Japan energy storage for grid stability

grid connection and stability. Storage technologies have the potential to resolve these issues and help advance Japan into the next stage of its renewable energy transition. This briefing examines the regulatory framework for energy storage in Japan, draws comparisons with the European markets and

This study, jointly conducted by Japan"s Renewable Energy Institute and Agora Energiewende, investi-gates the impact of the integration of renewables in Japan on frequency stability and - to a lesser extent - power flows. It is based on a modelling and simulating tool chain of the Japanese power system developed

Grid Stability: By reducing the need for curtailment and providing a buffer against fluctuations in generation and consumption, PV + storage systems enhance grid stability. This is particularly important in regions with high renewable energy penetration, such as Kyushu.

Energy storage in Japan consists of thermal storage, hydro, pumped hydro, and Battery Energy Storage Systems. As Japan works to increase renewable penetration to meet its Net Zero targets, grid balancing becomes more critical to ensure grid stability and replace the inertia typically generated by thermal generators.

The platform will initially target 1GW of BESS projects in Japan over the next five years, and seek to build and grow a long-term business in Japan to facilitate Japan"s carbon neutrality goal, while supporting grid stability and reliability.

Japan's commitment to renewable energy has seen a significant transformation over the past decade. With a strong focus on solar power, the nation has become a leader in photovoltaic (PV) installations given the limited flat surface area. However, the intermittent nature of solar energy has presented challenges in balancing supply and demand. To address these challenges, Japan introduced the Feed-in Premium (FIP) scheme, a pivotal policy aimed at integrating PV systems with energy storage solutions.

The Feed-in Premium (FIP) scheme is an evolution of the earlier Feed-in Tariff (FIT) program, designed to encourage the adoption of renewable energy. While the FIT scheme guaranteed fixed payments for electricity generated from renewable sources, the FIP scheme offers a more dynamic approach. Under the FIP, renewable energy producers receive a premium on top of the market price of electricity, incentivizing them to be more responsive to market signals.

The FIP premium price calculation involves a specific logic designed to incentivize storage integration and optimization with PV. It boosts potential revenue in regions with high renewable energy generation, such as Kyushu. The premium is calculated by taking the ratio of the total electricity supply excluding periods with a market price of 0.01 yen/kWh to the total electricity supply including periods with a market price of 0.01 yen/kWh. This ratio is then multiplied by the base premium price.

This means that in areas and months where there is a high supply of electricity at the 0.01 yen/kWh rate, the premium is significantly amplified. However, you will not receive any premium for the amount you generate during 0.01yen/kWh time slots.

Balancing Supply and Demand: Solar energy production is highest during the day when demand may not always match supply. Storage systems capture this excess energy and release it when demand increases, ensuring a more balanced and reliable energy supply.

Maximizing Revenue: The ability to store and strategically release energy allows producers to minimize curtailment, take more FIP premium and take advantage of price fluctuations in the electricity market. This maximizes the financial returns on their investments in PV and storage technologies.

An excellent example of the FIP scheme in action is the PV + storage power plant operated by Kyocera TCL Solar G.K. in Arao, Kumamoto Prefecture. This project, which started commercial operations in June 2024, leverages Tensor Energy's advanced operating system to optimize battery charge and discharge schedules. The integration of storage at this plant is a testament to the effectiveness of the FIP scheme in promoting advanced renewable energy solutions.

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