July 2, 2026

Rapid Growth in Grid Connection Applications and Regulatory Reform

—Challenges and Responses in Japan and the United States Regarding Grid-Scale Battery Storage and Data Centers? —

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In Japan, applications for grid connection have been increasing rapidly, driven by the expanding deployment of renewable energy generation and grid-scale battery energy storage systems (BESS). In particular, from FY2023 through the second half of FY2025, both grid connection studies and connection applications for battery storage projects increased substantially, resulting in a significant accumulation of projects at the grid connection study stage.

Specifically, as of January 2023, virtually no grid-scale battery storage systems had been connected to the grid. Projects under grid connection study totaled 8.787 GW, while projects with submitted connection applications amounted to approximately 0.668 GW[1]. By December 2025, however, although the capacity of grid-connected battery storage systems had increased to only approximately 0.64 GW, projects under grid connection study had surged to approximately 172 GW, and projects with submitted connection applications had reached approximately 30 GW[2]. These figures indicate that only a limited proportion of projects proceed from the grid connection study stage to actual grid connection.

This discrepancy suggests that some projects may be securing grid connection capacity at the planning stage without having a realistic prospect of implementation. Applications for grid-scale battery energy storage systems (BESS) are particularly likely to increase rapidly because such projects typically have relatively short construction periods, require comparatively little land, and may be able to avoid the need for upstream transmission network reinforcement through non-firm grid connections. As a result, grid capacity has increasingly been occupied by projects with limited feasibility.

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[1] Agency for Natural Resources and Energy. (2023, February 28). *On the connection and utilization of grid-scale battery energy storage systems*. Retrieved June 27, 2026, from https://www.meti.go.jp/shingikai/enecho/shoene_shinene/shin_energy/keito_wg/pdf/044_02_00.pdf

[2] Agency for Natural Resources and Energy. (2026, March 27). *Measures to accelerate grid interconnection for grid-scale battery energy storage systems and other power generation facilities*. Retrieved June 27, 2026, from https://www.meti.go.jp/shingikai/enecho/denryoku_gas/saisei_kano/smart_power_grid_wg/pdf/009_01_00.pdf

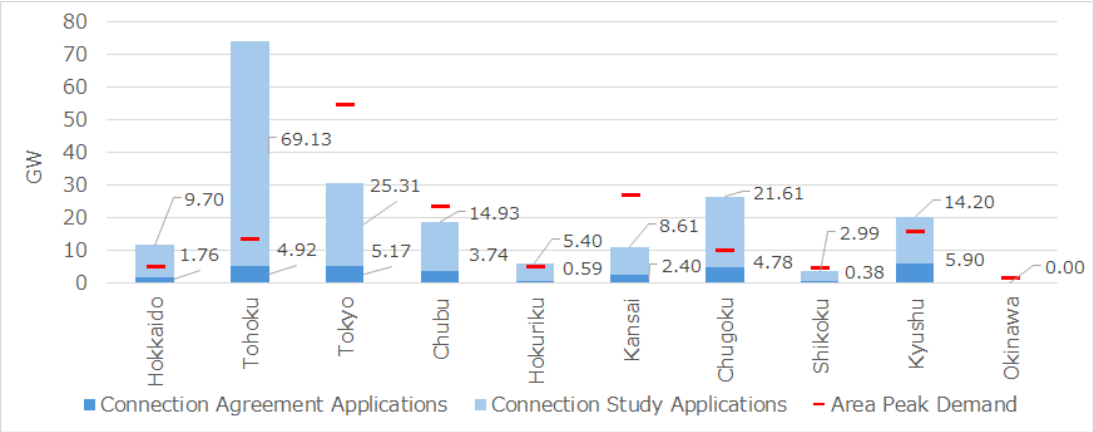

Figure 1. Status of Grid Connection Study Requests and Connection Applications for Grid-Scale Battery Energy Storage Systems (BESS) in Japan (as of the end of December 2025)
Source: Prepared by The Institute of Energy Economics, Japan (IEEJ) based on data from the Agency for Natural Resources and Energy (ANRE).

