CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

>> Rwanda Electrogaz Compact Fluorescent Lamp (CFL) distribution project
Version 2
Completed October 2008

A.2. Description of the small-scale project activity:

>>
Rwanda is a poor rural country with about 90% of the population engaged in (mainly subsistence) agriculture. It is the most densely populated country in Africa and is landlocked with few natural resources and minimal industry. Rwanda continues to receive substantial aid and obtained IMF-World Bank Heavily Indebted Poor Country (HIPC) initiative debt relief in 2005-06. Rwanda also received Millennium Challenge Account Threshold status in 2006.

Rwanda faces acute electricity supply shortage even though less than 10% of its total population is connected to the grid. The purpose of the project activity is to expand the use of high-efficiency lighting technology in Rwanda's residential sector through the distribution of high-quality Compact Fluorescent Lamps, starting with the units already connected to the grid (Component 1) and also considering the units that will be connected as part of the national electrification program.

This efficient lighting project will benefit the consumers providing them high quality, low price CFLs, thereby reducing their electricity consumption and their bills. It also enables poorest clients to afford access to electricity on a more sustainable basis while proposing a competitive alternative to traditional fuels, such as kerosene lamps and small batteries, which have a negative impact on the local and global environment and health.

The project activity, implemented by the national public electricity utility, Electrogaz, is designed with two components.
Component 1: Existing grid-connected customers will have the opportunity to exchange incandescent lamps of a range of 40 to 100 watts for high-quality self-ballasted compact fluorescent lamps (CFLs) of a range up to 20 watts. At the time of exchange, all CFLs are tested to assure that they are functioning and the following data is recorded: (i) the number and wattage of CFLs provided, (ii) the number and wattage of the incandescent lamps, (iii) household information (name of the costumer, home location, preferably through the customer reference ID), and (iv) the date of the exchange. The incandescent bulbs will be destroyed and disposed of.
Component 2: The new connection development program in Rwanda aims to increase the grid-connected rate up to 35% by 2012. New Electrogaz costumers will receive a fixed number of CFLs with their new electricity meter at the time of the connection. Therefore, as the new costumers did not have electric lighting spot in their unit before the connection to the grid, the CFLs are installed in new lighting spots, and there is no replacement in this case.

The CFL distribution project is implemented through several phases starting mid-2007 to the beginning of 2010. A pilot phase (or phase 1) was completed in August-September 2007 with the distribution of 50,000 CFLs. A maximum of 2 CFLs were provided in exchange of incandescent bulbs (IBs). The second phase, for which the distribution happened in September and October 2008, spread 150,000 CFLs

over the residential sector, up to 5 CFLs per household at a price of RWF200 (US$0.37) per bulb and with exchange of incandescent bulbs. The third phase (200,000 CFLs) will happen by the beginning of 2009. The three first phases are expected to cover nearly all existing Electrogaz costumers. The fourth phase – amounting to 400,000 CFLs under this PDD – will therefore mainly focus on the new connection program (i.e. 2nd component of the project) and will be conducted at the same pace. As a way to fully integrate the lighting market, the distribution of CFLs will also occur through the private retailers and at a price approaching step by step the regular market range.

	Number of CFLs	**Indicative timeline of distribution**	**Component**
Phase 1	50,000	Aug-Sept 2007	1
Phase 2	150,000	Sept-Oct 2008	1
Phase 3	200,000	Early 2009	1
Phase 4	400,000	Mid 2009 to mid 2010 (monthly recorded)	2
TOTAL	**800,000**		

The light bulb distribution will take place at decentralized distribution outlets (antennas or stations) run by Electrogaz or through private retailers.

An ex-ante installation survey was conducted on a 200-household sample1 to establish the lighting baseline reference, to measure the market penetration, the potential CFL need, the public awareness and the daily lighting time. It was established that high-quality CFLs are more expensive than incandescent bulbs and represent a negligible portion of all the lighting devices available in the market. A post-installation survey following the pilot phase, conducted on a 50-household sample, showed increased interest of the population in this low energy device.

The contributions of the project activity to sustainable development can be summarized as follows:

- Reduction in grid electricity demand, including peak demand (in term of GWh or MW), which allows the utility to increase its consumer base and provide access to unelectrified households
- Lower electricity bill for end-users since CFLs are 75% more energy efficient than incandescent lamps
- Carbon emission reduction linked with electricity generation

[1] The sample has been chosen outside the pilot phase recipients to avoid, as far as possible, interference.

A.3. Project participants:

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Name of Party involved (*)	Private and/or public entity(ies) project participants	Party wishes to be considered as project participant (Yes/No)
Rwanda (host Party)	Electrogaz	No
State of the Netherlands	International Bank for Reconstruction and Development as trustee of the Community Development Carbon Fund	Yes

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

>> Rwanda

A.4.1.1. Host Party(ies):

>> Rwanda.

A.4.1.2. Region/State/Province etc.:

>> Country wide

A.4.1.3. City/Town/Community etc:

>> Country wide, mainly on urban areas, which are or will be covered by Electrogaz

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity:

>> The location of each consumer, existing or new, is known from the 'Consumer contract number' issued by the Power company Electrogaz. Each number is unique to a customer and provides complete information, including address and contact information.
The project targets the existing 97,000 residential and tertiary customers of Electrogaz (as of September 2008 data) and the additional 100,000 new costumers. The latter costumer group is part of the national grid extension program.
The distribution of CFLs will be done through the 21 antennas/stations of the utility and through the private distributors, where customer information and, where applicable, details of exchanged bulbs will be recorded. This data will assist in unique identification of recipients.

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

>> This project activity is under Type II – Energy Efficiency Improvement Project, and uses two SSC methodologies:

- AMS-II.J "Demand-side activities for efficient lighting technologies", which is presently used for the replacement of Incandescent Bulbs (IBs), and
- AMS-II.C "Demand-side energy-efficiency activities for specific technologies", which is followed for the installation of CFLs at new costumer sites.

Both methodologies apply to public or private sector initiatives that encourage the adoption of efficient lighting equipment that is more expensive and less GHG emitting than the baseline technology. The high-efficiency technology must be new equipment not transferred from another activity and may (i) replace existing equipment or (ii) be installed at new sites.

