



Monitoring report form
(Version 05.0)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

MONITORING REPORT

Title of the project activity	Rwanda Electrogaz Compact Fluorescent Lamp (CFL) distribution project
UNFCCC reference number of the project activity	3404
Version number of the monitoring report	1
Completion date of the monitoring report	3/4/2015
Monitoring period number and duration of this monitoring period	Second Monitoring Period: 1/08/2012 – 31/3/2014
Project participant(s)	<p>Rwanda: Rwanda Energy Group (REG);</p> <p>Netherlands: Netherlands' Ministry of Infrastructure and the Environment (IenM);</p> <p>Germany: BASF SE; KfW;</p> <p>Austria: Kommunalkredit Public Consulting GmbH;</p> <p>Denmark: Maersk Olie og Gas A/S; DONG Naturgas A/S; Nordjysk Elhandel A/S; Danish Ministry of Climate, Energy and Building/Danish Energy Agency; Aalborg Portland A/S;</p> <p>Sweden: Goteborg Energi AB;</p> <p>Italy: Government of Italy - Ministry for the Environment, Land and Sea;</p> <p>Belgium: Bruxelles Environnement – IBGE; Walloon Region: Walloon Air and Climate Agency;</p> <p>Spain: Kingdom of Spain - Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness; EDP - Energias de Portugal, S.A.; Endesa Generación, S.A.; Gas Natural SDG, S.A.; Hidroeléctrica del Cantábrico, S.A.;</p> <p>Finland: Ruukki Metals Oy;</p> <p>Norway: Statoil ASA; Statkraft Carbon Invest AS;</p> <p>Switzerland: Schweizerische Rückversicherungsgesellschafts AG (Swiss RE);</p> <p>Japan: Daiwa Securities Co., Ltd.; Fujifilm Corporation; Idemitsu Kosan Co., Ltd.; JX Nippon Oil & Energy Corporation; The Okinawa Electric Power Corporation, Inc.;</p> <p>Luxembourg: Ministry of Sustainable Development and Infrastructure</p>

	Bilateral and Multilateral Funds: International Bank for Reconstruction and Development (IBRD) as Trustee of the Community Development Carbon Fund (CDCF)	
Host Party	Rwanda	
Sectoral scope(s)	Sectoral Scope 3: Energy demand	
Selected methodology(ies)	AMS-II.J. ver. 3 - Demand-side activities for efficient lighting technologies AMS-II.C. ver. 11 - Demand-side energy efficiency activities for specific technologies	
Selected standardized baseline(s)	-	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	45,714	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	3,888	11,164

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The purpose of the Rwanda Electrogaz CFL Distribution Project is to expand the use of high-efficiency lighting technology in Rwanda's residential sector through the distribution of high-quality Compact Fluorescent Lamps.

The project activity, implemented by the national public electricity utility REG¹, is designed with two components:

Component 1: Existing grid-connected customers have the opportunity to exchange incandescent lamps of a range of 25 to 100 watts for high-quality self-ballasted compact fluorescent lamps (CFLs) of up to 20 Watts.

Component 2: As part of the national electrification program, which aims to increase the grid-connected rate up to 36% by 2020, newly connected REG customers receive a capped number of CFLs with their new electricity meter at the time of the connection. CFLs of 15 and 20 Watts were distributed.

The CFL distribution project is implemented through 4 phases starting mid-2007. Distribution of 4 phases was completed as of May 2014, with distribution of nearly 700,000 lamps. Emission reductions achieved from lamps distributed under Phase 4 have not been claimed in this monitoring report.

The total emission reductions achieved during the monitoring period from 1/8/2012 to 31/03/2014 are 15,052 tCO₂.

A.2. Location of project activity

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Location: Rwanda

Region: Country-wide

City/Town/Community etc: Country-wide, mainly in urban areas, at all REG existing or future customers

REG geographic cover is divided in 7 antennas in Kigali and 14 stations in the rest of the country:

- 7 antennas: Gikondo, Kacyiru, Kanombe, Muhima, Nyamirambo, Nyarugenge, and Remera,
- 14 stations: Gicumbi, Huye, Kabaya, Karongi, Muhanga, Musanze, Ngoma, Nyagatare, Nyamagabe, Nyanza, Rubavu, Rulindo, Rusizi, and Rwamagana.

The location of each customer, existing and new, is known from the "Customer contract number" (or ID) issued by REG. Each number is unique to a customer and provides complete information, including address and contact information.

¹ The name of this entity is REG (Rwanda Energy Group) according to Law no 87/03 of 16/08/2014. Prior to this date the name was EWSA (Energy, Water and Sanitation Authority). Prior to 07/12/2010 the name was RECO RWASCO. Prior to 08/2009, RECO - RWASCO was officially named Electrogaz. The change does not impact project legal terms and implementation. For coherence in this document, only REG is used in the MR to refer to the project entity, unless there is a historical or legal reason to use an earlier name.