To address this issue, the Japanese government is moving toward introducing measures in both the grid connection study process and the connection application process. Measures in the grid connection study process include: (1) requiring applicants to submit documentation demonstrating information related to the proposed project site; (2) imposing an upper limit on the number of grid connection study requests that can be submitted by a single developer; and (3) improving operational procedures so that the results of the grid connection study are provided promptly once it becomes evident that construction costs or other conditions do not meet the applicant's requirements. Measures in the connection application process include: (4) requiring

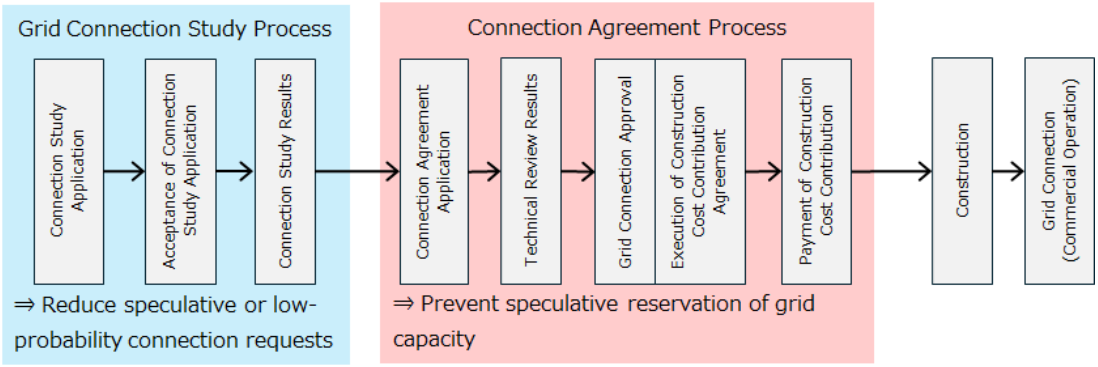

Figure 2. Grid Connection Process in Japan
Source: Prepared by The Institute of Energy Economics, Japan (IEEJ) based on data from the Agency for Natural Resources and Energy (ANRE).

applicants to demonstrate legal rights to use the proposed project site; and (5) increasing the security deposit required upon submission of a connection application and setting a minimum amount for the initial installment payment of construction costs[3].

[3] Agency for Natural Resources and Energy. (2026, June 3). *Future renewable energy policy toward making renewable energy the primary power source*. Retrieved June 27, 2026, from https://www.meti.go.jp/shingikai/enecho/denryoku_gas/saiene_shuryoku/pdf/001_03_00.pdf

On the demand side, the growth of large-scale electricity demand, including data centers, has also emerged as a new challenge. As of 2023, approximately 90% of data centers in Japan, measured by floor area, were concentrated in the Kanto and Kansai regions, indicating a pronounced regional concentration of demand[4]. In particular, in the Inzai and Shiroi areas of Chiba Prefecture, there were approximately 40 large-scale demand projects awaiting grid connection, with a total requested capacity of around 2,500 MW. The grid reinforcement costs required to accommodate these projects are estimated to exceed JPY 200 billion, while the customers seeking grid connection would bear only around JPY 10 billion of these costs[5].

Such concentration may lead to delays in electricity supply and inefficient investment in grid infrastructure. Large-scale electricity consumers typically do not reach their maximum demand immediately after commencing operations; rather, their electricity demand generally increases gradually over several years. As a result, discrepancies arise between contracted capacity and actual demand, leading to the reservation of unused grid capacity and inefficient utilization of the grid resulting from subsequent changes to project plans. To address these issues, the Japanese government is considering measures such as guiding project siting through the expansion of the Welcome Zone Map and enabling earlier grid connection, subject to electricity receiving restrictions.

Table 1. Distribution of Data Centers in Japan (2023)

Region	Floor Area (m²)	Share	Number of Buildings	Share
Hokkaido	17,290	1%	16	3%
Tohoku	25,590	2%	40	8%
Kanto	1,070,450	64%	194	38%
Chubu	69,150	4%	78	15%
Kansai	411,550	24%	84	16%
Chugoku/Shikoku	37,920	2%	49	10%
Kyushu/Okinawa	47,960	3%	49	10%
Total	1,679,910	100%	510	100%

Source: Prepared by The Institute of Energy Economics, Japan (IEEJ) based on data from the Agency for Natural Resources and Energy (ANRE).

[4] Ministry of Economy, Trade and Industry. (2024, May 30). *Expert meeting on the development of digital infrastructure, including data centers*. Retrieved June 27, 2026, from https://www.meti.go.jp/policy/mono_info_service/joho/conference/digital_infrastructure/0007/004_jimukyokusiryou.pdf

[5] Agency for Natural Resources and Energy. (2025, October 15). *Toward the next generation of Japan's electricity network*. Retrieved June 27, 2026, from https://www.meti.go.jp/shingikai/enecho/denryoku_gas/jisedai_kiban/system_design_wg/pdf/005_05_00.pdf

Similar challenges have also emerged in the United States. The total capacity of power generation and other facilities awaiting grid interconnection studies has reached approximately 2,290 GW, nearly twice the existing installed generation capacity of 1,322 GW. Furthermore, of the projects that applied for grid interconnection between 2000 and 2019, only 13% had commenced commercial operation by the end of 2024, while 77% had been withdrawn[6]. These figures indicate that only a limited proportion of interconnection requests ultimately proceed to project completion.

