452nd Forum on Research Works December 19, 2025

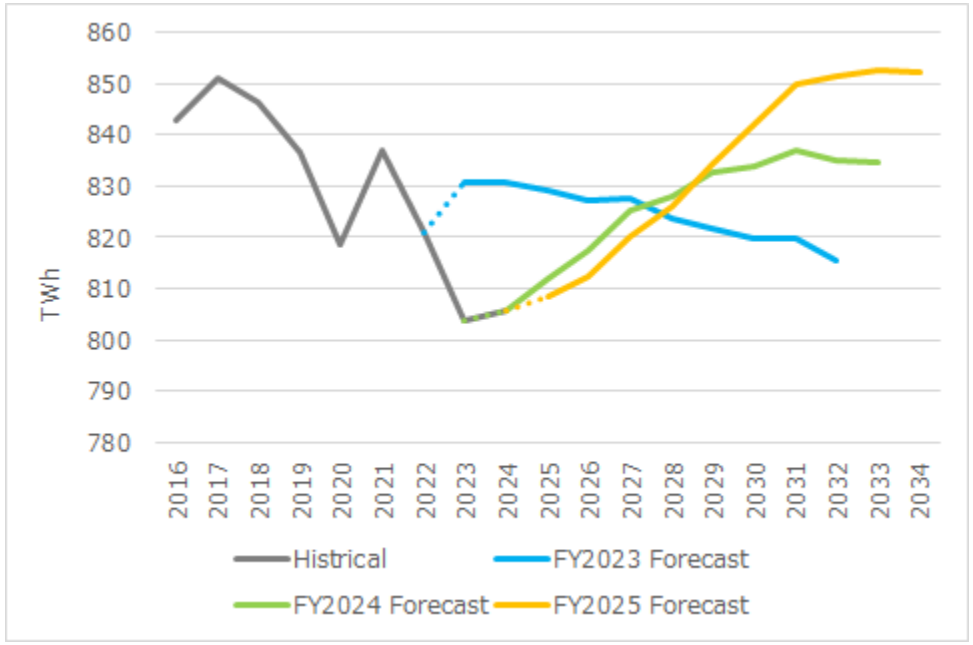
Challenges for Japan's Electricity Policy in 2026

～ Securing Long-Term Power Supply in the Face of Increasing Electricity Demand ～

Kenichi Onishi
Electric Group, Electric Power Industry Unit
The Institute of Energy Economics, Japan

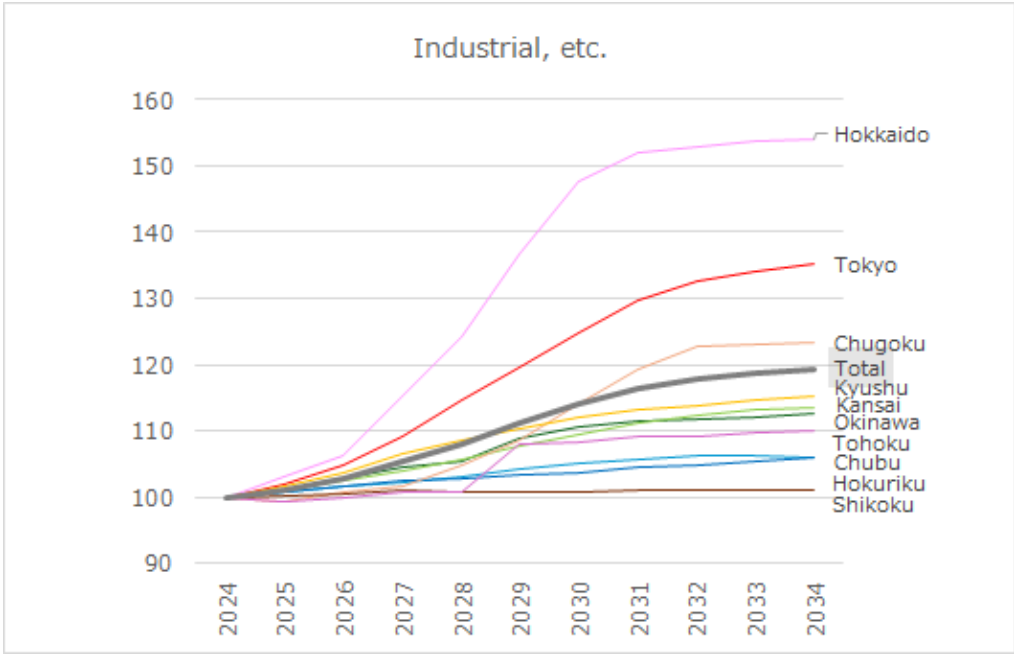
Outlook for Electricity Demand in Japan

- According to the demand outlook published in January 2025 by the Organization for Cross-regional Coordination of Transmission Operators, Japan (OCCTO), nationwide electricity demand (end-use basis) is expected to increase at an average annual rate of 0.6% between FY2024 and FY2034. This represents a shift from the previous outlook published in January 2023, which projected an average annual decline of 0.2% between FY2022 and FY2032.
- From FY2026 onward, electricity demand is expected to continue rising through FY2034, driven by economic growth and the ongoing construction of new data centers and semiconductor plants. Regionally, localized increases in electricity demand are anticipated.