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 whether the Party involved wishes to be considered as project participant (yes/no)
Rwanda (host)	Rwanda Energy Group (REG)	NO
Netherlands	Netherlands' Ministry of Infrastructure and the Environment (IenM)	YES
Germany	BASF SE; KfW	NO
Austria	Kommunalkredit Public Consulting GmbH	NO
Denmark	Maersk Olie og Gas A/S; DONG Naturgas A/S; Nordjysk Elhandel A/S; Danish Ministry of Climate, Energy and Building/Danish Energy Agency; Aalborg Portland A/S	YES
Sweden	Goteborg Energi AB	NO
Italy	Government of Italy - Ministry for the Environment, Land and Sea	YES
Belgium	Bruxelles Environnement – IBGE; Walloon Region: Walloon Air and Climate Agency	YES
Spain	Kingdom of Spain - Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness; EDP - Energias de Portugal, S.A.; Endesa Generación, S.A.; Gas Natural SDG, S.A.; Hidroeléctrica del Cantábrico, S.A.	YES
Finland	Ruukki Metals Oy	NO
Norway	Statoil ASA; Statkraft Carbon Invest AS	NO
Switzerland	Schweizerische Rückversicherungsgesellschaft AG (Swiss RE)	NO
Japan	Daiwa Securities Co., Ltd.; Fujifilm Corporation; Idemitsu Kosan Co., Ltd.; JX Nippon Oil & Energy Corporation; The Okinawa Electric Power Corporation, Inc.	NO
Luxembourg	Ministry of Sustainable Development and Infrastructure	YES
Netherlands, Belgium, Spain, Luxembourg, Austria, Finland	International Bank for Reconstruction and Development (IBRD) as Trustee of the Community Development Carbon Fund (CDCF)	YES

A.4. Reference of applied methodology and standardized baseline

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AMS-II.J. "Demand-side activities for efficient lighting technologies" (Version 3)

AMS-II.C. "Demand-side energy efficiency activities for specific technologies" (Version 11)

“Tool to calculate the emission factor for an electricity system” (Version 2)

A.5. Crediting period of project activity

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Fixed crediting period

Start Date: 30/05/2010

Length: 10 years 0 months

A.6. Contact information of responsible persons/entities

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SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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The project is implemented in 4 phase, all of them completed.

The table below provides the number of CFLs distributed under each phase, as accounted for and double-checked as per the PDD requirements.

Table 1: CFL distribution project status

Phase	Procured/Estimated Number of CFLs	Actual Distributed CFL ²	Distribution Timeline in the registered PDD	Actual End date of distribution
Phase1	50,000	43,119	August - September 2007	December 2007
Phase2	150,000	132,351	September 2008 - March 2009	June 2009
Phase3	200,000	185,453	Mid 2009	December 2010
Phase4 ³	400,000	308,306	Mid 2010 to early 2011 (monthly recorded)	May 2014

The deviation between the number of CFLs procured and the number of CFLs distributed is due to the following:

- Some lamps were found faulty during the distribution,
- Others were broken, and
- Some losses were noted during the lamps distribution.

The overall timeline of the project was lengthened compared to the projection in the PDD due to two major factors, as follows:

² The number of lamps used for ER calculation is taken conservatively by comparing the number of CFLs distributed with the number of ICLs collected.

³Phase 4 have not been considered in this monitoring report, which comprise the period 1/08/2012 to 31/3/2014. Phase 4 distribution was completed in May 2014.

- The distribution pace for existing customers (Component 1: Phase 1, Phase 2 and partly Phase 3) slowed down at the second half of Phase 2 and during Phase 3 as the coverage of existing customers increased, reducing the target population.
- Each phase is associated with a specific lamp purchase contract. The procurement process and the contract implementation (up to the lamp delivery) for the 3rd phase took more time than expected, mainly due to procurement delays, leading to a delay of about 6 months. The planned supply of phase 4 of 400,000 CFLs in mid-2010 was delivered in December 2011 and their distribution was only completed as of May 2014.

In exchange for each CFL distributed in Component 1, the customers provide an incandescent lamp (ICL). All the incandescent lamps were shipped to the central warehouse in Kigali for storage before destruction. Prior to the destruction of the incandescent lamps, an Environmental study needs to be conducted to provide guidance on the proper way to dispose of the lamps (as required by Rwanda Environmental Management Authority - REMA). The Rwanda National University has prepared the study. The report has been sent to the Rwanda Development Board (RDB) which is entitled to approve EIAs in Rwanda, and the project participants are awaiting the response from RDB, prior to implementing the recommendation of the report on ICL disposal.

Table 2: Quantity and Rated power of the collected ICLs, ex-post monitored ⁴

ICL Group (W)	Power rate	Number of ICL in Component 1		
		Phase 1	Phase 2	Phase 3
25		953	0	0
40		12,330	1,068	22,059
60		11,961	51,266	34,667
75		15,084	79,708	33,970
Total		40,328	132,042	90,696

For Component 1, the number of distributed CFLs and received ICL should be equal; however, losses of ICLs resulted during the shifting of lamps from the branches to the central storage location in Kigali. The lamp numbers presented in the table above represent those that have been verified physically in the central storage location. Also, broken ICLs were not accounted for.

The number of lamps distributed per household was restricted in each Phase of the distribution. Phase 1 distribution was limited to 2 per household. Phase 2 was limited to 5 per household. Phase 3 was limited to 4 per household. The number of lamps distributed per household was always fewer than six.

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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A temporary deviation will be requested together with this monitoring report, since annual checks of a sample of non-metered systems have not been conducted for the calendar years 2012, 2013 and 2014.

B.2.2. Corrections

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N/A

⁴ Refer to project databases. The number of lamps used for ER calculation is taken conservatively by comparing the number of CFLs distributed with the number of ICLs collected.

B.2.3 Changes to start date of crediting period

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N/A

B.2.4 Inclusion of a monitoring plan to the registered PDD that was not included at registration

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N/A

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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A permanent change from the registered monitoring plan will be requested together with this monitoring report in order to use the default value of 3.5 hours per day for the parameter “*O_i – Operating hours of the distributed CFLs*” instead of a monitoring value, as stated in methodology AMS II.J version 03.

