Joint Crediting Mechanism Approved Methodology ID_AM005

"Installation of LED Lighting for Grocery Store"

A. Title of the methodology

Installation of LED Lighting for Grocery Store Version 1.0

B. Terms and definitions

Terms	Definitions
Luminous efficiency	Luminous efficiency is the capacity of light flux per watt. The formula to calculate luminous efficiency is as below. Luminous efficiency [lm/W] = Luminous flux [lm] ÷ Rated power consumption [W]

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	This methodology applies to the project that aims for saving energy by introducing LED (Light Emitting Diode) lighting for grocery store in Indonesia.
Calculation of reference emissions	Reference emissions are GHG emissions from using reference lighting, calculated with total power consumption of project lighting, ratio of luminous efficiency of project/reference lighting, and CO_2 emission factor for consumed electricity.
Calculation of project emissions	Project emissions are GHG emissions from using project lighting, calculated with total power consumption of project lighting, and CO_2 emission factor for consumed electricity.
Monitoring parameters	Total power consumption of project lighting

D. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	LED lighting is newly installed or installed to replace existing fluorescent lighting for grocery store whose selling area is less than 400 (four hundred) m^2.
Criterion 2	The installed LED lighting is a straight type LED with color temperature between 5,000 and 6,500 K, length between 602.5 and 1,513.0 mm, and luminous efficiency of more than 120 lm/W.
Criterion 3	A measurement result of the illuminance (lux (lm/m^2)) of the installed LED lighting which is equal or above the minimum value (300 lux) for illuminance of grocery store is obtained. See explanatory note for the measurement method.
Criterion 4	In the case of replacing existing fluorescent lighting with the project LED lighting, mercury contained in existing fluorescent lighting is not released to the environment.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Power consumption by reference lighting	CO_2
Project emissions	
Emission sources	GHG types
Power consumption by project LED lighting	CO_2

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emissions are calculated with total power consumption of project lighting, ratio of luminous efficiency of project/reference lighting, and CO_2 emission factor for consumed electricity.

The luminous efficiency of reference lighting is conservatively set *ex ante* in the following manner to ensure the net emission reductions.

1. In Indonesia, usually fluorescent lighting is chosen when purchasing lighting equipment.
2. The reference luminous efficiency of LED lighting is adopted as LED lighting is more

energy efficient than fluorescent lighting.

3. The most efficient value of LED lighting commercially available in Indonesia is defined as η_{RE}, as described in Section I.

F.2. Calculation of reference emissions

$$RE_p = EC_{PJ,p} \times (\eta_{PJ} \div \eta_{RE}) \times EF_{elec}$$

RE_p : Reference emissions during the period p [tCO_2/p]

$EC_{PJ,p}$: Total power consumption of project lighting during the period p [MWh/p]

η_{PJ} : Luminous efficiency of project lighting [lm/W]

η_{RE} : Luminous efficiency of reference lighting [lm/W]

EF_{elec} : CO_2 emission factor for consumed electricity [tCO_2/MWh]

G. Calculation of project emissions

$$PE_p = EC_{PJ,p} \times EF_{elec}$$

PE_p : Project emissions during the period p [tCO_2/p]

$EC_{PJ,p}$: Total power consumption of project lighting during the period p [MWh/p]

EF_{elec} : CO_2 emission factor for consumed electricity [tCO_2/MWh]

H. Calculation of emissions reductions

$$ER_p = RE_p - PE_p$$

ER_p : Emissions reductions during the period p [tCO_2/p]

RE_p : Reference emissions during the period p [tCO_2/p]

PE_p : Project emissions during the period p [tCO_2/p]

I. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below.

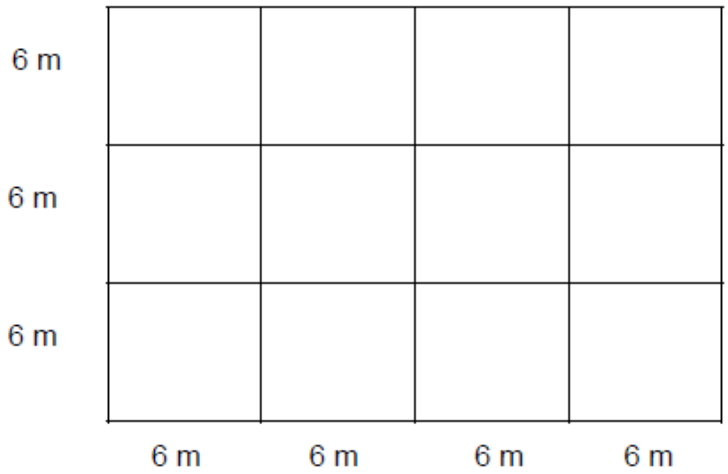
Parameter	Description of Data	Source
EF_{elec}	CO_2 emission factor for consumed electricity.	**[Grid electricity]**

	When project lighting consumes only grid electricity or captive electricity, the project participant applies the CO_2 emission factor respectively. When project lighting may consume both grid electricity and captive electricity, the project participant applies the CO_2 emission factor with lower value. **[CO_2 emission factor]** For grid electricity: The most recent value available from the source stated in this table at the time of validation For captive electricity: 0.8* [tCO_2/MWh] *The most recent value available from CDM approved small scale methodology AMS-I.A at the time of validation is applied.	Updates on Grid Electricity Emission Factors (calculated in year 2013), National Committee on Clean Development Mechanism, Indonesia, unless otherwise instructed by the Joint Committee. **[Captive electricity]** CDM approved small scale methodology AMS-I.A
η_{PJ}	Luminous efficiency of project lighting. The value prepared by manufacturer is applied. When more than one type of lighting equipment is installed, the luminous efficiency of lowest value amongst the installed equipments is applied.	Specifications of project lighting prepared for the quotation or factory acceptance test data by manufacturer.
η_{RE}	Luminous efficiency of reference lighting. Since LED lighting is limited and can only be found in newly opened grocery stores by international brands, reference emissions are determined under the assumption that commercially available LED lighting in Indonesia is installed in the stores. Top 5 manufacturers of lighting equipment in the country are identified through interview, and based on Criterion 2, LED lighting by one manufacturer meets the specifications. Therefore, luminous efficiency of merchandise by the manufacturer (110 lm/W) is set as η_{RE}.	Nominal value available on product catalogs, specification documents or websites. The default value is derived from the result of survey on luminous efficiency of LED from manufacturers that have high market share. The default value should be revised if necessary from survey result which is conducted by JC or project participants every three years. The survey should prove the use of clear methodology.

Explanatory note

Measurement method for the illuminance (lux) of the installed LED lighting is as follows.

1. Equipment: Use luxmeter which shows the readings of the measurement in illuminance. Record the model of the luxmeter used for the measurement and its most recent record of the calibration. The accuracy of luxmeter is within ±6%. For each measurement, stable numerical values are obtained.
2. Measurement points: Divide the store horizontally with 6 meter squares or less as shown below and take readings at each point of intersection at the height of 1 meter above the floor.



3. Number of measurement and recording: Conduct and record measurement of illuminance for 3 times at each measurement point. Calculate the average illuminance in each measurement point, as well as average illuminance for all of the measurement points. Use the average illuminance for all of the measurement points for the comparison to the minimum value (300 lux (lm/m^2)) for illuminance of grocery store.
4. Others: At the time of measurement, the door of the grocery store and room lighting is set in line with the normal working condition.

History of the document

Version	Date	Contents revised
01.0	14 May 2015	Electronic decision by the Joint Committee Initial approval.