[Figure] Historical and projected nationwide electricity demand (end-use basis)

[Note] Demand figures are adjusted to normal weather conditions



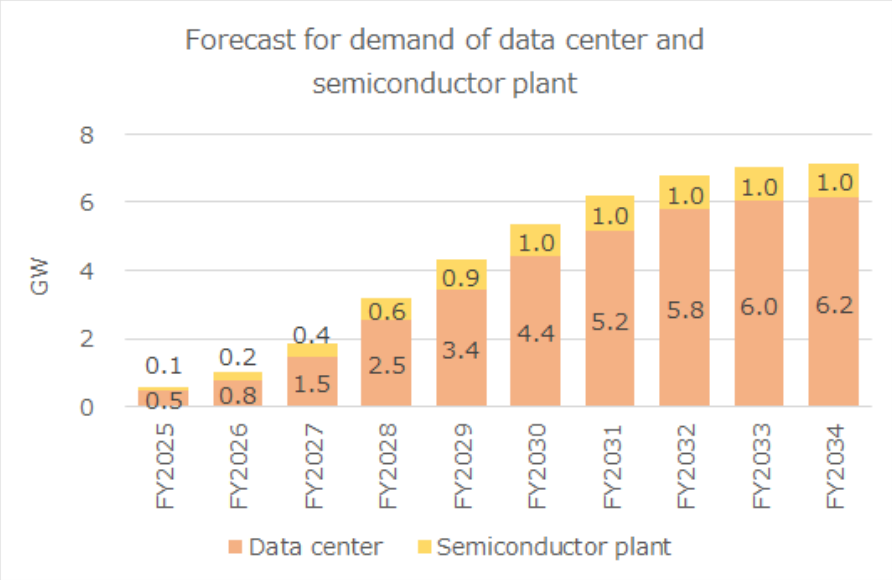
[Figure] Regional outlook for industrial electricity demand (end-use basis)

[Note] FY2024 = 100

[Source] Source: Compiled by IEEJ based on OCCTO materials

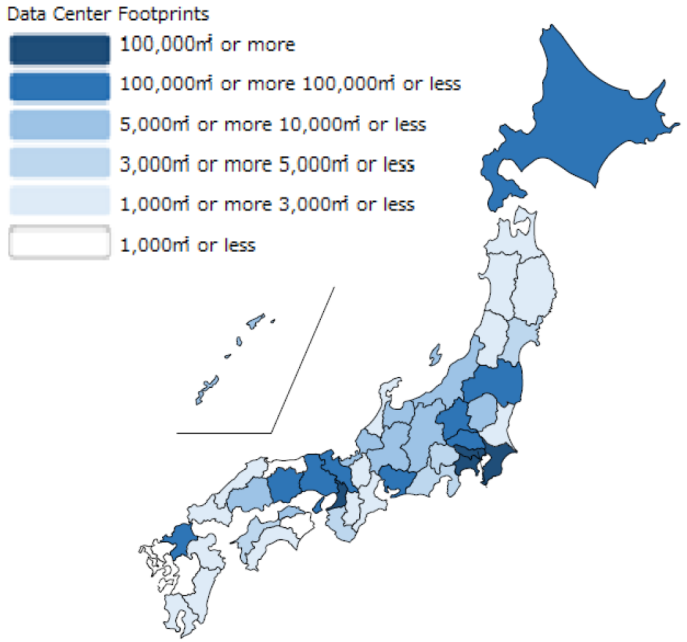
Outlook for Electricity Demand from Data Centers in Japan

- OCCTO estimates that new and expanded data centers and semiconductor plants will increase peak electricity demand by up to 71.5 GW between FY2024 and FY2034. Japan currently has approximately 1.5 million square meters of data center floor space (equivalent to about 30 Tokyo Domes), with over 80% concentrated in the Tokyo and Osaka metropolitan areas.
- In the Tokyo metropolitan area, grid reinforcement is sometimes required for data center interconnection, raising concerns that connection lead times may increase.
- Going forward, in addition to efforts to enable earlier grid connections, it will be important to promote geographical dispersion of data centers outside the Tokyo and Osaka areas, particularly for applications that do not require ultra-low latency.



[Figure] Trend in peak power demand associated with new and expanded data centers and semiconductor fabs in Japan

[Source] OCCTO. (2025). National and Regional Electricity Demand Outlook (FY2025).



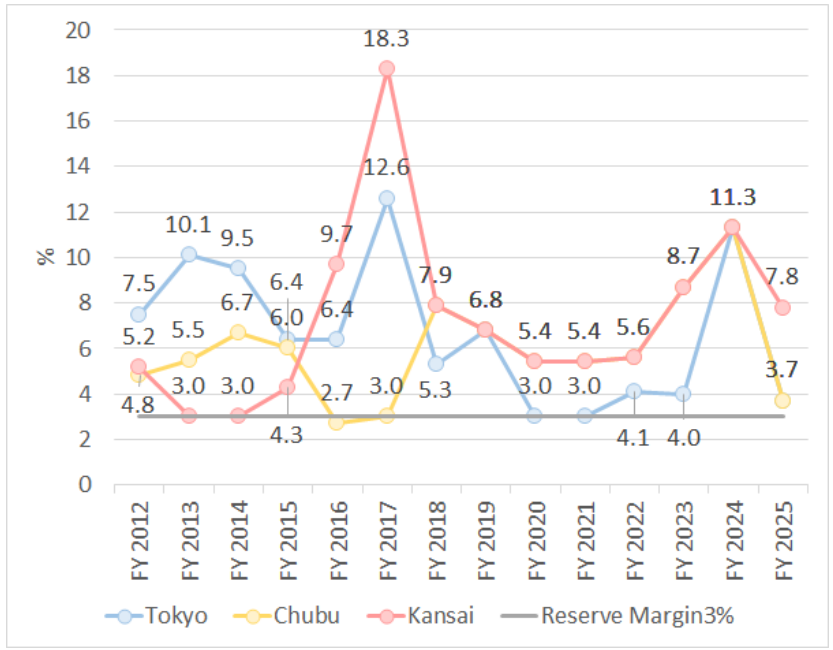
[Figure] Map of Data Center Distribution in Japan

[Source] MIC & METI. (2024). Expert Panel on the Development of Digital Infrastructure (Data Centers, etc.): Secretariat Presentation Materials for the 7th Meeting (May 30, 2024).

