

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

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**MONITORING REPORT**  
**Version 07 – 11/10/2012**

**CUIDEMOS Mexico (Campaña De Uso Inteligente De Energía Mexico) –  
Smart Use of Energy Mexico**  
**CPA: CUIDEMOS Mexico (Campana De Uso Inteligente De Energia Mexico) – Puebla**  
**CDM Reference: 2535-0001**  
**Monitoring Period: 1**  
**01/12/09 – 30/11/10**

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

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

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**1. Purpose of the project activity and the measures taken to reduce greenhouse gas emissions**

The purpose of the Project was to distribute up to 1 million energy efficient light bulbs free of charge to households across the State of Puebla, Mexico. Compact Fluorescent Lamps (CFLs), were exchanged for an equivalent number of incandescent bulbs (which are comparatively energy inefficient). Through the exchange of light bulbs, the Project generates certified emission reductions (CERs) by reducing the consumption of electricity through increased efficiency.

**2. Brief description of the installed technology and equipments**

15W and 20W CFLs were exchanged for an equivalent number of incandescent bulbs at retail distribution points in October-November 2009. Each household was able to bring up to four incandescent light bulbs to exchange for the same number of CFLs. Incandescent light bulbs were collected, destroyed and recycled.

The total number of energy efficient light bulbs distributed by the Project free of charge to recipients was 954,706. This is in conformity with the registered PDD.

**3. Relevant dates of the project activity**

Date of CDM registration: 31 July 2009

Project Implementation: 31 October 2009 to 30 November 2009

Start of the CDM crediting period: 1 December 2009

Start of monitoring period: 1 December 2009

End of monitoring period: 30 November 2010

**4. Total emission reductions achieved in this monitoring period**

Emission reductions achieved in this Monitoring Period are 19,241tCO<sub>2</sub>-e.

**A.2. Project Participants**

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Cool nrg Mexico SRL de CV (“Cool nrg Mexico”) is the SSC-CPA implementer.

Cool nrg Carbon Investments Pty Ltd is the Focal Point for the SSC-CPA.

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

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The SSC-CPA involved households in the State of Puebla, Mexico. CFL distribution points were concentrated in urban areas; however, the light bulb exchange offer was open to all households and residents from Puebla.

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

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954,706 high quality Compact Fluorescent Lamps (CFLs), were exchanged for an equivalent number incandescent bulbs (which are comparatively energy inefficient).

The CFLs have a 10,000 hour life and >0.5 Power Factor, and are suitable for the Mexican electricity grid (127 Volts). The proportions of CFL wattages distributed were as follows:

CFL Wattage	Frequency
15	59.8%
20	40.2%

A detailed description of the monitoring system, including process flow diagrams, is provided in Section C.

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

&gt;&gt;

- AMS II.C. "Demand-side energy efficiency programmes for specific technologies", Version 9
- AMS I.D. "Renewable energy generation for a grid", Version 13 (for baseline calculations in accordance with AMS II.C.)
- "Tool to calculate the emission factor for an electricity system", Version 1 (EB Report 35, Annex 12)

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

&gt;&gt;

31/07/2009

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

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Crediting period: 10 years

Start date: 1/12/2009. (Note that the Start date at registration was 31/07/09; the Board has accepted this post-registration change to the Start date.)

Type of crediting period: Fixed

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

&gt;&gt;

Organisation: Cool nrg Carbon Investments Pty Ltd

Telephone: +61 3 9387 2964

Fax: +61 3 9387 0299

E-mail: cdm-info@coolnrg.com

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

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**1. Implementation and Starting Date of Operation**

Implementation was carried out in accordance with the PDD.

The distribution of light bulbs was completed over 31 days from 31 October to 30 November 2009.

The starting date of operation is considered to be the commencement of distribution, which constitutes “real action” and an appropriate start date. This date was 31 October 2009.

#### *Collection of Incandescent and CFL Nameplate Data*

15W and 20W CFLs were exchanged free of charge to households in Puebla for an equivalent number of incandescent bulbs at the retail distribution points of project partners Comex (leading hardware and paint retailer) and Coppel (large electric appliance retailer). Comex and Coppel provided employees to exchange the light bulbs and enter customer details (name, address, wattages of incandescents surrendered and CFLs provided, store location, date) into the Data Management System (DMS).

#### *Check that numbers of CFLs and incandescent bulbs correspond*

Once the exchange program in November 2009 was complete, the creator and host of the DMS, Impact Data, undertook an analysis and audit of the final database to highlight any duplicate records and other data problems; their findings on the final number of corresponding CFLs and incandescent bulbs are contained in a report<sup>1</sup>. Further, the final value for the corresponding number of CFLs and incandescent bulbs exchanged is more conservative than in this report and excludes test records, duplicates, exchanges without unique electricity bill number or address and any exchanges that could be considered to be above the limit of 4 per customer. This process ensures each record is unique and prevents any double counting.

#### *Independent check of scrapped incandescent bulbs*

Receptacles were provided to store the collected incandescent light bulbs, which were then sent to a central warehouse for destruction and recycling to ensure they could no longer be used. As required in paragraph 10 of the utilised methodology AMS II.C v09, an independent verification of the scrapping of incandescent light bulbs was conducted by Enviro Sense S.A. de C.V, a local, independent environmental audit firm.<sup>2</sup>

#### *Monitoring Use of Project Devices*

Metering equipment was installed on 240 lighting sockets in households belonging to the Project Sample Group (PSG) in order to monitor a sample of distributed CFLs to determine the average hours of utilisation ( $o_k$ ).

#### *Establishment of Project Sample Group*

In accordance with the PDD, a sample of CFLs is monitored to determine the average hours of utilisation and total energy consumption by installing metering equipment on 240 lighting sockets in households. The annual operating hours of monitored devices is used to determine the project and baseline energy consumption for each monitoring period.

The PSG has been implemented by installing monitoring equipment in 60 households (4 bulbs per house) in the Puebla area.

#### *Determination of EF*

The emissions factor for electricity displaced from the grid relevant to the project boundary has been calculated in accordance with the “Tool to calculate the emission factor for an electricity system”, Version 1, as referred to in paragraph 9a) of AMS I.D. v13, as referred to in paragraph 5 of AMS II.C. v09.

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<sup>1</sup> *ExchangeDMSReport.docx* provided to DOE

<sup>2</sup> *EnviroSense report Puebla\_FINAL.pdf* provided to DOE

On page 4 of the “Tool to calculate the emission factor for an electricity system”, Version 1, it stipulates the following for the ex-ante option (as used in the PoA-DD) for calculating the simple Operating Margin (OM):

*A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period*

Therefore, an Emissions Factor of 0.514 tCO<sub>2</sub>/MWh was determined at Registration in the PoA-DD and will be used for the CUIDEMOS Mexico PoA, until the renewal of the PoA crediting period is undertaken, at which point the Emission Factor will be revised.

#### *Data Management System*

As described in the CPA-DD, the project developer implemented a data management system and collected the following data in compliance with the monitoring plan:

<b>Data</b>	<b>Compliance with approved monitoring plan</b>
Collection of Incandescent (ILB) nameplate data	Yes
Collection of CFL nameplate data	Yes
Check that numbers of CFLs and ILBs correspond	Yes
Independent check of scrapped ILBs	Yes
Monitoring use of project devices	Yes
Establishment of project sample group	Yes
Survey of project cross check sample group	Yes
Determination of Emission Factor (EF)	Yes
Data Management System in place	Yes

#### *Monitoring Periods*

The first Monitoring Period is from the 1<sup>st</sup> December 2009 to 30<sup>th</sup> November 2010 inclusive.

