Aggregation of Electricity Supply Plans for Fiscal Year 2024

September 2024

Organization for Cross-regional Coordination of Transmission Operators, Japan

INTRODUCTION

The Organization for Cross-regional Coordination of Transmission Operators, Japan (hereinafter “the Organization”) has aggregated electricity supply plans for the 2024 fiscal year (FY). This aggregation was conducted according to the provisions of Article 28 of the Operational Rules of the Organization and Article 29 of the Electricity Business Act (hereinafter “the Act”). These articles require electric power companies (EPCOs) to submit plans and publish their results.

EPCOs are required to submit their electricity supply plans according to the Network Code of the Organization. The Organization then aggregates the plans and sends them to the Ministry of Economy, Trade and Industry (METI) by the end of March each year. A total of 1,902 electricity supply plans were aggregated for FY 2024, including 1,893 submissions from companies that had become EPCOs by the end of November 2023 and nine from companies that had become EPCOs by March 1, 2024.

Number of Electric Power Companies Subject to the Aggregation in FY 2024

Business License	Number
Generation Companies	1,108
Retail Companies	680
Specified Wholesale Suppliers	60
Specified Transmission, Distribution and Retail Companies	33
Specified Transmission and Distribution Companies	8
Transmission Companies	3
General Transmission and Distribution Companies	10
Distribution Companies	0
Total	1,902

[Reference] Electricity supply plan

EPCOs shall develop a comprehensive plan regarding electricity supply and the development of a generation or transmission facility for 10 years according to the provisions of Article 29 of the Act.

METI will then recommend alterations to the EPCOs' supply plans if it recognizes them as inadequate for comprehensively and rationally ensuring the security of a stable supply through cross-regional operation or other development aspects of the electricity business.

Due Date of Submission of Supply Plans	
(1)Electric Power Company (EPCO) except General Transmission and Distribution Company, and Distribution Company: submission to the Organization	March 1, 2024 (draft submission: Feb. 9, 2024)
(2)General Transmission and Distribution Company, and Distribution Company: submission to the Organization	March 25, 2024 (draft submission: Mar. 8, 2024)
(3)The Organization: submission to the METI	End of March, 2024

[Reference] Items to be aggregated in the electricity supply plan

Items aggregated in the electricity supply plan are described in the relevant cover letter according to the provisions of METI's ordinance. The Organization aggregated the plans according to this description.

Items to be reported in the Aggregation (determined by the Ordinance of the METI)	Contents
I. Electricity Demand Forecast	
1. Actual and Preliminary Data for FY 2023, and Forecast for FY 2024 and 2025 (Short-Term)	**Actual peak demand for the previous year, and forecast peak demand for the 1st and 2nd years of the projected period in both each regional area and nationwide**
2. 10-Year Demand Forecast (Long-Term)	**Forecast peak demand from the 3rd to 10th years of the projected period in both each regional area and nationwide**
II. Electricity Supply and Demand	
1. Actual Data for FY 2023, and Projection for FY 2024 and 2025 (Short-Term)	**Actual supply-demand for the previous year, and projected supply-demand for the 1st and 2nd years of the projected period in both each regional area and nationwide**
2. Projection of Supply–Demand Balance for 10 years (Long-Term)	**Projected supply-demand from the 3rd to 10th years of the projected period in both each regional area and nationwide**
III. Analysis of the Transition of Power Generation Sources	**Development and retirement plans of power generation sources which express the transition of power generation in nationwide**
IV. Development Plans for Transmission and Distribution Facilities	**Aggregated reinforcement plans of inter- and intra-regional transmission and distribution facilities**
V. Cross-Regional Operation	**Aggregated transaction plans between each area**
VI. Analysis of Characteristics of Electric Power Companies	**Aggregated situation for electric power companies by each business licenses**
VII. Findings and Current Challenges	**Opinion to the Minister of Economics, Trade & Industry**

CONTENTS

I. Electricity Demand Forecast

1. Actual and Preliminary Data for FY 2023 and Forecast Values for FY 2024 and 2025 (Short Term)

a. Peak Demand (Average Value of the Three Highest Daily Loads) in August[1]

Table 1-1 presents actual data for the aggregated peak demand for each regional service area[2] submitted by 10 general transmission and distribution (GT&D) companies for FY 2023 and the forecast[3] values for FY 2024 and 2025.

The peak demand (i.e., the average value of the three highest daily loads) for FY 2024 was forecast to be 158,570 MW. This represents a 0.8% increase over 157,230 MW, the temperature-adjusted[4] value for FY 2023.

Furthermore, the peak demand for FY 2025 was forecast to be 159,410 MW, which represents a 1.4% increase over the temperature-adjusted [4] value for FY 2023.

Table 1-1 Peak Demand (Average Value of the Three Highest Daily Loads) in August
(Nationwide, 10^4 kW at the Sending End)

FY 2023 Actual (temperature adjusted)	FY 2024 Forecast	FY 2025 Forecast
15,723	15,857 (+0.8%*)	15,941 (+1.4%*)

*% change compared with actual data for FY 2023 (temperature adjusted)

b. Forecast Values for FY 2024 and 2025

Tables 1-2 and 1-3 present the monthly peak demand in FY 2024 and 2025, respectively, from the aggregated peak demand for each regional service area submitted by 10 GT&D companies. The monthly peak demand in summer (August) is approximately 10 gigawatts (GW) more than that in winter (January); therefore, the nationwide peak demand occurs in summer.

1 The peak demand corresponds to the average value of the three highest daily loads (hourly average) each month.
2 The peak demand in the regional service areas refers to the average value of the three highest daily loads in public demand supplied by retail companies and GT&D companies through the latter companies' transmission and distribution network. The Organization publishes these average values according to the provisions of paragraph 5, Article 23 of the Operational Rules.
3 The demand forecast beyond FY 2024 is based on normal weather. Thus, the weather conditions for the forecast assumptions may vary compared with the actual data or estimated value in FY 2023.
4 Temperature adjustment is implemented to capture the current demand based on normal weather, which excludes demand fluctuations triggered by air-conditioner operation.

Table 1-2 Monthly Peak Demand (Average Value of the Three Highest Daily Loads) in FY 2024
(Nationwide, 10^4 kW at the Sending End)

	Apr.	May	Jun.	Jul.	Aug.	Sep.
Peak Demand	11,119	11,055	12,624	15,823	15,857	13,704
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Peak Demand	11,639	11,967	13,868	14,806	14,790	12,801

Table 1-3 Monthly Peak Demand (Average Value of the Three Highest Daily Loads) in FY 2025
(Nationwide, 10^4 kW at the Sending End)

	Apr.	May	Jun.	Jul.	Aug.	Sep.
Peak Demand	11,203	11,136	12,708	15,908	15,941	13,793
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Peak Demand	11,722	12,050	13,951	14,891	14,874	12,885

c. Annual Electrical Energy Requirements

Table 1-4 presents the preliminary data[5] for FY 2023 and the forecast values for FY 2024 from the aggregated electrical energy requirements of each regional service area submitted by the 10 GT&D companies.

The electrical energy requirements for FY 2024 are forecast to be 846.1 TWh, which is an increase of 0.6% compared with the 841.3 TWh in the preliminary data for FY 2023.

Table 1-4 Annual Electrical Energy Requirements
(Nationwide, TWh at the Sending End)

FY 2023 Preliminary (temperature- and leap-year-adjusted)	FY 2024 Forecast
841.3	846.1 (+0.6%*)

* % changes over the preliminary value for the previous year

[5] The preliminary data for annual electrical energy requirements are an aggregation of actual data from April to November 2023 with the preliminary data from December 2023 to March 2024.

2. 10-Year Demand Forecast (Long Term)

Table 1-5 presents significant economic indicators developed and published by the Organization on November 29, 2023. These indicators are assumptions to be used by GT&D companies to forecast the peak demand in their regional service areas.