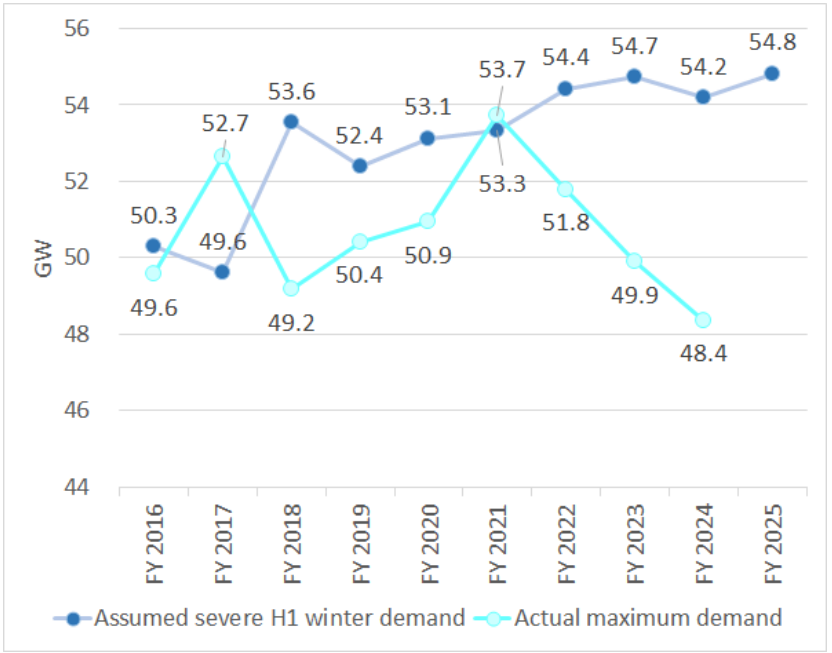
Supply–Demand Outlook for Winter FY2026 in Japan

- For winter FY2025, Japan is expected to secure a minimum reserve margin of 3% or more in all regions against severe winter demand assumptions.
- While generation capacity (kW) has been secured through the capacity market since FY2024, it is also important to establish an environment that enables power producers to conclude medium- to long-term bilateral contracts with retail electricity suppliers for energy supply (kWh). Such arrangements would support long-term fuel procurement by generators.

[Note1] "Severe winter demand" refers to H1 demand levels based on the coldest winter observed over the past 10 years.



Outlook for January Supply Reserve Margins in Major Areas



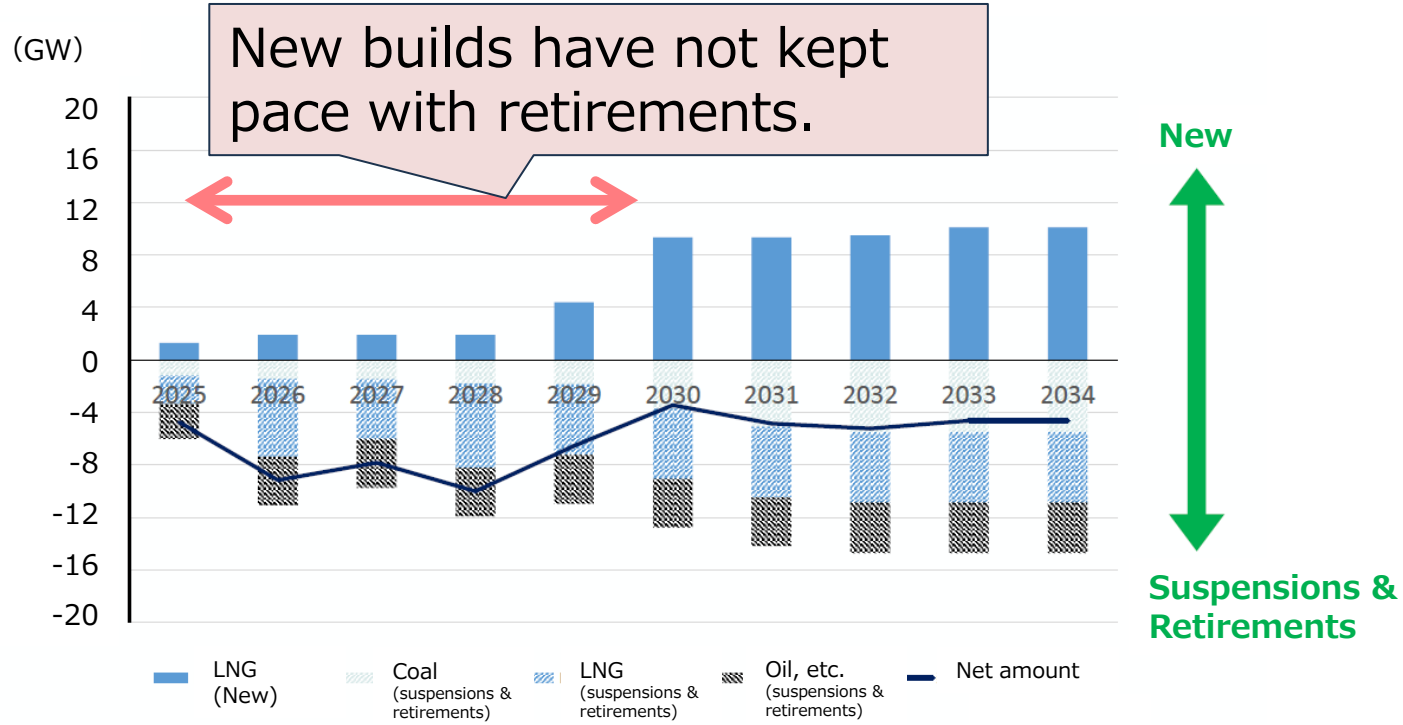
Assumed and Actual Winter Demand in the Tokyo Area

[Figure] Winter Supply–Demand Outlook During Severe Cold (H1 Demand Surge Scenario)

[Source] Prepared by IEEJ, based on the Power Supply–Demand Verification Subcommittee Reports for FY2013–FY2015 and the Power Supply–Demand Verification Reports for FY2016 onward.

Trends in Thermal Power Plant Retirements in Japan

- Going forward, long-term suspensions and retirements—particularly of inefficient coal-fired power plants—are expected to continue. At the same time, new construction and replacement of power plants such as LNG-fired power plants will advance through the Long-Term Decarbonized Power Source Auction, though commercial operation will begin after 2029.
- As Japan enters a transitional phase of power supply restructuring, tight supply–demand conditions may persist into the early 2030s, especially during peak summer and winter periods.



[Figure] Trends in Thermal Power Plant Retirements and Decommissioning

[Source] ANRE. (November 11, 2025). Measures for Securing Power Supply Capacity (Document No. 3).

