

Energy-efficient Street Lighting for Safety and Urban Design

Tokyo
Development
Learning
Center

The case of Hirosaki City

Japan Project Brief

Background and Objectives

The Great East Japan Earthquake and Tsunami on March 11, 2011, not only caused the Fukushima nuclear crisis but also stopped operations of power plants. Consequently, electricity supply capacity declined by 40% in the Kanto region, including the Tokyo metropolitan area, while it declined by 35% in the Tohoku region¹. Due to the significant decline of the power supply, the Kanto region, where Tokyo Electric Power Company Holdings supplies power, had to implement rolling blackouts. This power shortage crisis highlighted the importance of saving energy. In addition, street safety is always a concern in communities. Using advanced technology for streetlights, Aomori Prefecture is ensuring safety while saving costs on energy. This note summarizes the experience of Hirosaki City and Aomori City in introducing LED streetlights using the ESCO project.

In 2010, Mayor Noriyuki Kasai of Hirosaki City announced Action Plan 2013, which consists of the seven commitments and 103 measures to achieve a city full of the smiles of children. As a part of the measures to promote the Action Plan, the city started converting streetlights into LED lights. Subsequently, Aomori City began converting about 28,600 fluorescent security lights on roads and sidewalks to LED lights since 2015 following to Aomori City's New Energy Conservation Vision. The project commissioned a local streetlight association which consists of 23 electrical shops. A scheme was developed by the Energy Service Company (ESCO), whereby costs to install energy saving equipment/facilities can be compensated by a reduction in energy expenses and the ESCO business entity will benefit from part of the customer energy savings. Using this scheme, the commissioned association replaced the lights, conducted maintenance, and verified energy savings for ten years. The two cities have introduced ESCO projects that allow local governments to receive benefits by commissioning to private business operators which have the advanced expertise in installation, maintenance, and financing. The greatest challenge, however, was posed by snow. Since LEDs are less luminous, they emit less heat than other lights. Thus, snow sometimes covers the lights and does not melt. This leads to an unsuitable situation with regards to security.

Project Overview

Hirosaki's electronic association has received a loan for the LED project. This project guaranteed saving energy in Hirosaki City, with a private entity providing an energy-saving service to customers. Using the ESCO project, the city government commissioned a local electronic company association to replace the streetlights with LEDs and maintain them for

ten years. The commission fee to the local electronic company association was JPY 340 million for ten years². The association also utilized a loan from Aomori Bank. This financing scheme for the ESCO project is unique because the loan was provided to the commissioned ESCO company for the project (Figure 1).

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The streetlights were owned by neighborhood associations, and the city government provided a subsidy for electricity and some repairs to neighborhood associations, which was 7% of the annual electricity fee. Neighborhood associations had to pay for the rest of repairs. In this ESCO project, neighborhood associations

granted ownership to the city for free, and they would convert all 17,800 streetlights to LEDs utilizing the ESCO scheme². Hirosaki City's subsidy was up to one-third. To address LED specifications, the project developed dark LEDs, which are customized for Hirosaki City to address their particular snow problems.

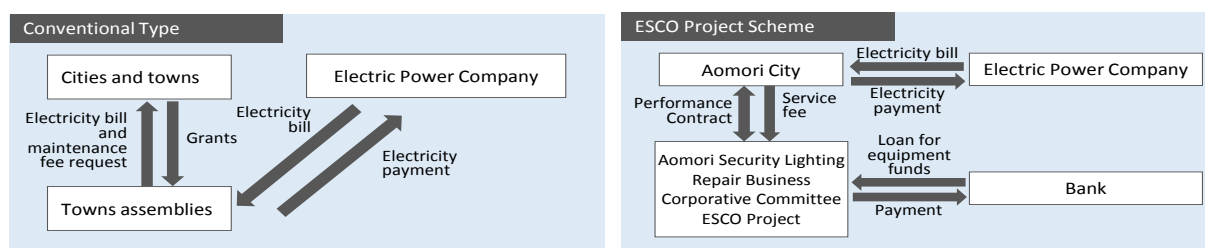


Figure 1: Comparison between conventional and ESCO financial schemes

Source: Aomori Bank. News Release of 28 January, 2015. <http://www.a-bank.jp/contents/information/news/2015/012801/012801.html>

Project Impacts

Economic Impact:

As a result of this implementation, the city government's electricity bill fell by JPY 30 million annually², which is a saving of JPY 9 million³. Additionally, the neighborhood association does not need to pay for maintenance. For example, before the project, the city had a budget of JPY 72 million for streetlights. However, after the project in 2014, the total budget was reduced to JPY 67 million (JPY 33 million for electricity and JPY 34 million for commission)².

Social Impact:

This project installed 138,000 LED streetlights. Since LEDs save on lighting costs, the saved costs are now spent on maintenance for the lights. In addition, LED streetlights are brighter than conventional lights, thereby working to prevent crime and are believed to increase safety in communities. It is also expected that brighter streets would increase visibility for drivers and pedestrians, especially at night, eventually leading to a decrease in traffic accidents.

Environmental Impact:

LEDs use only 30% of the electricity consumed by conventional lights. This project resulted in a decrease of 1,236 tons of CO₂ annually³. In addition, the increased brightness of the streets is expected to ensure a cleaner environment for cities because people tend to avoid littering in brighter streets compared to darker ones.

Lessons Learned

Electricity Pricing Policy Matters:

The reason why LED became so popular is that electricity companies have lowered the price of LED streetlights compared to conventional lights. In December 2011, major electric power companies in Japan established a new pricing for streetlights lower than 10 watts. For example, 20-watt fluorescent lights cost JPY 169 monthly, whereas 10-watt LEDs cost JPY 120 monthly. This price difference makes the proliferation of LED streetlights more beneficial².

Harnessing Private Sector Expertise:

The ESCO project would be applicable even if local governments do not have specific expertise in the energy sector. The ESCO business provides customers with comprehensive services on energy-saving. Ultimately, it aims to maintain the same quality of service while contributing to savings and energy conservation. Specifically, ESCO operators provide customers with comprehensive services such as energy-saving diagnosis for factories and buildings, design and construction/installation, maintenance and operation management of facilities, and procurement of business funds. It can realize energy-saving without decreasing the quality of energy service.

¹ Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry. 2011 Annual Report on Energy (in Japanese).
http://www.enecho.meti.go.jp/about/whitepaper/2011pdf/whitepaper2011pdf_1.pdf

² The news article on 7 December, 2013 of Toa Nippou

³ Hirosakishi Shimin Hyouka Kaigi. December 2016. The Third Party Evaluation Report for the Hirosaki City Action Plan (in Japanese).
<http://www.city.hirosaki.aomori.jp/jouhou/keikaku/soukei/houkokusyo26.pdf>

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