JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM FOR SMALL-SCALE PROJECTS
Version 01.1 - in effect as of: 27 October 2006

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SECTION A. General description of the small-scale project

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

Implementation of energy-efficient lighting system in the Donetsk Region with the use of Kyoto Protocol mechanism: replacement of incandescent lamps with energy-efficient ones at budget financed and social entities in the Yenakiive town (under Track 2)

Sectoral scope 3: Energy demand

Version 01
15/03/2011

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

This project, is proposing the replacement of traditional incandescent lamps (ICL) by the modern compact fluorescent lamp (CFL) or light-emitting diode (LED) lamps at public sector institutions in the town of Yenakiive. The CFL is an energy-saving bulb, which in comparison with ICL consumes about four-five times less electricity to provide equivalent illumination. The service life of a CFL ranges from 6,000 to 15,000 hours, which is 6-16 times longer than an average life of an ICL. CFLs are fully compatible with standard fixtures used for the ICLs and are characterized by a soft white/yellowish glow. Normally, CFL capacity ranges from 25 to 150 W.

A.3. Project participants:

Table A.1. Project participants

Party involved	Legal entity project participants (as applicable)	Please indicate if the Party involved wishes to be considered a project participant (Yes/No)
United Kingdom	• Carbon Futures LLP	Yes
Ukraine (Host party)	• Innovation Center "Ecosystem" • Yenakiive Town Council	Yes

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

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

Yenakiive Town, Donetska oblast, Ukraine. The Project covers medical, educational and other public facilities in the town.

A.4.1.1. Host Party(ies):

Ukraine

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

Donetska oblast

A.4.1.3. City/Town/Community etc.:

Yenakiive Town

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

Yenakiive Town is located in the east of Donetska oblast. It is situated at:
Latitude: 48.218794°
Longitude: 38.203869°

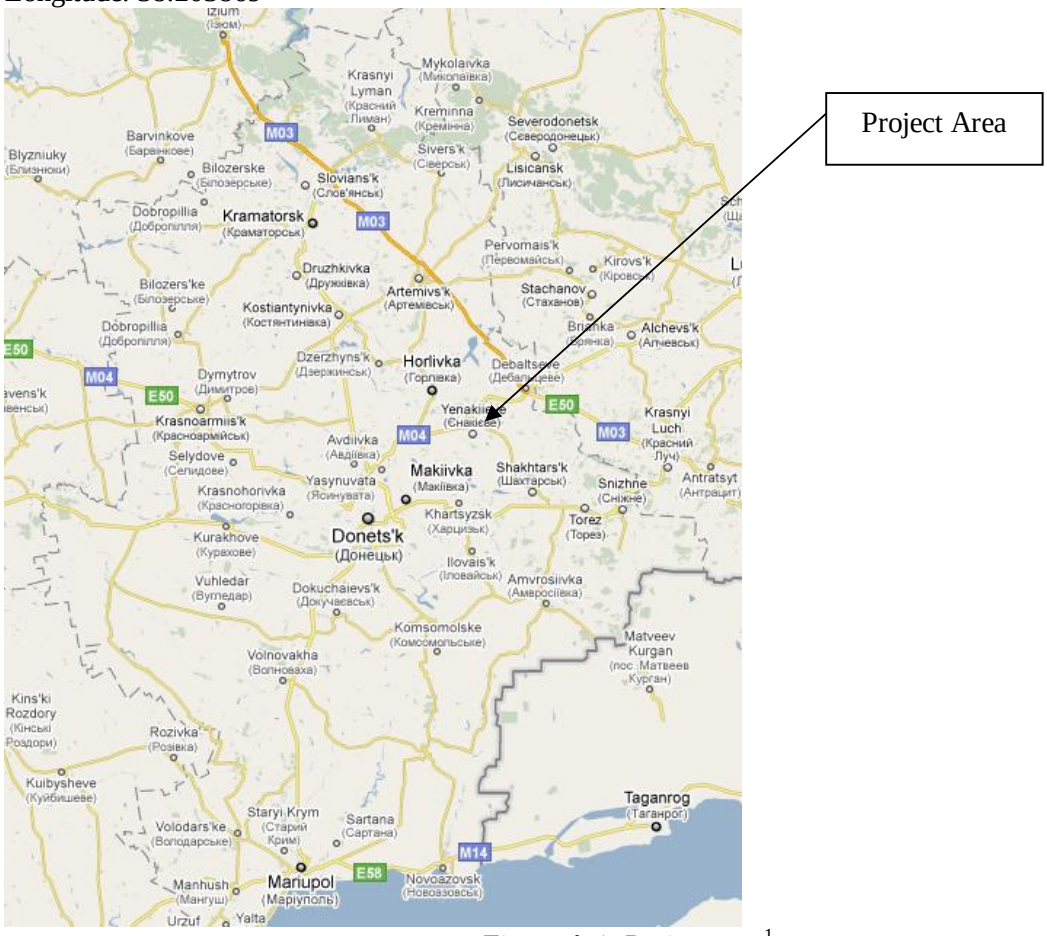

Figure A.1. Project area[1]