In Rwanda, the electrical power of the IBs available in the market ranges from 25 to 100 W. According to the Baseline survey conducted in April 2008, it is assumed that the IB power shares are breakdown as follow:

IB electrical power	Share
25 W	2%
40 W	6%
60 W	14%
75 W	20%
100 W	57%

Electrogaz distributes the CFLs of a range up to 20 W, consistently with the device lumen breakdown, (i.e. similar lumen or above, as required by AMS-II.J point 2). The table below gives the lumen for incandescent bulbs and CFLs (*source: Efficient Lighting Initiative (ELI) voluntary technical specifications*). The CFL lumen is also a requirement of the technical specifications of the CFL purchase tender and is cross checked by tests undertaken by the manufacturer.

Minimum light output (Lumen)	Incandescent lamp (Wattage)	CFL (Wattage)
230	25	5
415	40	9
715	60	12
940	75	15
1350	100	22

For example, a 25-to-60W IB and a 60-to-100W IB can be replaced by respectively a 15W CFL and a 20W CFL. However, for better benefits in term of electricity demand decrease, Electrogaz is focusing first on highest power (100W IBs in exchanged of 20W CFLs).
In the case of new connections, Electrogaz will provide CFLs with lumen that matches the household need. A conservative approach, consistent with the lumen breakdown above, is proposed here to be used as a reference in the baseline scenario: it is assumed that energy savings come from the installation of 16-to-20W CFLs or up-to-15W CFLs instead of using respectively 75W IBs or 40W IBs.

The devices are purchased through international tenders. The technical characteristics of the CFLs are based on ELI CFL technical specifications, which also specifie a one-year warranty and promote a rated lifetime[2] of at least 6,000 hours.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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Years	Estimation of annual emission reductions in tonnes of CO_2 e		
	Component 1	**Component 2**	**Project Activities**
2009	16,020	1,209	17,229
2010	14,409	12,698	27,108
2011	12,799	14,512	27,311
2012	10,619	14,512	25,132
2013	6,977	14,512	21,490
2014	4,724	14,512	19,236
2015	4,235	14,512	18,747
2016	3,170	14,512	17,683
2017		11,126	11,126
2018		7126	726
Total estimated reductions (tonnes of CO_2 e)	72,954	112,834	185,788
Total number of crediting years			Crediting Period is 10 years (starting in January 2009 and ending in March 2018 at the end of the last CFL batch lifetime as the project is designed)

NA = not applicable

[2] As per AMS-II.J, the 'Rated lifetime' or 'rated average life' or 'rated life to 50% failures' is the expected time at which 50% of any large number of lamps reach the end of their individual life.

A.4.4. Public funding of the small-scale project activity:

>> Public funding from Parties included in Annex I to the Convention is not being sought to support this CDM project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

>> There is no other CFL promotion project operating in Rwanda.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

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- AMS-II.J "Demand-side activities for efficient lighting technologies", Version 1, and
- AMS-II.C "Demand-side energy-efficiency activities for specific technologies", Version 10

B.2 Justification of the choice of the project category:

>> The project activity will promote the installation of Compact Fluorescent Lamps (CFLs) which is a lighting energy-efficient device. The project has two components: (i) CFLs replace incandescent lamps for existing Electrogaz costumers, and (ii) CFLs are installed at new sites at the time of new connections. The project is eligible to apply a small-scale methodology because the energy savings from the replacement of incandescent lamps by efficient CFLs and the CFLs installed at new sites under the project are estimated to be a maximum of 38 GWh annually, which is below the 60 GWh limit for Type II small-scale project activities.

B.3. Description of the project boundary:

>> Consistent with the SSC methodologies, the project boundary is the physical, geographical location of each CFL installed, within Rwanda's national border. The exact location is determined based on customer ID recorded at the time of the distribution. This enables a unique identification (i.e., name and address) of the project participants who are limited to Electrogaz costumers (existing and new ones).
Certified Emission reductions (CERs) will be earned for the emission reductions associated with the reductions in the demand for electricity supplied by the national utility Electrogaz.

B.4. Description of baseline and its development:

>> The baseline scenario of the proposed project is assumed to be a continuation of current practice, which involves purchase and use of incandescent bulbs (IBs), by existing and future Electrogaz costumers. The baseline is the use of standard incandescent lamps with wattages in a range of 25 to 100 watts. For the existing costumers who exchange IBs, the baseline corresponds to the use of the exchanged IBs uniquely recorded. For the new costumers benefiting from the new connection “package”, a conservative reference is taken from the Baseline survey. It is assumed that 40W IBs and 75W IBs would have been used instead of the project efficient technology, ranged in two categories, respectively up-to-15W CFLs and 16-to-20W CFLs.
According to the ex-ante installation survey, the daily lighting time in Kigali is on average over 4 hours. Therefore, as specified in the Methodology AMS II.J, the baseline lighting time is set at a maximum allowed of 3.5 hours per day per bulb.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

>> The emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity. The project activity is additional and would have not occurred otherwise due to the following barriers:

Investment barrier

The main barrier to the uptake of CFLs is the high up-front cost of a CFL, as compared to IBs, both for households and the national electricity utility, Electrogaz.

This barrier is particularly significant in poor countries such as Rwanda, where only around 9% households, mainly in urban areas, have access to electricity for lighting use and the per capita income is US$250 per year[3]. CFLs, imported only, are much more expensive than IBs. In Rwanda, any type of IBs is sold at around US$0.4. The low quality CFLs [4] (7 to 20 watts) are sold at a unit price of US$2 to US$3. The Rwandan market price of good quality CFL is approximately US$7. [5] It is evident that the cost of CFL constitutes a very high upfront investment and a barrier for the average households.

For the implementation of this project, the utility is bearing the costs, in terms of purchase[6] and distribution of CFLs, collection and disposal of incandescent lamps, customer data collection and outreach.