B.2.6. Changes to project design of registered project activity

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N/A

B.2.7. Types of changes specific to afforestation or reforestation project activity

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N/A

SECTION C. Description of monitoring system

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Data Collection Procedures

Data collection procedures applicable for both Component 1 (AMS-II.J, Version 03) and Component 2 (AMS-II.C, Version 11)

Recording of lamp distribution data

Data	Date of CFL distribution Customer identification (REG customer ID, which allows for unambiguous identification of the recipient of the equipment). Number of CFLs provided and wattage. Number of ICLs exchanged for each type (for Component 1 only).
Data generation	Customer provides unique identification to REG employee (e.g. REG bill, prepaid purchase or voucher). Component 1 only: Customer provides ICL(s) to REG employee. REG provides CFL(s) to customer.
Responsible	REG employees
Location	REG Antennas and Stations
Data recording	Phase 1: Data entered in a handwritten register and then entered into an Excel database. Phase 2 & 3: Data entered in an Excel database and in an in-house software. The Excel database serves as the reference for data recording.

Data aggregation	Phase 1: Data from handwritten registers aggregated in the Excel database Phase 2 & 3: Data aggregated Excel database and in the in-house software. The Excel database serves as the reference for data recording.
Archiving	All electronic data are stored until two years after the end of the crediting period

Note on ICL destruction: The ICLs were collected and stored at the distribution outlets, then shipped to REG central warehouse in Kigali. These lamps will be destroyed. Prior to the destruction of the incandescent lamps, an Environmental study has been conducted to provide guidance on the proper way to dispose of the lamps, to fulfil the requirements of REMA. The study has been concluded and presented to the relevant authority for approval. Once approval is obtained, it will be possible to follow the study recommendations regarding the stored ICLs.

Data collection procedures applicable for Component 1 (AMS-II.J, Version 03) only

Ex post monitoring surveys carried out within the first year after installation and once for every 30% of the elapsed rated lifetime (or every 3 years) to confirm installation and operation of the CFLs

The CFLs distributed in Phases 1 to 3 have a rated lifetime of 6,000 hours or 4.7 years, considering a daily use of 3.5 hours. Based upon this, and the requirement that the first survey be carried out within the first year after installation, the following schedule of the ex-post monitoring surveys has been implemented.

Phase	Time Elapsed from Equipment Installation				Dates of ex-post surveys		
	30% of rated life	60% of Rated Life	90% of Rated Life	100% of rated life	First	Second	Third
Phase 1	5/28/2009	10/24/2010	3/21/2012	9/9/2012	Apr-08	Oct-09	Jun-11
Phase 2	11/26/2010	4/23/2012	9/19/2013	3/10/2014	Oct-09	Jun-11	Sep-13
Phase 3	5/28/2012	10/24/2013	3/22/2015	9/10/2015	Jun-11	Sep-13	NA

Data	Check whether each CFL distributed under the project activity is installed (based on records on the type/number of efficient lamps distributed to each individual household) Record whether CFLs distributed under the project activity are operational Determine whether defective CFLs were replaced by the end-user and, if so, with what type/wattage of lamp. <i>General Information:</i> <i>Interviewer</i> <i>Date of interview</i> <i>Name and Address (or description of location of dwelling)</i> <i>Ownership status (owner/tenant/other).</i>
Data generation	Door-to-door surveys of a sample of CFLs, with a sample size no less than 100 or 0.1% of the population
Responsible	REG
Location	Installation locations of distributed CFLs
Data recording	Data are recorded in a central database, or in a spread sheet and then in the database
Data aggregation	The data analysis results are provided in the survey report

Archiving	The survey report is stored until two years after the end of the crediting period
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Data collection procedures applicable for Component 2 (AMS-II.C, Version 11) only

Annual checks of a sample of non-metered systems to ensure that they are still operating

The percentage of CFLs that are still operating is captured through annual surveys on a sample of non-metered lamps. The percentage of functioning non-metered CFLs will be used to discount the energy savings and thus emission reductions.

AMS-II.C is applicable only for Phases 3 (part of CFLs distributed) and 4 (Component 2). This monitoring period does not comprise Phase 4, since CFL distribution under Phase 4 was completed in May 2014 and this monitoring period ended in March 2014. Therefore, annual checks are only required for Phase 3 as per AMS-II.C, version 11. Since the end date of CFL distribution for Phase 3 was December 2010, the first annual check needs to be conducted between January and December 2011 (it was actually conducted in June 2011).

A temporary deviation of the monitoring plan will be requested together with this monitoring report since annual checks of a sample of non-metered systems as required by methodology AMS-II.C version 11 has not been conducted.

Data	Record whether CFLs distributed under the project activity are operational <i>General Information:</i> <i>Interviewer</i> <i>Date of interview</i> <i>Name and Address (or description of location of dwelling)</i> <i>Ownership status (owner/tenant/other).</i>
Data generation	Door-to-door surveys of a sample of CFLs, with a sample size no less than 100 or 0.1% of the population
Responsible	REG
Location	Installation locations of distributed CFLs
Data recording	Data are recorded in a central database, or in a spread sheet and then in the database
Data aggregation	The data analysis results are provided in the survey report
Archiving	The survey report is stored until two years after the end of the crediting period

Recording the “power” of the device installed using nameplate data or bench tests of a sample of the units installed

The power rate of the distributed lamps is recording during the distribution phase using nameplate data.

Data	“power” (rated Wattage) of CFLs distributed under the project activity that are installed
Data generation	Data are captured in the distribution software or in a registry by each REG distribution branches and consolidated in a central database. The power rate is also evidenced through the CFL specifications and test reports
Responsible	REG
Location	Installation locations of distributed CFLs
Data recording	Data are recorded in a central database, or in a spread sheet and then in the database
Data aggregation	The data analysis results are provided in the survey report

Archiving	The database is stored until two years after the end of the crediting period
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Organizational Structure

REG, the implementer of this project activity, conducts monitoring of the lamp distribution data through its antennas and stations or through private retailers; and collection, storage and destruction of ICLs.

REG supervises the monitoring surveys, which are undertaken by external consultants.