Supply–Demand Outlook for Summer and Winter FY2026

- According to the FY2026 outlook published in October 2025, overlapping long-term outages and suspensions of power plants could reduce the reserve margin in the Tokyo area to as low as 0.9% in August 2026.
- As a countermeasure, a 12 GW capacity auction (kW tender) [Note1] was proposed for the Tokyo area.
- In November 2025, the Governor of Niigata Prefecture approved the restart of Kashiwazaki-Kariwa Nuclear Power Plant Unit 6. Its restart could increase the reserve margin by approximately 2.4 percentage points, potentially raising it to around 3.3% even without a kW tender, thereby mitigating supply shortage risks in the Tokyo area.

[Note1] A scheme to solicit and secure available generation capacity (kW) in advance from generators, self-generation facilities, and consumers to prepare for tight supply–demand conditions.

	Jul.	Aug.	Sep.	Dec.	Jan.	Feb.	Mar.
Hokkaido	7.9	7.2	13.6	20.5	7.7	8.1	14.8
Tohoku	7.9	7.2	13.6	20.5	7.7	8.1	12.3
Tokyo	5.5	7.2	13.6	20.5	7.7	8.1	20.1
Chubu	5.5	7.2	13.6	11.1	7.7	9.7	20.1
Hokuriku	9.2	11.1	13.6	11.1	8.9	9.7	20.1
Kansai	9.2	11.1	13.6	11.1	8.9	9.7	20.1
Chugoku	9.2	11.1	13.6	11.1	8.9	9.7	20.1
Shikoku	25.8	23.6	21.5	11.1	8.9	9.7	20.1
Kyushu	13.6	11.1	13.6	10.3	6.0	**3.2**	20.1
Okinawa	27.2	36.8	32.3	37.0	34.1	45.6	51.0

FY2025 Forecast (%)

	Jul.	Aug.	Sep.	Dec.	Jan.	Feb.	Mar.
Hokkaido	10.9	8.5	15.3	20.2	5.7	6.1	12.4
Tohoku	10.9	8.5	11.3	20.2	5.7	6.1	12.4
Tokyo	**2.1**	**0.9**	**2.7**	20.2	5.7	6.1	8.5
Chubu	9.7	8.0	2.7	8.8	5.7	7.5	14.1
Hokuriku	11.4	11.6	9.6	8.8	5.7	7.5	14.1
Kansai	11.4	11.6	9.6	8.8	5.7	7.5	14.1
Chugoku	11.4	11.6	9.6	8.8	5.7	7.5	14.1
Shikoku	11.4	11.6	9.6	8.8	5.7	7.5	14.1
Kyushu	11.4	18.0	9.6	8.8	5.7	7.5	18.4
Okinawa	15.9	36.8	31.7	42.2	44.8	46.3	53.3

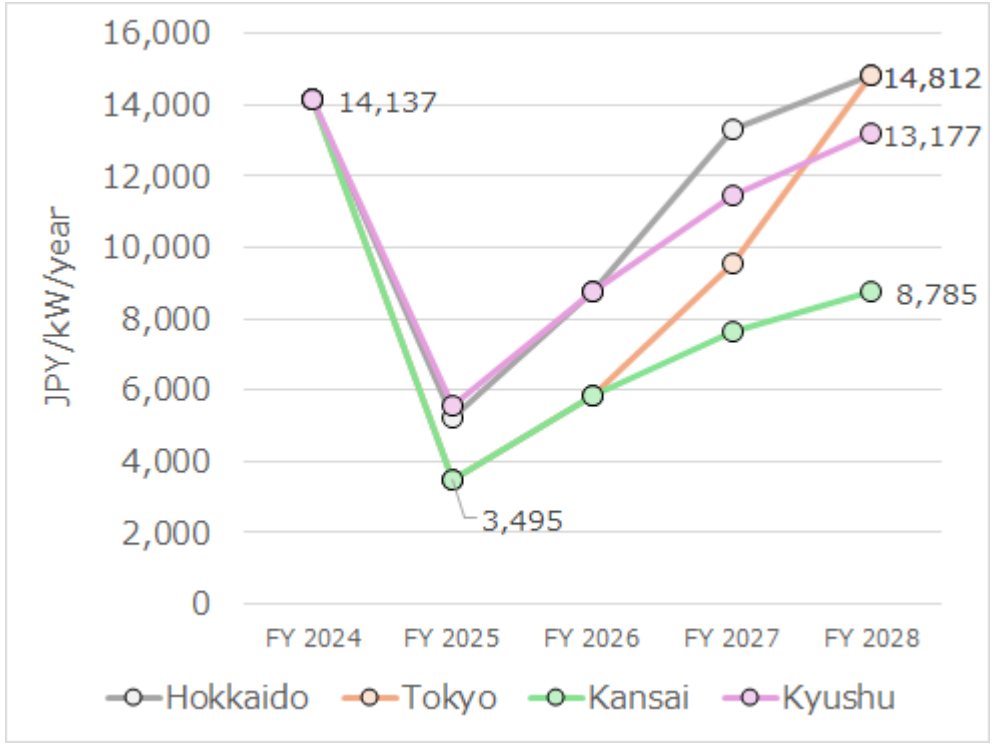
FY2026 Forecast (%)

[Figure] Minimum Reserve Margin for Severe Weather H1 Demand (Preliminary)