Bulk procurement of CFLs results in the utility being able to negotiate significantly reduced price, as compared to the market, of US$1.5 per CFL. However, the revenues from the CFL sale do not cover the expenditures. As the project is promoting a new device and customer response was not known, in the pilot phase, CFLs were distributed in exchange of incandescent bulbs, which do not have any value for Electrogaz as they will be destroyed. Based on encouraging response from the customers, phase 2 is selling the CFLs at US$0.37 per CFL. To promote market penetration, gradually over phases, CFLs will be sold at a price approaching the regular market range.

As the CFLs are sold at subsidised rate, Electrogaz is bearing the entire cost differential and the project management cost. Project management cost includes a centralised database, collection, storage and certified destruction of incandescent bulbs.

Barrier due to prevailing practices

The project is the first of this kind. No project activity has been implemented yet in this country.

Institutional barrier

There is no policy/regulation or incentive scheme in place in Rwanda to promote the use of compact fluorescent lamps, which are much more expensive than incandescent lamps (5 to 20 times as per the quality of the CFL). Furthermore, the government does not have any regulatory requirement, quality standard or testing facility to ensure the import of high quality CFLs. As a result, (i) CFL, low and

[3] Source: 2008 World Development indicators.

[4] None of the CFLs in Rwanda market indicate adherence to international quality standards, provide any label or guarantees. Anecdotal evidence suggests that these widely available low quality CFLs contain high levels of mercury and a very low lifetime (sometimes as low as 3 months), thus affecting the consumer confidence in the product.

[5] Average price obtained from retailers in April 2008.

[6] Through bulk procurement by the utility, the price of a CFL may be brought down to US$1.3 to US$2.0, a price which remains higher than the cost of an IB, which is around US$0.35.

especially high quality, as a consumer product, is not widely available with small shops and retailers, and (ii) end-users are not aware of the benefits of using CFLs instead of incandescent lamps, including lifecycle electricity bill savings. The use of CFLs by Rwandan households continues to be limited (near 0% for high quality CFLs, 22% for low quality CFLs)[7].
Electrogaz has voluntary decided to introduce this coordinated action supported by the CDM as part of its strategy to increase electricity access while addressing the country's acute electricity supply shortage and reducing GHG emissions.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>> Ex-ante estimation of emission reductions (ERs) due to the installation of energy efficient CFLs are divided in two components. ERs are calculated differently for Component 1: Using AMS II.J, when the beneficiary is an existing Electrogaz costumer (CFLs replacing IBs) and Component 2: Using AMS II.C, when the beneficiary is a new costumer (CFLs installed at new sites).

Component 1: CFLs replacing IBs

As per AMS-II.J, the electricity saved by the project activity in year *y* is calculated as follows:

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

Where:

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

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 = The factor for Transmission & distribution loss in year *y* (fraction)
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)
$P_{i, PJ}$ = 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
BP = Baseline Penetration Factor (1 for a single Project Activity)

The Lamp Failure Rate (LFRy) is the % of lamps that have failed during a year. The rated lifetime is used to calculate the ex ante Lamp Failure Rate as follows:

$$\text{If } y * X_i < L_i,\ LFR_{i,y} = y * X_i * (100 - R_i) / (100 * L_i)$$

[7] According to the Baseline survey conducted in April 2008.

If $y * X_i >$ or $= L_i$, $LFR_{i,y} = 1$

Where:

$LFR_{i,y}$ = Lamp Failure Rate for equipment type i in year y (fraction)
L_i = Rated average life for equipment type i (hours)
R_i = Percentage of lamps of type *i* operating at the rated lifetime (use a value of 50)
X_i = Number of operating hours per year for equipment type *i* (hours)
y = Counter for year

$ER_y = NES_y * EF_{CO2,ELEC,y}$

$EF_{CO2,ELEC,y}$ = Emission factor in year *y* calculated in accordance with the provisions in AMS I.D (tCO_2/MWh)
ER_y = Emission reductions in year *y* (tCO_2e)

Component 2: CFLs installed at new sites

As per AMS-II.C, the amount of reduced GHG emissions for the project activity is calculated as follows.

$ER_y = BE_y - PE_y = (E_B - E_P) * EF_{grid}$

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_B = Annual electricity consumption by the IBs in the baseline scenario
E_P = Annual electricity consumption by the CFLs in the project scenario
EF_{grid} = Emission Factor of the connected grid

If the energy displaced is electricity, the energy baseline (E_{BL}) and the energy project (E_{PJ}) are calculated as follows:

$E_{BL \text{ or } PL} = \sum (N_i . P_{i,BL \text{ or } PL} . O_i)$

Where:

$E_{BL \text{ or } PL}$ = 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 IBs)
O_i = the average annual operating hours of the devices

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	**$EF_{CO2,ELEC,y}$ or EF_{grid}**
Data unit:	kg CO_2e/kWh
Description:	Emission factor for the national electricity grid for 2007
Source of data used:	See PDD annex for EF grid calculation
Value applied:	0.71
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated as per Combined Margin approach from the tool (ACM0002, AMS I.D) using data from 2003 to 2007 provided by the electricity company Electrogaz. All references are included in the annex.
Any comment:	

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

Data / Parameter:	**$Q_{PJ,i}$**
Data unit:	None
Description:	Number (quantity) of pieces of equipment of type *i* distributed and commissioned under the project activity (units)
Source of data used:	Provided by Electrogaz
Value applied:	$Q_{PJ,1}$ = 50,000; $Q_{PJ,2}$ = 150,000; $Q_{PJ,3a}$ = 100,000, $Q_{PJ,3b}$ = 100,000
Justification of the choice of data or description of measurement methods and procedures actually applied :	The utility records the exact number of CFLs distributed to the costumers. The ex-ante data refers to the tender.
Any comment:	Here *i* as a number relates to the phase, and *i* as a letter relates to the type of the equipment (when necessary to differenciate).

