



Monitoring report form (Version 03.1)

Monitoring report

Title of the project activity	Wind Power Project in Gujarat, India
Reference number of the project activity	7369
Version number of the monitoring report	02
Completion date of the monitoring report	10/06/2013
Registration date of the project activity	05/10/2012
Monitoring period number and duration of this monitoring period	01 and 05/10/2012 to 30 April, 2013 (first and last days included)
Project participant(s)	Vish Wind Infrastructure LLP
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope – 1; ACM0002 (Version 12.3.0, EB 66)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	42,938 tCO ₂ e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	20,011 tCO ₂ e

SECTION A. Description of project activity**A.1. Purpose and general description of project activity**

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(a) Purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG removals by sinks;

The purpose of the project activity is to utilize wind energy potential for generation of electricity. The project activity replaces anthropogenic emissions of greenhouse gases (GHGs) from the atmosphere, by displacing an equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansions connected to the grid, which would have been the scenario in the absence of the project activity.

(b) Brief description of the installed technology and equipment;

During the project registration, the proposed capacity of the project activity was 36 MW, which involves 45 wind energy converters (WECs) of Enercon make (800 kW E-53) with internal electrical lines connecting the project activity with local evacuation facility. During installation of the WTGs, the actual installed capacity of the project activity was 32 MW (40 WECs). The detailed explanation has been provided in the section B.2.4.

(c) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.);

The first machine under the project activity was commissioned on 31 March, 2012 and last machine was commissioned on 04 April, 2013. The expected operational lifetime of the project is for 20 years.

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period.

The total emission reductions achieved under this monitoring period (5 October, 2012 to 30 April, 2013) is 20,011 tCO₂.

A.2. Location of project activity

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- (a) Host Party (ies): India
 (b) Region/ State/ Province, etc.: Western region, Kutch district, Gujarat
 (c) City/ Town/ Community, etc.: Nakhatrana Wind Farm Site, the nearest railway station and the airport is at Rajkot which is about 180 km away from the site.
 (d) Physical/ Geographical location.

The details of the geo-coordinates of the individual machine have been given below:

SL. No.	Loc. No.	Latitude			Longitude		
		Deg.	Min.	Sec.	Deg.	Min.	Sec.
1	52	23	26	7.6	69	8	28.4
2	53	23	26	16.4	69	8	25.8
3	54	23	26	22.3	69	8	19.6
4	55	23	26	9.7	69	8	14.2
5	82	23	27	19.8	69	6	55.7
6	86	23	27	38.8	69	6	25.6
7	97	23	29	2.3	69	7	5.8
8	98	23	28	55.7	69	6	48.5
9	99	23	28	59.0	69	6	29.7
10	103	23	28	50.9	69	6	21.7
11	104	23	28	39.6	69	6	23.9
12	106	23	28	32.7	69	6	13.9

13	107	23	28	26.7	69	6	22.0
14	111	23	28	4.4	69	5	0.4
15	125	23	28	43.7	69	4	9.2
16	126	23	28	36.5	69	4	14.6
17	127	23	28	15.6	69	3	30.3
18	128	23	28	6.7	69	3	36.9
19	129	23	28	1.5	69	3	43.5
20	130	23	28	13.4	69	3	55.5
21	131	23	28	5.4	69	3	59.4
22	132	23	27	53.5	69	3	47.8
23	133	23	27	44.0	69	3	53.7
24	134	23	27	36.6	69	4	10.2
25	135	23	27	17.8	69	4	43.2
26	136	23	26	32.3	69	4	35.9
27	143	23	25	38.0	69	4	58.8
28	157	23	24	26.4	69	5	29.4
29	160	23	24	1.7	69	5	12.9
30	161	23	23	55.3	69	5	18.4
31	162	23	23	48.3	69	5	25.3
32	163	23	23	28.5	69	4	56.7
33	164	23	23	19.3	69	5	0.0
34	172	23	22	6.0	69	6	15.7
35	173	23	21	57.0	69	6	17.6
36	208	23	24	1.2	69	3	48.7
37	209	23	24	5.0	69	3	7.4
38	215	23	24	53.2	69	2	16.6
39	220	23	24	23.4	69	1	47.1
40	243	23	26	41.1	69	0	47.5
41	244	23	26	42.3	69	0	33.2
42	264	23	26	1.1	69	3	13.0
43	268	23	26	26.8	69	2	47.6
44	269	23	26	33.7	69	2	42.8
45	273	23	26	33.8	69	2	59.0

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)	Vish Wind Infrastructure LLP (Private entity)	No

A.4. Reference of applied methodology

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Title: “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”

Reference: Approved consolidated baseline methodology ACM0002 (Version 12.3.0, EB 66)

Tool:

- Tool to Calculate the Emission Factor for an Electricity System – Version 02.2.1, Annex 19, EB 63
- Tool for the Demonstration and Assessment of Additionality – Version 06.0.0, Annex 21, EB 65

Other guidelines: Guidelines on the Assessment of Investment Analysis – Version 05, Annex 5, EB 62

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

<http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

A.5. Crediting period of project activity

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The length of the Crediting period of the project activity as per registered PDD is 10 years (Fixed). The crediting period start date is 05 October, 2012 and length of crediting period is 10 years (from 05 October, 2012 - 04 October, 2022). The monitoring period for the project activity has been considered as 05 October, 2012 to 30 April, 2013.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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The first machine under the project activity was commissioned on 31 March, 2012 and last machine was commissioned on 04 April, 2013. The project activity consists of 45 WEGs (800 kW) of Enercon make E- 53 model. The commissioning date for all the machines included in the project activity is given in the table below:

S. NO.	WEG Location no.	WTG ID No.	Date of Commissioning
1	52	2948	04/04/2013
2	53	2949	04/04/2013
3	54	2950	04/04/2013
4	55	¹ -	-
5	82	-	-
6	86	2586	31/03/2012
7	97	2952	04/04/2013
8	98	2953	04/04/2013
9	99	2954	04/04/2013
10	103	2955	04/04/2013
11	104	2956	04/04/2013
12	106	2483	31/03/2012
13	107	2957	04/04/2013
14	111	2587	31/03/2012
15	125	2590	31/03/2012
16	126	2591	31/03/2012
17	127	2592	31/03/2012
18	128	2593	31/03/2012
19	129	2594	31/03/2012
20	130	2595	31/03/2012
21	131	2596	31/03/2012
22	132	2597	31/03/2012
23	133	2598	31/03/2012
24	134	2599	31/03/2012
25	135	2588	31/03/2012
26	136	2589	31/03/2012
27	143	2652	04/04/2013

¹ Please refer to section B.2.4.

28	157	2643	31/03/2012
29	160	2644	31/03/2012
30	161	2645	30/05/2012
31	162	2646	31/03/2012
32	163	2647	31/03/2012
33	164	2648	31/03/2012
34	172	2649	30/05/2012
35	173	2650	28/06/2012
36	208	2653	28/06/2012
37	209	2654	28/06/2012
38	215	-	-
39	220	2660	28/06/2012
40	243	-	-
41	244	-	-
42	264	2655	28/06/2012
43	268	2657	28/06/2012
44	269	2658	28/06/2012
45	273	2659	28/06/2012

B.2. Post registration changes**B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

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Not applicable

B.2.2. Corrections

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Not applicable

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

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Not applicable.

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

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In the registered PDD, the capacity of the project activity has been considered as 36 MW, whereas the actual installed capacity of the project activity is 32 MW. Five machines of the same capacity (4 MW) could not be installed due to non-conductive soil condition at the respective locations. This does not require any prior approval in line with the para 4 of Appendix 1 of Clean development mechanism project standard, Version 02.0.

B.2.5. Changes to start date of crediting period

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Not applicable

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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Since, the ex-ante approach has been followed for the project activity, monitoring of the emission factor value is not required. The sole parameter to be monitored is the amount of net electricity supplied by the project activity to the grid.

Measurement procedures of the net electricity supplied to the grid by the project activity

The project activity has various clusters and each cluster has exclusive dedicated metering arrangement. All these cluster meters are connected to the GETCO Main meter (also known as revenue meter) at the substation, maintained by Enercon (O & M personnel). The main meter reading (GETCO meter) is taken jointly by the representatives of Enercon (O & M personnel) and GEDA/GETCO in the form of JMR. Gujarat Electricity Development Authority (GEDA) then apportions the net electricity supplied to the grid at the Enercon substation by all the project owners after adjusting transmission loss to the meter readings taken at dedicated cluster meters of different project owners.

If during meter testing, the cluster meters are found beyond the permissible limit of error, the sum of panel meter (LCS meter) readings located at each wind turbine of the project activity will be provided to GEDA for purpose of apportioning of the net electricity supplied to the grid. The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WEGs. In case, there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system, the machine will stop working and generate the error report.

As per the registered PDD, the net electricity supplied to the grid has been sourced directly from the GETCO share certificate and will be further cross-checked with the invoices.

However, the apportionment procedure is performed by the state utility and PP does not have any control on the procedure and the bi-furcation which has been done at the GETCO substation to generate the share certificate. This bi-furcation is done based on the PPA signed under the supervision of the state utility. Therefore, in case of the project activity, for PP's machines, 26.4 MW, 20.8 MW and 15.2 MW are the bifurcation as per GETCO share certificate, which is not in line with the registered capacity of the project activity. To address the above issue, PP has used the apportionment procedure using the GETCO share certificate (difference between JMR export & JMR import value after adjusting the transmission loss) and the LCS meters data².