A.4.2. Small-scale project type(s) and category(ies):

According to paragraphs 7 and 8 of Provisions for JI SSC Projects, type of small-scale project activity is II (Energy efficiency improvement projects which reduce energy consumption, on the supply and/or demand side, by up to the equivalent of 60 GWh per year). According to Condition for Common baseline for

[1] Source: Google map

bundled SSC Project Activities, category of the project is II.C (demand-side energy efficiency activities for specific technologies).
The proposed project has following features:

1. The proposed project is a demand-side energy efficiency activity, which eventually leads to the reduction of electricity consumption.
2. The activity includes energy-efficient measures.
3. The project activity is to be carried out in Public Buildings.
4. The annual energy savings of the project activity is estimated to be about 3.9 GWh/year.

A.4.3. Technology(ies) to be employed, or measures, operations or actions to be implemented by the small-scale project:

Technical aspects of the project to replace ICLs with CFLs are simple and require minimal labour qualifications. Lamps subject to replacement under this project are most energy consuming with a rated power of 100 and 150 W. The buildings and spaces where the replacement will take place are mainly limited to medical, educational and other public facilities with average operational times about 10 hours per day. CFLs are to be installed instead of the 100 and 150 W ICLs and will provide the minimum light flux of 2,180 and 3,090 lumens (lm), respectively. CFL's lifetime indicated by the manufacturer is 8,000 hours.

CFLs (or possibly LEDs) that will be used to replace the ICLs as part of this project will have a special marking (in addition to the standard manufacturer's specifications). Additional marking will ensure the correct use of CFLs in the project and enable proper project execution and verification. The replaced ICLs will be utilized in an environmentally safe manner and properly verified to avoid any carbon leakage.

The Innovation Center "Ecosystem" will coordinate the project implementation in the town of Yenakiive and will provide specific engineering, logistical and organizational support. "Ecosystem" will distribute CFLs (or LEDs) to public organizations and will assume responsibility for replacement for ICL with CFL, collection and disposal of replaced ICLs (in accordance with the requirements of environmental safety), and also replace CFLs that are out of order.

The Project Investor, Carbon Futures, is responsible for purchasing and delivering CFLs to the project site as well as covering all the project costs, including "Ecosystem" services. Carbon Futures is the ultimate owner of the ERUs resulting from the project, which is supported by the respective contracts with "Ecosystems" and the regional administration.

A.4.4. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed small-scale project, including why the emission reductions would not occur in the absence of the proposed small-scale project, taking into account national and/or sectoral policies and circumstances:

The Ordinance of the Cabinet of Ministers of Ukraine No. 1337-p "Concerning implementation of activities to reduce electrical power consumption by state-financed institutions"[2] calls for the gradual replacement of common ICLs with up-to-date energy efficient light sources requiring no change of lighting fixtures. This document binds municipal executive body to convert subordinate state-financed institutions to energy efficient devices and lighting systems in compliance with sanitary mandated lighting norms. It was supposed to make energy efficient lighting devices mandatory since November, 1, 2008, while phasing out ICLs after expiry of their lifetime. Starting from January, 1, 2009 capital and maintenance home repairs should be supplemented with the installation of energy efficient lighting devices. However, the state funding

[2] http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1337-2008-%F0

for large-scale replacement of ICLs with CFLs in the public sector is not sufficient. As it was confirmed by executive officers of the municipal authority of Yenakiive state-financed and social institutions have to replace expired ICLs with those of the same type to provide proper illumination of their rooms. If they had aimed to fulfill the Ordinance within prescribed limits of budget costs for lighting, some areas would be left being without proper illumination. Thus the project intervention leads to measurable reduction of GHG emissions additional to the baseline scenario.

A.4.4.1. Estimated amount of emission reductions over the crediting period:

Table A.2. Emission reduction levels for crediting period under the Kyoto Protocol

	Years
Length of the crediting period	2
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2011	3,858
2012	4,606
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	8,464
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	4,232

Table A.3. Emission reduction levels for late crediting period after 2012

	Years
Length of the crediting period	8
Year	Estimate of annual emission reductions, tonnes of CO_2 equivalent
2013	4,582
2014	4,586
2015	4,590
2016	4,586
2017	4,515
2018	4,441
2019	4,425
2020	4,071
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	35,796
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	4,475

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

The proposed small-scale project activity is not a de-bundled component of a large project because:

- The project participants have not registered any small scale JI activity or applied for registration of another small scale JI project activity within 1 km of the project boundary of this proposed project, in the same project category and technology/measure.

A.5. Project approval by the Parties involved:

The Project Idea Note had been submitted for review of the National Environmental Investment Agency of Ukraine. Subsequently, the National Environmental Investment Agency of Ukraine issued a Letter of Endorsement for this project №2145/23/6 on 13/12/2011.

After the project has completed the determination process, the PDD and the Determination Report will be presented to The National Environmental Investment Agency of Ukraine to obtain a Letter of Approval.