Data / Parameter:	**TD_y**
Data unit:	None
Description:	The factor for Transmission & distribution loss in year *y* (fraction)
Source of data used:	Methodology default value
Value applied:	= 1/(1-0.1) = 1.11
Justification of the choice of data or description of measurement methods and procedures actually applied :	No recent data is available.
Any comment:	

Data / Parameter:	**NTG**
Data unit:	None
Description:	Net-to-gross adjustment factor
Source of data used:	Methodology default value
Value applied:	0.95
Justification of the choice of data or description of measurement methods and procedures actually applied :	No recent data is available.
Any comment:	

Data / Parameter:	**$P_{i,BL}$**
Data unit:	Watts
Description:	Rated power of the baseline incandescent bulbs of the group of "*i*" lighting devices
Source of data used:	Provided by Electrogaz
Value applied:	$P_{A,BL}$ = 25W, $P_{B,BL}$ = 40W, $P_{C,BL}$ = 60W, $P_{D,BL}$ = 75W, $P_{E,BL}$ = 100W
Justification of the choice of data or description of measurement methods and procedures actually applied :	Electrogaz records the wattage of the IBs exchanged. Any IB wattage is allowed, even if Electrogaz promotes the highest powers. For ex-ante calculations, only 40W and 75W are considered as an average for IBs replaced by respectively up-to-15W CFLs and 16-to-20W CFLs.
Any comment:	Here *i* as a capital letter relates to the type of the incandescent bulb.

Data / Parameter:	**$P_{i,PJ}$**
Data unit:	Watts
Description:	Rated power of the project CFLs of the group of "*i*" lighting devices
Source of data used:	Provided by Electrogaz, technical specification set in the tender
Value applied:	$P_{a,PJ}$ = 15W, $P_{b,PJ}$ = 20W
Justification of the choice of data or description of measurement methods and procedures actually applied :	Electrogaz records the wattage of the CFL distributed.
Any comment:	Here *i* as a letter relates to the type of the Compact Fluorescent Lamp.

Data / Parameter:	**O_i**
Data unit:	Hours
Description:	Average daily operating hours of the lighting devices replaced by the group of "*i*" lighting devices
Source of data used:	Methodology default value
Value applied:	3.5
Justification of the	Stipulated by methodology: the lower of the following: a) 3.5 hours per 24 hrs

choice of data or description of measurement methods and procedures actually applied :	period; b) Daily usage hours determined by the baseline survey. The Baseline survey conducted in April 2008 doesn't enable to get an accurate number but shows explicitly that the daily operating time is above 4 hours.
Any comment:	

Data / Parameter:	L_i
Data unit:	Years
Description:	Equipment lifetime
Source of data used:	Provided by Electrogaz, technical specification set in the tender
Value applied:	4.7 years or 6000 hours (Phases 1 and 2) 7.8 years or 10000 hours (Phase 3)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Stipulated by the methodology: 'Rated lifetime' or 'rated average life' or 'rated life to 50% failures' is the expected time at which 50% of any large number of lamps reach the end of their individual life. Lamps procured under the project in Rwanda have a rated lifetime of 6000 hours or 10000 hours. The daily hours of operation is set at 3.5 hours (as per the methodology requirement).
Any comment:	

Data / Parameter:	X_i
Data unit:	hours
Description:	Number of operating hours per year for equipment type *i*
Source of data used:	Methodology default value
Value applied:	1278
Justification of the choice of data or description of measurement methods and procedures actually applied :	Stipulated by methodology, the lower value of 3.5 hours per 24 hrs period is considered for this project activity.
Any comment:	

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

Data / Parameter:	$P_{i,BL}$
Data unit:	Watt
Description:	Power of the incandescent bulbs in the baseline scenario
Source of data used:	Baseline survey conducted in April 2008
Value applied:	40W (if up-to-15W CFL installed instead of IB) 75W (if 16-to-20W CFL installed instead of IB)
Justification of the choice of data or description of measurement methods and procedures	The power of the baseline light bulb has been considered as a conservative mean, according to the baseline survey, related to the device lumen.

actually applied :	
Any comment:	

Data / Parameter:	**n_i**
Data unit:	None
Description:	Number of CFLs installed during the year
Source of data used:	Provided by Electrogaz
Value applied:	Phase 4: if i = 15W CFL, $n_i = n_a$ =200,000 if i = 20W CFL, $n_i = n_b$ =200,000
Justification of the choice of data or description of measurement methods and procedures actually applied :	Electrogaz records the number and wattage of the CFLs distributed per costumer uniquely identified. For the ex ante calculations, the numbers are given by Electrogaz project design.
Any comment:	Here *i* as a letter relates to the type (wattage) of the Compact Fluorescent Lamp.

Data / Parameter:	**$P_{i,PJ}$**
Data unit:	Watts
Description:	Power of the CFLs installed of the group of *i* devices
Source of data used:	Provided by Electrogaz, technical specification set in the tender
Value applied:	$P_{a,PJ}$ = 15W, $P_{b,PJ}$ = 20W
Justification of the choice of data or description of measurement methods and procedures actually applied :	Electrogaz records the wattage of the CFL distributed.
Any comment:	Here *i* as a letter relates to the type (wattage) of the Compact Fluorescent Lamp.

Data / Parameter:	**O_i**
Data unit:	Hours
Description:	Average annual operating hours of the CFLs
Source of data used:	To be monitored in samples
Value applied:	3.5 hours per day is applied for ex ante calculations
Justification of the choice of data or description of measurement methods and procedures actually applied :	Electrogaz will assure a continuous measurement using run time meters to be installed in a sample equal to 0.1% of the total CFLs distributed. For ex ante calculations, operating time is set at 3.5 hours to be consistent with Component 1 using the AMS-II.J methodology.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>> Applying the formulae given in this PDD section B 6.1, for both component 1 and component 2, the ex-ante calculations of the energy savings and emission reductions are explained below.

The Electricity Savings are assumed to be the difference between the electricity consumption of the IBs exchanged or market referenced at new sites (Baseline) and the electricity consumption of CFLs with similar lumen (Project). The exact number and rating of CFLs distributed during the project will be recorded at the time of distribution.

Component 1

For calculating the baseline emissions as well as the project emissions, the total number of lamps operating during the monitoring interval and the daily operating time are needed. Ex-post monitoring surveys, conducted on participant samples, will enable to assume the amount of lamps installed and functional at the end of each monitoring interval, which will be the reference of the ex post adjustment of the ex-ante ER estimation.