QA/ QC procedures

The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WEGs. In case, there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system, the machine will stop working and generate the error report.

In order to determine the net electricity supplied to the grid by the project activity, the following apportionment procedure is followed:

² Please refer to section B.2.4.

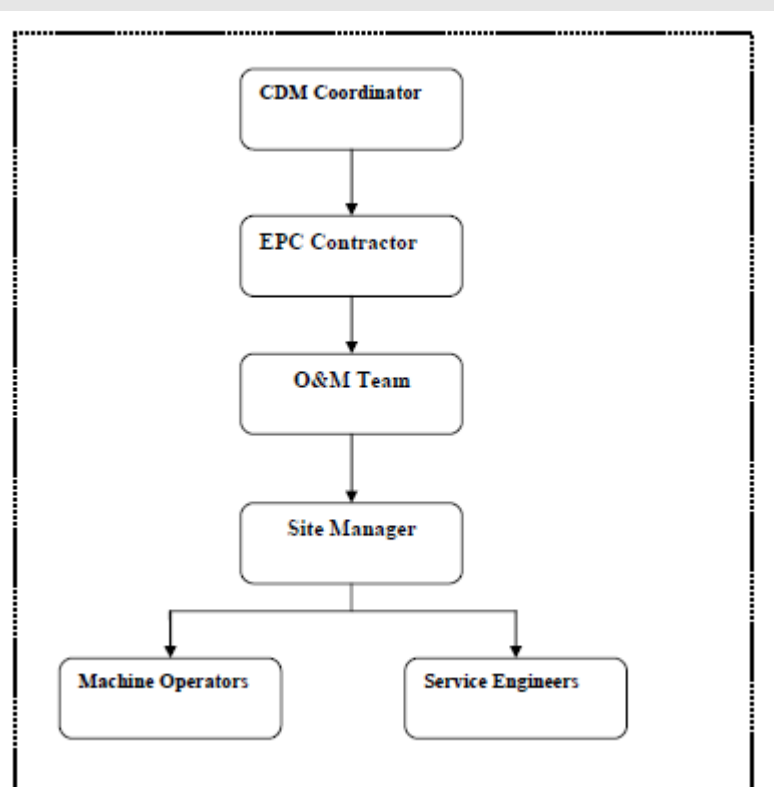
$EG_{GETCO,EXPORT}$	=	Electricity exported as recorded by the main meter at Enercon sub-station
$EG_{GETCO,IMPORT}$	=	Electricity imported as recorded by the main meter at Enercon sub-station
$EG_{GETCO,NET Supply}$	=	Net supply value as per GETCO share certificate (difference between JMR export & JMR import value after adjusting the transmission loss)
$EG_{LCS,EXPORT}$	=	Electricity generated by the WTGs of the project activity or other WTGs (non-project) as measured at controller panel (LCS meter reading)
$EG_{LCS, WF, EXPORT}$	=	Electricity exported by all the WTGs (project and non-project) as measured at controller panel (LCS meter reading)
$EG_{PJ,y}$	=	Net electricity supplied by the machines of the project activity to the grid

Therefore, Net electricity supplied by the project activity to the grid

$$EG_{PJ,y} = EG_{GETCO,NET Supply} \times EG_{LCS,EXPORT} / EG_{LCS, WF, EXPORT}$$

$$\Sigma EG_{PJ,y} = EG_{facility, y} = \text{Net electricity supplied by the project activity to the grid} = EG_y$$

Enercon (India) Limited (EIL) is the O & M contractor for the project activity and will be responsible for maintaining all the monitoring data on behalf of VWIL for the project activity. The operational and management structure implemented for data monitoring is as follows:



Enercon is an ISO 9001:2008 certified Quality Management system from Germanischer Lloyd. Enercon follows the documentation practices to ensure the reliability and availability of the data for all the activities as required starting from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project. The accuracy of the monitoring parameter is ensured by adhering to the calibration and testing of the metering equipment as mentioned above.

Training and maintenance requirements

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Energy Converters (WECs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure that Enercon's service staff is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. Enercon Training Academy provides need-based training to meet the training requirements of the projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the

attitude and skills of all trainees.

Metering

- The GETCO main meters are two-way meters (one main meter and one backup meter).
- In case the meters are found to operate outside the permissible limits, the meters will be either replaced immediately or calibrated. Whenever a main meter goes defective, the consumption recorded by the backup meter will be referred.
- The main meter readings are apportioned based upon the LCS meter readings of individual WECs to compute net electricity supplied from individual WECs. The LCS meter readings are archived electronically on continuous basis. Joint meter reading at the EB substation and at the pooling substation of Enercon is noted each month. Therefore, cumulative LCS meter reading for each month is used for purpose of allocation of net electricity supplied to the grid from the project activity.

