講演番号	205

文献番号	20225205

Optimized Design of Solar Power for Virtual Grid Community using Electric Vehicles

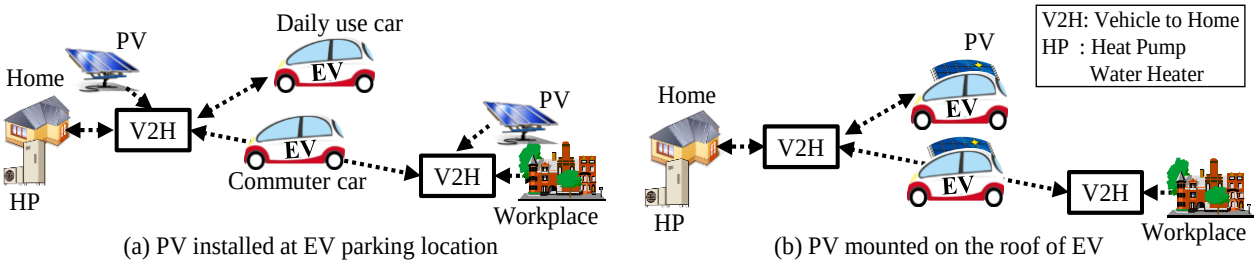
Hideyuki Chisaka [1)] **Tsuguhiko Nakagawa** [1)]

1) Tokai National Higher Education and Research System Gifu University of Institute for Advanced Research
Renewable Energy System Research Center & Graduate school of Engineering
1-1 Yanagido, Gifu City, Gifu, 501-1193, Japan (E-mail: tjnala@gifu-u.ac.jp)

KEY WORDS: **EV systems, Power storage system, Energy management,** Renewable energy, Heat pump [A3]

A new concept of integrated energy system called "virtual grid (VG)" has proposed to store and transport renewable electricity such as photovoltaic power (PV) using electric vehicles (EV). In order to construct the design method for the virtual grid, the PV specification (installation location, power generation output, etc.,) have to be decided by the complicated virtual network consisting of EV and moving places of EV. In this paper, a computer simulator has been developed and studied the complicated virtual network of their configuration and effect of CO_2 reduction.

As energy systems targeted in this study, Figure 1 shows configuration in which a home is connected to two private vehicles, one for commuting and the other for daily or leisure activities. Two possible installation locations for PV can be considered: PV can be installed in a parking area shown in Figure1(a) or mounted on the roof of EV shown in Figure(b). Figure 2 also shows 6 cases combined PV installation locations and EV charging & discharging method considered in this study.



(a) PV installed at EV parking location (b) PV mounted on the roof of EV

Fig.1 Energy systems targeted in this study

As a result, the difference in PV surplus rate for each case is shown in Figure 3. Each case in Figure 3(a) only charges the EV with PV power, while each case in Figure 3(b) supplies power from the EV to the home. In each case, the annual driving distance is 6,000 km/year. Figure 3(a) shows that in all cases, PV surplus rate increases as PV output increases. The increase is particularly remarkable in Case 1. As the reason for this, PV surplus power is not supplied to other demand. From Figure 3(b), PV surplus power is suppressed in all Cases 4-6. Therefore, Vehicle to home (V2H) and a whole energy management system to supply power from EV are necessary to use PV power more effectively, regardless of vehicle installation of PV and outside supply of the PV power.

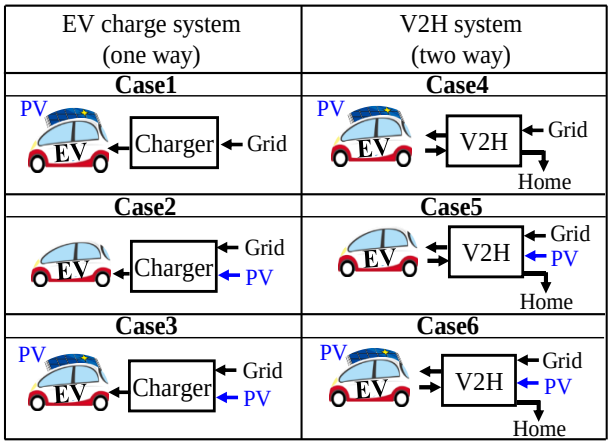


Fig.2 Study cases of EV charge & V2H system

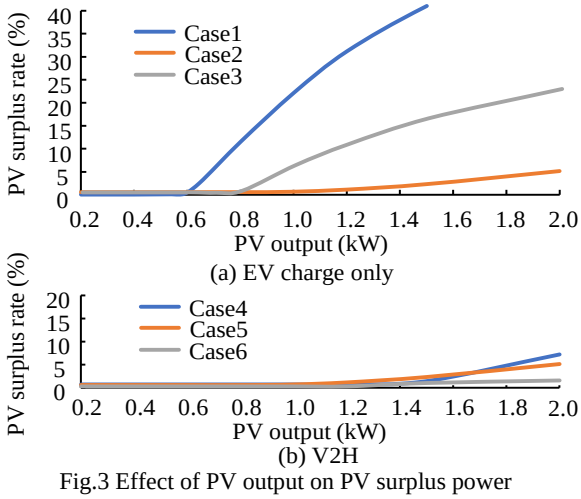


Fig.3 Effect of PV output on PV surplus power