This component, which refers to the CFLs distributed to the existing costumers in exchange of the incandescent bulbs, includes 3 phases described as follow:

	CFLs			IBs exchanged		
	Wattage	**Rated lifetime (hours)**	**#**	**Wattage**	**#**	**Timeline of installation[8]**
Phase 1	20	6000	50,000	75	50,000	September 2007
Phase 2	20	6000	150,000	75	150,000	November 2008
Phase 3	15	10000	100,000	40	100,000	May 2009
	20	10000	100,000	75	100,000	

According to the baseline survey, for ex-ante calculations, the baseline IB power is set at 75 W for IBs replacing 16-to-20 W CFLs and at 40 W for IBs replacing up-to-15 W CFLs.
The final number of CFLs and IBs relating to the wattage and the lifetime and the actual timeline of installation will be provided by Electrogaz at the end of the CFL distribution campaign. This data will be used to determine the estimated number of ERs

Considering the equipment lifetime, the component 1 will generate ERs from September 2007 to February 2017 (the crediting period running until August 2017).

According to the equations (1), (2) and (3) of AMS-II.J (mentioned in section B.6.1 above) and based on a monthly basis, the annual Net Electricity Savings are reported in the table below:

Year y	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NES (MWh)	902	5,922	22,563	20,295	18,027	14,957	9,827	6,653	5,964	4,465

[8] The timeline of installation is referenced as monthly and is determined as the time when the distribution is totally completed.

Component 2

Meters installed on a consistent sample of CFLs will measure the daily operating time that will be used in the ex-post calculations.

The component 2, which refers to the CFLs distributed to the new costumers at the time of the connection to the grid, includes only one phase described as follow:

	CFLs			IBs referenced		
	Wattage	**Rated lifetime (hours)**	**#**	**Wattage**	**#**	**Timeline of installation[9]**
Phase 4	15	10000	200,000	40	200,000	40,000 CFLs installed per month starting on September 2009
	20	10000	200,000	75	200,000	

According to the baseline survey, for ex-ante calculations, the baseline IB power is set at 75 W for IBs replacing 16-to-20 W CFLs and at 40 W for IBs replacing up-to-15 W CFLs.
The final number CFLs relating to the wattage, the lifetime and the timeline of installation as well as the daily operating time will be provided by Electrogaz at the end of each monitoring period.

As the equipment lifetime is assumed to be 7.8 years, the component 2 will generate ERs from September 2009 to May 2017, actually starting from the date of registration of the project and finishing at the end of the crediting period.

According to the equation of AMS-II.C (mentioned in section B.6.1 above) and calculated on a monthly basis (consistently with the timeline of distribution), the annual Electricity Savings are reported in the table below:

Year y	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
ES (MWh)	1,703	17,885	20,440	20,440	20,440	20,440	20,440	20,440	15,671	1,022

Energy savings and emission reductions for the project activity

$ER_y = NES_y * EF_{grid}$ (Component 1) + $ESy * EF_{grid}$ (Component 2)

[9] The timeline of installation is referenced as monthly and is determined as the time when the distribution is totally completed.

Summary of ex-ante estimation of emission reductions over the crediting period

	Estimation of Energy or Net Energy savings (MWh)	Estimation of Emission Reductions (tCO2e)
2009	24,267	17,229
2010	38,180	27,108
2011	38,467	27,311
2012	35,397	25,132
2013	30,267	21,490
2014	27,093	19,236
2015	26,404	18,747
2016	24,905	17,683
2017	15,671	11,126
2018	1,022	726
TOTAL	**261,673**	**185,788**

B.6.4 Summary of the ex-ante estimation of emission reductions:

>> As ex-ante estimated calculations, the project activity generates 185,788 tonnes of CO2e over 10 years of the crediting period.
The estimated annual energy savings varies up to 38GWh.

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**Customer information (for components 1 and 2)**
Data unit:	None
Description:	Costumer identification Number (unique – as per Electrogaz records) Name of head of household Location of household
Source of data to be used:	Information provided by utility customers at the distribution points and cross-checked by Electrogaz centralised database
Value of data	
Description of measurement methods and procedures to be applied:	Information to be collected once during CFL distribution and recorded in a register or in a in-house software
QA/QC procedures to be applied:	Identity of heads of households and customer ID to be cross-checked with utility records by Electrogaz to avoid several purchase with the same ID
Any comment:	This is the basic identification parameter that is used for existing and new consumers and forms the foundation of the monitoring of both component 1 and 2 of the project.

Data / Parameter:	$Q_{PJ,i}$ or N_i (for components 1 and 2)
Data unit:	None
Description:	Number (quantity) of pieces of CFLs of type *i* distributed under the project
Source of data to be used:	Recorded by Electrogaz staff or the private sector at distribution points
Value of data	
Description of measurement methods and procedures to be applied:	Information to be collected by Electrogaz staff or the private sector during the CFL distribution and recorded in a register or in a in-house software
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$P_{i,PJ}$ (for components 1 and 2)
Data unit:	Watt
Description:	Rated power of the project CFLs of the group of "*i*" lighting devices
Source of data to be used:	Lamp marking data
Value of data	15 or 20 W
Description of measurement methods and procedures to be applied:	Read by the distributor staff from the lamp while distribution is taking place Information to be collected by Electrogaz staff or the private sector during the CFL distribution and recorded in a register or in a in-house software
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$Q_{BL,i}$ (for component 1 only)
Data unit:	None
Description:	Number (quantity) of pieces of incandescent bulbs (IBs) of type *i* exchanged under the project
Source of data to be used:	Recorded by Electrogaz staff or the private sector at distribution points
Value of data	
Description of measurement methods and procedures to be applied:	No measurements required Information to be collected by Electrogaz staff or the private sector during the CFL distribution and recorded in a register or in a in-house software
QA/QC procedures to be applied:	
Any comment:	Cross-check with CFL inventory