#### *CFL Collection & Recycling Scheme*

The project proponent continues to investigate CFL recycling options. Most recently a quote for the recycling treatment of CFLs was obtained from a Mexican service provider<sup>3</sup>.

## 2. Actual Operation of Project Activity

The operation of the project activity constitutes the use of the project CFLs in households in the State of Puebla. As per the CPA-DD, this requires the following as part of the ongoing operation of the project:

- Monitoring the average daily lighting use of households in the PSG
- An independent survey of households in the Puebla area (the PCCG) to ascertain the proportion of project CFLs installed
- Operating and maintaining the DMS to store project data.

#### *Operation of the Project Sample Group*

Monitoring equipment was installed in households in the PSG at the time of the exchange and the daily lighting use was recorded over the Monitoring Period. The equipment monitors the actual number of hours per day each bulb is being used. The usage data is transmitted and stored in a central database.

#### *Establishment of Project Cross Check Sample Group*

A sample of at least 240 CFLs installed in participating households was surveyed by independent market research organisation Global Scan in November 2010 to ensure continuing

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<sup>3</sup> *Sitrasa CFL Recycling Quote.pdf* provided to DOE

operation<sup>4</sup>. The households included in the PCCG were randomly selected from the database of participating households. The result of this sampling determines the proportion of the total number of devices still operating at the end of each monitoring period ( $n_k$ )<sup>5</sup>. CFLs distributed under the PoA were marked with a logo to ensure that they can be unambiguously differentiated from other light bulbs installed in the cross-check households.

#### *Operation of the Data Management System (DMS)*

The coordinating entity continues to operate and manage the DMS.

### 3. Events during the Monitoring Period

There were no events or situations in the first Monitoring Period that impact the applicability of the methodology.

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

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There has been revision of the monitoring plan. The request for revision of the monitoring plan of programme of activities “CUIDEMOS Mexico (Campana De Uso Inteligente De Energia Mexico) - Smart Use of Energy Mexico” (2535) was approved on 15 June 2012.

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

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The request for deviation was applied to this monitoring period. The request for deviation, I-DEV-POA-0476 entitled "Request for deviation from the precision level of 90/10 during the monitoring period from 01/12/2009 to 31/08/2012 for PoA applicable for CPA-2535-0001 only, CDM Reference No. 2535; CPA-2535-0001" was approved on 24 July 2012.

#### **B.4. Notification or request of approval of changes**

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

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

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The monitoring system for CPA1 involves the collection and management of data (known as the Data Management System (DMS)) that is categorised into the three following areas:

1. The customer and exchange database  
(collected once at implementation during the bulb exchange from the 31 October to 30 November 2009);
2. The Project Sample Group (PSG) Monitoring Data  
(collected continuously over the 10 year project period); and
3. The Project Cross Check Group (PCCG) Household Surveys  
(collected once each monitoring period)

The monitoring system including the DMS is managed by Cool nrg personnel both in-country (Mexico) and in Australia.

#### **1. Customer and exchange database**

The customer and exchange database contains:

<sup>4</sup> *Global Scan surveyed households final report Nov 10.doc* provided to DOE

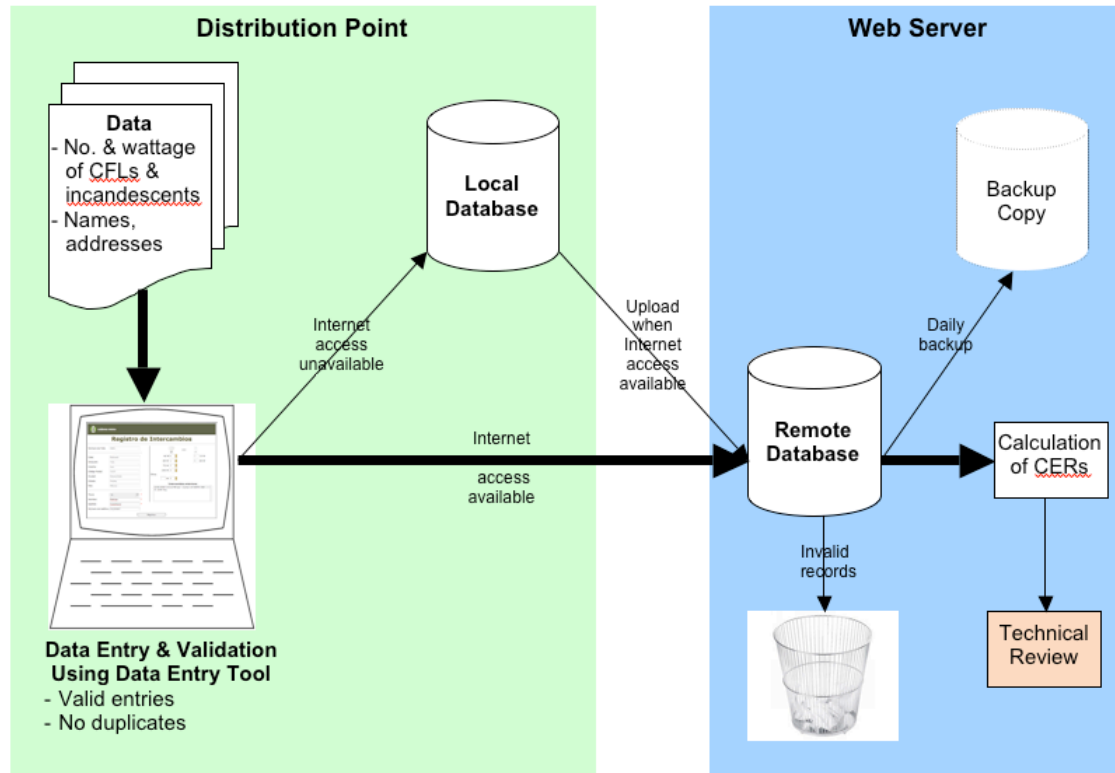
<sup>5</sup> *Global Scan surveyed households final report Nov 10.doc* provided to DOE

- A list of households participating in the project, including information to identify households by name and address.
- A record of the incandescent bulbs collected (number and power) surrendered by, and replacement CFLs (number and power) provided to, each participating household.

This information was entered into the customer and exchange database at the time of bulb exchange.

#### Customer Database Process Flow

A diagram showing the process of data collection and storage for the Customer Database gathered during the bulb exchange is given below.