The project approval by the UK side will be obtained during the process of project determination.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

The project is focused on the replacement of ICLs with CFLs in pre-selected public buildings and spaces within the buildings in the town of Yenakiive. Accordingly, the baseline scenario is defined as the "continuation of use of incandescent lamps due to lack of funds for CFLs or LEDs". The baseline scenario can be confirmed due to the following reasons:

- The Ordinance of the Cabinet of Ministers of Ukraine No. 1337-p "Concerning implementation of activities to reduce electrical power consumption by state-financed institutions"[3] came into force in 2008 but it is not well implemented due to lack of budget funding;
- The JI project proposed here targets only functioning ICLs that do not have to be replaced under the repairs or renovations;
- The ICLs that are to be replaced are those that are actually operating and will likely to operate w/out the project.

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the small-scale project:

As per Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities[4] a small scale CDM project activity needs to demonstrate at least one of the four barriers faced by the project activity to establish the project additionality. The four types of barriers that could be demonstrated for a small scale project activity are:

1. Investment barrier
2. Technological barrier
3. Barrier due to prevailing practice
4. Other barriers

The three of four barriers are described below.

(a) Investment barrier. The Ordinance of the Cabinet of Ministers of Ukraine No. 1337-p "Concerning implementation of activities to reduce electrical power consumption by state-financed institutions" calls for the gradual replacement of common ICLs with up-to-date energy efficient light sources requiring no change of lighting fixtures. This document binds municipal executive bodies to convert subordinate state-financed institutions to energy efficient devices and lighting systems in compliance with sanitary mandated lighting norms. It was supposed to make energy efficient lighting devices mandatory since November, 1, 2008, while phasing out ICLs after expiry of their lifetime. Also starting from January, 1, 2009 capital and maintenance home repairs should be supplemented with the installation of energy efficient lighting devices. However, the state funding for large-scale replacement of ICLs with CFLs in the public sector is not sufficient. The prevailing practice shows that despite the Ordinance, no funds are allocated for such a replacement.

(b) Technological barrier. The current practice shows a very low use of CFLs in public buildings due to lack of public funding. Therefore the public building managers are not very familiar with CFL- or LED-based lighting technology (despite its simplicity). Additional technological barrier is related to the need for proper utilization of expired CFLs, which is handled appropriately within the current JI project.

[3] http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1337-2008-%F0

[4] http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf

(c) Other barriers: Unauthorized CFL Removal. Due to high cost of CFLs they are not widely used in the residential sector of the region. The installation of CFLs in public buildings without proper supervision and monitoring is likely to lead to unauthorised removal (theft) of CFL for the re-sale or personal use purpose. The special CFL supervision and monitoring of installed CFLs under the current JI project effectively removes this barrier.

B.3. Description of how the definition of the project boundary is applied to the small-scale project:

The project activity involves a set of measures to improve energy efficiency in lighting systems of public buildings. Project boundaries are the whole of physical and geographical locations for implementation of every single activity to replace ICLs with CFLs (or LEDs) and safely dispose replaced ICLs.

GHG emission sources taken into account in the project activity are shown in the table B.3.

For both "Baseline Scenario" and "Project Scenario", CO_2 emissions should be included in the baseline and project scenarios. At the same time the project reduces emissions of CH_4 and N_2O from fuel consumption. However these emissions are much smaller in comparison with than emissions of CO_2 and are excluded from the project to ensure that emission reductions are estimated in a conservative manner.

Table B.1. GHG emission sources related to the project activity

		Inside project boundary	Outside project boundary
Baseline Scenario	Included in the project	CO_2 emissions from electricity consumption of existing facilities	No GHG emissions related to business as usual activities
	Excluded from the project	CH_4 and N_2O emissions from electricity consumption of existing facilities	No GHG emissions related to business as usual activities
Project Scenario	Included in the project	CO_2 emissions from electricity consumption of facilities after applying energy-efficiency improvement measures	No GHG emissions related to the project activities
	Excluded from the project	CH_4 and N_2O emissions from electricity consumption of facilities after applying energy-efficiency improvement measures	No GHG emissions related to the project activities

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

The baseline emissions for the project activity will be calculated from the available information on the replaced number of CFL and its usage during the project lifetime.

Date of completion of the baseline study: 15/03/2011.

Name of the person/entity determination of the baseline:

ICF Consulting

Legal address: Sardinia House 52, Lincoln's Inn Fields, London WC2A 3LZ, UK
Mailing address: ICF Consulting Office 454, 3 Tverskaya Zastava sq., Moscow, 125047, Russia
Contact phone: + 7 495 250 4339
Contact fax: + 7 495 250 0615
Contact e-mail: asankovski@icfi.com
ICF Consulting is not a project participant listed in annex 1.

SECTION C. Duration of the small-scale project / crediting period

C.1. Starting date of the small-scale project:

Investment phase of the project began on the 02/08/2010. Operation phase of the project started on 24/01/2011.

C.2. Expected operational lifetime of the small-scale project:

Expected project period will last until 31/12/2020.

