

Regional Model

Feasibility of 80% reduction in Japan

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Background and Objective

Japan's long-term climate target by 2050 is reducing GHG emission by 80% compared to 1990. However, no nuclear power plant is operating now and availability of nuclear power in 2050 is uncertain. Complying with the plan of the former political administration, all nuclear power plant must not operate more than 40 years. It means all nuclear power phase out by 2050.

This study is intended to estimate a possibility to achieve 80% reduction target without nuclear power, by using regional Enduse model in Japan.

Methodology and scenario

The model structure is based on AIM/Enduse [Japan], and it is divided into 10 regions which are consistent with Japan's 10 major electric power company's distribution area. The regional characteristics such as renewable energy potential and climate condition by region are reflected in the model. The model can also consider the electricity interconnection capacity limit between 10 regions, and treat reinforcement of interconnection as a countermeasure.

In this study, four scenarios are prepared. In baseline scenario, no carbon price is set and nuclear power phase out by 2050. In following scenarios, carbon price is determined to reduce GHG emission by 80%. Only in nuclear remain scenario, current capacity remains by 2050. In nuclear phase out scenario, nuclear power plant operates no more than 40 years. Only in reinforcing interconnection scenario, reinforcement of electricity interconnection is allowed, and other conditions are same as nuclear phase out scenario.

Result and implication

In nuclear phase out scenario, carbon price to reduce GHG by 80% is about 600 USD/t-CO₂, increased 25% from nuclear remain scenario. But in reinforcing interconnection scenario, carbon price is reduced by 9% compared to nuclear phase out scenario, because power generation from renewable in Hokkaido and Tohoku region become available in Tokyo region, the largest electricity consumer in Japan.

Without nuclear power, carbon price to achieve 80% reduction by 2050 is high. To reduce economic impact, not only implementation of energy efficiency or renewable but system technology such as reinforcing electricity interconnection is important.

