

Study on the Effective Utilization of Energies in Collaboration with Roads and the Surrounding Areas

(Research period: 2013 – 2017)

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1. Introduction

The Paris Agreement came into effect in November 2016 with the goal of keeping the rise in the earth's temperature below two degrees compared to before the industrial revolution and achieving zero greenhouse gas emissions in real terms by the latter half of this century. On the other hand, in recent years, although systemic reforms and technical innovation are in progress in the energy field, the charge for the proprietary use of roads was cut by approximately 90 percent in the road field with the revision of the Enforcement Order of the Road Act in July 2013. As a result, active introduction of renewable energies into road spaces is expected, and the necessity of considering the effective utilization of energies in road spaces is increasing.

The Road Environment Division has been considering measures for the effective utilization of energies in the road field and studied the collaboration with roads and the surrounding areas in terms of energy based on the result of estimating the amount of electric power demand on roads as follows.

2. Investigation Contents

In advancing this study, we conducted the following investigation.

First, in order to determine the electricity usage characteristics (time-variable) and the amount of electric power demand of road infrastructures as shown in the figure, we investigated the electricity usage of National Highway Offices across the country. As a result, the demand for energies, such as electricity and heat for road infrastructures, was generated unevenly depending on the time and season, the characteristics of the demand varied depending on the region, and the demand for heat for melting the snow made up a significant proportion especially in cold, snowy regions.

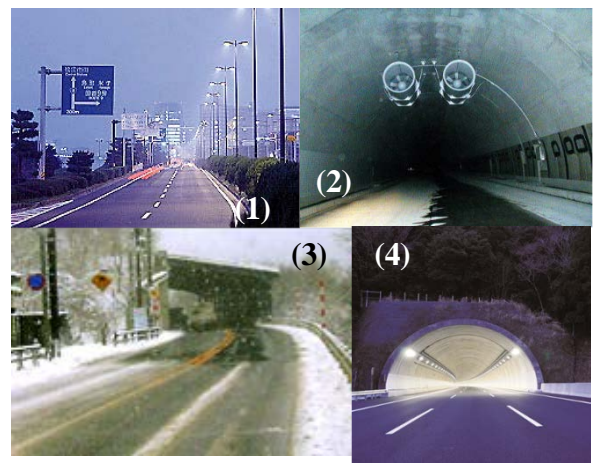
Next, we organized the measures related to energies. Organizing the measures from the perspectives of the road (road infrastructure, vehicle, fuel supply) and region. The vehicles on the road (single measure and promotion of introduction) and fuel supply for the road are promoted in combination with regulations, tax system, and aid, and the amount of aid is high. Therefore, it was found that energy conservation is currently promoted mainly in these two sections.

In addition, we also investigated case examples from domestic and foreign smart communities. No verification experiment has ever been conducted incorporating the

energy demand and supply of road infrastructures. However, as a result of organizing the case examples by expanding the scope to individual vehicle and fuel supply facilities, we found that the introduction of electric vehicles has been promoted as a single measure from the road and vehicle perspectives.

3. Future Plans

We are considering advancing the reduction of carbon emissions for the entire region by collecting information on the trends of new technologies and collaborating intelligently with the energies of roads and the surrounding areas. In such a case, we are expecting to achieve higher energy reduction effects by conducting such activities in the regions where energy density is high considering the regional characteristics.



(1) Road lighting, (2) Tunnel ventilation facilities,
(3) Road heating, (4) Tunnel lighting

Figure: Major road infrastructures consuming electric power

☞ For details, refer to the following:

1) Study toward effective utilization of energies of road infrastructures: The Committee on Environmental Systems of Japan Society of Civil Engineers: Proceedings of the 43rd Annual Meeting of Environmental Systems Research, The 43rd, pp. 33 - 37, 2015. 10