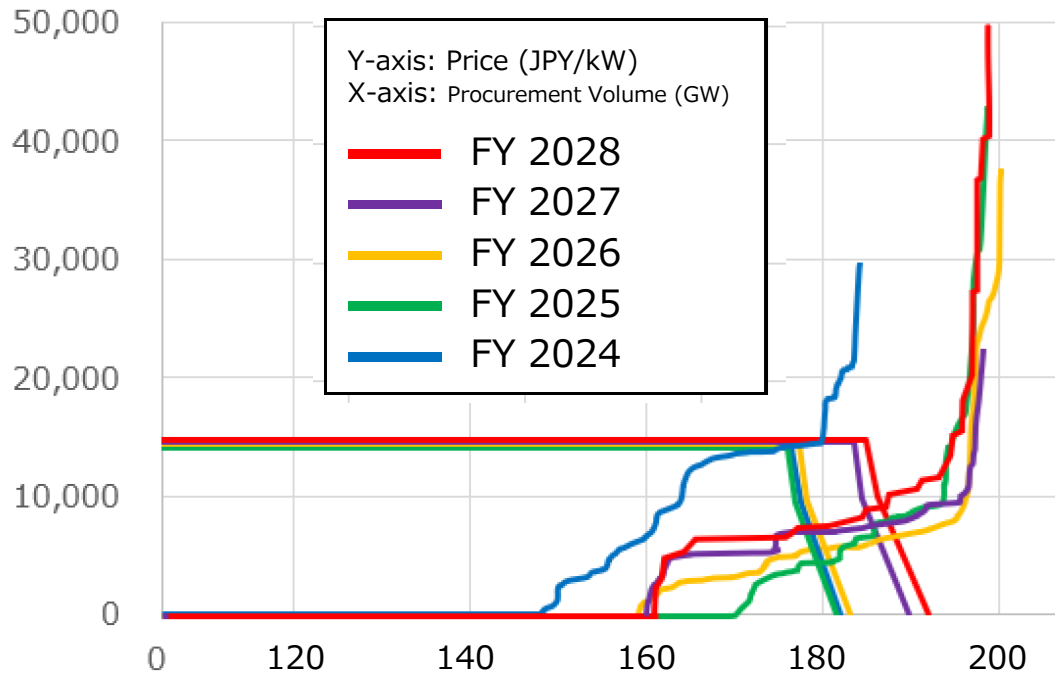
[Source] Prepared by IEEJ, based on materials from ANRE.

Trends and Outlook for Capacity Prices in Japan

- Japan has introduced a capacity market designed to secure supply capacity four years ahead. In January 2025, a capacity auction for FY2028 supply was conducted, and capacity prices have been rising overall.
- The primary driver of higher capacity prices is believed to be an increase in bid price levels.
- If electricity demand continues to grow while supply capacity remains constrained, capacity prices could rise further, potentially leading to higher electricity tariffs.



[Figure] Trends in Capacity Prices

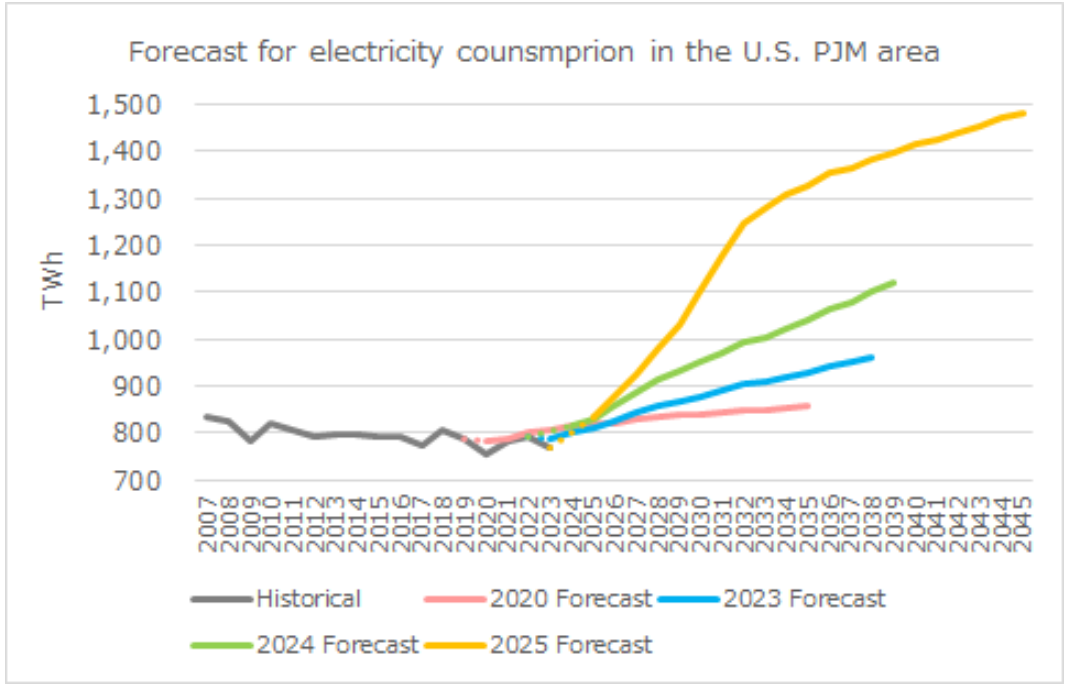


[Figure] Comparison of Supply–Demand Curves in the Capacity Market

[Source] Prepared by IEEJ, based on materials from OCCTO.

Electricity Demand Outlook in the United States

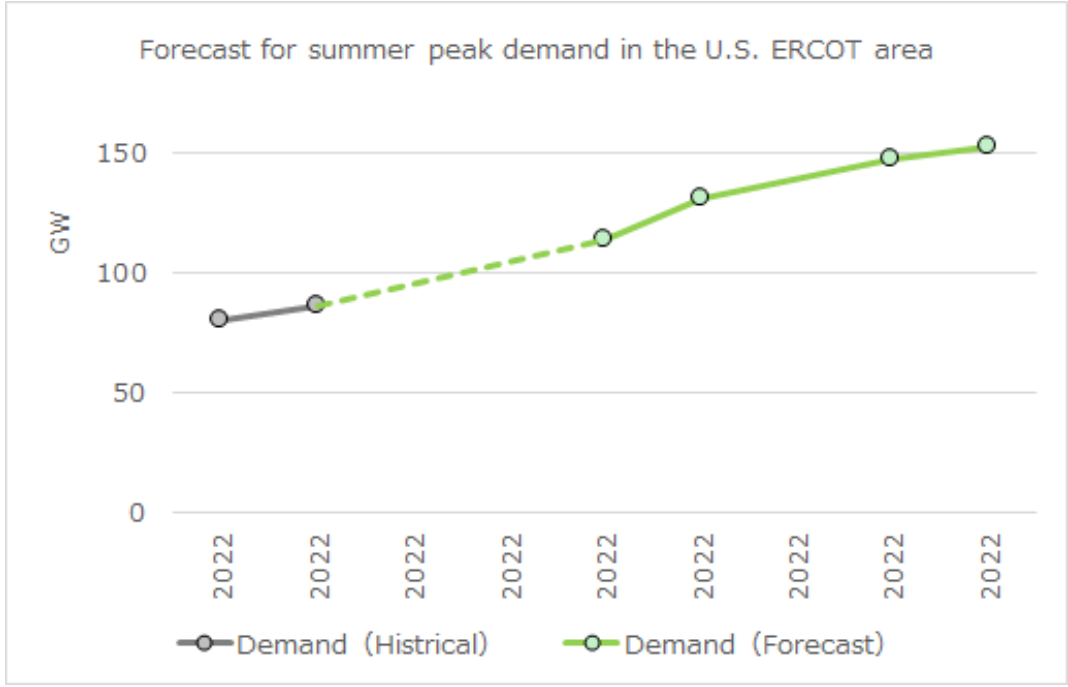
- In the PJM region in the eastern United States, demand forecasts have been revised upward annually.
- While the projected average annual growth rate of electricity consumption over the next decade was 0.7% in the 2020 outlook, it increased to 4.8% in the 2025 outlook.