The real gross domestic product (GDP)[6] was estimated to be 556.9 trillion Japanese yen (JPY) in FY 2023 and 598.6 trillion JPY in FY 2033, with an annual average growth rate (AAGR) of 0.7%. The index of industrial production (IIP)[7] was projected to be 104.3 in FY 2023 and 111.3 in FY 2033, with an AAGR of 0.7%. By contrast, the population was estimated to be 124.41 million in FY 2023, with a projected 118.07 million in FY 2033, representing an AAGR of −0.5%.

Table 1-5 Major Economic Indicators Assumed for the Demand Forecast

	FY 2023	FY 2033
Gross Domestic Product(GDP)	556.9 trillion JPY	598.6 trillion JPY [+0.7%]*
Index of Industrial Product(IIP)	104.3	111.3 [+0.7%]*
Population	124.41 million	118.07 million [−0.5%]*

* Average annual growth rate for the forecast values of FY 2023

a. Peak Demand in August

Table 1-6 presents the peak demand forecast for FY 2024, 2028, and 2033 as the aggregation of peak demand values for each regional service area submitted by the 10 GT&D companies.
Furthermore, Figure 1-1 presents the actual data and forecast values of the peak demand from FY 2012 to 2033.
The peak demand nationwide is forecast to be 161,170 MW in FY 2028 and 161,630 MW in FY 2033, with an AAGR of 0.3% from FY 2023 to 2033.

The peak demand in FY 2023 exhibits a downward trend due to the decreasing residential demand through a reduction in the remote work–energy conservation ratio. However, beyond FY 2024, it is forecast to exhibit an upward trend due to larger positive factors, such as economic recovery and demand growth triggered by the new installation of data centers and semiconductor factories, compared with negative factors, such as efforts to reduce electricity use, wider use of energy-saving electrical appliances, and a decreasing population.

Table 1-6 Peak Demand Forecast (Average Value of the Three Highest Daily Loads) for August (Nationwide, 10^4 kW at the Sending End)

FY 2024 [aforementioned]	FY 2028	FY 2033
15,857	16,117 [+0.5%]*	16,163 [+0.3%]*

* Average annual growth rate for the forecast values of FY 2023

[6] Expressed as the chained price for calendar year (CY) 2015.
[7] Index value in CY 2020 = 100.

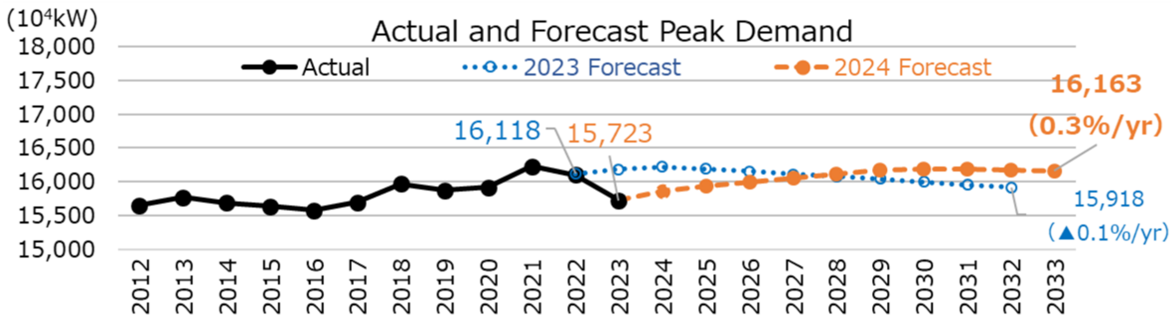


Figure 1-1 Actual and Forecast Peak Demand (August for Nationwide, 10^4 kW at the Sending End)

b. Annual Electric Energy Requirement

Table 1-7 presents the forecast annual electrical energy requirements in FY 2024, 2028, and 2033 as the aggregation of the electrical energy requirements for each regional service area submitted by the 10 GT&D companies.

The nationwide annual electrical energy requirement is forecast to be 869.1 TWh in FY 2028 and 875.4 TWh in FY 2033, with an increase in the AAGR of 0.4% from FY 2023 to 2033.

The peak demand in FY 2023 presents a downward trend due to a decreasing residential demand through a reduction of the remote work–energy conservation ratio. However, beyond FY 2024, it is forecast to exhibit an upward trend due to larger positive factors, such as economic recovery and demand growth triggered by the new installation of data centers and semiconductor factories, compared with negative factors, such as efforts to reduce electricity use, the wider use of energy-saving electrical appliances, and a decreasing population.

Table 1-7 Annual Electrical Energy Requirement Forecast
(Nationwide, TWh at the Sending End)

FY 2024 [aforementioned]	FY 2028	FY 2033
846.1	869.1 [+0.7%]*	875.4 [+0.4%]*

* Average annual growth rate for the forecast values of FY 2023

II. Electricity Supply and Demand

1. Supply Reliability Criteria

In FY 2021, the Organization applied expected unserved energy (EUE) as a reliability criterion to the electricity supply plans based on discussions held by the Study Committee on Regulating the Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation.[8] In the discussion at the Committee's 81st meeting, the basic principle of considering severe weather among the criteria for supply reliability was reviewed,[9] while accidental supply–demand variance and severe weather were decided to be calculated based on recent data for each target year at the 94th and 95th meetings.[10] Therefore, the Organization applies the target outage rate to the capacity market scheme, which is shown in Table 2-1 for the 2024 Supply Plan. For the Okinawa area, the evaluation is implemented based on the policy developed at the Committee's 85th meeting..[11]

Now, among the supply reliability criteria applied for electricity supply plans, annual EUE criteria are included to confirm supply reliability; however, supply capacity must be balanced for each month according to each area's characteristics, such as winter in Hokkaido or severe weather. Therefore, the Organization evaluates whether the supply capacity in the short term (the first and second year of the projected period) is satisfied by the annual EUE criteria and simultaneously confirms the reserve margin of each area and month.

Table 2-1 Target Outage Volume at Capacity Market Scheme in the FY 2024 Electricity Supply Plan [kWh/kW・year]

Forecast	Nationwide Peak Demand (excl. isolated islands)* [10^4kW]	RM for Accidental Supply-demand Variance [%]	RM for Severe Weather Condition [%]		RM for Rare Occurrences Risk [%]	Target Outage Volume at Capacity Market Scheme in Electricity Supply Plan [kWh/kW・year]	RM for Continuous Supply-demand Variance [%]
			Summer/ Winter	Spring/ Autumn			
FY 2024	15,799	6.7	3.4	3.0	1	0.033	2
FY 2025	15,882	6.7	3.4	3.0		0.033	
FY 2026	15,937	6.6	3.6	3.1		0.028	
FY 2027	16,007	6.5	3.6	3.2		0.027	
FY 2028	16,058	5.9	4.2	3.6		0.016	
FY 2029	16,110	5.8	4.2	3.7		0.016	
FY 2030	16,120	5.8	4.3	3.7		0.015	
FY 2031	16,121	5.8	4.3	3.7		0.015	
FY 2032	16,114	5.8	4.3	3.7		0.015	
FY 2033	16,098	5.8	4.3	3.7		0.015	

* RM: Reserve Margin
Sum of peak demand in each area in August, except for Hokkaido, Tohoku, and Hokuriku in January.

[8] Source: Material 2, 58th meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation (March 3, 2021) [written only in Japanese]. https://www.occto.or.jp/iinkai/chouseiryoku/2020/files/chousei_58_02.pdf

[9] Source: Material 1, 81st meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation (January 24, 2023) [written only in Japanese]. https://www.occto.or.jp/iinkai/chouseiryoku/2022/files/chousei_81_01r.pdf

[10] Source: Material 1, 94th meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation (January 24, 2024) [written only in Japanese]. https://www.occto.or.jp/iinkai/chouseiryoku/2023/files/chousei_94_01.pdf
Source: Material 1, 95th meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation (February 20, 2024) [written only in Japanese]. https://www.occto.or.jp/iinkai/chouseiryoku/2023/files/chousei_95_01.pdf

[11] Source: Material 1, 85th meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation (April 19, 2023) [written only in Japanese]. https://www.occto.or.jp/iinkai/chouseiryoku/2023/chousei_jukyu_85_haifu.html

(Reference) Characteristics of the Annual EUE

Figure 2-1 presents the characteristics of annual EUE. For evaluations using annual EUE criteria, a stable supply is secured throughout the year at the usual level if the annual EUE value is less than the target outage volume in the capacity market scheme and electricity supply plan.