#### Quality Assurance

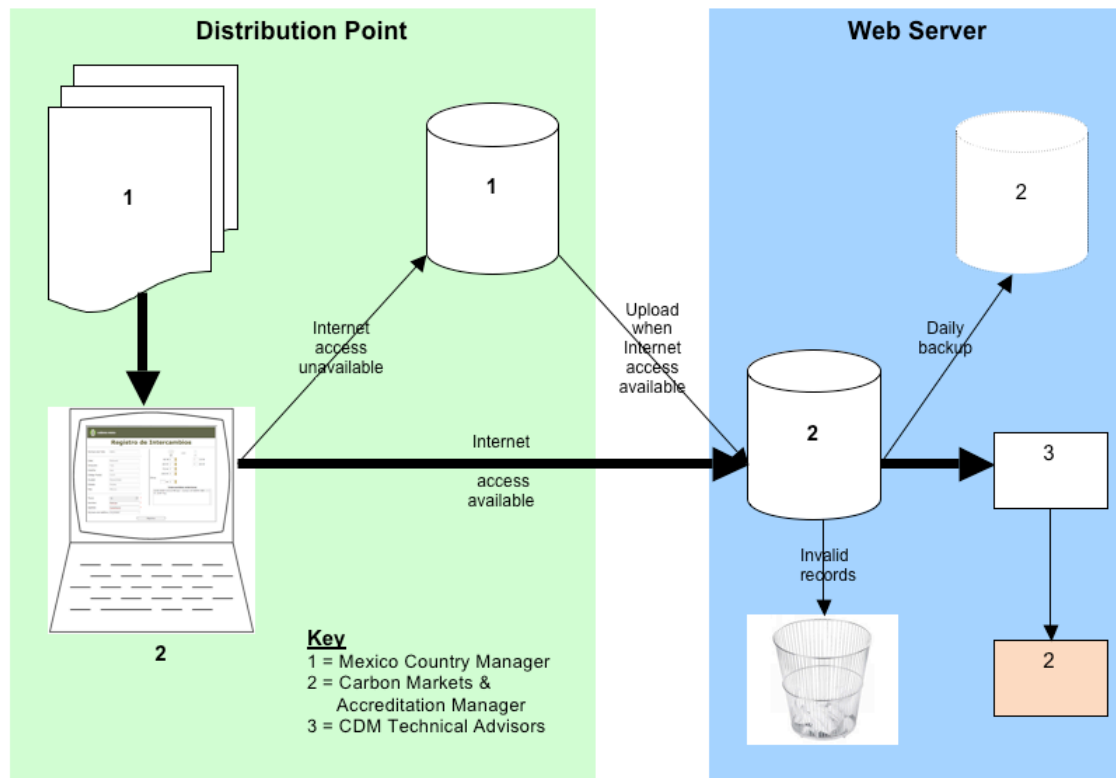
The central database is owned by database hosting company Impact Data and located in Melbourne, Australia. Impact Data also maintain a backup copy in a separate location to the main database.

In order to ensure complete data security, Cool nrg also stores a copy of the database in both its Mexico and Melbourne offices.

Once the exchange program in November 2009 was complete, the creator and host of the DMS, Impact Data, undertook an analysis and audit of the final database to highlight any duplicate records and other data problems; their findings are contained in a report<sup>6</sup>. Further, the final value for the corresponding number of CFLs and incandescent bulbs exchanged is more conservative than in this report and excludes test records, duplicates, exchanges without unique electricity bill number or address and any exchanges that could be considered to be above the limit of 4 per customer. This ensures each record is unique and prevents any double counting.

<sup>6</sup> *ExchangeDMSReport.docx* provided to DOE

The overall responsibilities for each stage of the Customer Database process flow are shown on the following page.



## 2. Monitoring the Project Sample Group (PSG)

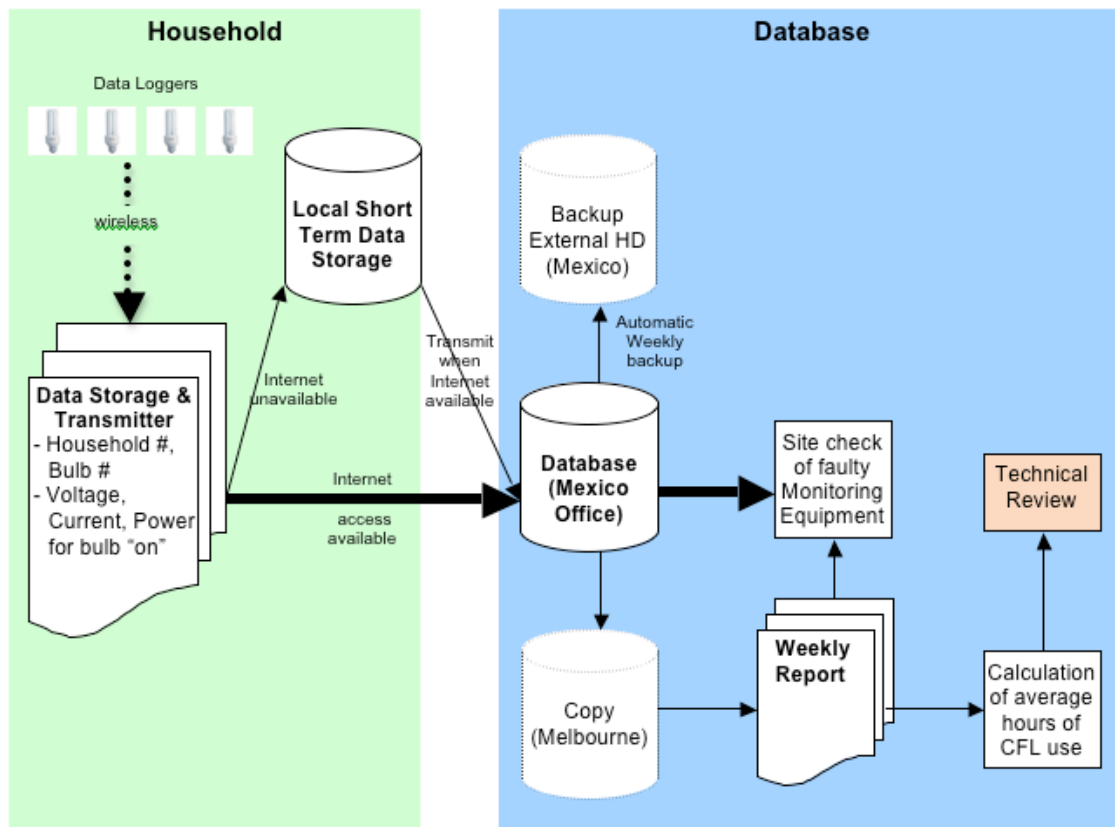
In accordance with the PDD, a sample of 240 CFLs are monitored to determine the average hours of utilisation and total energy consumption by installing metering equipment in households. This is the Project Sample Group (PSG). The annual operating hours of monitored devices is used to determine the project and baseline energy consumption for each monitoring period.

The PSG has been implemented by installing monitoring equipment in 60 households (4 bulbs per house) in the Puebla area. This equipment consists of a data logger for each bulb and a transmitter for each house. The equipment monitors the actual number of hours per day each bulb is being used. The usage data is transmitted and stored in a central database.

### PSG Monitoring Data Process Flow

A diagram showing the process of data collection and storage for the PSG Monitoring Data is given on the following page.