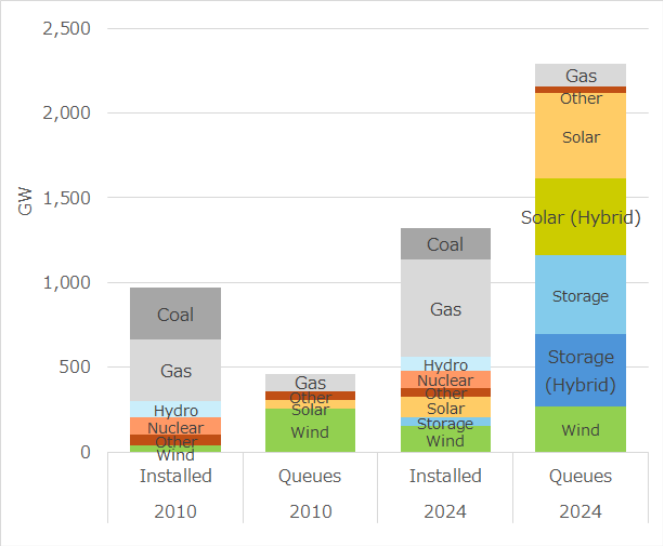

Figure 3. Status of Power Plant Grid Interconnection Requests in the United States, by Generation Technology (2010 and 2024)
Source: Prepared by The Institute of Energy Economics, Japan (IEEJ) based on Rand, J., et al. (2025), Queued Up: 2025 Edition: Characteristics of Power Plants Seeking Transmission Interconnection as of the End of 2024.

As a result, the large volume of interconnection requests, combined with the submission of many projects with limited feasibility, has created a substantial backlog in the interconnection queue. Consequently, evaluating necessary transmission network reinforcements and conducting interconnection studies have become increasingly time-consuming. In the United States, the median time required to complete the grid interconnection process now exceeds four years, making prolonged delays and growing uncertainty serious challenges.

To address these issues, the Federal Energy Regulatory Commission (FERC), through Order No. 2023, has introduced reforms including the adoption of cluster studies that evaluate multiple interconnection requests simultaneously, strengthened financial security and withdrawal penalties,

[6] Rand, J., et al. (2025, December 15). *Queued up: 2025 edition: Characteristics of power plants seeking transmission interconnection as of the end of 2024*. Lawrence Berkeley National Laboratory. Retrieved June 27, 2026, from https://eta-publications.lbl.gov/sites/default/files/2025-12/queued_up_2025_edition_12.15.2025.pdf

and enhanced information disclosure requirements[7].

In addition, the rapid expansion of large electricity demand from data centers and other facilities has raised concerns about accelerating electricity demand growth and declining grid reliability. In response, the United States is considering measures for large electricity demand projects of 20 MW or greater, including an integrated assessment of load and associated generation resources, the introduction of financial security requirements, and requiring large demand customers to bear the full cost of necessary grid reinforcements[8].

As discussed above, both Japan and the United States face common challenges of rapidly increasing grid connection applications and prolonged interconnection review processes, driven by the rapid deployment of grid-scale battery energy storage systems (BESS) and data centers. Underlying these challenges are structural issues, including the reservation of grid capacity by projects with limited feasibility and discrepancies between planned and actual demand and supply.

Going forward, it will be important to enhance the credibility of grid connection applications by revising financial security requirements and withdrawal rules, while making more efficient use of limited grid capacity through measures such as guiding project siting toward areas with available grid capacity and promoting more flexible use of the transmission network. Furthermore, as grid connection demand is expected to continue increasing with the expansion of data centers, accelerating grid development in parallel with regulatory reform will be essential to achieving both a reliable electricity supply and decarbonization.

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[7] Federal Energy Regulatory Commission. (2023, July 28). Order No. 2023: *Improvements to generator interconnection procedures and agreements* (Docket No. RM22-14-000). Retrieved June 27, 2026, from https://www.ferc.gov/media/order-no-2023

[8] U.S. Department of Energy. (2025, October 23). *Secretary of Energy's direction that the Federal Energy Regulatory Commission initiate rulemaking procedures and proposal regarding the interconnection of large loads pursuant to the Secretary's authority under Section 403 of the Department of Energy Organization Act*. Retrieved June 27, 2026, from https://www.energy.gov/sites/default/files/2025-10/403%20Large%20Loads%20Letter.pdf