Initially, the project activity was partially included in REG's Urgent Electricity Rehabilitation Project (UERP), which closed in 2010. For the three first phases of the CDM project, the UERP implementation unit was responsible for the CFL purchase, including the procurement process. For the 4th Phase, REG was directly in charge of the procurement.

Training has been arranged for the relevant participants in the project monitoring:

- The REG CFL distribution staff was trained on the benefits of CFLs at the beginning of the project.
- The REG CFL distribution staff was also trained on the procedures for distribution and data recording in accordance with the requirements of the methodologies and the PDD.
- Staff using the in-house software for lamp distribution data collection was trained by the IT staff on use of the program.

Quality Control and Emergency Procedures

Recording of lamp distribution data

The REG station/antenna manager receives a specified number of CFLs, and the station/antenna manager acts as, or designates, a "storekeeper". The storekeeper releases a fixed number of CFLs to the lamps distributor. The distributor operates the computer, where data is entered on customer name/number, ICLs received and CFLs provided and their Wattage.

For component 1, the cashier and the customer test the ICLs and CFLs before the exchange. The storekeeper receives a specified number of ICLs from the cashier. ICLs are shipped to REG warehouse in Kigali where they are stored before destruction. At the end of each phase, an independent party certifies the collection of incandescent lamps through a random sampling of the lamps in storage – the number, rating and operational condition of the ICLs, as per REG records. The independent certifier prepares a report, including witnessing the destruction/crushing of the ICLs in the safe disposal area.

SECTION D. Data and parameters

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

Data and parameters applicable for Component 1 (AMS-II.J, Version 03) and 2 (AMS-II.C, Version 11)

Data/parameter:	EF_{CO2,ELEC,y} / EF_{grid}
Unit	kg CO ₂ e/kWh
Description	Emission factor for the national electricity grid for 2007

Source of data	The calculation is detailed in section B.6.3. of the registered PDD. All references are included in the annex to the PDD. Calculated as per Combined Margin approach from the "Tool to calculate the emission factor for an electricity system" (version 2), mentioned in ACM0002 and AMS I.D, using data from 2003 to 2008 provided by the electricity company Electrogaz (now REG).
Value(s) applied)	0.6540
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of baseline emissions and emission reductions
Additional comments	-

Data and parameters applicable for Component 1 (AMS-II.J, Version 03)

Data/parameter:	TD_y
Unit	-
Description	Average annual technical grid losses in year y
Source of data	Methodology default value
Value(s) applied)	0.1
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation emission reductions
Additional comments	-

Data/parameter:	NTG
Unit	-
Description	Net-to-gross adjustment factor
Source of data	Methodology default value
Value(s) applied)	0.95
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of emission reductions
Additional comments	-

Data/parameter:	P_{i,BL}
Unit	Watts
Description	Rated power of the baseline incandescent lamps of the group of "i" lighting devices or 75W if the baseline lighting device is a 100W ICL and the project lighting device a 20W CFL
Source of data	REG
Value(s) applied)	P _{A,BL} = 25W, P _{B,BL} = 40W, P _{C,BL} = 60W, P _{D,BL} = 75W
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of emission reductions
Additional comments	

Data/parameter:	O_i
Unit	Hours
Description	Average daily operating hours of the lighting devices replaced by the group of "i" lighting devices
Source of data	Methodology default value
Value(s) applied)	3.5
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions and emission reductions
Additional comments	-

Data/parameter:	L_i
Unit	Years
Description	Equipment lifetime
Source of data	Technical specification set in the tender, provided by REG
Value(s) applied)	At least 6000 hours
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of emission reductions
Additional comments	

Data/parameter:	X_i
Unit	Hours
Description	Number of operating hours per year for equipment type <i>i</i>
Source of data	Methodology default value
Value(s) applied)	1277.5
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of emission reductions
Additional comments	

Data and parameters applicable for Component 2 (AMS-II.C, Version 11)

Data/parameter:	P_{i,BL}
Unit	Watts
Description	Power of the incandescent lamps in the baseline scenario
Source of data	Baseline survey conducted in April 2008
Value(s) applied)	83.3
Choice of data or measurement methods and procedures	-

Purpose of data	Calculation of baseline emissions
Additional comments	-

Data/parameter:	P_{i,PJ}
Unit	Watts
Description	Power of the CFLs installed of the group of <i>i</i> devices
Source of data	Provided by REG, technical specification set in the tender
Value(s) applied	P _{a,PJ} = 15W, P _{b,PJ} = 20W
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comments	-

D.2. Data and parameters monitored

Data and parameters applicable for Component 1 (AMS-II.J, Version 03) and 2 (AMS-II.C, Version 11)

Data/parameter:	Customer information (for components 1 and 2)
Unit	-
Description	Customer Identification Number (unique – as per REG records) Name of head of household Address or description of location of household
Measured/calculated/default	Measured
Source of data	Recorded by REG (Lamps distribution databases)
Value(s) of monitored parameter	Recorded information is available to the DOE; personal information not publicly released
Monitoring equipment	N/A
Measuring/reading/recording frequency:	Once at bulb distribution
Calculation method (if applicable):	N/A
QA/QC procedures:	Customer presents a REG bill, prepaid purchase or voucher to substantiate information (component 1) Compare to REG records from the Commercial Department data base (component 2)
Purpose of data:	Calculation of baseline, project emissions and emission reductions
Additional comments:	-

Data/parameter:	Distribution date (Components 1 and 2)
Unit	Date
Description	Date of the CFL distribution uniquely recorded for each customer participant
Measured/calculated/default	Measured
Source of data	Recorded by REG (Lamps distribution databases)
Value(s) of monitored parameter	Available to the DOE in the project distribution database

