampling plan

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Not relevant to the 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

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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	01/05/2011	31/05/2011	5,780,254 <sup>1</sup>	2,312 <sup>2</sup>	5,777,942
2	01/06/2011	30/06/2011	5,397,626 <sup>3</sup>	6,683 <sup>4</sup>	5,390,943
3	01/07/2011	31/07/2011	3,278,376 <sup>5</sup>	14,774 <sup>6</sup>	3,263,602
4	01/08/2011	31/08/2011	2,580,600	16,700	2,563,900
5	01/09/2011	30/09/2011	1,715,200	24,700	1,690,500
6	01/10/2011	31/10/2011	916,950	32,900	884,050
7	01/11/2011	30/11/2011	676,600	34,750	641,850
8	01/12/2011	31/12/2011	1,212,150	23,200	1,188,950
9	01/01/2012	31/01/2012	1,277,500	26,500	1,251,000
10	01/02/2012	29/02/2012	1,373,100	22,000	1,351,100
11	01/03/2012	31/03/2012	1,511,400	21,750	1,489,650

<sup>1</sup> This value has been corrected by applying the maximum permissible error of the meter conservatively as per the guidelines in Section 9.4.4 of EB 70, Annex 03 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 in Section 9.4.4 of EB 70, Annex 03 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 in Section 9.4.4 of EB 70, Annex 03 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 in Section 9.4.4 of EB 70, Annex 03 due to delay in calibration of the meter.

<sup>5</sup> This value has been corrected by applying the maximum permissible error of the meter conservatively as per the guidelines in Section 9.4.4 of EB 70, Annex 03 due to delay in calibration of the meter.

<sup>6</sup> This value has been corrected by applying the maximum permissible error of the meter conservatively as per the guidelines in Section 9.4.4 of EB 70, Annex 03 due to delay in calibration of the meter.

12	01/04/2012	30/04/2012	2,111,100	15,400	2,095,700
13	01/05/2012	31/05/2012	4,727,400	4,300	4,723,100
14	01/06/2012	30/06/2012	5,580,900	6,850	5,574,050
15	01/07/2012	31/07/2012	5,498,400	12,200	5,486,200
16	01/08/2012	31/08/2012	4,221,350	7,650	4,213,700
17	01/09/2012	30/09/2012	1,602,750	43,250	1,559,500
18	01/10/2012	31/10/2012	629,050	39,000	590,050
19	01/11/2012	30/11/2012	502,050	36,800	465,250
20	01/12/2012	31/12/2012	1,069,400	26,200	1,043,200
Total			51,662,156	417,918	51,244,237

Total Net Electricity Generation = 51244.237 MW

$$\text{Baseline Emissions (BE}_y\text{)} = \text{EG}_{\text{BL},y} * \text{EF}_{\text{CO}_2}$$

Where,

$\text{EG}_{\text{BL},y}$  = Energy baseline in year y; MWh

$\text{EF}_{\text{CO}_2}$  =  $\text{CO}_2$  Emission Factor in year y; t  $\text{CO}_2\text{e/MWh}$  = 0.9224 t  $\text{CO}_2\text{e/MWh}$  (Fixed ex-ante)

$$\begin{aligned}\text{Thus, Baseline Emissions (BE}_y\text{)} &= 0.9224 \times 51244.237 \\ &= 47,267 \text{ tCO}_2\text{e}\end{aligned}$$

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

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Project Emissions for the project activity are zero.

Hence,  $\text{PE}_y = 0$

## E.3. Calculation of leakage

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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.

$$\text{LE}_y = 0$$

### Emission Reduction Calculation:

$$\text{ER} = \text{BE}_y - \text{PE}_y - \text{LE}_y$$

$$\text{BE}_y = 47,267 \text{ tCO}_2\text{e}$$

$$\text{PE}_y = 0$$

$$\text{LE}_y = 0$$

$$\begin{aligned}\text{Thus, ER} &= 47,267 - 0 - 0 \\ &= 47,267 \text{ tCO}_2\text{e}\end{aligned}$$

Total baseline emissions = 47,267 t $\text{CO}_2\text{e}$

Total project emissions = 0 t $\text{CO}_2\text{e}$

Total leakage = 0 t $\text{CO}_2\text{e}$

Total emission reductions = 47,267 t $\text{CO}_2\text{e}$

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

Item	Baseline emissions or baseline net GHG removals by sinks (t CO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO <sub>2</sub> e)
Total	47,267	0	0	47,267

**E.5. Comparison of actual emission reductions or net anthropogenic 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 <sub>2</sub> e)	48,399	47,267

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

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During the present monitoring period 01/05/2011 to 31/12/2012 (600 days), the actual emission reduction is 47,267 tCO<sub>2</sub>e whereas the estimated emission for 600 days as per the registered PDD is 48,399 tCO<sub>2</sub>e. The emission reduction obtained in the monitoring period is less than that mentioned in the registered PDD.

**E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards**

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO <sub>2</sub> e)	47,267	NA

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**Annex 1**

WT G No.	Date of Commis sioning	Subst ation	Feeder No.	Main Meter No.	Check Meter No.	Date of Calibration1	Due Date of Next Calibration	<sup>7</sup> Date of Calibration2	Due date of Next Calibration	Date of last Calibration	Due Date of Next Calibration
VW 42	18/03/20 10	Shikar pur	Feeder – VI	GJB03 625	20832 0448	12/03/2010	11/03/2011	07/07/2011	06/07/2012	03/07/2012	02/07/2013
VW 43	18/03/20 10	Shikar pur	Feeder – VI	GJU56 186	20832 0620	12/03/2010	11/03/2011	07/07/2011	06/07/2012	03/07/2012	02/07/2013
VW 45	18/03/20 10	Vandh iya	Feeder – II	GJU56 185	20832 0616	12/03/2010	11/03/2011	07/07/2011	06/07/2012	03/07/2012	02/07/2013
VW 46	18/03/20 10	Vandh iya	Feeder – II	GJU56 184	20832 0647	12/03/2010	11/03/2011	07/07/2011	06/07/2012	03/07/2012	02/07/2013
VW 47	18/03/20 10	Vandh iya	Feeder – II	GJU56 180	20832 0686	11/03/2010	10/03/2011	07/07/2011	06/07/2012	03/07/2012	02/07/2013
JW1 4	31/03/20 10	Vandh iya	Feeder – II	GJU56 182	20832 0447	11/03/2010	10/03/2011	07/07/2011	06/07/2012	03/07/2012	02/07/2013
JW1 5	31/03/20 10	Vandh iya	Feeder – II	GJU56 181	20819 0837	11/03/2010	10/03/2011	07/07/2011	06/07/2012	03/07/2012	02/07/2013
NM 82-1	20/03/20 10	Vandh iya	Feeder – II	GJU56 183	20820 0823	12/03/2010	11/03/2011	07/07/2011	06/07/2012	03/07/2012	02/07/2013
NM 82-2	20/03/20 10	Vandh iya	Feeder – II	GJU56 178	20832 0646	12/03/2010	11/03/2011	07/07/2011	06/07/2012	03/07/2012	02/07/2013

<sup>7</sup> Delay in calibration due on 11/03/2011. The generation value has been corrected by applying the maximum permissible error of the meter conservatively as per the guidelines in Section 9.4.4 of EB 70, Annex 03 due to this delay.

### Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
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 anthropogenic 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, performance monitoring		