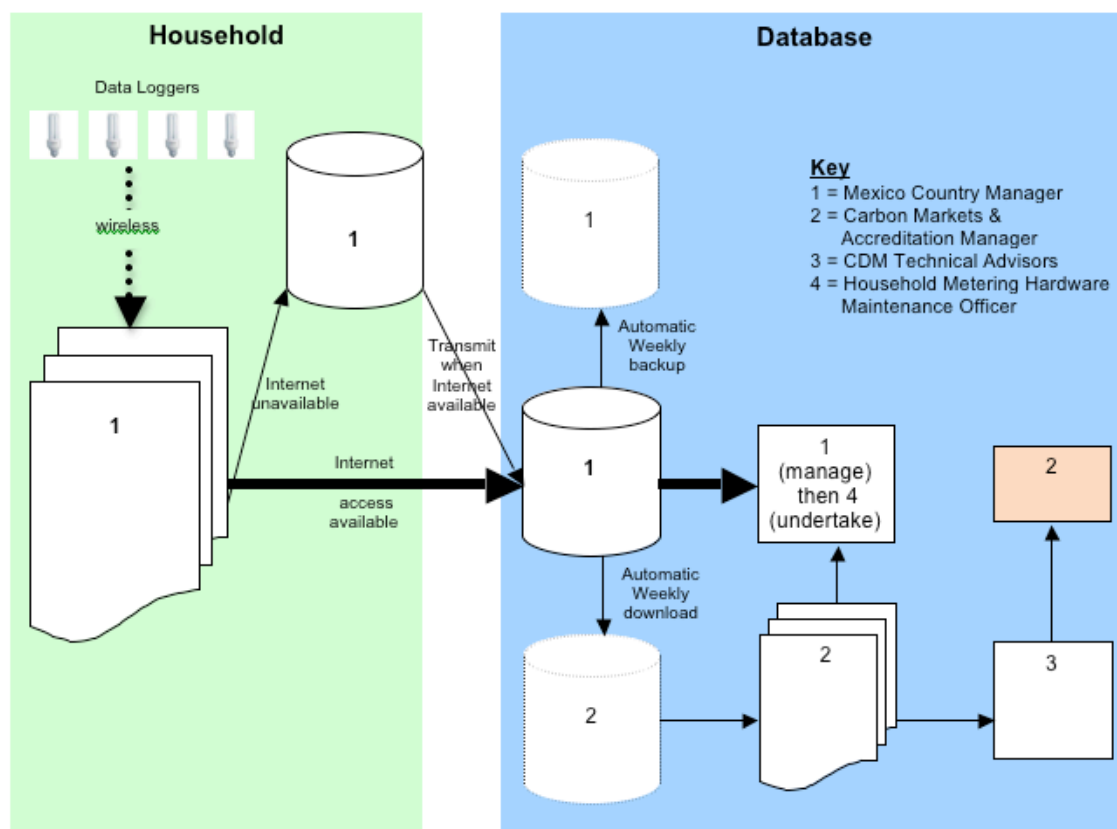


### Quality Assurance

A diagram showing the overall responsibilities for each stage of the PSG Monitoring Data process flow is given on the following page. Note that there are two copies of the entire database held – one in Mexico and one in Melbourne – and that separate team members are responsible for the maintenance of these copies to ensure redundancy in the unlikely case that the main database is lost and needs to be restored from a backup.

The periodic reports contain information to both trend the data collected and highlight any problems with the function of monitoring equipment or transmission of data. Whilst the reports are discussed in the weekly Data Management team meeting, the resolution of issues highlighted in the report is the responsibility of the Mexico Country Manager.

The Mexico Country Manager, in conjunction with the Monitoring Data Software Analyst, is also responsible for regularly interrogating the main database itself to identify problems with monitoring data collection or transmission. Should a site visit be necessary to check and / or repair monitoring equipment, this is undertaken by the Household Metering Hardware Maintenance Officer.



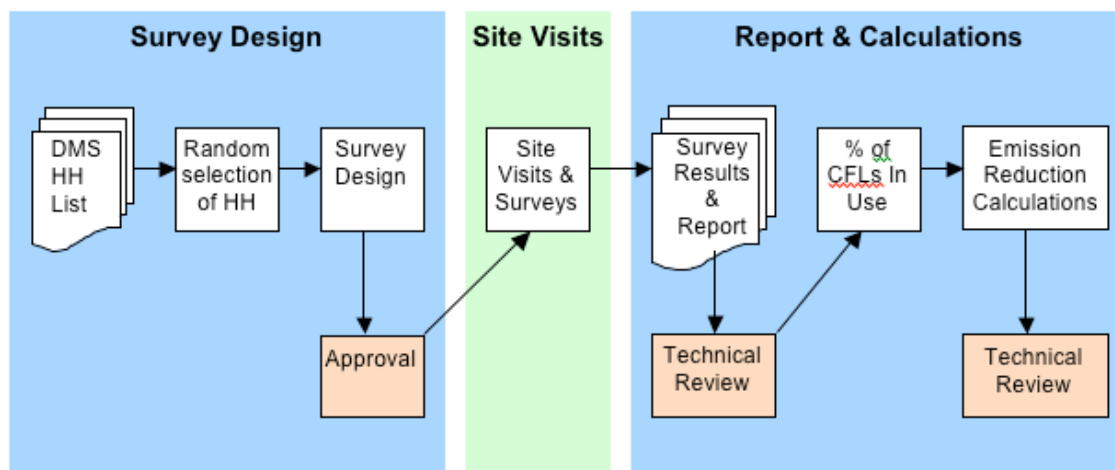
### 3. Project Cross Check Group (PCCG) Household Surveys

In accordance with the PDD, a sample of at least 240 CFLs installed in participating households is surveyed by an independent research firm every monitoring period to ensure continuing operation. The households surveyed for the PCCG will be randomly selected from the database of participating households. The result of this sampling will determine the proportion of the total number of devices still operating at the end of each monitoring period ( $n_k$ ) which will be applied to the calculation of emissions reductions for that period. CFLs distributed under the PoA were marked with a logo to ensure that they can be unambiguously differentiated from other light bulbs installed in the cross-check households. For the first monitoring period, the report was completed by Global Scan, an independent global market research firm, in November 2010<sup>7</sup>.

#### PCCG Household Surveys Process Flow

A diagram showing the process of data collection and storage for the Household Surveys (PCCG) is given on the following page.

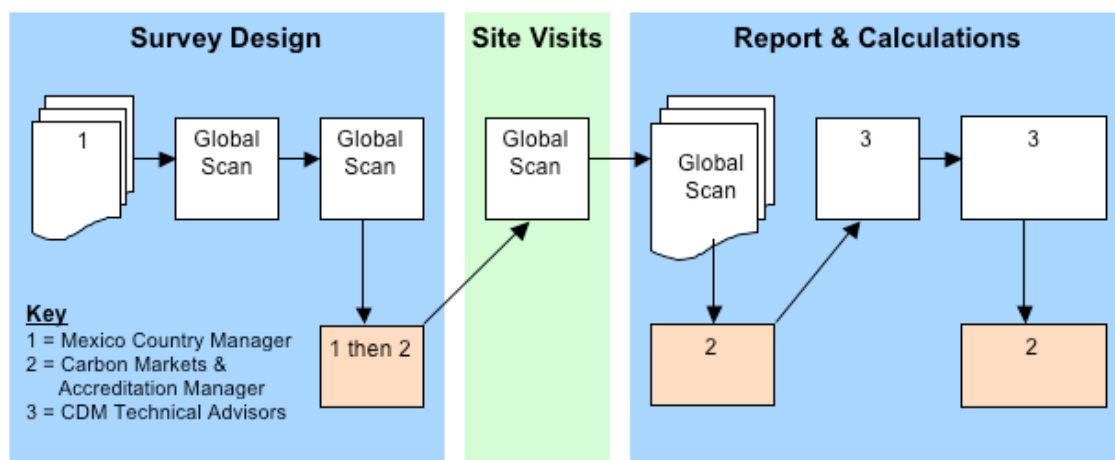
<sup>7</sup> Global Scan surveyed households final report Nov 10.doc provided to DOE



### Quality Assurance

The overall responsibilities for each stage of the PCCG Household Survey process flow are shown in the diagram below. The boxes shown in orange highlight the key quality assurance stages of the process.

The PCCG Household Surveys and report will be completed by an independent research firm every monitoring period. For the first monitoring period, the report was completed by Global Scan, an independent global market research firm, in November 2010<sup>8</sup>.