Still, it is difficult to understand the lowering of the reserve margin in a specific area and month solely by the annual EUE evaluation. This is because of an imbalance in the supply capacity caused by the scheduled maintenance of the generation facilities and other factors. Therefore, the Organization implements a conventional approach for evaluating the reserve capacity each month.

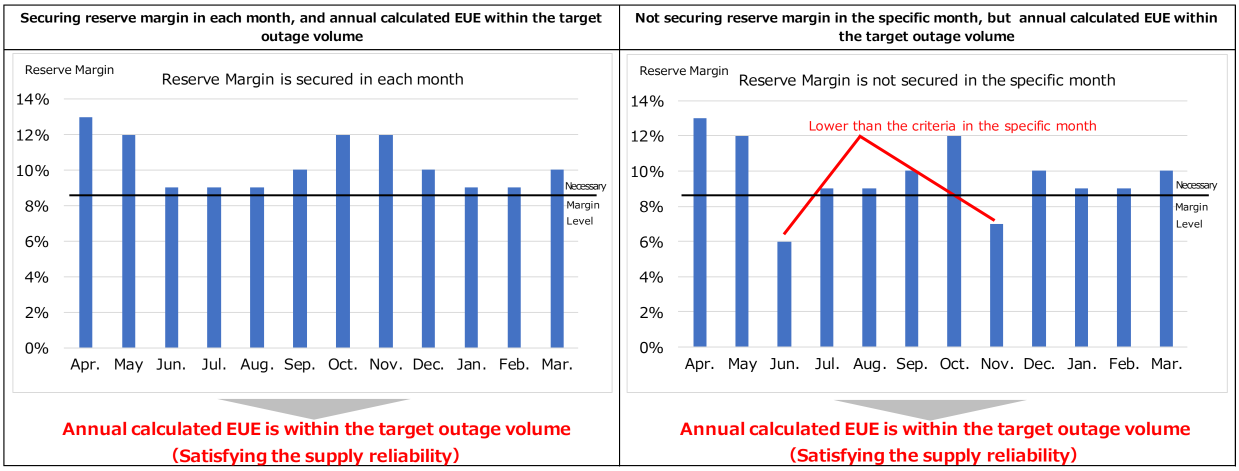


Figure 2-1 Characteristics of the Annual EUE

2. Evaluation of Supply Capacity Using the EUE Approach in the Projected Period (FY 2024–2033)

Table 2-2 presents the calculated supply capacity results using the annual EUE approach. In the short term (the first and second years of the projected period), supply capacity shortages are forecast in the Hokkaido, Tokyo, and Kyushu areas in FY 2025 due to suspension and decommissioned or scheduled maintenance of generating units.

In the long term, due to the suspension and decommissioning of generating units, the calculated results do not fall within the criteria for FY 2026–2029 in the Hokkaido and Tokyo areas; the Tohoku area for FY 2026, 2028, and 2029; the Kyushu area for FY 2026–2033; and the Okinawa area for FY 2026 and 2028.

Table 2-2 Calculated Supply Capacity Results Using the Annual EUE

(kWh/kW-year)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Hokkaido	0.024	0.085	0.035	0.214	0.024	0.021	0.014	0.011	0.012	0.010
Tohoku	0.001	0.004	0.104	0.002	0.029	0.027	0.010	0.008	0.009	0.008
Tokyo	0.009	0.043	0.612	0.047	0.029	0.027	0.011	0.009	0.009	0.008
Chubu	0.001	0.017	0.022	0.010	0.006	0.006	0.003	0.005	0.006	0.006
Hokuriku	0.009	0.000	0.004	0.004	0.004	0.004	0.002	0.003	0.003	0.004
Kanasai	0.000	0.000	0.004	0.004	0.004	0.004	0.002	0.003	0.004	0.005
Chugoku	0.000	0.000	0.004	0.004	0.004	0.004	0.002	0.003	0.004	0.005
Shikoku	0.000	0.000	0.003	0.003	0.003	0.003	0.001	0.002	0.002	0.003
Kyushu	0.002	0.039	0.803	0.701	0.726	0.567	0.240	0.234	0.213	0.193
Interconnected areas	0.005	0.024	0.303	0.093	0.085	0.068	0.029	0.028	0.027	0.025
Okinawa	0.069	0.094	3.385	1.163	3.745	1.276	1.364	1.462	1.521	1.354
<Target outage volume aimed by capacity market and electricity supply plan>										
Interconnected areas	0.033	0.033	0.028	0.027	0.016	0.016	0.015	0.015	0.015	0.015
Okinawa	1.996	1.996	1.996	1.996	1.996	1.996	1.996	1.996	1.996	1.996

3. Short-Term Evaluation of Supply Capacity Using the Conventional Approach

The Organization evaluates the supply–demand balance nationwide and for each regional service area using the supply capacity[12] and peak demand data for the regional service areas. Then, it confirms that the reserve margin[13] against the peak demand exceeds the sum of the accidental supply–demand variance and the continuous supply–demand variance.

In the Okinawa EPCO regional service area, the criterion is to secure the supply capacity (which is deducted from the necessary reserve capacity based on actual operation[14]) or the activating standard of Generator I'[15], (whichever is larger), which must cover the average of the three highest loads in its regional service area. The evaluation is implemented at the time of the smallest reserve margin.

Figure 2-2 summarizes the supply–demand balance evaluation. The supply capacity is the sum of the generation capacity owned by EPCOs (main generation company) and the traded supply capacity of non-EPCOs (sales deducted from procurement); then, the traded supply capacity of the registered specified transmission, distribution, and retail company is subtracted.

When the operation of a nuclear power plant becomes uncertain, the corresponding unit or plant's supply capacity is recorded as zero. Furthermore, the corresponding supply capacity is reported as "uncertain" according to the Procedures for Electricity Supply Plans of FY 2024, published in December 2023 by the Agency for Natural Resources and Energy.[16]

[12] Supply capacity is the maximum power generated steadily during the peak demand period (average value of the three highest daily loads)..

[13] Reserve margin (%) describes the difference between the supply capacity and the peak demand (average value of the three highest daily loads) divided by the peak demand.

[14] Reference: Material 2, 85th meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation (April 19, 2023) [written only in Japanese]. https://www.occto.or.jp/iinkai/chouseiryoku/2023/files/chousei_85_02.pdf

[15] Reference: Guideline for soliciting balancing capacity of Generator I' activating at severe weather for FY 2024 [written only in Japanese]. https://www.okiden.co.jp/shared/pdf/business/free/2023/ps1/dengen_tyousei_10.pdf

[16] Procedures for Electricity Supply Plans of FY 2024 https://www.enecho.meti.go.jp/category/electricity_and_gas/electricity_measures/001/pdf/2023-12_kyoukei_kisaiyouryou.pdf