C.3. Length of the crediting period:

Emission reduction units (ERUs) will be transferred to the Investor during the period from Q1 2011 to 31/12/2012. The transfer of emissions reduction units after the year 2012 will be made in compliance with forthcoming international agreements and Ukrainian legislation.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The project monitoring will incorporate all the procedures required for CFL delivery, installation and operation and continuous replacement. The initial stage of monitoring will also include confirmation of safe utilization of replaced ICLs. The monitoring will be based on filled and officially endorsed monitoring CFL transfer and utilization protocols and well as daily records of CFL use. Those records will be subsequently digitized and incorporated into an Excel based database for verification and analysis purposes.

D.2. Data to be monitored:

Data / Parameter	$Q_{PJ,i}$
Data unit	Number
Description	Number (quantity) pieces of equipment of type 'i' distributed or installed under the project activity (units) instead of ICLs; the power rating of the CFL would be 20W or 32W
Time of determination/monitoring	It will be determined during the first ex-post monitoring survey which will be done within the first month of installation of all the lamps. Refer Annex 3 for further details.
Source of data (to be) used	Actual CFL distribution during the project.
Value of data applied (for ex ante calculations/determinations)	20W CFL: 13,414 32W CFL: 30
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This number is a constant value once all of the project's CFLs are distributed, it is independent of the year y.
QA/QC procedures (to be) applied	Standardised forms will be used for the data collection during the survey and the people responsible for conducting the survey on ground will be reasonably educated about the project. Additionally, there will be experts and reliable personnel from the project participants to oversee the overall process.
Any comment	

Data / Parameter	$P_{i, BL}$
Data unit	Watts
Description	Rated power of the baseline lighting devices of the group of "i" lighting devices (Watts)
Time of determination/monitoring	It will be determined during the first ex-post monitoring survey.
Source of data (to be) used	Weighted Average Power Rating of the baseline ICLs as recorded during lamp distribution
Value of data applied (for ex ante calculations/determinations)	ICL of following two power rating would be replaced as part of the project activity. These are 100W (13,414 pieces) and 150W (30 pieces). Average power rating of ICLs is 100.1W.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The power rating recorded on each ICL will be considered as the primary source of this data. In cases where the wattage label is not visible, a portable power meter will be used to determine the rating on the spot.

QA/QC procedures (to be) applied	Standardised forms will be used for the data collection during the distribution and the people responsible for distribution on ground will be reasonably educated about the project. Additionally, there will be experts and reliable personnel from the project participants to oversee the overall process.
Any comment	This data may be verified during the ICL utilization.

Data / Parameter	$P_{i, PJ}$
Data unit	Watts
Description	Rated power of the project lighting devices of the group of "i" lighting devices (Watts)
Time of determination/monitoring	It will be determined during the first ex-post monitoring survey.
Source of data (to be) used	Weighted Average Power Rating of the project CFLs as recorded during lamp distribution
Value of data applied (for ex ante calculations/determinations)	CFL of the following two power rating would be distributed as part of the project activity. These are at least 20W (13,414 pieces) to replace 100W ICLs and at least 32W (30 pieces) to replace 150W ICLs. Average power rating of CFLs is 20.0W.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The power rating mentioned on the CFLs will be recorded during the lamp distribution.
QA/QC procedures (to be) applied	Standardised forms will be used for the data collection during the distribution and the people responsible for distribution on ground will be reasonably educated about the project. Additionally, there will be experts and reliable personnel from the project participants to oversee the overall process.
Any comment	

Data / Parameter	O_i
Data unit	hours
Description	Average annual operating hours of the devices of the group of "i" baseline devices
Time of determination/monitoring	Monitoring during credit periods
Source of data (to be) used	Preliminary feasibility study on the CLF replacement has been conducted. Measurement of a representative sample are conducted concurrent with the first ex-post monitoring survey
Value of data applied (for ex ante calculations/determinations)	About 10 hours a day
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The average annual operating hours will be determined through continuous measurement of usage of baseline or project lamps for a minimum of 90 days at representative sample installations. For this measurement, manually completed forms will be used in all the selected buildings. These records will be processed and extrapolated to get the annual operating hours for the entire project. There are two types of consumers in the project area, medical and educational facilities. Therefore, weighted average operating hours for each type of facility will be used for calculation of final emission reductions achieved.
QA/QC procedures (to be)	Continuous external inspections initiated by the municipal authorities will be

applied	used to ensure correct completion of data records.
Any comment	This value may be determined any time before the first ex-post monitoring survey even before the lamp distribution.

