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ABSTRACT

The role of Electric Vehicles (EV) to promote PV installation in Kyushu
Toward reducing the total generation cost

Keiichi N. Ishihara
Department of Socio-Environmental Energy Science
Kyoto University

Unlike in Germany the Japanese power grid is self-contained within Japan. Thus, if we are taking the balance of supply and demand into consideration, the introduction of variable renewable energy is limited due to fluctuations in output.
Furthermore, Japan exhibits certain characteristics, such as a difference in frequency between East and West Japan, and three islands (Hokkaido, Shikoku, and Kyushu) that are attached to the mainland Honshu, of which each has a limiting effect on the electric power transmission.
Especially in the Kyushu region, a large number of solar power plants have already been introduced, and to maintain the balance between supply and demand, from 2018 output control has been established, which in 2019 came into effect on about 60 days. There are plans to install even more solar power plants, but in this case, we have to investigate carefully how to manage this issue effectively and additional output control cannot be avoided. Therefore, it is necessary to take introducing large-scale power-storage devices into consideration. Based these assumptions, we have constructed a power supply and demand model of the Kyushu region, which estimates the electrical power overflow (curtailment) that will be produced if solar power generators are introduced further. In addition, for the electric power storage devices (batteries) additional expenses will incur, thus we are looking for the most suitable battery introduction amount considering the overall cost.
This optimal amount depends on the battery installation cost and it can be shown that it is possible to reduce the cost by utilizing electric vehicles which we expect to be introduced increasingly in the future as well and might make it possible to reduce the overall greenhouse effect gases, by avoiding transportation energy from fossil energy.