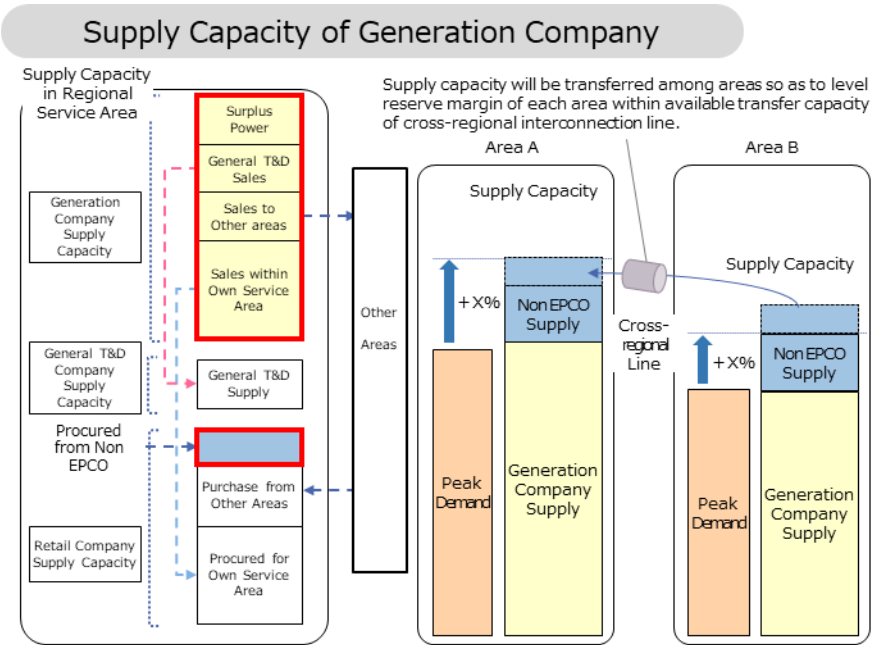


Figure 2-2 Summary of Supply–Demand Balance Evaluation

[Reference] Method for Calculating the Supply Capacity

The calculation method for supply capacity or surplus power is based on the description in the "Guidelines for the Calculation of Demand and Supply Capacity"[17](Agency for Natural Resources and Energy: December 2023) and "Procedures for Electricity Supply Plans of FY 2024"[16] (Agency for Natural Resources and Energy: December 2023). Essentially, the evaluation segment of supply capacity is performed according to the segment of supply capacity submission.

[Reference] Calculation Method of Available Transfer Capability(ATC)

When calculating the cross-regional reserve margin, the supply capacity is transferred within the available transfer capacity to level around the neighboring areas. The supply capacity in each regional area is calculated based on the generation facilities of EPCOs before the levelization and does not consider the scheduled trade of utilizing cross-regional interconnection lines. Therefore, the Organization calculates the scheduled power flow as zero to the margin levelization.

ATC = transfer capability (1) – transfer margin (2)

<u>Short term</u>

(1) Based on the "Transfer Capability of Cross-regional Interconnection Lines FY 2024–2033"

[17] Guideline for the Calculation of Demand and Supply Capacity [written only in Japanese].
https://www.enecho.meti.go.jp/category/electricity_and_gas/electricity_measures/001/pdf/2023-12_jukyujuyou_keijogaidorain.pdf

(annual and long-term plans; March 1, 2024: The Organization)[18]
(2) Based on the “Transmission Margin of Cross-regional Interconnection Lines FY 2024 and 2025” (annual plan; March 1, 2024: The Organization)[19], a and the calculated figures considering expected contributions from external areas (equivalent to 3% of the transfer capability of interconnection lines) lines)
(3) Based on monthly scheduled power flows reported in the “Plan for Transaction of Electricity (Table 36)” of the electricity supply plan for FY 2023 and 2024

Mid-to-long term
(1) For FY 2024 and 2025, the August value was calculated from (1) in the short term above; the value for FY 2026–2033 was based on the “Transfer Capability of Cross-regional Interconnection Lines FY 2024–2033” (annual and long-term plans; March 1, 2024: The Organization)[18]
(2) For FY 2024 and 2025, the August value was calculated from (2) in the short term above; the value for FY 2026–2033 was based on the “Transmission Margin of Cross-regional Interconnection Lines FY 2024–2033” (long-term plans; March 1, 2024: The Organization). [19]

[18] Reference: “Cross-regional Transfer Capability from FY 2024 to FY 2033” (annual and long-term) [written only in Japanese].
https://www.occto.or.jp/renkeisenriyou/oshirase/2023/files/oshirase_1_2024-2033_unyouyouryou.pdf
[19] Reference: “Cross-regional Transmission Margin from FY 2024 to FY 2033 (annual and long-term), consideration and securing reasons for margin setting at the actual supply–demand timing” [written only in Japanese].
https://www.occto.or.jp/renkeisenriyou/oshirase/2023/files/20240301_margin_3_kakuhoriyuu.pdf

a. Projection of the Supply–Demand Balance in FY 2024 and 2025

To present the cross-regional reserve margin, the Organization recalculates the monthly projection of the smallest reserve margin for each regional service area to the level of neighboring areas. Furthermore, additional supply capacity is applied to the interconnected areas (except Okinawa) in July and August based on the correlation between solar power generation and electric demand.[20]

In addition, information on the environmental assessment of thermal power plants[21] probably includes some generation facilities in which EPCOs confirm their business judgment and proceed to their construction. Therefore, the Organization has investigated generation facilities that are not included in electricity supply plans; however, they have already applied for generator connections to GT&D companies and submitted construction plans according to the provisions of Article 48 of the Act in cooperation with the government.

(i) Projection for FY 2024

Table 2-3 presents the projected reserve margin in each regional service area for FY 2024. The reserve margin in every area and month exceeds 13%.

Table 2-2 Monthly Projection of Cross-Regional Reserve Margins Nationwide and for Each Regional Service Area (at the Sending End)

Note: Power exchanges through cross-regional interconnection lines and generation facilities not included in the electricity supply plans have been added.

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	25.1%	33.8%	26.2%	20.9%	28.0%	27.0%	24.2%	13.6%	25.7%	20.3%	19.7%	24.5%
Tohoku	25.1%	33.8%	25.8%	20.9%	18.9%	27.0%	16.9%	13.6%	25.7%	20.3%	19.7%	31.5%
Tokyo	25.1%	24.6%	17.6%	18.4%	18.9%	27.0%	16.9%	13.6%	25.7%	20.3%	19.7%	31.5%
Chubu	27.6%	31.0%	26.8%	18.4%	18.9%	27.0%	30.3%	23.5%	19.9%	17.9%	19.0%	30.2%
Hokuriku	29.9%	31.0%	26.8%	18.4%	18.9%	27.0%	31.1%	24.2%	19.9%	17.9%	18.5%	30.2%
Kansai	29.9%	31.0%	26.8%	18.4%	18.9%	27.0%	31.1%	24.2%	19.9%	17.9%	19.0%	30.2%
Chugoku	29.9%	31.0%	26.8%	18.4%	18.9%	27.0%	31.1%	24.2%	19.9%	17.9%	19.0%	30.2%
Shikoku	29.9%	36.4%	32.2%	18.4%	18.9%	27.0%	31.1%	24.2%	19.9%	17.9%	19.0%	30.2%
Kyushu	32.3%	31.0%	26.8%	18.4%	18.9%	27.0%	31.1%	24.2%	19.9%	17.9%	19.0%	30.2%
Okinawa	67.8%	42.7%	31.7%	36.6%	39.3%	32.9%	49.6%	65.8%	96.9%	65.6%	71.3%	78.4%

* Cross-regional reserve margins becoming the same value are shown in the same background colors after utilization of cross-regional interconnection line. The least reserve margins in the Okinawa area are included.

The Okinawa EPCO regional service area[22] is a small, isolated island system that is unable to receive power through interconnection lines; thus, the same criteria used in other areas cannot be applied. In Okinawa, the stable supply criterion means to secure a supply capacity over the peak demand by deducting the necessary reserve capacity based on the actual operation of 342 MW.

[20] Reference: 69th meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation [written only in Japanese].
https://www.occto.or.jp/iinkai/chouseiryoku/2021/files/chousei_69_01.pdf

[21] Reference: Information on the environmental assessment of thermal power plants (METI website) [written only in Japanese].
https://www.meti.go.jp/policy/safety_security/industrial_safety/sangyo/electric/detail/index_assessment.html

[22] In the Okinawa EPCO regional service area, the evaluation is implemented at the time of the lowest reserve margin instead of when the peak demand occurs.