Data / Parameter	$DATE_{instalation}$ and $DATE_{replacement}$
Data unit	Date
Description	Date of installation, and replacement of CFLs
Time of determination/monitoring	Monitoring during credit periods
Source of data (to be) used	Provided by distribution team and responsible personal
Value of data applied (for ex ante calculations/determinations)	Format dd.mm.yyyy
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The date of installation will be recorded at the replacement form when the replacement of ICL by CFL is physically taking place. Date for CFLs replacement will be recorded for each replacement separately. Date of replacement of broken lamps will be collected in Log Book for Lamp replacement.
QA/QC procedures (to be) applied	Experts and reliable personal is appointed from the project participants. These person(s) are engaged in data collection and calculation.
Any comment	
Data / Parameter	**$LFR_{i,v}$**
Data unit	Fraction
Description	Lamp Failure Rate of the equipment type i in year y
Time of determination/monitoring	Monitoring during credit periods
Source of data (to be) used	Ex-post monitoring survey
Value of data applied (for ex ante calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The failure rate is determined as per the results of the monitoring survey of the installed lamps. The ex- ante estimate of the LFR which is based on the average rated lifetime and the annual operating hours is corrected as per the actual failure observed during the survey of the representative sample.
QA/QC procedures (to be) applied	The sampling and survey is conducted as per the methodology applied and the EB guidelines for Sampling and Surveys for small scale CDM project activities.
Any comment	The failure rate in a particular year may be less than the theoretical lamp failure rate due to the regular replacement of the failed CFLs during the crediting period.

Data / Parameter	**TDL_v**
Data unit	%
Description	Average annual technical grid losses (transmission & distribution) during the year y for the grid serving the locations where lamps are installed
Time of determination/monitoring	Monitoring during credit periods
Source of data (to be) used	Recent, accurate and reliable data available for the country and should be obtained from a verifiable source.
Value of data applied (for ex ante	

calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	No measurement required
QA/QC procedures (to be) applied	To the extent possible the data will be sourced from information published by national utility or any other official government body.
Any comment	If no recent, accurate & reliable data is available then default value of 10% may be used as per the methodology.

Data / Parameter	**CEF_y**
Data unit	Kg CO_2e/kWt-h
Description	Carbon Emission Factor (CEF) during the year y for the grid serving the locations where lamps are installed
Time of determination/monitoring	Monitoring during credit periods
Source of data (to be) used	Recent, accurate and reliable data available for the country and should be obtained from a verifiable source, endorsed by the National JI Focal Point.
Value of data applied (for ex ante calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	No measurement required
QA/QC procedures (to be) applied	To the extent possible the data will be sourced from information published by national utility or any other official government body.
Any comment	The CEF value could be updated annually if available.

D.3. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

Data/Parameter	**QA/QC procedures to be applied:**
$Q_{PJ,i}$	Experts and reliable personal is appointed by the project participants. The person(s) are engaged in data collection and calculation.
$Q_{B,i}$	Experts and reliable personal is appointed by the project participants. The person(s) are engaged in data collection and calculation.
$P_{i, BL}$	Experts and reliable personal is appointed by the project participants. The person(s) are engaged in data collection and calculation.
$P_{i, PJ}$	Experts and reliable personal is appointed by the project participants. The person(s) are engaged in data collection and calculation.
O_i	Experts and reliable personal is appointed by the project participants. The person(s) are engaged in data collection and calculation.
$DATE_{instalation}$	Experts and reliable personal is appointed by the project participants. The person(s) are engaged in data collection and calculation.
$DATE_{replacement}$	Experts and reliable personal is appointed by the project participants. The person(s) are engaged in data collection and calculation.

D.4. Brief description of the operational and management structure that will be applied in implementing the monitoring plan:

The project partner "Ecosystem" is in charge of data collection and reporting. The Yenakiive administration has assembled the special working group (SWG) to oversee the project implementation. Each building supervisor/manager will have a separate task of monitoring and safeguarding the project implementation. Random inspections will be conducted by SWG in the buildings to ensure proper project implementation.

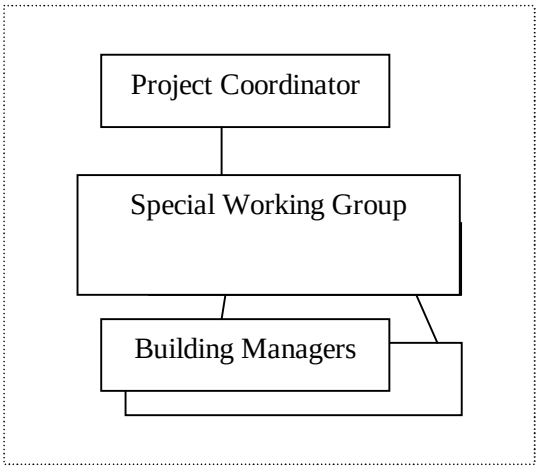

Figure D.1. Management structure

[redacted]

A. Monitoring Requirements as per the Methodology

Before and during the project implementation, a database of the facilities covered under the project activity will be prepared and maintained in digital format with data control procedures in place. Monitoring data is transmitted to Ecosystem in Microsoft Excel format. The database is stored in digital format on the hard drive. It is backed up, updated, and stored on DVD disc regularly.

Appropriate record keeping procedures would be implemented to ensure that each monitoring period dataset is transparent enough to ensure smooth validation and verification of data and prevent any possibility of double counting.

As per the methodology AMS IIJ version 04[5] and choices made in the PDD, following monitoring is to be carried out:

1. **O_i Survey**: This survey is required to determine the average annual operating hours for the lamps which will be same for the baseline as well as project lamps. Therefore, this survey will be

[5] http://cdm.unfccc.int/methodologies/DB/5RMYBVTQ83H9CJA99M2392TSNO9IUJ

conducted with first ex-post survey. For the determination of the hours of operation of the lamps, manual recording of CFL hours of operation will be conducted at the selected sample installations for the 90day (3 months) duration.