Monitoring equipment	N/A
Measuring/reading/recording frequency:	Once at distribution
Calculation method (if applicable):	N/A
QA/QC procedures:	N/A
Purpose of data:	Calculation of emissions reductions
Additional comments:	Components 1 and 2 Dates are reported monthly for the purpose of the ER calculations

Data and parameters applicable for Component 1 (AMS-II.J, Version 03)

Data/parameter:	$Q_{PJ,i}$
Unit	-
Description	Number (quantity) of pieces of CFLs of type i distributed under the project,
Measured/calculated/default	Measured
Source of data	Recorded by REG (Lamps distribution databases)
Value(s) of monitored parameter	<ul style="list-style-type: none"> For distributed CFL, $i = 15$ W Phase 3: 56,726 For distributed CFL, $i = 20$ W Phase 1: 40,328 Phase 2: 132,042 Phase 3: 22,573
Monitoring equipment	N/A
Measuring/reading/recording frequency:	Once at distribution
Calculation method (if applicable):	N/A
QA/QC procedures:	Equipment storage control system for inputs and outputs is applied at both REG central store at Kigali and in all antennas and stations. The IDs of the beneficiaries are compared to avoid duplication in each phase.
Purpose of data:	Calculation of emissions reductions
Additional comments:	Component 1. The number of CFL distributed is compared to the number of ICL collected and received at the central storage in Kigali. The lowest number is used as monitored values for ERs calculation.

Data/parameter:	$P_{i,PJ}$
Unit	Watts
Description	Rated power of the project CFLs of the group of " i " lighting devices, i
Measured/calculated/default	Default
Source of data	Technical specifications set in the tender
Value(s) of monitored parameter	Phase 1 and Phase 2 20 W Phase 3 15 W and 20 W
Monitoring equipment	N/A
Measuring/reading/recording frequency:	Once at distribution

Calculation method (if applicable):	N/A
QA/QC procedures:	As part of the CFLs procurement process, bidders provided CFL test certificates in all phases. For phase 2, REG conducted a mission in China to participate in the testing of a sample of CFLs in a laboratory. This mission was part of REG quality control approach set up in the bidding process of Phase 2, where the selected supplier was requested to finance a trip in a laboratory where a sample of CFLs supplied will be tested in the presence of REG staff
Purpose of data:	Calculation of baseline emissions
Additional comments:	Component 1

Data/parameter:	Q _{BL,i}					
Unit	-					
Description	Number (quantity) of pieces of incandescent lamps (ICLs) of type <i>i</i> exchanged under the project					
Measured/calculated/default	Measured					
Source of data	Recorded by REG (Lamps distribution databases)					
Value(s) of monitored parameter	ICL types		Values per Phase and CFL type			
	Parameter	(W)	Phase 1	Phase 2	Phase 3	
			20 W	20 W	15 W	20 W
	P _{ABL}	25	953	0	0	0
	P _{BBL}	40	12,330	1,068	22,059	0
	P _{CBL}	60	11,961	51,266	34,667	0
	P _{DBL}	75	15,084	79,708	0	22,573
	Total	-	40,328	132,042	56,726	22,573
Monitoring equipment	N/A					
Measuring/reading/recording frequency:	Once at CFL distribution					
Calculation method (if applicable):	N/A					
QA/QC procedures:	<p>A third party was engaged to certify the number of ICLs collected. The report is available for Phases 1, 2 and 3. The sampling methodology is based on the Standard ISO 2859-1: 1999. The report was prepared by an independent consultant using a sampling approach based on the Guidelines for sampling and surveys for CDM project activities and programme of activities, version 04.0.</p> <p>Overall, the numbers of ICLs derived from the reports are compared to the number of ICLs in the database and the lowest values are always used for ERs calculations. For Phase 1, the report found a total of 41,169 ICLs, of which the lower value of 40,328 ICLs is used in ER calculation. For Phase 2 and Phase 3, the report found 136,325 ICLs and 87,626 ICLs compared to 132,042 ICLs and 79,299 ICLs respectively.</p>					
Purpose of data:	Calculation of emissions reductions					
Additional comments:	<p>For Component 1 only. Collected ICLs are matched to distributed project CFLs on a 1 to 1 basis.</p> <p>ICL with rated power equal or above 75W are conservatively counted as 75W ICLs in the baseline. 65W ICL are conservatively counted as 60W ICL in the baseline.</p> <p>The monitored values are derived from the comparison between the number of ICL collected and received at the central storage in Kigali. The lowest number is used for ERs calculation.</p> <p>The emission reduction calculations apply the minimum number of bulbs between ICLs collected and CFLs distributed.</p>					