Table 2-4 presents the monthly reserve margin, indicating that the stable supply was secured in each month:

Table 2-4 Monthly Reserve Margin Forecast Using the Conventional Approach in Okinawa (at the Sending End)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Okinawa	34.4%	16.1%	8.5%	14.6%	17.2%	10.4%	24.1%	35.2%	61.3%	32.9%	35.6%	41.9%

(ii) Projection for FY 2025

Table 2-5 presents similar calculation results for FY 2025, indicating that the reserve margins are over 10% in every month and area:

Table 2-5 Monthly Projection of Cross-Regional Reserve Margins Nationwide and for Each Regional Service Area (at the Sending End)

Note: Power exchanges through cross-regional interconnection lines and generation facilities not included in the electricity supply plans have been added.

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	19.3%	29.6%	33.9%	23.2%	18.0%	22.0%	17.7%	12.7%	20.5%	15.5%	17.0%	23.0%
Tohoku	19.3%	17.3%	16.8%	17.1%	18.0%	27.1%	17.7%	12.7%	20.5%	15.5%	17.0%	23.0%
Tokyo	19.3%	17.3%	16.8%	17.1%	18.0%	27.1%	10.9%	12.7%	20.5%	15.5%	17.0%	23.0%
Chubu	29.1%	30.7%	28.1%	17.1%	18.0%	27.1%	30.7%	23.7%	20.5%	15.5%	17.1%	33.6%
Hokuriku	29.1%	30.7%	28.2%	17.2%	18.0%	27.1%	30.7%	23.7%	20.5%	19.1%	18.3%	33.6%
Kansai	29.1%	30.7%	28.2%	17.2%	18.0%	27.1%	30.7%	23.7%	20.5%	19.1%	18.3%	33.6%
Chugoku	29.1%	30.7%	28.2%	17.2%	18.0%	27.1%	30.7%	23.7%	20.5%	19.1%	18.3%	33.6%
Shikoku	29.1%	34.6%	35.8%	42.5%	40.7%	45.0%	54.1%	49.6%	20.5%	19.8%	18.3%	35.2%
Kyushu	29.1%	21.3%	28.2%	17.2%	18.0%	27.1%	30.7%	23.7%	20.5%	19.1%	15.2%	32.1%
Okinawa	60.1%	40.7%	38.8%	29.8%	39.7%	34.7%	42.3%	57.3%	66.2%	60.5%	74.2%	83.8%

* Reserve margins becoming the same value are shown in the same background colors after utilization of cross-regional interconnection line. The least reserve margins in the Okinawa area are included.

Like the FY 2024 evaluation, Table 2-6 presents the monthly reserve margin for Okinawa, indicating that a stable supply was secured each month:

Table 2-6 Monthly Reserve Margin Forecast Using the Conventional Approach in Okinawa (at the Sending End)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Okinawa	26.8%	14.3%	15.7%	8.0%	17.7%	12.4%	17.0%	26.9%	30.8%	27.9%	38.7%	47.5%

b. Difference Between Scheduled Maintenance of Generation Facilities for FY 2024 Evaluated Using the Conventional Approach

Figure 2-3 presents the monthly scheduled maintenance planned for FY 2024 in the 2024 Supply Plan, which is subject to a generation capacity of 100 MW and above. Figure 2-4 presents the difference in scheduled maintenance for FY 2024 between the supply plans for FY 2024 (1st year) and FY 2023 (2nd year), which was subject to the same generation capacity.

The Organization has requested that all EPCOs avoid tight supply–demand balance periods for the scheduled maintenance of their generation facilities.[23] However, major generation facilities have been shut down and their restoration was unknown at the time of submitting supply plans; moreover, scheduled maintenance has increased compared with the 2023 Supply Plan.

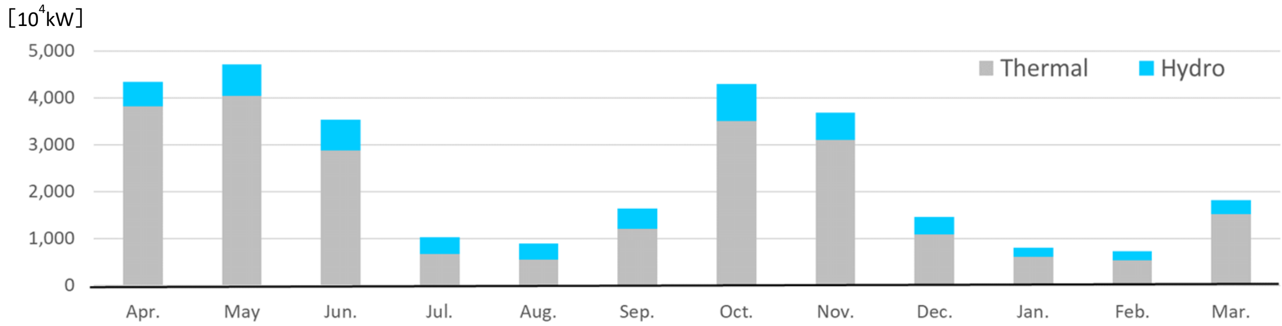


Figure 2-3 Monthly Scheduled Maintenance Planned for FY 2024 in the 2024 Supply Plan

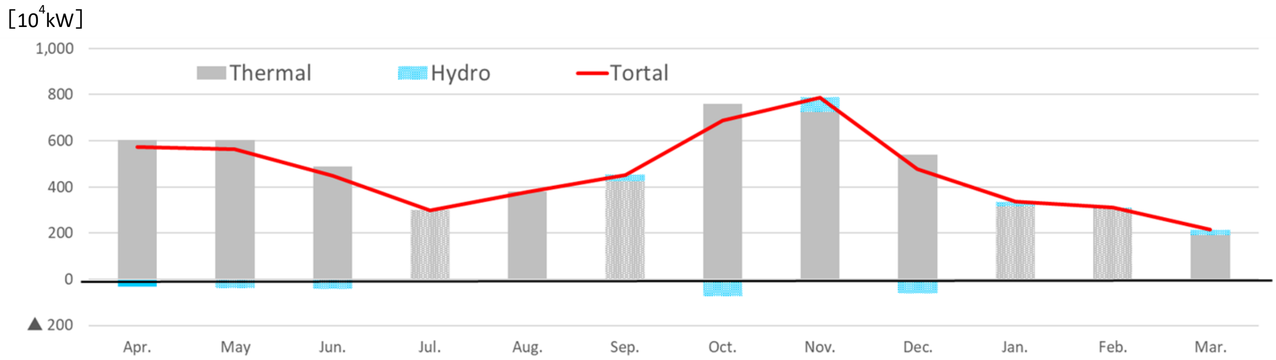


Figure 2-4 Difference in Scheduled Maintenance for FY 2024 between the FY 2023 (2nd year) and FY 2024 (1st year) Supply Plans

c. Suspension and Decommissioning of Generation Facilities in the 2024 Supply Plan

Table 2-7 presents the suspension and decommissioning of thermal generation facilities (subject to the generation capacity of 1 MW and over, excluding isolated island facilities) in the 2024 Supply Plan.

The plan adds a capacity of 220 MW to the suspension and decommissioning plan. Furthermore, 1,930 MW of generation facilities has been included in the suspension and decommissioning plan until FY 2023. In total, a capacity of 2,150 MW is planned for suspension and decommissioning in FY 2024.

Table 2-7 Suspension and Decommissioning of Generation Facilities in the 2024 Supply Plan (10^4 kW)

(10^4kW)

Fuel	Newly Added	Already Included	Total Capacity to be Decommissioned
LNG	0	62	62
Oil	0	95	95
Coal	22	36	58
Total	22	193	215

[23] Reference: “Further Security of Supply Capacity in FY 2024” [written only in Japanese].
https://www.occto.or.jp/kyoukei/oshirase/231201_2024kyoukyuryokukakuho.html

4. Evaluation of Energy Supply

To evaluate the energy supply (kWh), the Organization has implemented a semiannual evaluation since FY 2021, which it calls "Supply Energy Monitoring," for the summer and winter periods. It is implemented when various types of information required for the demand forecast (e.g., weather forecast and generation fuel inventory) are available, enabling additional fuel procurement for generation. The Organization plans to continue these evaluations and publish the results.
Notably, the Organization did not evaluate the energy supply balance in the aggregated FY 2024 Supply Plan; however, it did confirm the annual energy supply balance at this point and published information to elicit a response from EPCOs.

a. Projection of Energy Supply

Figure 2-5 presents the monthly energy supply balance for nine interconnected areas in FY 2024 (the 1st year of the projected period of the FY 2024 plans). Table 2-8 presents the forecast energy requirement of the FY 2024 plan along with volumes and shortage rates from the forecast. In some months, the energy supply[24] will be 1.3 TWh/month less than the forecast energy requirement (equivalent to 1.8% against the forecast energy requirement).