2. **Ex-post Survey**: The ex-post surveys are required to determine the actual Lamp Failure Rate which in turn gives the share of the total lamps replaced that still functioning. The first ex-post survey is different from the subsequent ones in terms of the applicability of the results (not the methodology of the survey) because the results of this survey fix the $Q_{PJ,i}$ i.e. number of lamps of type replaced during the project implementation. This number remains fixed throughout the crediting period and is adjusted with LFR in the subsequent years. The present project design assumes immediate replacement of failed CFLs with new CFLs of the same type and rating.

   The frequency of these surveys is as often as the emission reductions are claimed. Whereas the minimum frequency required is either once in every 3 years or once for every 30% of the elapsed rated average life of the lamp. The project aims at the daily operations of 10 hrs per day which means annual operations of about 3,650 hrs. For a lamp with average rated life of 8,000 hrs, 30% of the life will elapse in less than a year.

   Changes in the Lamp Failure Rate as per Ex-post Monitoring Survey

   The Net Electricity Savings shall be modified for changes to the Lamp Failure Rate as may be indicated by *ex post* monitoring survey results and/or on the basis of CFL Average Life values if a CFL Rated Average Life was used initially. The modifications shall be made using the following methods:

   a) If Rated Average Life values were used initially for calculating LFR_y, per equation (1), as soon as Average Life values are available they shall be used for calculation of subsequent year $LFR_{i,y}$ values.

$$LFR_{i,y} = \frac{X_i \cdot (100 - 50)}{100 \cdot L_i} \quad (1)$$

Table D.2. Description for lamp failure rate calculation

Symbol	Parameter Definition	Ex-ante value Applied	Rationale for value applied
LFR_i	Lamp Failure Rate	Calculated based on Equation (1)	-
L_i	Average Life for equipment 'i'	20W: 8,000 hours 32W: 8,000 hours	-
X_i	Total operating hours for devices of the group of "i"	-	-

   b) If the *ex post* monitoring surveys indicate that the failure rate is equal to or less than the $LFR_{i,y}$ value indicated using equation (1) with *ex ante* or prior year, *ex post* monitoring values, for subsequent years $LFR_{i,y}$ shall continue to be determined using Equation (1) and the established Average Life values for L_i.

   c) However, for subsequent years, Li values in $LFR_{i,y}$ equation (1) shall be adjusted if the *ex post* monitoring surveys indicate that the failure rate ($LFR_{i,y}$) is greater than the value indicated using equation (1) with Average Life or prior year, *ex post* monitoring values. In

this situation, a new value for Li shall be determined using equation (1) and new values of $LFR_{i,y}$ shall be used beginning from the first calculation year after completion of the *ex post* survey.

Shall the immediate CFL replacement be used (as planned); the LFR will be set to ZERO in the emission reduction calculation.

3. **ICL Destruction:** The replaced ICLs would be collected from the premises and will be stored till their destruction. It will be assured that the number of ICLs collected is more than or equal to the CFLs installed. The assurance will be achieved by manual counts of collected ICLs from each building and their comparison with the number of CFLs delivered to that building. These 2 values will be confirmed in a separate transfer acts. Once the certain volumes of ICLs are collected and cross-checked they will be transported to the utilization site (e.g., sanitary landfill) and utilized/destructed witnessed by the Special Working Group representatives. A special destruction protocol will be filled and signed.

   The ICLs proper utilization/destruction will be subject to random verification by DOE.

4. **CFL Destruction:** At the beginning of each monitoring interval, project proponent will compile and update the record of number of failed CFLs collected from the facilities. The utilization of the failed CLFs would be carried out as per the national regulations and proper documentation shall be maintained to facilitate verification by the AIE.

B. Institutional Arrangement for Monitoring

Please see above.

C. Training & Calibrations

A project manual will be developed before the start of the CFL distribution to ensure proper implementation of the project and subsequent monitoring. [redacted]

[redacted]

The staff involved in project implementation and conducting surveys will be trained as per the manual and evidences of such trainings shall be maintained for records.

D.5. Name of person(s)/entity(ies) establishing the monitoring plan:

Alexei Sankovski, ICF International

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions and formulae used in the estimation:

Step1. The electricity consumption by the project activity in year 'y' is calculated as follows:

$$EC_y = \sum_{i=1}^{n} Q_{PJ,i} \cdot P_{i,PJ} \cdot O_i / 1000 \quad (2)$$

Table E.1. Description for project electricity consumption calculation

Symbol	Parameter Definition	Ex-ante value Applied	Rationale for value applied
EC_{PJ}	Project electricity consumption in year y (thousand kWh)	Calculated based on Equation (2)	-
$\sum_i$	Sum over the group of "i" devices (i.e. 20W and 32W CFLs)	-	-
$Q_{PJ,i}$	Number (quantity) of devices of the group of "i" devices (i.e. 20W and 32W CFLs)	20W: 13,414 32W: 30	-
$P_{PJ,i}$	Power of the devices of the group of "i" project devices	20W: 13,414 32W: 30	-
O_i	Average annual operating hours of the devices of the group of "i" baseline devices	2011: 3,060 hours; 2012-2020: 3,650 hours	-