Data / Parameter:	$P_{i,BL}$ (for component 1 only)
Data unit:	Watt
Description:	Power of the incandescent bulbs exchanged (for the component 1 only)
Source of data to be used:	Lamp marking data
Value of data	25 to 100W
Description of measurement methods and procedures to be applied:	Read by the distributor staff from the lamp while distribution is taking place Information to be collected by Electrogaz staff or the private sector during the CFL distribution and recorded in a register or in a in-house software
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	Distribution date (for components 1 and 2)
Data unit:	Date
Description:	Date of the CFL distribution uniquely recorded for each costumer participant
Source of data to be used:	Recorded by Electrogaz staff or the private sector at distribution points
Value of data	Format *dd.mm.yyyy*
Description of measurement methods and procedures to be applied:	Information to be collected by Electrogaz staff or the private sector during the CFL distribution and recorded in a register or in a in-house software
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$O_{k,d,m}$ (for component 2 only)
Data unit:	Hours
Description:	Operating hours of the distributed CFL *k* on day *d* as given by valid meter *m*
Source of data to be used:	Readings of measuring instruments
Value of data	Daily operating hours
Description of measurement methods and procedures to be applied:	Meters are installed on a sample of lamp appliances (CFL). Data recording protocol depends of the meter technology. Information to be collected at the end of each monitoring period. Only meters delivering valid data records are counted.
QA/QC procedures to be applied:	Meter technology and calibration and metering procedures will be described by the manufacturer at the time of purchase. Validity and reliability of meters are evaluated.
Any comment:	

Data / Parameter:	$N_{sample,s}$ (for component 1 only)
Data unit:	None
Description:	Number of sampled CFLs checked during the post installation survey *s*
Source of data to be used:	Provided by the consultant conducting the survey
Value of data	At least 100 or 0.1% of the participants
Description of measurement methods and procedures to be applied:	Required by the survey terms of reference. The data of each checked CFL will be recorded on the survey questionnaire while the ex-post installation survey is conducted. One questionnaire is filled in per each sampled costumer. The information from the questionnaire is afterwards entered into a survey database; this database is related to one monitoring interval.
QA/QC procedures to be applied:	Application of standardized data forms and compliance protocols
Any comment:	Survey has to be done per each monitoring interval separately

Data / Parameter:	$N_{ok,s}$ (for component 1 only)
Data unit:	None
Description:	Number of sampled CFLs which are functional during the post installation survey *s*
Source of data to be used:	Provided by the consultant conducting the survey
Value of data	$N_{sample,s}$ minus CFL found not functioning during the post installation survey *s*
Description of measurement methods and procedures to be applied:	The status (functioning or not) of each checked CFL will be recorded on the survey questionnaire while the ex-post installation survey is conducted. One questionnaire is filled in per each sampled costumer. The information from the questionnaire is afterwards entered into a survey database; this database is related to one monitoring interval.
QA/QC procedures to be applied:	Application of standardized data forms and compliance protocols
Any comment:	Survey has to be done per each monitoring interval separately

B.7.2 Description of the monitoring plan:

>> This Monitoring Plan (MP) describes the management systems and procedures to be implemented by the project entity upon project implementation in order to ensure consistency with the two methodologies AMS-II.C and AMS-II.J, especially regarding monitoring, processing and reporting of data required for the calculation of emission reductions (ERs). All data collected is entered into the database.

The methodologies require the following monitoring activities:
Applicable for both Component 1 and Component 2,

(i) Recording of lamp distribution data

Applicable for Component 1,

(ii) An ex ante baseline survey,

(iii) 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 if shorter).

Applicable for Component 2,

(iv) Recording annually the "power" of the device installed using nameplate data or bench tests of a sample of the units installed and metering a sample of the units installed for their operating hours using run time meters.

The implementation organisation

Electrogaz is the coordination entity. It conducts the project activity campaign, the CFL distribution through its antennas and stations or through private retailers, the IBs collection and destruction, and the monitoring. The monitoring surveys are usually realized by external consultants.

The project activity is partially included in the Urgent Electricity Rehabilitation Project. For the three first phases, the UERP implementation unit is responsible for the CFL purchase, including the procurement process. For the following phases, Electrogaz will be in charge of the procurement.

The monitoring plan consists of the elements listed in the following table:

Key Elements of Monitoring Plans Applicable to Deemed Savings

Monitoring Plan Element	Rwanda CFL Monitoring Plan
Ex ante baseline survey	The purpose of the ex ante baseline survey is to obtain information about existing light bulb market and usual practice. This information helps in CFL procurement and other aspects of the CDM project design, especially to set the stipulated hours of operation. The survey has been conducted door-to-door in April 2008, on a 200-household sample, chosen randomly within Electrogaz costumers – minus those having benefited from the first phase in August-September 2007 in order to assure relevant data. The questionnaire was consistent with the template provided in the Annexe I of AMS-II.J. It identified and documented the following information: • Type(s) of installed lamps • Number of lamps per room • Wattage or other measure of equipment capacity • Usage patterns, including hours of operation • Awareness on energy efficient lamps Data is recorded in a database.
Recording of lamp distribution data	1- The CFLs are purchased through a procurement process, including tender documents which describe the required technical specifications (number of CFLs procured, wattage, lumen, lifetime, etc.). 2- All Electrogaz costumers are eligible to participate in the project. The CFLs are distributed by Electrogaz or private retailers to the costumers upon presentation of a document enabling unique identification (i.e. his/her Electrogaz bill, prepaid purchase or voucher) and assuring (with cross-check or so) unique-time purchase. For the existing costumers, CFLs are distributed in exchange of the incandescent lamps brought by the costumers. For the new costumers, the CFLs are distributed with the new electricity meter as a "package". Each costumer is provided up to a maximum number of CFLs (2 in Phase 1, 5 in Phase 2, etc.). Except for the pilot phase, the costumer pays also a small participation (the price