<sup>8</sup> Global Scan surveyed households final report Nov 10.doc provided to DOE

## Management and Responsibilities

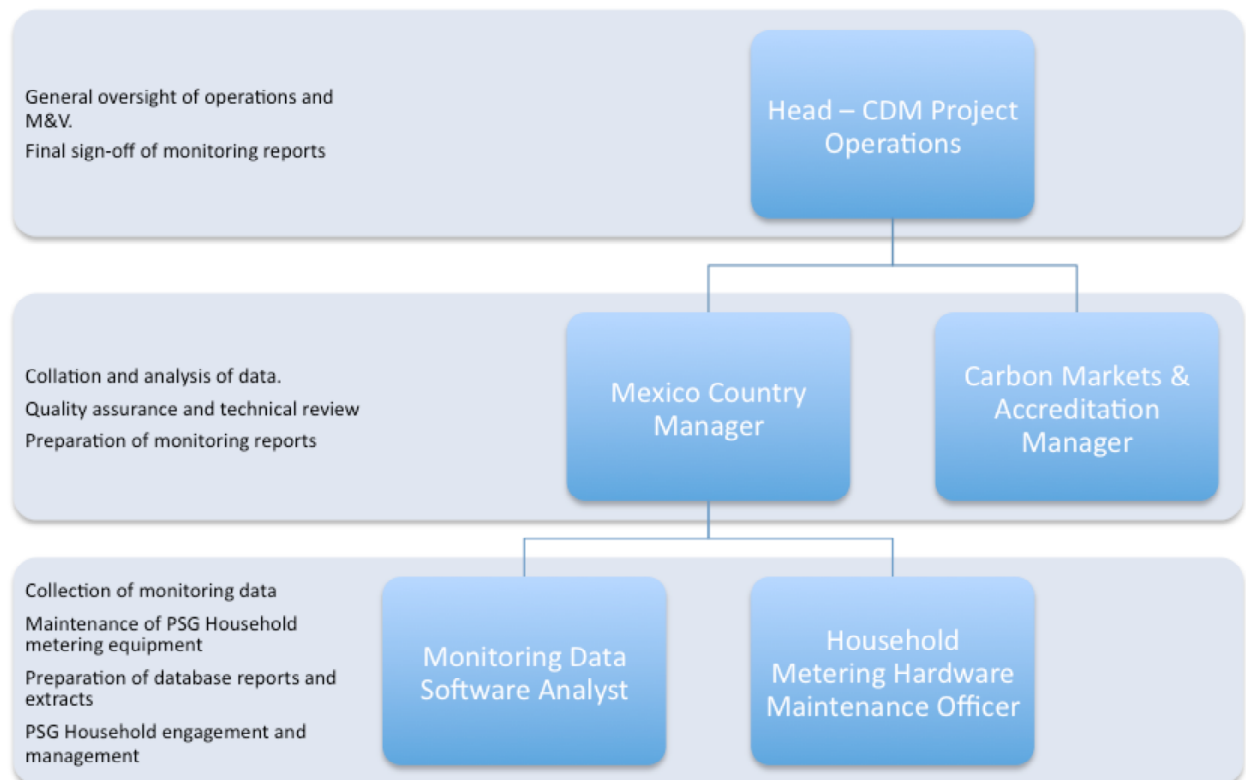
The Data Management System is managed by the project proponent both in-country (Mexico) and in Australia, with the assistance and input of a number of external organisations in both countries.

The roles and responsibilities of key Project Proponent personnel and External Experts are shown in the diagrams below and on the following page. These roles are split between local resources in Mexico and central management in Australia.

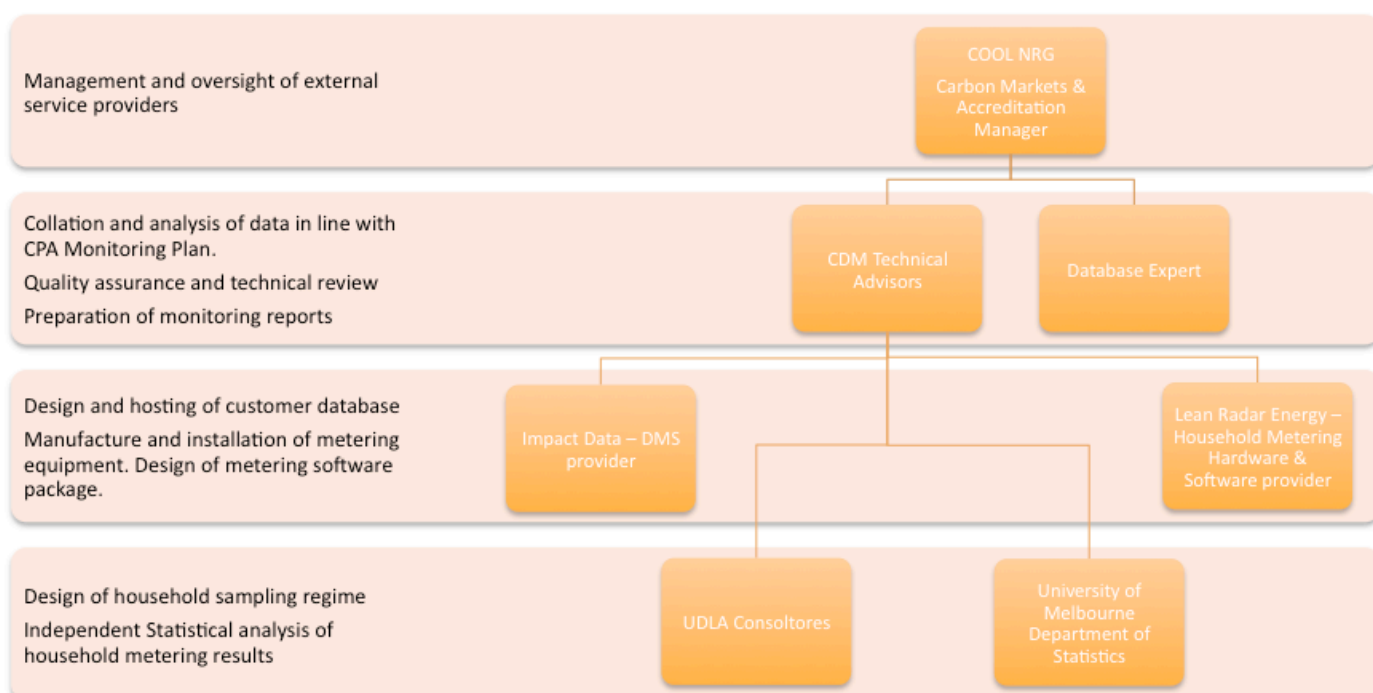
The key in-country teams meet on a weekly basis to discuss data management issues:

- **Data Management:** Head – CDM Project Operations, Carbon Markets & Accreditation Manager, Mexico Country Manager and CDM Technical Advisors
- **Monitoring:** Mexico Country Manager, Monitoring Data Software Analyst, Household Metering Hardware Maintenance Officer

### Project Proponent Roles & Responsibilities



## External Expert Roles & Responsibilities



### Risk Management, Data Integrity & Security

A document containing a list of the key risks to data integrity and security for all data types, along with measures to mitigate these risks and their status of implementation, has been provided to the DOE<sup>9</sup>.

## SECTION D. Data and parameters

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

*(Copy this table for each data and parameter. To report multiple values, a table may be used)*

Data / Parameter:	$L_k$
Data unit:	-
Description:	Number of project activity devices distributed by the CPA coordinator
Source of data used:	Data Management System (DMS) and Impact Data report
Value(s) :	954,706
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project
Additional comment:	Actual number of devices distributed and recorded in the DMS for the SSC-CPA. Once the exchange program in November 2009 was complete, the creator and host of the DMS, Impact Data, undertook an analysis and audit of the final database; their findings are contained in a report. The final value for $L_k$ is more conservative than in this report excluding test records, duplicates, exchanges without unique electricity bill number or address and any exchanges that could be considered to