Table E.2. Result for project electricity consumption calculation

Year	electricity consumption, thousand kWh
2011	824
2012	983
2013	983
2014	983
2015	983
2016	983
2017	983
2018	983
2019	983
2020	983
Total	9,671

Step 2. The emission by the project activity in year 'y' is calculated as follows:

$$PE_y = EC_{PJ,y} \cdot CEF_y \quad (3)$$

Table E.3. Description for project emission calculation

Symbol	Parameter Definition	Ex-ante value Applied	Rationale for value applied
PE_y	Emission in year t CO_2	Calculated based on Equation (3)	

EC_{PJ}	electricity Consumption in year y (thousand kWh)	Calculated based on Equation (2)	
CEF (including transmission losses)	Demand Side Carbon Emission Factor for Ukraine, t CO_2/MWh	2011 – 1.171 2012 – 1.172 2013 – 1.166 2014 – 1.167 2015 – 1.168 2016 – 1.167 2017 – 1.148 2018 – 1.130 2019 – 1.126 2020 – 1.036	The study project "Development of the electricity carbon emission factors for Ukraine"[6] that was elaborated for the European Bank for Development and Reconstruction by the Lahmeyer International in 2009

Table E.4. Result for project emission

Year	Project Emissions, t CO_2
2011	965
2012	1,152
2013	1,146
2014	1,147
2015	1,148
2016	1,147
2017	1,129
2018	1,110
2019	1,107
2020	1,018
Total	11,069

E.2. Estimated leakage and formulae used in the estimation, if applicable:

There is no leakage in the project on either installation side or disposal side, due to the following reasons:

- Project leakage (indirect effects) may be incurred due to improper storage and partial re-use of ICLs that are replaced with CFLs. Leakage may occur, for example, either when undestroyed 100W lamps are used instead of expired 60W or 75W ICLs in buildings outside of the project boundary or when such lamps are installed in locations with no illumination prior to project initiation. To prevent project leakage, implementing organizations will properly replace ICLs with CFLs, store and dispose those ICLs being replaced. Moreover, necessary evidence and data are to be collected and subject to verification by AIE

Other leakage:

In the course of operation certain lamps will fail which might result in decreased emission reductions. However, the project provides for the immediate replacement of failed CFLs with new CFLs. In the course of monitoring the replacement date will be recorded and the operating hours of the lamp will be corrected as needed (e.g., during the replacement the time when the lamp is not functioning will be subtracted from the daily number of operational hours). Below there is a calculation of the quantity of the lamps to be replaced.

[6] http://www.ebrd.com/downloads/sector/eecc/Ukraine_English.pdf

The lamp failure rate calculated below will not be used to estimate the project emissions, but will be applied to provide guidance to project participants on the number of CFLs that need to be stored to ensure immediate replacement.

A lamp failure rate was used in order to calculate the number of the failing lamps. Its calculation is based on the lamp failure rate according to Breakage Curve provided below.

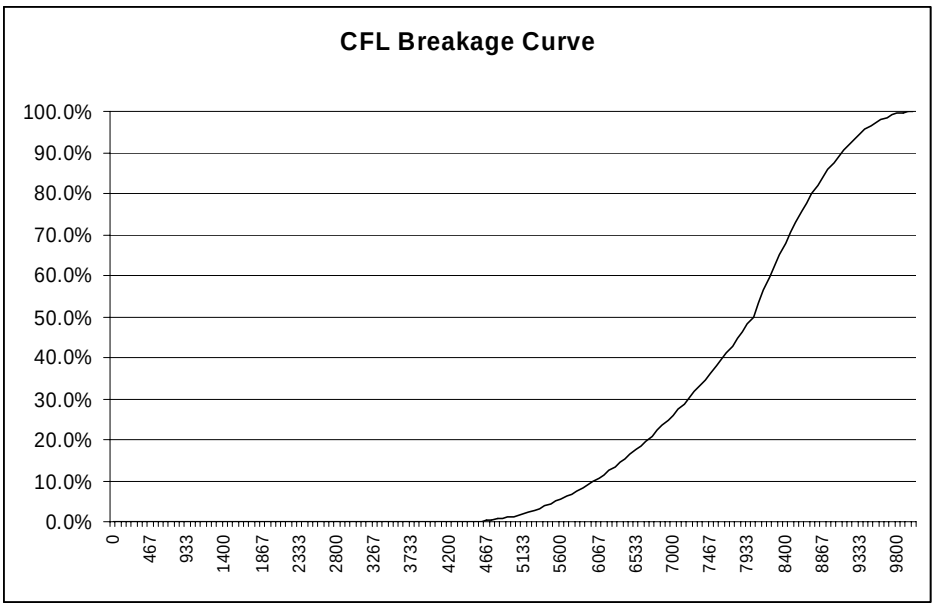

Figure E.1. CFL breakage curve

The average number of lamps to fail is shown in table E.5.

