

Osaka Gas and Sekisui House to Start New Living Experiment at 3-Battery House ~ Demonstration Experiment Anticipating a Society Whose Main Power Source is Renewable Energy ~

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In anticipation of a society where renewable energy is the main power source, Osaka Gas Co., Ltd. (President: Takehiro Honjo; hereinafter, "Osaka Gas") and Sekisui House, Ltd. (President: Yoshihiro Nakai; hereinafter, "Sekisui House") will jointly conduct a living experiment at a house equipped with three types of batteries (fuel cell, storage battery, and solar cells) (hereinafter, "3-battery house") for about one year from April 1 in order to verify to what extent the 3-battery house can contribute to power grid stabilization.

For two years from December 2016, Osaka Gas and Sekisui House conducted a long-term living experiment at a renovated house that achieved net zero energy^{*2} while improving comfort by maximizing the use of fuel cells.^{*1} This time, we will start the following new living experiments at this verification site.

Verification of 3-battery house's contribution to power grid stabilization

We will confirm to what extent the 3-battery house can contribute to power grid stabilization in the following aspects.

1. Operation of the fuel cell and storage battery is controlled in accordance with fluctuations in the power generated by the solar cells of the 3-battery house in order to suppress fluctuations in the power grid and thereby minimize effects on the power grid.
2. When power supplied from renewable energy sources, such as solar cells, is excessive in the power grid, the amount of the power generated by the fuel cell is reduced and excess power is stored in the storage battery to contribute to maintaining a supply-demand balance in the power grid.
3. With the assumption that the 3-battery house is a resource of a virtual power plant (VPP),^{*3} we will check if the 3-battery house can provide adjustability required to maintain the supply-demand balance in the power grid in response to simulated instructions from electric utility companies. We will also assess consequent effects on residents to detect any issues.

(Explanation)

If renewable energy becomes the main power source in the future, it will probably be difficult to adjust the supply-demand balance in the power grid only by efforts on the supply side. Therefore, the demand side will be required to adjust the power consumption and the output of the generator (DR).^{*4} For example, when the power supply is excessive in the power grid, the amount of power generated by the fuel cell is reduced and excess power is stored in the storage battery to contribute to reducing power supply capacity. Conversely, when the power supply is insufficient, the amount of power generated by the fuel cell is increased and the storage battery discharges to contribute to increasing power supply capacity.

Generally, in the case of a system that consists of solar cells and a storage battery, the storage battery has a wide range of charging/discharging power adjustability. However, when cloudy days continue, the storage battery cannot discharge due to insufficient charge level and consequently cannot provide adjustability. In contrast, fuel cells have a small range of power adjustability, but can continue generating electric power regardless of the weather. Therefore, they can continue providing adjustability for a long period of time. We believe that 3-battery houses, which combine these features, will continue to contribute to regulating power over the long term and will play a major role in power grid stabilization in the future.

Osaka Gas and Sekisui House will continue to promote the spread of houses using fuel cells, and contribute to the realization of comfortable lifestyles for customers, reduction of environmental burdens, and the spread of renewable energy.

- *1: To keep operating the fuel cell efficiently at rated operating conditions, besides the fuel cell, solar cells are installed, and the power generated by each type of cell is separately measured and sold. In addition, exhaust heat from the fuel cell is utilized for hot water supply and room heating.
- *2: The net annual consumption of primary energy becomes less than or equal to zero by creating energy using solar cells and other devices (as in the Building Energy Consumption Performance Standard, power consumption by home appliances is excluded).
- *3: Virtual power plant: Business operators called "aggregators" use the supply capacity and adjustability provided by dispersed power sources in a bundle.
- *4: Demand response: To change the pattern of power demand by controlling energy resources on the demand side.

(Appendix 1)

Overview of the living experiment house



■ Location

Oji-cho, Kita-katsuragi-gun, Nara Prefecture

■ Building outline

- Lightweight steel frame, 2 stories
- Four-bedroom house (total floor area: 138.8 m²)

■ Equipment overview

- Fuel cell: Solid oxide fuel cell (SOFC) (rated output: 700 W)
- Solar cells: Polycrystalline type (rated output: 5.08 kW)
- Storage battery: Lithium-ion storage system (9.8 kWh)
- Other equipment: Air conditioners, floor heating, LED lighting, electric shutters, etc.

■ Resident family members

- 3 people

■ Experiment period

April 2020 to March 2021 (scheduled)