<sup>9</sup> CUIDEMOS Mexico CPA 1 Data Management + Quality Assurance Procedures.doc provided to DOE

	be above the limit of 4 per customer. This process ensures each record is unique and prevents any double counting.
<b>Data / Parameter:</b>	<b>n<sub>PSG</sub></b>
Data unit:	-
Description:	Total sample size used for monitoring utilisation hours/electricity consumption of CFLs.
Source of data used:	Determined by project participants
Value(s) :	240
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project
Additional comment:	
<b>Data / Parameter:</b>	<b>n<sub>PCCG</sub></b>
Data unit:	-
Description:	Total sample size of CFLs used for checking to ensure ongoing operation of project devices.
Source of data used:	Determined by project participants
Value(s) :	240
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project
Additional comment:	<p>International independent market research firm Global Scan undertook the PCCG Household Survey in November 2010 in such a way that, in accordance with the PDD, sufficient households were randomly selected from the database of participating households to ensure that <i>at least</i> 240 project CFLs would be checked during the survey.</p> <p>However, the number of project CFLs to be found continuously operating in each household could not be known in advance of the survey, and once the individual household surveys had been collated, it became apparent that many more CFLs were checked (504 CFLs) than required for the PCCG (240 CFLs).</p> <p>As the increased sample of size of 504 CFLs was <i>greater</i> than the 240 CFLs required, it was determined that the minimum requirement specified in the PDD had been met. In addition, it was feared that the process of reducing the sample size by selectively choosing the survey results of 240 CFLs from the 504 CFLs surveyed may have proven problematic and resulted in a less accurate, or in some way biased, outcome.</p> <p>As the households surveyed were still randomly selected from the database of participating households, and therefore only difference in approach in the survey undertaken compared with that specified in the PDD was the increased number of CFLs checked, the only potential effect was expected to be an increase in the accuracy of the survey result.</p> <p>Therefore, it was not deemed necessary to reduce the sample size from the 504 CFLs obtained to the minimum of 240 required.</p>
<b>Data / Parameter:</b>	<b>EF</b>

Data unit:	kgCO <sub>2</sub> /kWh
Description:	Emissions factor for electricity displaced from the grid relevant to the project boundary.
Source of data used:	Official government data – SENER “Prospectiva del sector electrico 2005-2014”, “Prospectiva del sector electrico 2006-2015”, “Prospectiva del sector electrico 2007-2016”
Value(s) :	0.514
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and Project
Additional comment:	Validated by the DOE for registration using the “Tool to calculate the emission factor for an electricity system” version 1 (EB Report 35, Annex 12).

<b>D.2. Data and parameters monitored</b>	
<i>(Copy this table for each data and parameter. To report multiple values, a table may be used)</i>	
<b>Data / Parameter:</b>	<b>n<sub>k</sub></b>
Data unit:	-
Description:	Number of operational CFLs
Measured /Calculated /Default:	Calculated
Source of data:	Record keeping during CFL exchange process in the DMS, and the PCCG Household Survey.
Value(s) of monitored parameter:	933,869
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	Once per monitoring period
Calculation method (if applicable):	The initial value of L <sub>k</sub> was determined through record keeping during the exchange of CFLs for incandescent lamps and has been adjusted according to the proportion of devices found still to be operating during the survey of Project Cross Check Group (PCCG) Households. The household survey therefore provides the value to be used for n <sub>k</sub> .
QA/QC procedures applied:	<p>At the time of the exchange with each household, a record was kept of the number and power of CFLs provided to them. This information is stored in the project Data Management System (DMS). Each employee involved in the distribution of CFLs was trained in the use of the DMS to ensure accurate record keeping.</p> <p>The DMS used industry standard software, databases, infrastructure and back-up procedures to allow full auditability with the aim of ensuring long-term data integrity and security so that data is not misrecorded, overwritten or lost. Data entry occurred at the point of CFL distribution to householders, with the full database stored at a central location. Data was verified in a timely manner at point of data entry to ensure valid and non-duplicate names and addresses, and a</p>

	<p>valid and accurate number and wattage of both incandescent bulbs replaced, as well as number and wattage of CFLs distributed, for each household.</p> <p>The PCCG Household Survey was designed and implemented by international independent market research firm Global Scan's qualified personnel.</p> <p>All data will be stored in the project DMS for at least two years after the crediting period or the last issuance of CERs, for this programme, whichever occurs later.</p>
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<b>Data / Parameter:</b>	<b><math>n_i</math></b>
Data unit:	-
Description:	Number of incandescent bulbs operational in baseline scenario
Measured /Calculated /Default:	Calculated
Source of data:	Record keeping during incandescent exchange process in the DMS, and the PCCG Household Survey.
Value(s) of monitored parameter:	933,869
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	Once per monitoring period
Calculation method (if applicable):	<p>The coordinating entity kept records of each household participating in the project activity, including the number of incandescent bulbs collected and subsequently destroyed. This initial value of <math>n_i</math>, determined immediately after the collection of ILBs has been completed, provides the starting point for quantification of the baseline scenario.</p> <p>For the purposes of calculating emission reductions, the coordinating entity has applied the same value for <math>n_i</math> as for <math>n_k</math>, ensuring equivalent comparison of energy usage of project CFLs and baseline ILBs. This value has been obtained from the PCCG Household Survey.</p>
QA/QC procedures applied:	<p>At the time of the exchange with each household, a record was kept of the number of incandescent bulbs replaced. This information is stored in the project Data Management System (DMS). Each employee involved in the project was trained in the use of the DMS to ensure accurate record keeping.</p> <p>The DMS uses industry standard software, databases, infrastructure and back-up procedures to allow full auditability with the aim of ensuring long-term data integrity and security so that data is not misrecorded, overwritten or lost. Data entry occurs at point of incandescent exchange with householders, with the full database stored at a central location. Data was verified in a timely manner at point of data entry to ensure valid and non-duplicate names and addresses, and</p>



	<p>a valid and accurate number and wattage of both incandescent bulbs replaced, as well as number and wattage of CFLs distributed, for each household.</p> <p>The PCCG Household Survey was designed and implemented by international independent market research firm Global Scan's qualified personnel.</p> <p>All data will be stored in the project DMS for at least two years after the crediting period or the last issuance of CERs, for this programme, whichever occurs later.</p> <p>As per the requirements of AMS.II.C., the coordinating entity commissioned Enviro Sense SA de CV (independent environmental auditor) to verify the collection and subsequent destruction of the incandescent bulbs during the distribution period between 31<sup>st</sup> October and 30<sup>th</sup> November 2009. This involved an independent verification of the total number of incandescent bulbs collected. A copy of the Enviro Sense audit report is provided as an attachment to the monitoring report<sup>10</sup>. This report provides independent assurance that there has been no leakage associated with the implementation of the project activity.</p>
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<b>Data / Parameter:</b>	<b>p<sub>i</sub></b>
Data unit:	Watts
Description:	The weighted average power of the incandescent bulbs "i" replaced during the exchange process.
Measured /Calculated /Default:	Calculated
Source of data:	Nameplate data stored in the Data Management System.
Value(s) of monitored parameter:	74.39 Watts for incandescent bulbs
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	Once
Calculation method (if applicable):	The coordinating entity kept records of each household participating in the project activity, including the wattage of incandescent bulbs collected and subsequently destroyed.
QA/QC procedures applied:	<p>At the time of the exchange with each household, a record was kept of the power of incandescent bulbs replaced. This information was stored in the project Data Management System (DMS). Each employee involved in the project was trained in the use of the DMS to ensure accurate record keeping.</p> <p>In order to reduce operator error, the DMS interface was designed to minimise the amount of free text entry required to enter data. Drop down menus were provided for common ILB wattages, with their CFL</p>

