

## Japan residential energy storage

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As Japan's energy market continues to evolve, residential energy storage systems (ESS) are playing an increasingly vital role in grid management. Recently, utility companies like Tokyo Electric Power Company (TEPCO) and Tokyo Gas have launched projects aimed at optimizing power supply and demand through remote control of these storage systems.

Host: Japan has initiated several projects that involve residential ESS in grid management. Could the experts provide a brief overview of the project background and the market situation?

Expert 1: Certainly. These projects reflect the rapid growth of the residential energy storage market in Japan. As of 2023, over 300,000 households in Japan have installed storage systems, with this number expected to rise to one million by 2030. There are multiple driving factors behind this trend. First, there is a growing need to address natural disasters. Second, rising household electricity prices are a concern. Finally, there are increasingly stringent carbon emission targets.

Additionally, as Japan gradually phases out traditional coal and nuclear power generation in favor of renewable energy, the stability of the grid and the pressures of balancing supply and demand are increasing. Companies like TEPCO recognize the potential of residential storage systems and are integrating them into the grid to improve flexibility in power management.

Expert 2: The increase in household electricity prices is another significant factor driving growth in the residential storage market. In recent years, fluctuations in fossil fuel prices and reductions in government subsidies for renewable energy have led to noticeable increases in household electricity costs. Data shows that in 2022, the average household electricity price in Japan reached 27 yen per kilowatt-hour (about \$0.25), representing a year-over-year increase of approximately 7%.

Residential storage systems allow users to store cheaper electricity during off-peak hours and use it during peak hours, effectively helping to reduce their electricity bills. For example, a household with a 5-kWh storage system can save about 15-20% on their annual electricity costs. In high-price areas like Tokyo and Osaka, the savings can be even greater. Moreover, these systems enhance the utilization of self-generated solar power, enabling users to store electricity produced during the day for use at night, which further improves the economic viability of energy storage.

Expert 3: In terms of operation, TEPCO remotely manages residential storage systems based on the grid's supply and demand conditions. Households equipped with storage systems connect in real-time

to the grid via the ENERES energy management system (EMS). This ensures that batteries provide support during peak demand periods. Battery status updates occur every ten minutes to ensure optimal response to grid needs.

Daily electricity usage for users remains largely unaffected. In fact, many families involved in these grid management projects receive financial incentives. For instance, participants in a Tokyo Gas project can earn a monthly reward of 200 yen while still maintaining the emergency power functionality of their systems. Users won't feel the impact of grid management and can monitor their battery's charge and discharge process through smart devices.

Expert 1: The primary advantage of residential storage systems lies in their dual functionality: they serve as emergency power sources for households while also providing flexibility to the grid. There are two key values to consider:

1. **Supply-Demand Balance:** Residential storage systems can help mitigate peak demand on the grid. Particularly when intermittent renewable sources like wind and solar are underperforming, these systems can quickly supply stable power to the grid. Studies show that distributed residential storage can effectively reduce grid load fluctuations by about 15%.
2. **Emergency Support:** In a country like Japan, which frequently experiences earthquakes and typhoons, residential storage systems provide crucial backup power. During extreme weather events, when the grid may fail due to line disruptions, these systems allow households to generate their own electricity and even support neighbors, thereby reducing recovery time for power restoration after disasters.

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