Data/parameter:	P _{i,BL}																									
Unit	Watts																									
Description	Rated power of the baseline incandescent lamps (ICLs) of the group of “I” lighting devices or 75W if the baseline lighting device is a 100W ICL and the project lighting device a 20W CFL																									
Measured/calculated/default	Measured as taken from ICL nameplate																									
Source of data	Recorded by REG using lamp marking																									
Value(s) of monitored parameter	25 W, 40 W, 60 W and 75 W The following table summarized the number of ICLs for each baseline wattage category. <table><tr><td></td><td>25W</td><td>40 W</td><td>60 W</td><td>75 W</td></tr><tr><td>Phase 1</td><td>953</td><td>12,330</td><td>11,961</td><td>15,084</td></tr><tr><td>Phase 2</td><td>0</td><td>1,068</td><td>51,266</td><td>79,708</td></tr><tr><td>Phase 3</td><td>0</td><td>22,059</td><td>34,667</td><td>22,573</td></tr><tr><td>Total</td><td>953</td><td>35,457</td><td>97,894</td><td>117,365</td></tr></table>		25W	40 W	60 W	75 W	Phase 1	953	12,330	11,961	15,084	Phase 2	0	1,068	51,266	79,708	Phase 3	0	22,059	34,667	22,573	Total	953	35,457	97,894	117,365
	25W	40 W	60 W	75 W																						
Phase 1	953	12,330	11,961	15,084																						
Phase 2	0	1,068	51,266	79,708																						
Phase 3	0	22,059	34,667	22,573																						
Total	953	35,457	97,894	117,365																						
Monitoring equipment	N/A																									
Measuring/reading/recording frequency:	Once at CFL distribution																									
Calculation method (if applicable):	N/A																									
QA/QC procedures:	A third party was engaged to certify the number of ICLs collected. The report is currently available for Phase 1, 2 and 3. The sampling methodology is based on the ISO 2859-1: 1999.																									
Purpose of data:	Calculation of energy savings and emissions reductions.																									
Additional comments:	Component 1 The numbers of ICL per wattage of baseline devices are consolidated as shown in the previous table. Only final numbers used in ER calculation are used. Note that for Phase 1, ICLs with unreadable wattage were assigned a wattage proportional to the distribution of wattages in the bulbs with a wattage measurement. Refer to “Component 1 Monitored PBL” in ERs calculation spreadsheet.																									

Data/parameter:	N_{sample,s}
Unit	-
Description	Number of sampled CFLs during the post installation survey s
Measured/calculated/default	Measured
Source of data	Survey reports
Value(s) of monitored parameter	<p>1st ex-post monitoring survey: Phase 1: 100</p> <p>2nd ex-post monitoring survey: Phase 1: 100, Phase 2: 200</p> <p>3rd ex-post monitoring survey: Phase 1: 110, Phase 2: 125, Phase 3: 120</p>
Monitoring equipment	N/A
Measuring/reading/recording frequency:	<p>As per AMS-II.J (Version 03), ex-post surveys are conducted:</p> <ul style="list-style-type: none"> – Once in the first year of installation, and – Once every 3 years, or once for every 30% of elapsed rated lifetime (whichever is shorter) <p>1st ex-post monitoring survey: April, 2008</p> <p>2nd ex-post monitoring survey: October, 2009</p> <p>3rd ex-post monitoring survey: June, 2011</p>
Calculation method (if applicable):	N/A

QA/QC procedures:	<p>As per AMS-II.J, version 03, the sampling size is determined by minimum 90% confidence interval and the 10% maximum error margin; the size of the sample shall be no less than 100. Using the calculation method for a normal distribution, the sample size would be 68, which is lower than the minimum size allowed by the methodology. Hence, the minimum size of the sample is 100 for each population (or phase).</p> <p>At the PDD registration, and in the absence of detailed guidelines from the UNFCCC on formula to calculate sample sizes, the project participant confirmed the minimum sample size for the Lamp Failure Rate parameter using the procedures outlined in Cochran (1977)⁵ and described by Bartlett et al (2001)⁶:</p> $n_c = \frac{(t)^2 \times (p \times q)}{(d)^2}$ <p>Where: t = value for the standard normal distribution value, with an infinite number of readings, and for the desired confidence level. For confidence level of 90%, t = 1.645 (pxq) = estimate of variance value = 0.25, meaning standard deviation (variability) of 50% is assumed as no historical data were available. d = acceptable margin of error (precision) for proportion being estimated 10%</p> $n_c = \frac{(1.645)^2 \times (0.25)}{(0.1)^2} = 68$
Purpose of data:	Calculation of baseline emissions
Additional comments:	Component 1

Data/parameter:	N_{OK,s}
Unit	-
Description	Number of sampled CFLs which are functional during the post installation surveys
Measured/calculated/default	Measured
Source of data	Survey reports
Value(s) of monitored parameter	1 st ex-post monitoring survey: Phase 1: 84 2 nd ex-post monitoring survey: Phase 1: 88; Phase 2: 160 3 rd ex-post monitoring survey: Phase 1: 58; Phase 2: 74; Phase 3: 77
Monitoring equipment	N/A
Measuring/reading/recording frequency:	<p>As per AMS-II.J, ex-post surveys are conducted:</p> <ul style="list-style-type: none"> – Once in the first year of installation, and – Once every 3 years, or once for every 30% of elapsed rated lifetime (whichever is shorter) <p>1st ex-post monitoring survey: April, 2008 2nd ex-post monitoring survey: October, 2009 3rd ex-post monitoring survey: June, 2011 4th ex-post monitoring survey: September 2013</p>
Calculation method (if applicable):	N/A
QA/QC procedures:	N/A

⁵ Cochran, W.E., 1977. Sampling Techniques, 3rd edition, Wiley

⁶ James E. Bartlett, II, Joe W. Kotrlik, Chadwick C. Higgins. 2001. Organizational Research: Determining Appropriate Sample Size in Survey Research. Information Technology, Learning, and Performance Journal, Vol. 19, No. 1, Spring 2001. Pages 43 – 50.