	being reduced compared to the market CFLs). Each CFL is tested before distribution. The IBs are collected and stored at the distribution outlets. During each phase distribution, the following data are recorded: • Date of distribution • Electrogaz costumer ID, which allows for unambiguous identification of the recipient of the equipment. This facilitates ex post surveys. • Number of CFLs purchased for each type i device technology and amount paid • Number of IBs (for component 1 only) exchanged for each type I baseline technology and status (functional or non-functional) A data management and quality assurance system is established, which include data entry forms. During phase 1, data have been recorded in a writing register and then filled in an Excel spread sheet. For the following phases, information is directly entered in an in-house software. All data collected will be archived for 2 years from the end of the crediting period. Electrogaz will ensure the training and the information of the involved personnel in this project. 3- The distributor body maintains inventory of collected IBs. The IBs are shipped to Electrogaz central store in Kigali where they are stored before being destroyed. To assure that the IBs are not reused, the lamps inventory and destruction process are cross-checked or supervised by an independent body who delivers a "certification". The destruction is done as specified by the appropriate local authority. It is assured that the destruction and the waste disposal are done in an appropriate and environmental friendly way with due care and safety and without causing any hazard.
Ex post installation surveys (Component 1), typically to confirm that equipment was installed and is still operating	Ex post installation surveys are conducted to confirm that the energy-efficient equipments were installed and that they are operating appropriately. The surveys are conducted door-to-door. The sample, which size is no less than 100 or 0.1%, is chosen within the project and includes a representative population of each phase (meaning the different types of devices and different collapsed time, as per the phases). The questionnaire is consistent with the template provided in the Annexe I of AMS-II.J. It identifies and document the following information: • Number of lamps per room • Number of pieces of high-efficiency equipment installed under the project by wattage or capacity • Equipment status • Usage patterns, including hours of operation • Equipment failure and replacement practices (including warranty practices) • Awareness on energy efficient lamps Data are recorded in a database. On the basis of ex post monitoring surveys, the net electricity savings are adjusted considering the actual lamp failure data, consistently with AMS-II.J.

Annual record of the device power and the operating hours (Component 2)	The meter ID together with the name, address and costumer ID will be recorded on the monitoring database. Run time meters are installed in a sample of 0.1% of the total number of CFLs installed (or Electrogaz costumers). To assure a random selection and to reach the more accurate measurement mean (based on different lighting spots per household), it is proposed to install meters on each CFL distributed to each 1000 new customer who have benefited of the project (i.e 1, 1001, 2001, etc.). If the uncertainty related to the determination of the mean daily operating hour is higher than 15%, for a confidence level of 95%, the number of run time meters will be increased. The verification and calibration of the run time meters will be done according to the procedure provided by the manufacturer. The operating time will be recorded annually in the database.

Monitoring period

To comply with AMS-II.J and AMS-II.C requirements, the monitoring intervals (or monitoring timeline), which refer to the time of the surveys or data record, will be conducted separately.

- Operating hour record for Component 2 will be done annually.
- Ex post monitoring surveys will be conducted:
  - at a pace allowing to match the more phases, considering the 30% collapse time interval,
  - at the end of the rated lifetime for each phase.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

>> Completed: 27 October 2008

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SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>> 1 October 2007. This is the approximate date when the first phase distribution ended and started generating ERs.

C.1.2. Expected operational lifetime of the project activity:

>> Around 10 years as per combined timeline for all phases, each phase has a separate timeline, starting after 2007 and ending prior to 2018

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>> NA

C.2.1.2. Length of the first crediting period:

>> NA

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>> 1 January, 2009 or the date of project registration by the CDM Executive Board

C.2.2.2. Length:

>> 10 years

SECTION D. Environmental impacts

>>

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>> In Rwanda, the Organic Law (Article 67), approved in 2005, requires that projects, programmes and policies that may affect the environment shall be subjected to environmental impact assessment before obtaining authorisation for implementation. But the Ministerial order determining the list of projects complying with the Article 67 has not been published yet in the official gazette, obstructing the law application.

Under the World Bank policy, the CFL project will be included in the Environmental and Social Management Framework update that will be done by the end of 2008 or early 2009 under the Rwanda Electricity Urgent Rehabilitation Project. Mitigation measures will be recommended when appropriate. All documents will be cleared and disclosed by the World Bank.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>> There is no regulation in Rwanda on the fluorescent lamp waste. Therefore, all fluorescent lamps in the private market in Rwanda – especially the tubular shaped lamps being used in commercial as well as in residential applications – are not currently recycled but disposed with the regular waste in landfills. Tubular lamps and CFLs contain mercury and therefore may eventually add to contamination of soils and groundwater resources. Electrogaz is aware of this fact and wants to address this issue proactively and therefore will implement a mitigation plan that will contribute to the prevention of mercury pollution from the project activity. The plan will include the following elements:

- Electrogaz will purchase the devices through tenders that require high quality CFLs, which contain nowadays less than 5 mg of mercury according to American NEMA (compared with low quality CFLs available in the private market, which have a higher amount of mercury).

The table below shows the improvement made on four-foot fluorescent lamps, (smaller) CFLs needing less mercury to operate than the four-foot lamps.

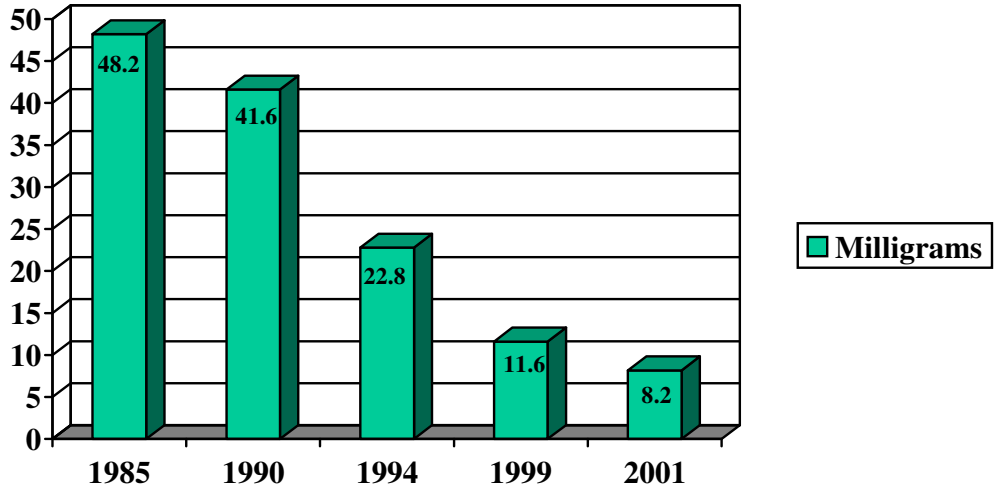

Figure 1: Mercury Contained in Four-Foot Fluorescent Lamp – Industry Average – ***Source: NEMA, Fluorescent and other Mercury-Containing Lamps and the Environment, March 2005***