[Figure] Electricity Consumption Outlook in PJM (U.S.)

[Source] Prepared by IEEJ, based on materials from PJM.

- In Texas, peak demand reached 85.5 GW in 2023.
- Based on accumulated grid interconnection applications from crypto mining, data centers, hydrogen production facilities, and others, peak demand could reach 152 GW by 2030.

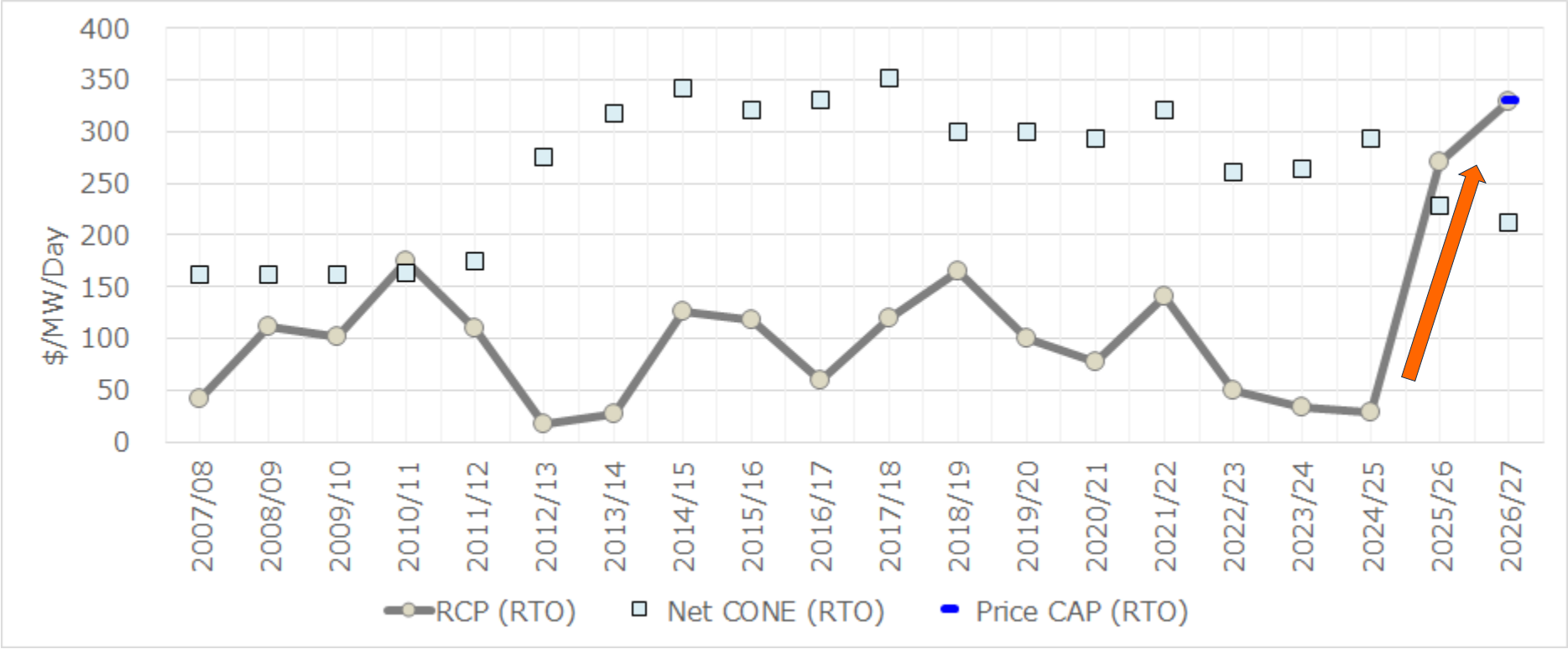


[Figure] Outlook for Peak Electricity Demand in Texas, United States

[Source] Prepared by IEEJ, based on materials from ERCOT.

Capacity Price Trends in the United States

- In PJM's capacity auction for the 2025/26 delivery year, capacity prices surged to USD 269.92/MW/day (approximately JPY 14,000/kW/year), about nine times higher than the previous year. For 2026/27, prices reached the price cap of USD 329.17/MW/day (around JPY 18,000/kW/year).
- Key factors behind the surge include: (1) reduced supply-side bidding volumes, (2) increased projected electricity demand, (3) higher required reserve margins (19.1%).



[Figure] Trends in Capacity Prices in PJM (U.S.)

[Source] Prepared by IEEJ, based on materials from PJM.

Results of Japan's Long-Term Decarbonized Power Source Auction

- In January 2024, Japan introduced the Long-Term Decarbonized Power Source Auction as a supplement to the capacity market. Winning bidders receive fixed-cost revenue for 20 years, while approximately 90% of profits from other markets are clawed back ex post.
- In both the first and second auctions, a significant number of battery storage projects were awarded. The first auction included the Shimane Nuclear Power Plant Unit 3, while the second focused on safety investments in existing nuclear plants totaling 31.53 GW. Although LNG-fired power plants saw strong participation in the first auction, the number of bids declined in the second.