Table E.5. Lamp Failure Rate

Year	Lamp Failure Rate, %
2011	0
2012	33
2013	100

The lamp failure rate analysis shows that only 33% of CFLs could fail till the end of 2012 and all lamps that are replaced at the beginning of the project activity will fail till the end of 2013.

E.3. Sum of E.1. and E.2.:

Since there in no applicable leakage to this project, the sum of E.1. and E.2. is equal to the value estimated in the section E.1.

E.4. Estimated baseline emissions and formulae used in the estimation:

Step1. The electricity consumption in baseline scenario in year 'y' is calculated as follows:

$$EC_{BL,y} = \sum_{i=1}^{n} Q_{BL,i} \cdot P_{i,BL} \cdot O_i \,/1000 \quad (4)$$

Table E.6. Description for baseline electricity consumption calculation

Symbol	Parameter Definition	Ex-ante value Applied	Rationale for value applied
EC_{BL}	Baseline electricity consumption in year y (thousand kWh)	Calculated based on Equation (4)	-
$\sum_i$	Sum over the group of "i" devices (i.e. 100W and 150W incandescent bulb)	-	-
$Q_{BL,i}$	Number (quantity) of devices of the group of "i" devices (i.e. 100W and 150W incandescent bulb)	100W: 13,414 150W: 30	-
$P_{BL,i}$	Power of the devices of the group of "i" baseline devices	100W: 13,414 150W: 30	-
O_i	Average annual operating hours of the devices of the group of "i" baseline devices	2011: 3,060 hours; 2012-2020: 3,650 hours	-

Table E.7. Result for baseline electricity consumption calculation

Year	baseline electricity consumption, thousand kWh
2011	4,118
2012	4,913
2013	4,913
2014	4,913
2015	4,913
2016	4,913
2017	4,913
2018	4,913
2019	4,913
2020	4,913
Total	48,335

Step 2. The emission in baseline scenario in year 'y' is calculated as follows:

$$BE_y = EC_{BL,y} \cdot CEF_y \quad (5)$$

Table E.8. Description for baseline emission calculation

Symbol	Parameter Definition	Ex-ante value Applied	Rationale for value applied
BE_y	Emission in year t CO_2	Calculated based on Equation (5)	
EC_{BL}	electricity Consumption in year y (thousand kWh)	Calculated based on Equation (4)	
CEF (including transmission/distribution losses)	Demand Side Carbon Emission Factor for Ukraine, t CO_2/MWh	2011 – 1.171 2012 – 1.172 2013 – 1.166 2014 – 1.167 2015 – 1.168 2016 – 1.167 2017 – 1.148	The study project "Development of the electricity carbon emission factors for Ukraine"[7] that was elaborated for the European Bank for

[7] http://www.ebrd.com/downloads/sector/eecc/Ukraine_English.pdf

		2018 – 1.130 2019 – 1.126 2020 – 1.036	Development and Reconstruction by the Lahmeyer International in 2009

Table E.9. Result for baseline emission calculation

Year	Baseline Emission, t CO_2
2011	4,823
2012	5,757
2013	5,728
2014	5,733
2015	5,738
2016	5,733
2017	5,645
2018	5,551
2019	5,532
2020	5,089
Total	55,329

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

The emission reductions (ERy)

ERy = (BEy – PEy) - LEy (6)

Where:
ERy – Emission reductions in year y (tCO2e)
LEy – Leakage emissions in year y (tCO2e)

E.6. Table providing values obtained when applying formulae above:

Table E.10. Emission reductions

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2011	965	0	4,823	3,858
2012	1,152	0	5,757	4,606
2013	1,146	0	5,728	4,582
2014	1,147	0	5,733	4,586
2015	1,148	0	5,738	4,590
2016	1,147	0	5,733	4,586
2017	1,129	0	5,645	4,515
2018	1,110	0	5,551	4,441
2019	1,107	0	5,532	4,425
2020	1,018	0	5,089	4,071
Total (tonnes of CO_2 equivalent)	11,069	0	55,329	44,260

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

On average every CFL contains about 5 ml of mercury that may have undesirable ecological effect if it is emitted into the environment. The use of CFLs should be in compliance with approved by State Sanitary-and-Epidemiologic Service Feasibility Statement. Meanwhile, the Project participants will provide installation site management with a warning memo concerning environmentally friendly collection and storage of CFLs as per current standards to prevent environmental mercury pollution.

The Project participants will support the efficient collection and disposal of failed CFLs in accordance with the current environmental standards.

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

Under Ukrainian laws or regulations, the project participants are not obligatory required to conduct EIA for this type of project. The environmental impacts derived through the project activity are such positive ones as energy savings. Therefore, EIA does not need to be carried out.

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

No comments.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

The baseline emissions for the project activity will be calculated from the available information on the replaced number of CFL and its usage during the project lifetime.

Annex 3

MONITORING PLAN

[redacted]

[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
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