- It has been estimated that the energy savings generated by the use of a CFL instead of an incandescent bulb will reduce, more than GHG emissions, mercury emissions from fossil fuel fired power plant.[10]
- A safety information campaign conducted by Electrogaz by the beginning of 2009 will inform the Electrogaz costumers who are part of the project activity about the mercury danger and how to use and handle the CFLs properly.
- The CFLs used in the project activity have a long lifetime, at least 6,000 utilization hours. This long lifetime also reduces the amount of other waste (glass, aluminium, plastic, PCB-board, etc.) to be disposed of and energy required to produce and distribute lamps, compared to incandescent bulbs, whose lifetime is no more than 1,000 hours. The high quality of the lamps is therefore eminent to make this a sustainable project.
- A study will be conducted to propose waste management solutions (including collection) and identify the environmental risks. The outputs of the study will be provided to the Rwandan government to be considered in the national waste management policy or to be included in any waste management project.
- The waste of the collected and destroyed incandescent bulbs will be handled in an appropriate and environmental friendly way with due care and safety without causing any hazard in accordance with national environmental regulations.

[10] For example, according to a survey conducted by NEMA in September 2007, in the US where a large part of the electricity is generated by coal fired power plant, “four to five times as much as mercury is emitted into the air to generate the electricity needed to run a standard light bulb than a CFL”.

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>> Large communication campaigns have been organized just before and during the distributions of the pilot phase and the first phase. Electrogaz used various kinds of supports in Kinyarwanda, French and English:

a. **Billboards rentals and printing** at strategic locations
b. **Lollipops rentals and printing** spread over Kigali
c. **TV spots** on TVR 3
d. **Radio spots on the most famous radio stations** (City radio, Contact FM and Radio Rwanda). Radio is the better way of communication in Rwanda, moreover in rural areas.
e. **Posters A2,** fixed in Electrogaz stations and antennas and in other places, and s**tickers**
f. **Inserts A4** in Imvaho, New Times and Creaxion.
g. **Stand at the Rwanda Expo 2007 and 2008** (Rwanda International Trade Fair) held in August/September 2007 and 2008. There, Electrogaz staff showed, on a demonstration board, the electrical benefits of using CFLs. CFLs were also distributed as a promotion.

This broad campaign was the more efficient way to inform the Rwandan population, but also government officials and representatives of various institutions and international bodies (who were by the way present at the Expo).
Electrogaz has also a hotline where every one can ask questions.

E.2. Summary of the comments received:

>> The questions asked via the hotline are available. No major issues have been raised, either via the hotline or at the Expo, where costumers could discuss directly with Electrogaz staff. Generally, they mainly (not to say all) agreed that the project would have significant benefits to the local community and the country as a whole.

E.3. Report on how due account was taken of any comments received:

>> No adverse comment on the project activity was received from any of the stakeholder parties.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Electrogaz
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URL:	www.carbonfinance.org
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Mobile:	
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Direct tel:	202-458-1873
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Not applicable

Annex 3

BASELINE INFORMATION

A baseline survey was conducted in April 2008. A sample of 200 customers was chosen among Electrogaz electricity customers who had not benefited from the pilot phase of the project, which was the distribution of 50,000 compact fluorescent lamps during the period of June-August 2007.

The sample was chosen in different geographical areas and among the four economical and social categories to reach an actual proportional representation of Electrogaz costumers.

Table 1. Key Results of the Survey

Customer category	no. of HH in sample	Average number of Lamps per HH	Average number of Incandescent lamps per HH	% number of incandescent bulbs by average hours of use /day		
				<2	2 to 4	>4
Workers	35	4.9	3	30%	39%	31%
Civil servant	65	6.1	3	41%	29%	31%
Private sector	59	5.5	3	28%	35%	37%
Unemployed /retired	41	6.2	4	39%	28%	32%
TOTAL	200	5.7	3	35%	32%	33%

The data were collected by the pollsters on site during the interviews with the customers making the sample in compliance with the preset questionnaire. Answers/responses were grouped and analyzed using SPSS programs. Some quotes of the survey illustrating the baseline are provided below.

- **Number of lamps and location**

As showed in the table below, most of the lamps are used in the bedrooms (22%), followed by outside (20%) and the dining rooms representing 18%.

Table 2. Number of lamps per room

	Bedroom	Kitchen	Family room	Dining Room	Outside	Bathroom	Total Lights
Total of lamps	252	133	189	208	225	143	1150
Percentage	22%	12%	16%	18%	20%	12%	100%
Average/HH	1.26	0.66	0.94	1.04	1.12	0.71	5.75

- **Types of lamps**

The breakdown by type of lamp shows an important number of incandescent lamps about 56%. The fittings are mainly the sockets (fittings of incandescent bulbs and compact fluorescent lamps) by 78.3 %, when “reglettes” (fittings for fluorescent tubes) come on a second position by around 20%.

Type of lamp	Wattage	Total	Percent
Compact fluorescent	10W	8	1%
Compact fluorescent	20W	246	21%
SUBTOTAL		254	22%
Fluorescent short	20W	118	10%
Fluorescent long	40W	115	10%
SUBTOTAL		233	20%
Incandescent	40W	42	4%
Incandescent	60W	96	8%
Incandescent	75W	132	11%
Incandescent	100W	373	32%
SUBTOTAL		643	56%
Other	25W	16	1%
Circular	100W	4	0%
SUBTOTAL		20	2%
Total General		1150	

- **Daily lighting time**

Concerning the hours of use per day, the survey showed that the daily lighting time lamps is quite high. 30% of the lamps are turned on less than 2 hours a day, 28% between 2 an 4 hours and 42% more than 4 hours. According to the survey, the balanced time of daily lighting per lamp is 3.84 hours.

Annex 4

MONITORING INFORMATION

The monitoring plan is detailed in Section B.7.2.

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