The Organization expects retail companies to procure supply capacity in a premeditated manner, while it expects generation companies to procure fuel to increase their energy generation to meet the actual demand and supply timing based on projections. Additionally, the Organization shall confirm projections for securing the energy supply by implementing kWh monitoring for the high-demand period.

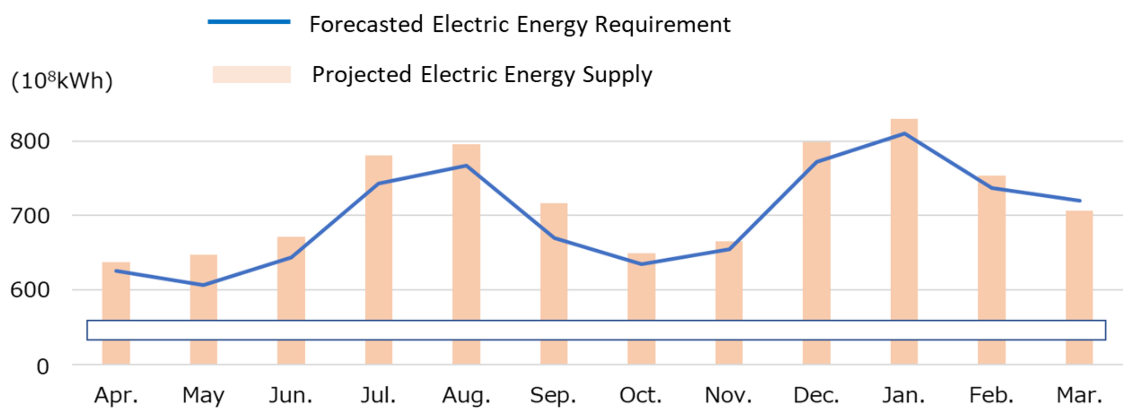


Figure 2-5 Monthly Energy Supply Balance for a Total of Nine Interconnected Areas in FY 2024

Table 2-8 Forecast Energy Requirement in the FY 2024 Plan, Volumes, and Shortage Rates from the Forecast

(10^8kWh)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual total
Forecasted Energy Requirement	626	606	643	743	767	669	634	654	772	810	737	719	8,381
Projected Energy Supply Shortage	11	41	28	37	29	47	15	11	27	20	16	-13	268
Projected Shortage Rate	1.8%	6.8%	4.4%	5.0%	3.8%	7.0%	2.4%	1.7%	3.5%	2.5%	2.2%	-1.8%	3.2%

[24] The projected energy supply is the addition of energy supply with bilateral contract to retail companies, which includes the generation of nonelectric power companies, and surplus power expected for market trade.

5. Evaluation of Supply–Demand for Supply Capacity and Energy Supply

・ Evaluation of Supply Capacity Using the EUE Approach

In the FY 2024 evaluation, the EUE indices are within the target outage volume in all areas. For FY 2025, the EUE indices exceed the targets for the Hokkaido, Tokyo, and Kyushu service areas. In the mid-to-long term (FY 2026–2033), the EUE indices exceed targets for Hokkaido and Tokyo from FY 2026 to 2029; Tohoku for FY 2026, 2028, and 2029; Kyushu from FY 2026 to 2033; and Okinawa in FY 2026 and 2028 due to the suspension or decommissioning of generation facilities.

・ Evaluation of Supply Capacity Using the Conventional Approach

The reserve margin is secured for 10% in FY 2024 and 2025 in every area and for all months.

・ Evaluation of Energy Supply

The energy supply in some months of FY 2024 is expected to be 1.3 TWh/month in volume less than the forecast energy requirement (equivalent to 1.8% against the forecast energy requirement).

・ Despite the coordination of scheduled maintenance among generation facilities in the capacity market scheme and the supply plan, the annual EUE of the Hokkaido, Tokyo, and Kyushu service areas for FY 2025 exceeds the target outage volume. The reasons are attributable to the following conditions:

- The revised annual EUE is more severe than the EUE used for coordinating scheduled maintenance among generation facilities due to the greater accuracy of reliability evaluations and reviews of the calculation of necessary capacities under severe weather.[25]
- Scheduled maintenance among generation facilities is coordinated based on the premise that part of the supply capacity—equivalent to 2% of the forecast peak demand—is planned to be procured at the incremental auction of the capacity market.

For FY 2025, the Organization shall coordinate with the government and corresponding EPCOs regarding supply–demand measures (e.g., the coordination of maintenance schedules), considering the necessity of the incremental auction discussed in the governmental council and its results.

In supply plans beyond FY 2026, the Organization shall carefully re-examine the supply capacity based on continuous observations of generation facility development in the mid-to-long term. It will also determine the necessity of incremental auctions as required with coordinated maintenance schedule results implemented two years in advance for the actual supply.

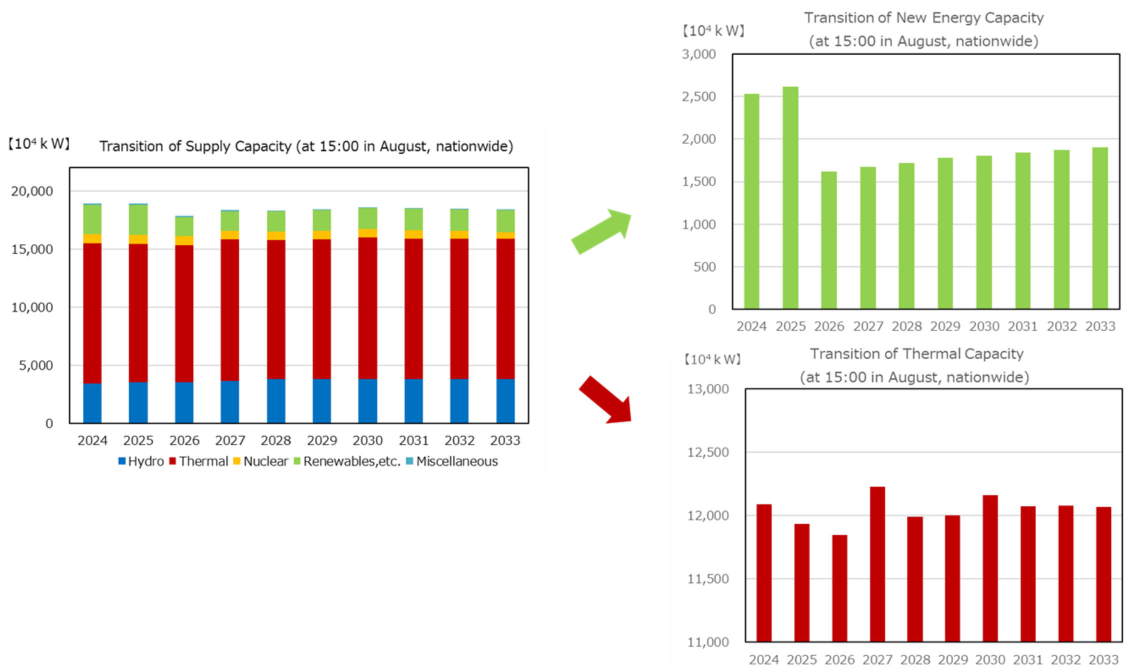
[25] As one requirement of stable generators contracted in the main auction of the capacity market, the maintenance schedule of generation facilities shall be coordinated, among other reasons, to secure reliability in each area and month two years before the actual supply.