Purpose of data:	Calculation of baseline emissions
Additional comments:	Component 1

Data and parameters applicable for Component 2 (AMS-II.C, Version 11)

Data/parameter:	N_i
Unit	-
Description	Number (quantity) of pieces of CFLs of type <i>i</i> distributed under the project
Measured/calculated/default	Measured
Source of data	Recorded by REG
Value(s) of monitored parameter	<ul style="list-style-type: none"> For distributed CFL, <i>i</i> = 15 W Phase 3: 25,524 For distributed CFL, <i>i</i> = 20 W Phase 3: 70,990
Monitoring equipment	N/A
Measuring/reading/recording frequency:	Once at distribution
Calculation method (if applicable):	N/A
QA/QC procedures:	Equipment storage control system for inputs and outputs is applied at both REG central store at Kigali and in all antennas and stations.
Purpose of data:	Calculation of baseline emissions
Additional comments:	Component 2

Data/parameter:	P_{i,PJ}
Unit	Watts
Description	Rated power of the project CFLs of the group of " <i>I</i> " lighting devices
Measured/calculated/default	Measured as taken from technical specifications
Source of data	Technical specifications set in the tender
Value(s) of monitored parameter	Phase 3: 15 W and 20 W
Monitoring equipment	NA
Measuring/reading/recording frequency:	Once at distribution
Calculation method (if applicable):	NA
QA/QC procedures:	As part of the CFLs procurement process, bidders provided CFL test certificates in all phase. For phase 2, REG conducted a mission in China to participate in the testing of a sample of CFLs in a laboratory. This mission was part of REG quality control approach set up in the bidding process of Phase 2, where the selected supplier was requested to finance a trip in a laboratory where a sample of CFLs supplied will be tested in the presence of REG staff.
Purpose of data:	Calculation of project emissions
Additional comments:	Component 2

D.3. Implementation of sampling plan

>>

(1) Data and parameters determined by a sampling approach: Component 1:

$N_{\text{sample},s}$ Number of sampled CFLs during the post installation survey s & $N_{\text{OK},s}$ Number of sampled CFLs which are functional during the post installation surveys

Implemented sampling design

The sampling objective was to determine the ex-post Lamp Failure Rate for adjustment of the net electricity savings and emission reduction calculations. As per AMS-II.J, the sampling size was determined by minimum 90% confidence interval and 10% maximum error margin; and the size of the sample was to be no less than 100. The target population is the distributed CFLs under Phase 1 through Phase 3. The sampling method was applied to each Phase separately. The number of households is determined by dividing the sample size by the number of CFLs distributed per household in each phase. Multi-stage sampling was applied where clusters (first stage) corresponded to REG branches, which are located in various administrative entities called sectors and districts, and clusters were randomly selected. In the second stage, households were selected randomly, in each selected cluster (REG branch).

The following method was used to select the cluster and the households to be surveyed based on the number of CFLs to be covered by the survey:

1. Make a list of antennas (21 total in Phases 1 and 2; 23 total in Phase 3)
2. Establish a sample selection interval
3. Pin point the distributed lamps named population
4. Calculate cumulative population
5. Choose randomly a number which is a starting point
6. Add the sampling interval for moving to the next step and select the cluster within which the number falls. Proceed until enough branches are selected to fulfill the sample size requirement (see table below)
7. Within the cluster, 5 (five) households to be surveyed are randomly selected (except for the first survey of Phase 1, where households were randomly selected proportionally to the quantity of bulbs distributed).

The number of samples for the survey relevant for this monitoring report is presented in the below table. The survey date is September 2013, which corresponds to the fourth survey for Phase 2 and second survey for Phase 3.

Survey #	Sampling Frame	Final Sample Size (#CFLs)	Number of CFLs per household	Number of households surveyed	Number of clusters (branches surveyed)
1) April 2008	Phase 1 CFLs	100	2	50	7
2) October 2009	Phase 1 CFLs	100	2	50	10
	Phase 2 CFLs	200	5	40	8
	Total	300	-	90	-
3) June 2011	Phase 1 CFLs	110	2	55	11
	Phase 2 CFLs	125	5	25	5
	Phase 3 CFLs	120	4	30	6
	Total	355	-	110	-
4) September 2013	Phase 2 CFLs	125	5	25	8
	Phase 3 CFLs	120	4	30	9
	Total	245		55	

Collected Data

The collected data is summarized in the survey report.

Analysis of the collected data

Survey #	Sampling Frame	N _{OK,s}	N _{sample,s}	LFR _{i,y}
1) April 2008	Phase 1 CFLs	84	100	0.160
2) October 2009	Phase 1 CFLs	88	100	0.120
	Phase 2 CFLs	160	200	0.200
3) June 2011	Phase 1 CFLs	58	110	0.473
	Phase 2 CFLs	74	125	0.408
	Phase 3 CFLs	77	120	0.358
4) September 2013	Phase 2 CFLs	75	125	0.400
	Phase 3 CFLs	75	120	0.375

The reliability of the sampling approach is checked to confirm that the 90/10 confidence/precision level requirement is met. As per the Standard for “*Sampling and surveys for CDM project activities and program of activities*” version 04.1, paragraph 11 (a) (i), the absolute precision level was calculated for all surveys under each phase. As it can be seen in the table below, the absolute precision level of 10% was achieved for all of them (for further information on the calculation of the absolute precision level, please see excel sheet named “Absolute Precision Calculation”).

	Survey 1 – April 2008	Survey 2 – October 2009	Survey 3 – June 2011	Survey 4 – September 2013
Phase 1	6.02%	5.34%	7.82%	-
Phase 2	-	4.65%	7.23%	7.20%
Phase 3	-	-	7.20%	7.28%

(2) Data and parameters determined by a sampling approach: Component 2:

Checks of a sample of non-metered systems to ensure that they are still operating

Implemented sampling design

The sampling objective is to determine the percentage of systems that are still operating. The target population is the distributed CFLs under Phase 3. Annual checks were not conducted in calendar year 2012, 2013 and 2014.