[Figure] Results of the Long-Term Decarbonized Power Source Auction (Left: 1st Auction, Right: 2nd Auction)

[Source] Prepared by IEEJ, based on materials from OCCTO.

Outlook for Japan's Long-Term Decarbonized Power Auctions Beyond the Third Round

- The third auction, scheduled to be held in January 2026, will introduce the following key changes:

Items	Changes
Addition of Power Sources	• Added new construction and replacement of ammonia-fired thermal power plants; retrofitting existing thermal power plants for hydrogen-only firing or ammonia-only firing; retrofitting to CCS-equipped facilities; and new construction and replacement of long-duration energy storage systems.
Changes to Requirements	• Limited the continuous operating duration of batteries, long-duration energy storage systems, and pumped-storage hydro to 6 hours or longer.
Changes to Price Caps	• Revised the price cap to ¥200,000/kW/year; decarbonized thermal power [Note 1] is set at a level that allows deployment.
Addition of Eligible Costs	• For decarbonized thermal power, variable costs such as fuel costs may be included in the clearing price. However, this is limited to the price differential compared with LNG or coal fuel costs, and applies up to a plant capacity factor of 40%.
Changes to Capital Cost Requirements	• Set WACC at a base level of 5%; power sources with a construction lead time of 10 years or longer receive a 1% increase, while those with a lead time of less than 5 years receive a 1% decrease.
Adjustment of Capacity Securing Contract Amounts	• For certain power sources, once additional investment amounts can be reasonably estimated, up to 1.5 times the initial construction cost may be reflected in the clearing price as an upper limit.
Restrictions on Cell Manufacturing Countries	• For winning bid volumes associated with cell manufacturing countries/regions other than Japan, the share is limited to less than 30% of total awarded capacity for each category of lithium-ion batteries and non–lithium-ion batteries, respectively.

[Note1] Decarbonized thermal power refers to ammonia- or hydrogen-fired plants (dedicated firing), ammonia or hydrogen co-firing plants, and thermal power plants equipped with CCS.

Key Issues for Japan's Long-Term Decarbonized Power Source Auctions from the Fourth Round Onward

- The following issues are expected to be considered from the fourth auction onward.

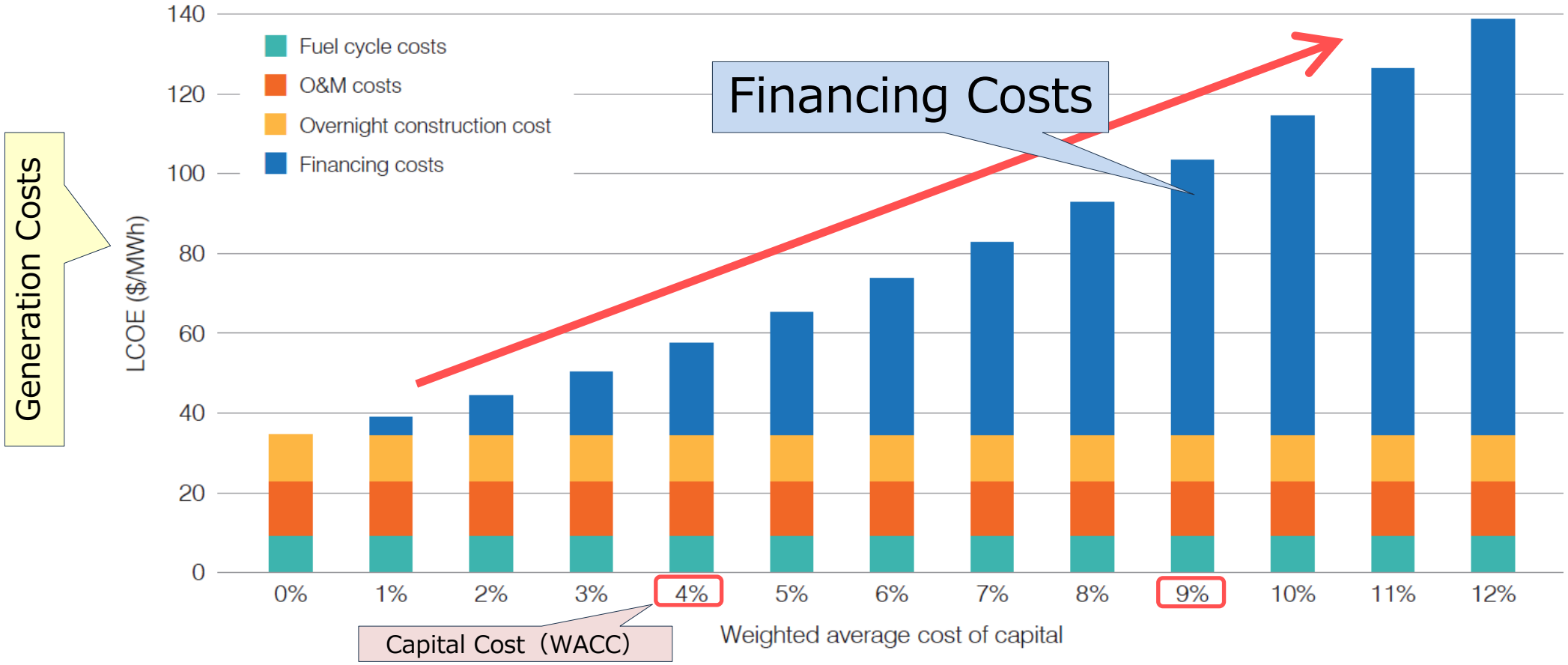
Item	Background	Issues	Expected Effects
① Eliminating the Risk of Unrecovered Fixed Costs for Nuclear Power and Other Sources	• Volatility in fixed costs due to rising raw material prices has reduced the predictability of investment recovery.	• Fixed costs that are not attributable to operators should be guaranteed.	• Lowering risk premiums, thereby reducing overall generation costs. <⇒ See next slide>
② Introducing Cost Recovery During the Construction Period for Nuclear Power and Other Sources	• Significant costs are incurred upfront during the construction period.	• A mechanism should be introduced to allow cost recovery during construction.	
③ Participation of Zero-Premium Offshore Wind FIP Projects in the Long-Term Decarbonized Power Auction	• It is necessary to enhance the certainty of project completion for offshore wind projects.	• To accommodate approximately 2.44 GW, measures such as expanding auction volumes are required.	• Improving predictability of fixed-cost recovery will help ensure the completion of offshore wind projects.
④ Achieving Optimal Operation of Battery Storage	• If fixed-cost recovery is guaranteed, batteries may not be utilized to their full potential.	• Operational control of batteries should be transferred to system operators.	• This makes it possible to maximize the supply–demand balancing capability of battery storage.
⑤ Deployment of Batteries by Region Considering the Geographic Concentration of Variable Renewables	• Nationwide auctions may fail to address the regional concentration of variable renewable energy.	• Battery deployment should be implemented on a regional basis, taking account of renewable energy concentration.	

