

Additional information for the proposed methodology

"Installation of LED street lighting technology with wireless network control"

1. Overview of the methodology applied

The proposed methodology involves introduction of high efficiency street light technology through utilization of light-emitting diode (LED) lamps and wireless network control.

Compared to conventional lighting technology, such as mercury vapor, metal halide, and high-pressure sodium lamps commonly known as High-intensity discharge (HID) lamps, LED lighting, semiconductor devices that produces visible light when an electrical current passes through them can generate light at much higher efficiency.

In addition, the wireless network technology enables controlling the volume of lighting in accordance with various conditions, such as weather conditions and traffic volume, leading to further increase in the efficiency of lighting that results in reduction of electricity consumption.

The image of the technology targeted by the methodology is demonstrated below.



Figure 1: Image of LED street lighting system with wireless network control

Source: Minebea Co., Ltd.

2. Street lighting technologies available in Cambodia

Although the energy policy of the Government of Cambodia supports efficient use of energy, it is yet to adopt a program specifically targeting street lighting technology and based on the interview with the Ministry of Environment of Cambodia, the vast majority of street lights utilize HID lamps without wireless network.

3. Reference luminaire efficiency of street lights in Cambodia

Step 1: Determination of reference HID technology

Among various HID lighting technologies, High Pressure Sodium Lamps (HPS) and mercury lamps are commonly used technologies for street lighting. As shown in Table 1, HPS lighting is to be considered as reference technology as it is the most energy efficient technology among the HID technologies.

Table 1: Comparison of efficiencies of various HID lighting technologies for major arterial roads

	Mercury Lamp	High Pressure Sodium Lamp
Luminaire efficiency	28~30(lm/W)	57~62(lm/W)

Source: Iwasaki Electric's Survey

Note: Surveyed lamps include those manufactured by major Japanese companies corresponding to

The comparison of luminaire efficiency of various lighting technologies is demonstrated below.

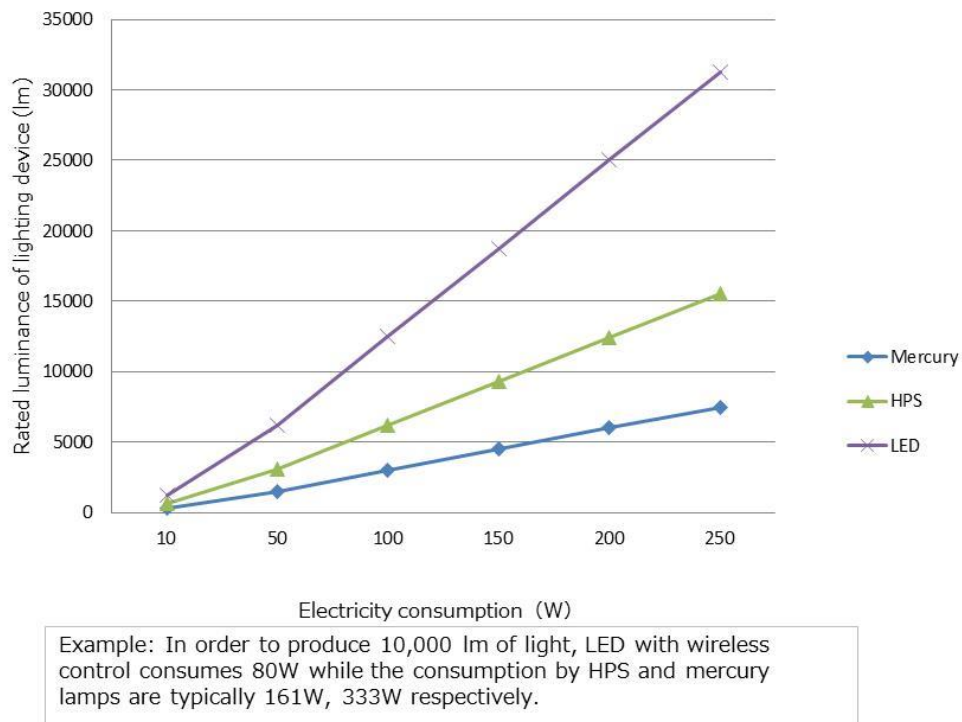


Figure 2: Comparison of luminaire efficiency of HID lamps and LED lamps with wireless network control for street lighting

Source: Representative data of Iwasaki Electric

Step 2: Determination of reference luminaire efficiency

Due to the unavailability of official or market information in Cambodia on HPS street lighting, the luminaire efficiencies of products by major street lighting technology providers in Japan have been surveyed. For the sake of conservativeness, the product type surveyed is based on the lighting used on major arterial roads, which is higher in luminous flux and more energy efficient compared to lighting used on lower class roads.

Table 2: List of luminaire efficiencies of products by major Japanese street lighting technology providers

Product	Luminaire efficiency (lm/W)	Remarks
NH250F	57	Iwasaki Electric's product for non-Japanese market
NH250F	57	GS Yuasa's product for Japanese and non-Japanese market
NH220FLS	62	Iwasaki Electric's product for Japanese market
NH220FL/N	62	Panasonic's product for Japanese market
NH220F·L-N	62	Toshiba Lighting and Technology's product for Japanese market

Source: Survey by methodology proponents

Note: Luminaire efficiency = Rated lumens (lm) / Rated power consumption (W) x equipment loss (0.65) x ballast loss (0.85). Equipment loss is based on evaluation by Iwasaki electric and ballast loss is assumed conservatively based on a Japan Industrial Standard (JIS C 8109)¹

Based on the result of the representative luminaire efficiencies of HPS lighting as shown in Table 2, the value of 62lm/W is selected on a conservative assumption in order to contribute to securing net emission reduction.

¹ JIS C 8019 indicates that "high efficiency power factor" refers to values above 0.85.