SECTION E. Calculation of emission reductions or GHG removals by sinks**E.1. Calculation of baseline emissions or baseline net GHG removals by sinks**

>>

Component 1

As per AMS-II.J, the emissions reduction by the project activity in year *y* is calculated directly as follows.

$$ER_y = NES_y * EF_{CO_2,ELEC,y}$$

Where:

$EF_{CO_2,ELEC,y}$ = Emission factor in year y calculated in accordance with the provisions in AMS I.D (tCO₂/MWh)

ER_y = Emission reductions in year y (tCO₂e)

$$NES_y = \sum Q_{PJ,i} * (1 - LFR_{i,y}) * ES_i * NTG / (1 - TD_y)$$

$$ES_i = (P_{i,BL} - P_{i,PJ}) * O_i * 365/1000$$

Where:

NES_y = Net electricity saved in year y (kWh)

$Q_{PJ,i}$ = Number (quantity) of pieces of equipment of type i distributed under the project activity (units)

i = Counter for equipment type

ES_i = Estimated annual electricity savings for equipment of type i , for the relevant technology (kWh)

$LFR_{i,y}$ = Lamp Failure Rate for equipment type i in year y (fraction)

TD_y = Average annual technical losses (transmission and distribution) in year y

NTG = Net-to-gross adjustment factor, a default value of 0.95 to be used unless a more appropriate value based on a lighting use survey from the same region and not older than 2 years is available

$P_{i,BL}$ = Rated power of the baseline lighting devices of the group of " i " lighting devices (Watts) or 75W if the baseline lighting device is a 100W ICL and the project lighting device a 20W CFL⁷

$P_{i,PJ}$ = Rated power of the project lighting devices of the group of " i " lighting devices (Watts)

O_i = Average daily operating hours of the lighting devices replaced by the group of " i " lighting devices

The Lamp Failure Rate (LFR_y), the % of lamps that have failed, is calculated based on the results of the ex-post surveys as follows:

$$LFR_y = 1 - (N_{OK,x} / N_{Sample,s})$$

Survey #	Sampling Frame	N _{OK,s}	N _{sample,s}	LFR _{i,y}
1) April 2008	Phase 1 CFLs	84	100	0.160
2) October 2009	Phase 1 CFLs	88	100	0.120
	Phase 2 CFLs	160	200	0.200
3) June 2011	Phase 1 CFLs	58	110	0.473
	Phase 2 CFLs	74	125	0.408
	Phase 3 CFLs	77	120	0.358
4) September 2013	Phase 2 CFLs	75	125	0.400
	Phase 3 CFLs	75	120	0.375

With respect to $Q_{PJ,i}$, since the quantity of collected ICLs and distributed CFLs do not match (fewer ICLs than CFLs), the ER calculation considers only as many CFLs as correspond to a collected ICL, to ensure conservativeness.

⁷ For conservativeness, and as agreed by the EB following with a request for deviation of AMS-II.J, when a 100W ICL is replaced by a 20W CFL, it is considered in the electricity savings calculations "that 20 W CFL is replacing a 75 W incandescent bulb (which is the next available standard wattage of incandescent bulb for which the light output of 20 W CFL will be equivalent or higher)".

The detailed CERs calculation for component 1 is in the attached calculation spreadsheet.

Component 2

As per AMS-II.C, the emissions reduction by the project activity in year y is calculated directly as follows.

$$ER_y = (E_{BL} - E_{PJ}) * EF_{grid} * (\% \text{ in operation})$$

Where:

ER_y = Annual reduction of GHG emissions

BE_y = Annual GHG emissions in baseline scenario

PE_y = Annual GHG emissions in project scenario

E_{BL} = Annual electricity consumption by the ICLs in the baseline scenario

E_{PJ} = Annual electricity consumption by the CFLs in the project scenario

EF_{grid} = Emission Factor of the connected grid

% in operation = percent of sampled CFLs which are functional (based on ex-post survey)

$$E_{BL \text{ or } PJ} = \sum (N_i * P_{i,BL \text{ or } PJ} * O_i) / (1 - l_y)$$

Where:

$E_{BL \text{ or } PJ}$ = annual energy baseline (BL) or project (PL) in kWh per year

N_i = the number of devices installed of the group i devices

$P_{i,BL \text{ or } PL}$ = the power of the device installed of the group i devices (either recorded for CFLs or assumed for ICLs)

O_i = the average annual operating hours of the devices

l_y = Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the devices are installed, expressed as a fraction.

Full calculations for all project components, for the entire monitoring period, are demonstrated in the attached spreadsheet.

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

>>

N/A

E.3. Calculation of leakage

>>

N/A

E.4. Summary of calculation of emission reductions or net 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)	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	15,052	0	0	3,888	11,164	15,052

E.5. Comparison of actual emission reductions or net 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)	45,714*	15,052

*The PDD value been calculated by prorating the PDD values by the number of days to match this monitored period (1/08/2012 to 31/3/2014).

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

>>

There is no increase in the actual GHG emission reductions achieved during this monitoring period as compared to estimates in the registered PDD. The main reason for the achievement of fewer emission reductions than estimated in the registered PDD, is:

- The delay in the distribution of the CFLs, especially those of Phase 4, which represent 50% of the bulbs to be distributed under the project.
- The lower number of verified collected ICL compared to the estimate in the PDD.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	Rwanda Energy Group
Street/P.O. Box	PO Box 537 Kigali, Anevue du Lac Ihema
Building	
City	Kigali
State/region	
Postcode	0000
Country	Rwanda
Telephone	
Fax	
E-mail	
Website	
Contact person	Yves Muyange
Title	
Salutation	Mr.
Last name	Muyange
Middle name	
First name	Yves
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	International Bank for Reconstruction and Development (IBRD) as Trustee of the Community Development Carbon Fund (SCF)
Street/P.O. Box	1818 H Street, NW
Building	
City	Washington
State/region	District of Columbia
Postcode	20433
Country	United States of America
Telephone	+1 202 458 1873
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E-mail	ibrd-carbonfinance@worldbank.org
Website	www.carbonfinance.org
Contact person	Jose Andreu
Title	Mr
Salutation	
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Middle name	
First name	Jose
Department	Carbon Finance Unit
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
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 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		