Joint Crediting Mechanism Approved Methodology ID_AM018
" Installation of LED Street Lighting with Lighting Control System"

A. Title of the methodology

Installation of LED Street Lighting with Lighting Control System, Version 01.0

B. Terms and definitions

Terms	Definitions
Lighting Control System	A system which controls the light intensity of the light output through changing the voltage used to light source.
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] = Rated luminous flux [lm] / Rated power consumption [W]

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	By introducing LED (Light Emitting Diode) street lighting accompanied by lighting control system, electricity consumption for the street lighting declines, which leads to the emission reductions.
Calculation of reference emissions	Reference emissions are CO_2 emissions from the use of reference street lighting, calculated with electricity consumption of project street lighting, ratio of luminous efficiencies of project and reference street lighting, and CO_2 emission factor for consumed electricity.
Calculation of project emissions	Project emissions are CO_2 emissions from the use of project street lighting calculated with electricity consumption of project street lighting and CO_2 emission factor for consumed electricity.
Monitoring parameters	● Electricity consumption of project street lighting

D. Eligibility criteria

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

Criterion 1	LED street lighting accompanied by lighting control system are newly installed or installed to replace existing street lighting.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Electricity consumption by reference street lighting(s)	CO_2
Project emissions	
Emission sources	GHG types
Electricity consumption by project street lighting(s)	CO_2

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emissions are calculated with electricity consumption of project street lighting, ratio of luminous efficiencies of project and reference street lighting, and CO_2 emission factor for consumed electricity.

In Indonesia, there is an ongoing initiative that promotes the replacement of conventional street lighting with LED for increased energy efficiency and GHG emission reductions. Though the installation rate of LED street lighting at the national level still remains relatively low, it shows steady progress towards its implementation goal.

Despite its low installation rate of LED street lighting, to ensure the conservativeness in reference technology and the net emission reductions in Indonesia, the reference technology in this methodology is set to LED street lighting accompanied by lighting control system with the luminous efficiencies of 115 lm/W or 100 lm/W, depending on the rated power consumption (RPC) of project street lighting as summarized in the table below. The luminous efficiencies of reference street lighting are derived from possible models of an LED street lighting which is available in the country.

RPC of project street lighting	RPC ≤ 90 W	RPC > 90 W
Luminous efficiency of reference street lighting	115 lm/W	100 lm/W

F.2. Calculation of reference emissions

$$RE_p = \sum_i EC_{PJ,i,p} \times \frac{\eta_{PJ,i}}{\eta_{RE,i}} \times EF_{elec} \quad \textbf{(Eq. 1)}$$

Where:

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

$EC_{PJ,i,p}$: Electricity consumption of project street lighting for group *i* during the period *p* [MWh/p]

$\eta_{PJ,i}$: Luminous efficiency of project street lighting for group *i* [lm/W]

$\eta_{RE,i}$: Luminous efficiency of reference street lighting for group *i* [lm/W]

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

i : Group of LED street lighting installed in the project based on rated power consumption (RPC)

G. Calculation of project emissions

$$PE_p = \sum_i EC_{PJ,i,p} \times EF_{elec} \quad \textbf{(Eq. 2)}$$

Where:

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

$EC_{PJ,i,p}$: Electricity consumption of project street lighting for group *i* during the period *p* [MWh/p]

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

H. Calculation of emissions reductions

$$ER_p = RE_p - PE_p \quad \textbf{(Eq. 3)}$$

Where:

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
$\eta_{PJ,i}$	Luminous efficiency of project street lighting for group i [lm/W].	Information prepared by manufacturer (e.g. catalogs, specifications, or quotations).
$\eta_{RE,i}$	Luminous efficiency of reference street lighting for group i [lm/W]. The default value is set as follows. RPC of project street lighting: RPC ≤ 90 W: 115 lm/W; RPC > 90 W: 100 lm/W	Value derived from the result of survey. The default value should be revised, if necessary.
EF_{elec}	CO_2 emission factor for consumed electricity. When project street lighting consumes only grid electricity or captive electricity, the project participant applies the CO_2 emission factor respectively. When project street 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]**	**[Grid electricity]** The data is sourced from "Emission Factors of Electricity Interconnection Systems", National Committee on Clean Development Mechanism (Indonesian DNA for CDM), based on data obtained by Directorate General of Electricity,

	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.	Ministry of Energy and Mineral Resources, Indonesia, unless otherwise instructed by the Joint Committee. **[Captive electricity]** CDM approved small scale methodology AMS-I.A.

History of the document

Version	Date	Contents revised
01.0	7 March 2019	Electronic decision by the Joint Committee Initial approval.