Testing

- Main meter (accuracy class 0.2s) at Enercon Substation will be calibrated once in three years.
- The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WECs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. The operations and maintenance staff will attend to the problem immediately in order to identify and correct the error.

Data recording

- The meter recording at the GETCO main meter at substation is continuously monitored and is recorded on monthly basis.
- The panel meter (LCS meter) reading is recorded continuously by the online monitoring system.
- All the monitored data will be recorded and filed electronically and in hard format for 2 years beyond the crediting period i.e. 10+2 years.

SECTION D. Data and parameters

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

(Copy this table for each piece of data and parameter.)

Data / Parameter:	EF_{grid}, OM, y
Unit:	tCO ₂ e/MWh
Description:	Operating Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data:	<p>"CO₂ Baseline Database for Indian Power Sector", version 7 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO₂ Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver7.pdf</p>
Value(s) applied:	0.9841
Purpose of data:	Baseline emission calculation
Additional comment:	The value is calculated one x-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	<i>EF_{grid,BM,y}</i>
Unit:	tCO ₂ e/MWh
Description:	Build Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data:	<p>"CO₂ Baseline Database for Indian Power Sector", version 7 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO₂ Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver7.pdf</p>
Value(s) applied:	0.8587
Purpose of data:	Baseline emission calculation
Additional comment:	The value is calculated one x-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	<i>EF_{grid,CM,y}</i>
Unit:	tCO ₂ e/MWh
Description:	Combined Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data:	<p>"CO₂ Baseline Database for Indian Power Sector", version 7 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO₂ Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver7.pdf</p>
Value(s) applied:	In case of wind power projects default weights of 0.75 for <i>EF_{grid,OM}</i> and 0.25 for <i>EF_{grid,BM}</i> are applicable as per ACM0002, Version 12.3.0. Combined Margin Emission Factor (EF _y or EF _{CM,y}) = 0.9527
Purpose of data:	Baseline emission calculation
Additional comment:	The value is calculated one x-ante basis and it will remain same throughout the crediting period.

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter:	EG_{facility, y} (EG_y)
Unit:	MWh (Mega-watt hour)
Description:	Net electricity supplied by the project activity to the grid
Measured/ Calculated / Default:	The detail calculation has been explained in section C and in the emission reduction (ER) sheet.
Source of data:	JMRs and online generation data
Value(s) of monitored parameter:	21,005
Monitoring equipment:	<ul style="list-style-type: none"> • Main meter (accuracy class 0.2s) (GETCO) • Controller panel (LCS meters) at WTG end

Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	The detail calculation has been explained in section C and in the emission reduction (ER) sheet.
QA/QC procedures:	<ul style="list-style-type: none"> • Main meter (accuracy class 0.2s) at Enercon Substation will be calibrated once in three years. • The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WECs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. The operations and maintenance staff will attend to the problem immediately in order to identify and correct the error.
Purpose of data:	Baseline emission calculation
Additional comment:	-

D.3. Implementation of sampling plan

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Not applicable

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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As described in the registered PDD, the baseline emission (BE_y) = $EG_{PJ,y} * EF_{grid, CM, y}$

Where,

BE_y is baseline emissions in year y , tCO_2e

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

$EF_{grid, CM, y}$ is the Combined margin CO_2 emission factor for grid connected power generation in year y (tCO_2/MWh) = EF_y

Therefore, Baseline Emission calculation for the period of 05/10/2012 to 30/04/2013:

$$\begin{aligned}
 \text{Baseline Emission (BE}_y\text{)} &= EG_y * EF_y \\
 &= 21,005 \text{ MWh} * 0.9527 \text{ tCO}_2 / \text{MWh} \\
 &= 20,011 \text{ tCO}_2
 \end{aligned}$$

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

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The project activity uses wind power to generate electricity and hence the emissions from the project activity have been taken as zero as per the approved methodology ACM0002.

$PE_y = 0$

E.3. Calculation of leakage

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No leakage has been considered from the project activity as per the approved methodology ACM0002.

$Ly = 0$

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 ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO ₂ e)
Total	20,011	0	0	20,011

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 ₂ e)	42,938 (7 months equivalent of annually 73,608 tCO ₂ e emission reductions estimated in the registered PDD)	20,011

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

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The Emission Reduction (ER) value in the monitoring period is 53% lower as compared to the value estimated in the registered PDD, which is due to the lower PLF observed at project site during the monitoring period.

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 ₂ e)	6,838	13,173

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.
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Document Type: Form		
Business Function: issuance		
Keywords: monitoring report, performance monitoring		