[Reference] Detailed Analysis of the Aggregation:

a. Transition of Supply Capacity by Generation Sources

Figure 2-6 presents the power generation sources' supply capacity (nationwide in August) in the projected period.

The supply capacity of new energy, among others, is projected to decrease temporarily in FY 2026 due to the calculation using an annual adjustment factor after that year; however, it is projected to increase thereafter. Furthermore, thermal power is projected to decrease until FY 2026 due to the suspension and decommissioning of generation facilities. Lastly, supply capacity is projected to increase until FY 2025 and then to remain almost the same.



Aggregated value submitted by each electric power company New Energy, etc: Wind, Solar, Geothermal, Biomass and Waste, classified by "Guideline for the Calculation of Demand and Supply Capacity" (Agency for Natural Resources and Energy: Dec. 2011) Renewable Energy : New Energy and Hydro

Figure 2-6 Transition of Supply Capacity by Generation Sources

b. Transition of Suspended Thermal Power Plants

Figure 2-7 presents mid-to-long-term projections of suspended thermal power plants (6–12 GW), which are not counted as part of the supply capacity due to long-term planned outages. While they tend to increase until FY 2026, the suspended capacity is projected to decrease for FY 2027 due to the resumption of operations following suspension for 1 year.

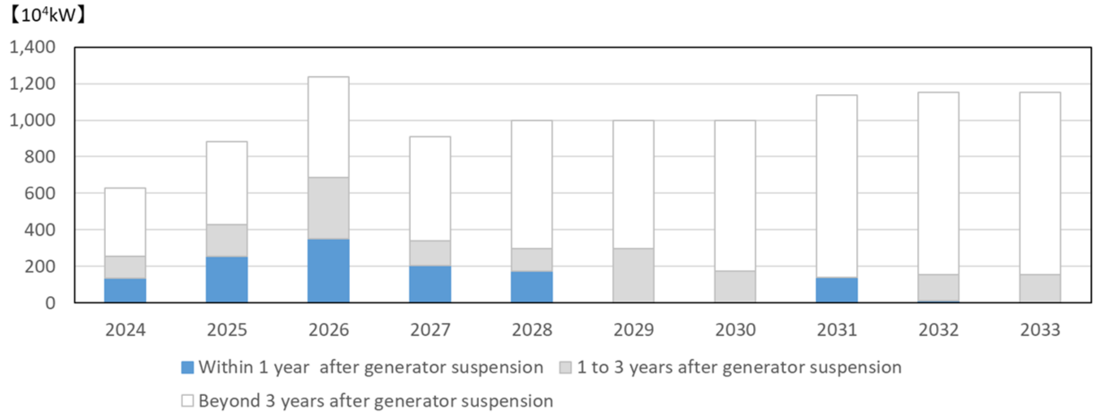


Figure 2-7 Projections of Suspended Thermal Power Plants

III. Analysis of the Transition of Power Generation Sources

This chapter's analysis is based on the automatic aggregation of values submitted by EPCOs. These values will not necessarily be realized in the future due to the operating conditions of power plants or actions due to political measures.

1. Transition of Power Generation Sources (Capacity)

The installed power generation capacity is the automatic aggregation of the capacity of an electric power plant's capacity owned by EPCOs and feed-in-tariff generators owned by companies (other than EPCOs) registered as procurers of the supply capacity for retail, specified wholesale suppliers, and GT&D companies in the projected period. For EPCOs' development plans, only generation facilities with a given probability of development are included in the calculation; however, not all development plans will necessarily be realized. In the future, inefficient facilities will proceed toward being decommissioned due to political measures.

The installed generation capacity by a power generation source submitted by EPCOs is calculated according to the following concepts:

*1 Hydro and Thermal[26]

For existing facilities, the generation company aggregates the generation facility that it owns. For a newly installed facility, a generation facility such as one that proceeds with its environmental assessment or publishing of its commercial operation, is included in the aggregation.

*2 Nuclear

The generation company aggregates its generation facilities with actual operation experience, along with 33 units for which the date for resuming operations is uncertain. Any facilities that have terminated their operations are excluded.

*3 Solar and Wind

The GT&D company aggregates the projected value of the generation facility's integration according to a preliminary consultation and the available connecting capacity of its transmission lines or the actual growth trend of integration.

Table 3-1 and Figure 3-1 present the transition of the installed power generation capacity by a power generation source. The EPCO submission values are automatically aggregated based on the abovementioned concepts.

[26] The same concept is applied to geothermal, biomass, and waste power generation sources as well as storage facilities.

Table 3-1 Composition of the Transition of Installed Power Generation Capacities by Power Generation Source (Nationwide, 10^4 kW)

Power Generation Sources		2023	2024	2028	2033
Thermal*1		14,880	15,018	14,755	14,946
	Coal	5,221	5,196	5,005	4,995
	LNG	7,942	8,178	8,156	8,354
	Oil and others[27]	1,717	1,645	1,594	1,598
Nuclear*2		3,308	3,308	3,308	3,308
Hydro and Renewables		13,752	14,116	16,065	17,803
	Conventional Hydro	2,192	2,196	2,210	2,219
	Pumped Storage	2,734	2,734	2,734	2,734
	Wind*3	562	621	1,257	1,798
	Solar*3	7,465	7,737	8,877	10,055
	Geothermal*1	50	50	54	55
	Biomass*1	591	645	738	740
	Waste*1	132	106	98	93
	Storage(battery)*1	24	28	97	109
Miscellaneous		204	252	58	58
Total		32,144	32,695	34,186	36,116

Note: The totals are not necessarily equal due to independent rounding.

*1 The Organization automatically aggregates the value of the generation facility owned by the generation company; however, not all development plans will necessarily be realized. In the future, inefficient facilities will be retired due to actions related to political measures. For newly installed facilities, generation facilities (e.g., proceeding with environmental assessments or publishing commercial operations) are included in the aggregation.
*2 Included are facilities with actual operation experience along with 33 units for which the date for resuming operations is uncertain; operation-terminated facilities are excluded.
*3 The GT&D company aggregates the projected value of integrating the generation facility according to a preliminary consultation and the available connecting capacity of its transmission lines or the actual growth trend of integration.

[27] The category of "oil and others" includes the total installed capacities from oil, LPG, and other gas and bituminous mixture fired capacities.

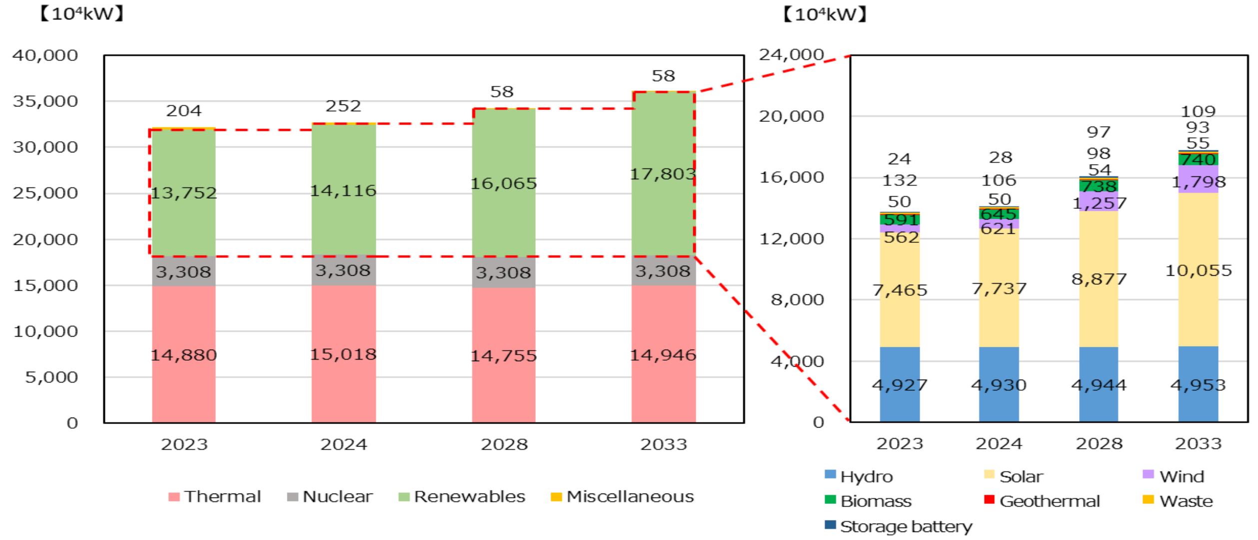


Figure 3-1 Transition of Installed Power Generation Capacities by Power Generation Sources (Nationwide)

* The sum of each power generation source's installed generation capacity is an aggregation of the values submitted by EPCOs.