<sup>10</sup> EnviroSense report Puebla\_FINAL.pdf provided to DOE

	<p>equivalents then selected automatically. In addition, no incentives were provided for data entry personnel to prioritise any particular bulb wattages, and no wattage was any easier to select than any other, thereby minimising the risk of any systematic errors or bias in the recording of data.</p> <p>The DMS uses industry standard software, databases, infrastructure and back-up procedures to allow full auditability with the aim of ensuring long-term data integrity and security so that data is not misrecorded, overwritten or lost. Data entry occurs at point of incandescent exchange with householders, with the full database stored at a central location. Data is verified in a timely manner at point of data entry to ensure a valid and accurate number and wattage of incandescent bulbs replaced.</p> <p>All data will be stored in the project DMS for at least two years after the crediting period or the last issuance of CERs, for this programme, whichever occurs later.</p>
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<b>Data / Parameter:</b>	<b><math>p_k</math></b>
Data unit:	Watts
Description:	The weighted average power of the CFLs “k” operating during the monitoring period, as stored in the Data Management System.
Measured /Calculated /Default:	Calculated
Source of data:	Project Data Management System
Value(s) of monitored parameter:	17.01 Watts for CFLs
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	Once
Calculation method (if applicable):	The coordinating entity kept records of each household participating in the project activity, including the wattage of CFLs distributed.
QA/QC procedures applied:	<p>At the time of the exchange with each household, a record was kept of the power rating of CFLs distributed. This information was stored in the project data management system (DMS). Each employee involved in the project was trained in the use of the DMS to ensure accurate record keeping.</p> <p>In order to reduce operator error, the DMS interface was designed to minimise the amount of free text entry required to enter data. Drop down menus were provided for common ILB wattages, with their CFL equivalents then selected automatically. In addition, no incentives were provided for data entry personnel to prioritise any particular bulb wattages, and no wattage was any easier to select than any other, thereby minimising the risk of any systematic errors or bias in the recording of data.</p>

	<p>In order to cross-check data collected on the volume of different CFL wattages distributed, data recorded in the DMS was compared to the wattage ratio of CFLs ordered from the supplier. In conducting this simple cross-check, the CPA implementer confirmed that the data recorded in the DMS matched the CFLs ordered from the supplier.</p> <p>The DMS uses industry standard software, databases, infrastructure and back-up procedures to allow full auditability with the aim of ensuring long-term data integrity and security so that data is not misrecorded, overwritten or lost. Data entry occurs at point of incandescent exchange with householders, with the full database stored at a central location. Data is verified in a timely manner at point of data entry to ensure a valid and accurate number and wattage of CFLs distributed for each household is recorded.</p> <p>All data will be stored in the project DMS for at least two years after the crediting period or the last issuance of CERs, for this programme, whichever occurs later.</p>
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<b>Data / Parameter:</b>	<b><math>O_k</math></b>
Data unit:	Hours
Description:	The average annual operating hours of CFLs “k” distributed during the monitoring period as calculated by the monitoring devices installed in the PSG. AMS IIC v9 provides the option to monitor either hours of use and power rating of the CFLs, or meter total energy consumption of light bulbs. The project proponents have chosen to measure hours of use along with recording the power rating of CFLs distributed. This choice complies with the methodology, capturing all parameters required to be monitored.
Measured /Calculated /Default:	Calculated
Source of data:	Data collected from light bulb meters installed in the project sample group (PSG) Households.
Value(s) of monitored parameter:	1.914 hours
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and Project
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>The project proponents will ensure that every household meter receives a routine re-calibration and maintenance check at least every three years.</p> <p>The household meter equipment was installed in the monitored houses during the period September to November 2009 and was completed on November 7th 2009. Use of the equipment for monitoring commenced on December 1<sup>st</sup> 2009.</p> <p>A re-calibration and maintenance check must be completed prior to November 6<sup>th</sup> 2012.</p> <p>In addition, ongoing calibration of equipment monitoring lighting use occurs by two means:</p> <ol style="list-style-type: none"> <li>1. Frequent reports (weekly at a minimum) based on the PSG metered data readily identify if a metering device has stopped reporting, or is functioning irregularly. Under the data</li> </ol>

	<p>management and quality control procedures<sup>11</sup>, if a meter is not providing data, a technician is sent to the household and repairs or maintenance undertaken. In this way, quality checking of the meters is undertaken regularly, with follow-up maintenance and calibration undertaken accordingly.</p> <p>2. To determine the length of time light bulbs are on, an accurate clock is required. The project proponent cross-checks the date and times of data used in the compilation of each weekly report to verify that timing aligns.</p>
Measuring/ Reading/ Recording frequency:	Usage data is logged every 90 seconds when the bulb is on
Calculation method (if applicable):	<p>In the first monitoring period (1/12/09 to 30/11/2010), the mean operating hours of CFLs was originally calculated as 3.234 hours. Subsequently and in order to address the issue of the completeness of data raised in the request for review dated 20th September 2011, a more conservative approach was taken that resulted in a mean operating hours calculated as 2.134 hours. However, the precision of the average operating hours of the CFLs did not meet the 90/10 confidence/ precision criteria as the precision was above 10% (i.e 10.33%).</p> <p>The CME had requested deviation proposing to use the lower value of the interval (instead of mean value of operating hours) for the first monitoring period.</p> <p>The request for deviation, I-DEV-POA-0476 entitled "Request for deviation from the precision level of 90/10 during the monitoring period from 01/12/2009 to 31/08/2012 for PoA applicable for CPA-2535-0001 only, CDM Reference No. 2535; CPA-2535-0001" was approved by the board on 24 July 2012.</p> <p>In line with the board's decision on deviation, the CME has applied 1.914 hours as <math>o_k</math> which was calculated as below:</p> <p>For a mean of 2.134 hours with precision of +/- 10.33%, the lower value of interval is calculated as 1.914 hours.</p>
QA/QC procedures applied:	<p>The metering equipment is web-enabled, allowing real-time collation of data. If irregularities are recorded with equipment or data, this is registered immediately and corrective actions implemented to repair or re-calibrate metering equipment.</p> <p>If the internet connection fails during monitoring, data can be stored in the loggers until the internet connection is restored and data is uploaded. Alternatively, data can be retrieved manually from meters.</p> <p>All data will be stored in the project DMS for at least two years after the crediting period or the last issuance of CERs for the Project, whichever occurs later.</p>

<sup>11</sup> CUIDEMOS Mexico CPA 1 Data Management + Quality Assurance Procedures.doc provided to DOE

<b>Data / Parameter:</b>	<b>CFL collection and recycling scheme</b>
Data unit:	N/A
Description:	The coordinating entity will work with government and non-government stakeholders to assist in the establishment of a national CFL collection and recycling scheme.
Measured /Calculated /Default:	N/A
Source of data:	Report from the coordinating entity <sup>12</sup> . An update as to the status of a CFL collection and recycling program is provided as an attachment to this monitoring report.
Value(s) of monitored parameter:	N/A
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	N/A
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	N/A
Calculation method (if applicable):	N/A
QA/QC procedures applied:	N/A

## SECTION E. Emission reductions calculation

### E.1. Baseline emissions calculation

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Because the energy displaced is electricity, the emission baseline is determined as the product of the baseline energy consumption of equipment/appliances and the emission factor for the electricity displaced:

$$BE_y = E_{BL,y} * EF_{CO2, ELEC,y} \quad (1)$$

$$E_{BL,y} = \sum_i (n_i \cdot p_i \cdot o_i) \quad (2)$$

Where:

$BE_y$	Baseline emissions in monitoring period $y$ (tCO <sub>2</sub> e)
$E_{BL,y}$	Energy consumption in the baseline in monitoring period $y$ (kWh)
$EF_{CO2,ELEC,y}$	Emission factor in monitoring period $y$ calculated in accordance with the provisions in AMS I.D (tCO <sub>2</sub> e /MWh)
$\sum_i$	the sum over the group of “i” devices (e.g. 40W incandescent bulb, 5hp motor) replaced, for which the substituted energy efficient equipment operating during the monitoring period, implemented as part of the project.