(Reference) Relationship Between Rising Capital Costs and Generation Costs

- World Nuclear Association (2024) points out that when comparing capital costs (WACC*) of 4% and 9%, the levelized cost of electricity (LCOE*) for newly built nuclear power plants is approximately doubled

  ※ WACC： Weighted Average Cost of Capital　※ LCOE： Levelized Cost of Electricity

- By improving the predictability of cost recovery, it is possible to reduce risk premiums and thereby lower power generation costs.



[Source] World Nuclear Association. (2024). Nuclear power economics and structuring - 2024 edition. Retrieved March 19, 2025, from https://world-nuclear.org/images/articles/economics-report-2024-April.pdf

(Reference) Fixed-Cost Recovery Schemes in Europe

［Figure］Fixed-Cost Recovery Guarantee Schemes for New Power Plants

Country	Scheme Name	Year Introduced	Procurement Volume	Eligible Power Sources	Selection Process	Funding Source
(Reference) Japan	Long-Term Decarbonized Power Source Auction (LTDA)	FY2023 (to be conducted annually)	Set annually (approx. 5 GW)	Decarbonized power sources	Competitive bidding	Capacity levy (collected from retail suppliers and transmission/distributio n operators)
Italy	Electricity Storage Capacity Market (MACSE)	2025 (next round to be determined)	10 GWh fully awarded in the first auction	Battery storage	Competitive bidding	Transmission tariffs
Germany	Hydrogen-Ready Power & LDES Competitive Auctions	First round planned for 2025 (to be implemented in phases)	Hydrogen-ready power: 12.5 GW + LDES: 0.5 GW	Hydrogen-ready power, LDES	Competitive bidding	Government budget
Sweden	Nuclear Power Financing Support Model	Legislation enacted in 2025	Approx. 5 GW	New nuclear power	Application / bilateral negotiation	Government budget, etc.
United Kingdom	LDES Cap & Floor	FID planned from 2026 onward	Not specified	LDES	Evaluation and decision by Ofgem based on MCA / CBA	Balancing Services Use of System charges (BSUoS)
	Nuclear CfD	FID and contracts signed in 2016	Hinkley Point C （1.6GW ×2）	New nuclear power	Bilateral negotiation	Levy
	Nuclear RAB	FID in 2025	Sizewell C （1.6GW ×2）	New nuclear power	Bilateral negotiation	Levy
	H2PBM	N.A.	N.A.	Hydrogen-fired power	N.A.	N.A.
Czech Republic	Nuclear CfD	2024 (European Commission approval: State aid SA.58207)	Dukovany （1.5GW ×1）	New nuclear power	Bilateral negotiation	Government budget

Transfer operational control to the system operator.

Allows cost recovery during construction.

［Source］Prepared by IEEJ based on various sources.

Consideration of Introducing Public Finance for Power Plants and Related Infrastructure in Japan

- To achieve decarbonization of the power sector and ensure a stable electricity supply, large-scale investment in power infrastructure, including power plants and transmission and distribution networks, is required.

- However, implementing large-scale investments within a short period makes fundraising difficult.

- Therefore, it is important to establish financing schemes that leverage government creditworthiness in order to complement private finance.

<Case Study: Texas, United States>

- In a statewide referendum in November 2023, voters approved the creation of the Texas Energy Fund (TEF). Under this scheme, the state government injects funds from general revenues into the fund, which then provides low-interest loans to power generation companies, with repayment made by the generators.
  - The scheme provides 20-year low-interest loans covering up to 60% of project costs for the construction of dispatchable power sources, such as gas-fired power plants (minimum capacity: 100 MW).
  - In addition, subsidies are granted separately for projects that complete grid interconnection by June 2029.
- A total of 72 applications (approximately 38 GW, USD 24.4 billion) have been submitted. As of November 20, 2025, six loan agreements have been concluded, and including 11 projects under review, the total capacity reaches 5.4 GW.

- While the financing scheme is expected to be administered by OCCTO, it is necessary to organize and develop funding mechanisms, including Fiscal Investment and Loan Program (FILP)–type financing, to ensure effective implementation.

Securing Long-Term Power Supply in the Face of Increasing Electricity Demand

- ✓ Over the next decade, electricity demand is projected to increase at an average annual rate of 0.6%, marking a shift from earlier forecasts of declining demand.
- ✓ In winter FY2024, a reserve margin of at least 3% is expected to be secured in all regions. However, during the transition period, supply–demand conditions remain unstable. For summer FY2026, a decline in the reserve margin in the Tokyo area had been a concern, but the restart of Kashiwazaki-Kariwa Nuclear Power Plant Unit 6 could mitigate the risk of supply shortages in the region.
- ✓ While capacity (kW) is being secured through mechanisms such as the capacity market, ensuring long-term energy supply (kWh) is also critically important.
- ✓ From the perspective of securing long-term capacity (kW), Japan introduced the Long-Term Decarbonized Power Source Auction in January 2024. Key challenges include eliminating the risk of unrecovered fixed costs and allowing cost recovery during the construction period. In addition, potential discussion points include the participation of zero-premium offshore wind FIP projects, optimal operation of battery storage, and region-specific deployment of batteries that take into account the geographic concentration of variable renewable energy.
- ✓ Furthermore, as large-scale power infrastructure investment may face increasing financing constraints, it is also important to complement private finance with government-backed lending schemes that leverage public creditworthiness.