

Research Trends and Results

Effective energy use measures in road field

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1. Introduction

Recently, institutional reform and technical innovation have been rapidly occurring in the energy field. In 2016, the retail power business is being liberalized, along with power system innovation.

In addition, demonstrative businesses have been deployed in various regions to effectively use electricity and heat by controlling the demands using an IT network connecting houses, buildings, factories, and traffic systems, called a Smart Community. In the road field, according to the revision of the Road Act Enforcement Ordinance in July 2013, the road occupancy charge was reduced by approximately 90%, and the active introduction of renewable energy into road spaces is expected.

The Road Environment Division is considering effective energy use measures in the road field. We estimated the demand for electric power for roads, and considered energy collaboration between the roads and peripheral regions, based on the estimation result. In this document, we introduce the results of this consideration.

2. Current status of power consumption in road field

In order to determine the electric power demand of directly controlled national roads across the country, we researched samples of electric power consumption and estimated the nationwide power consumption. The total estimated power consumption was approx. 581 GWh, which has the breakdown shown in Figure 1. We found the following two characteristics in the electric power demand:

- Almost 80% of the electric power demand was for road illumination, tunnel facilities, and snow melting systems. The road illumination was activated during the nighttime, the snow melting systems were activated in winter, and the drainage facilities were activated on rainy days. Therefore, the electric power demand significantly varied according to season and time.
- In some regions, the annual electric power demand for the snow melting systems was more than 50%, although there was a demand for heat to melt snow, and some snow melting systems with renewable energy such as ground heat were proposed and adopted.

3. Possibility of collaboration between road field and regions

Generally, if customers use electric power anytime they want, power stations must be reinforced to supply electric power at the peak time, which is a problem. Therefore, various regions are promoting Smart Community activities, where the customers intelligently use batteries, share electric power, and optimize the balance of the regional energy demand corresponding to variations in the electric power demand. We considered the effective use of excess energy in regions where energy (electricity and heat) is consumed for the road field by collaboration with the peripheral regions, through the application of this system (Figure 2). The problems to be solved are sharing the facility costs and a discussion about wider energy management. We will continue to monitor new technological trends and consider their effective use for the energy consumed in road facilities.

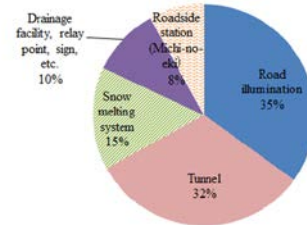


Figure 1: Breakdown of estimated electric power demand by directly controlled national roads

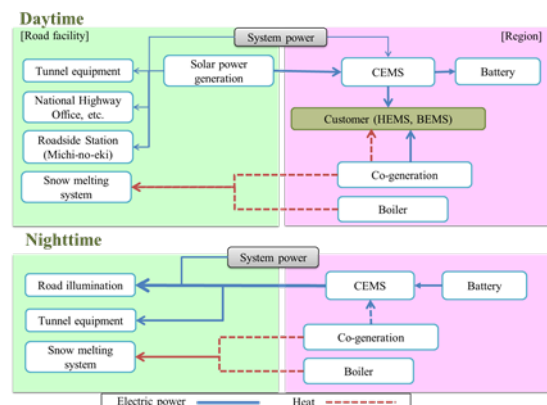


Figure 2: Energy usage plan in road field

Detailed information:

1) Keiko Ohkouchi, Ryuji Inoue, Hiroshi Yoshinaga: "Consideration on effective energy utilization of road facilities" (Lectures of the 43rd Environmental system research paper rollout, pp.33-37, 2015) (in Japanese)