<sup>12</sup> CFL collection and recycling report Nov10.doc provided to DOE

$n_i$	the number of devices of the group of “i” devices (e.g. 40W incandescent bulb, 5hp motor) replaced for which the substituted energy efficient equipment is operating during the monitoring period.
$p_i$	the power of the devices of the group of “i” devices (e.g. 40W incandescent bulb, 5hp motor) replaced. In the case of a retrofit activity, “power” is the weighted average of the devices replaced.
$o_i$	the average annual operating hours of the devices of the group of “i” devices replaced.

$n_i = 933,869$  incandescent bulbs replaced

$p_i = 74.39$  Watts.

$o_i = 1.914$  hours

**Therefore:**

$$\begin{aligned} E_{BL,y} &= (933,869 * 74.39 * 1.914 * 365)/1000 \\ &= 48,530,096 \text{ kWh} \end{aligned}$$

$$\begin{aligned} BE_y &= (48,530,096 * 0.514)/1000 \\ &= 24,944 \text{ tCO}_2\text{e} \end{aligned}$$

## **E.2. Project emissions calculation**

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Project emissions consist of electricity and/or fossil fuel used in the project equipment, determined as follows:

$$PE_y = E_{PJ,y} * EF_{CO2,y} \quad (3)$$

Where:

$PE_y$	Project emissions in monitoring period $y$ (tCO <sub>2</sub> e)
$E_{PJ,y}$	Energy consumption in project activity in monitoring period $y$ . This shall be determined <i>ex post</i> based on monitored values
$EF_{CO2,y}$	Emission factor for electricity or thermal energy displaced. The emissions associated with grid electricity consumption should be calculated in accordance with the procedures of AMS I.D.

Project energy consumption in case of project activities that displace grid electricity is determined as follows using the data of the project equipment:

$$E_{PJ,y} = \sum_k (n_k * p_k * o_k) \quad (4)$$

Where:

$\sum_k$	the sum over the group of “k” replacement devices operating during the year, implemented as part of the project.
$n_k$	the number of devices of the group of “k” replacement devices operating during the year.
$p_k$	the power of the devices of the group of “k” devices distributed to households.
$o_k$	the average annual operating hours of the devices of the group of “k” devices distributed to households.

$n_k = 933,869$  CFLs bulbs distributed

$p_k = 17.01$  Watts.

$$o_k = 1.914 \text{ hours}$$

Therefore:

$$\begin{aligned} E_{PJ,y} &= (933,869 * 17.01 * 1.914 * 365) / 1000 \\ &= 11,096,142 \text{ kWh} \end{aligned}$$

$$\begin{aligned} PE_y &= (11,096,142 * 0.514) / 1000 \\ &= 5,703 \text{ tCO}_2\text{e} \end{aligned}$$

### E.3. Leakage calculation

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Leakage is zero as all incandescent bulbs received in exchange for CFLs were destroyed. This was verified by local, independent environmental audit firm Enviro Sense S.A. de C.V.<sup>13</sup>.

$$LE_y = 0$$

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

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Total baseline emissions: 24,944

Total project emissions: 5,703

Total leakage: 0

Total emission reductions: 19,241

$$ER_y = (BE_y - PE_y) - LE_y \quad (5)$$

Where:

**ER<sub>y</sub>** Emission reductions in year y (tCO<sub>2</sub>e)  
**BE<sub>y</sub>** Baseline emissions in monitoring period y (tCO<sub>2</sub>e)  
**PE<sub>y</sub>** Total Project Emission in year y (tCO<sub>2</sub>e)  
**LE<sub>y</sub>** Leakage emissions in year y (tCO<sub>2</sub>e)

$$\begin{aligned} ER_y &= 24,944 - 5,703 - 0 \\ &= 19,241 \text{ tCO}_2\text{e} \end{aligned}$$

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

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Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO <sub>2</sub> e)	27,665	19,241

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

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Variable	Ex-ante Estimation	Ex-post Monitoring	Difference
ILB Wattage	66.66	74.39	11.6%

<sup>13</sup> EnviroSense report Puebla\_FINAL doc provided to DOE

Hours of use	3	1.914	-36.2%
CFLs Distributed	1,000,000	954,706	-4.5%
Proportion of Distributed CFLs Operating	99%	97.82%	-1.2%
Total Emission Reductions	27,665	19,241	-30.5

The aforementioned calculation (ex-ante calculation of the registered CDM-PDD and actual values reached during the monitoring period) suggests that there is **no increase** in the actual emission reductions achieved during the current monitoring period. However, the CME has described the reasons for difference in ex-ante estimation Vs ex-post monitoring variables below.

Variables:

**Incandescent bulb wattages:** for the purpose of calculations presented in the CPA-DD, the project proponents used a random number generation model of household lighting wattages to estimate that the ILB wattages that would be exchanged would be spread relatively evenly between 40, 60, 75 and 100W ILBs as follows:

Incandescent Wattage	Frequency
40	29%
60	25%
75	23.8%
100	22.2%

In reality, households behaved more “rationally” than this, exchanging a higher proportion of 60W and 100W ILBs (and fewer 40W and 75W bulbs), thereby maximising the energy and dollar savings they achieved through the exchange process. This has resulted in a higher than predicted ILB average power rating for the CPA, thereby increasing the power difference and energy savings achieved through the CFL-ILB exchange.

Ex-ante estimation: 66.66 Watts

Ex-post calculation: 74.39 Watts

**Daily hours of use:** The Ilumex project in Mexico undertook household surveys which estimated the average daily hours of lighting use in Mexico to be between 2.89<sup>14</sup> to 3.2 hours<sup>15</sup>. Based on this range, the project proponents used a conservative average of 3 hours per day for the CPA-DD calculations. However, actual data is lower than the ex-ante estimation. The reasons are described below:

In the first monitoring period (1/12/09 to 30/11/2010), the mean operating hours of CFLs was originally calculated as 3.234 hours. Subsequently and in order to address the issue of the completeness of data raised in the request for review dated 20th September 2011, a more conservative approach was taken that resulted in a mean operating hours calculated as 2.134 hours. However, the precision of the average operating hours of the CFLs did not meet the 90/10 confidence/ precision criteria as the precision was above 10% (i.e 10.33%).

The CME had requested deviation proposing to use the lower value of the interval (instead of mean value of operating hours) for the first monitoring period.

<sup>14</sup> page 53, *GEF World Bank\_2006 Report.pdf* provided to DOE

<sup>15</sup> page 6, *GEF\_World Bank\_Annex\_4 hours use.doc* provided to DOE



The request for deviation, I-DEV-POA-0476 entitled "Request for deviation from the precision level of 90/10 during the monitoring period from 01/12/2009 to 31/08/2012 for PoA applicable for CPA-2535-0001 only, CDM Reference No. 2535; CPA-2535-0001" was approved by the board on 24 July 2012.

In line with the board's decision on deviation, the CME has applied 1.914 hours as  $\sigma_k$  which was calculated as below:

For a mean of 2.134 hours with precision of +/- 10.33%, the lower value of interval is calculated as 1.914 hours.

Ex-ante estimation: 3 hours/day

Ex-post calculation: 1.914 hours/day

**Total number of bulbs distributed:** the CPA-DD states that the project will aim to distribute up to 1 million CFLs to households. The final number of eligible CFLs distributed during the campaign was 954,706. This lower number of bulbs will reduce the emission reductions generated by the CPA.

Ex-ante estimation: 1,000,000 CFLs

Ex-post calculation: 954,706 CFLs

**Proportion of operational bulbs:** in the CPA-DD, the project proponent estimated that 99% of CFLs would be operational in year one of the crediting period. The first PCCG has shown that the number of operational bulbs is 97.82%.

Ex-ante estimation: 99%

Ex-post calculation: 97.82%

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#### History of the document

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