2. Installed Power Generation Capacity for Each Regional Service Area

Figure 3-2 presents each regional service area's installed power generation capacity at the end of FY 2023.

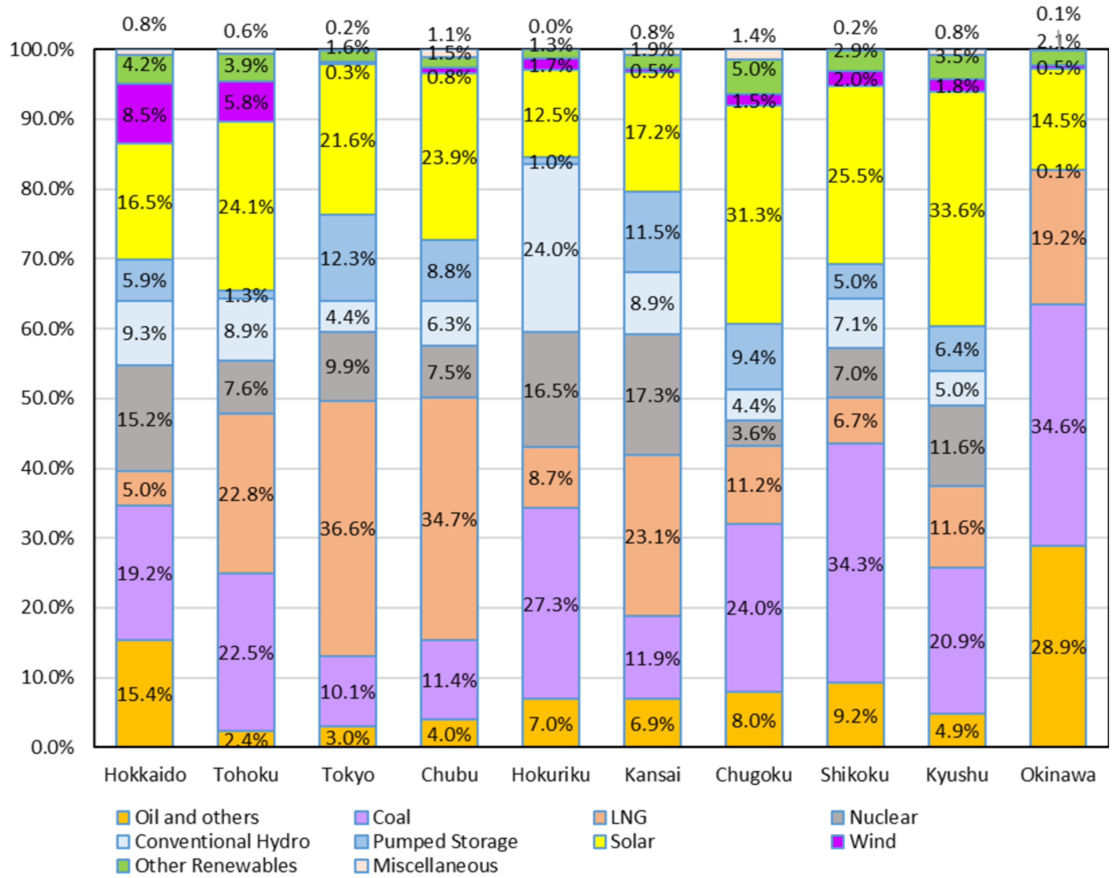


Figure 3-2 Composition of Installed Power Generation Capacity (kW) for Each Regional Service Area

* Each source's installed power generation capacity ratio is calculated by automatically aggregating the values.

3. Transition of Solar and Wind-Generation Capacities

Figure 3-3 presents the projection of integrated solar and wind-generation capacities for each regional service area (at the end of the indicated FY[28]):

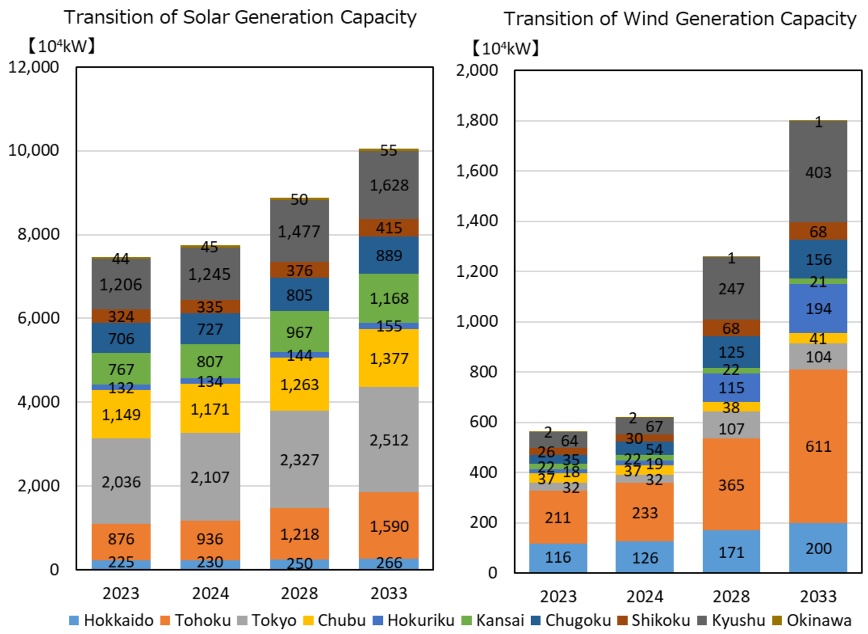


Figure 3-3 Transition of Solar and Wind Generation Capacities for Each Regional Service Area

[28] The GT&D company of each regional area aggregates the projected value of generation facility integration according to preliminary consultations for generator interconnection and the available connecting capacity of its transmission lines or the actual growth trend of integration.

4. Development Plans According to the Power Generation Source

Table 3-2 presents the development plans[29] of generation companies up to FY 2033, according to each one's new developments, uprated or derated installed facilities, and planned decommissioning of facilities in the projected period.

Table 3-2 Generation Development Plans up to FY 2033 by Stages (Nationwide, 10^4 kW)

Power Generation Sources		New Installation		Uprating/Derating		Decommission	
		Capacity	Sites	Capacity	Sites	Capacity	Sites
Hydro		**27.2**	**45**	**7.8**	**58**	**△3.5**	**11**
	Conventional	27.2	45	7.8	58	△3.5	11
	Pumped Storage	—	—	—	—	—	—
Thermal		**656.5**	**32**	—	—	**△483.0**	**42**
	Coal	—	—	—	—	△162.9	8
	LNG	641.4	13	—	—	△229.5	8
	Oil	15.1	19	—	—	△90.7	26
	LPG	—	—	—	—	—	—
	Bituminous	—	—	—	—	—	—
	Other Gas	—	—	—	—	—	—
Nuclear		**1,018.0**	**7**	**15.2**	**1**	—	—
Renewables		**1,023.4**	**331**	**0.2**	**1**	**△48.9**	**81**
	Wind	562.2	80	—	—	△33.2	43
	Solar	257.4	175	—	—	△6.0	28
	Geothermal	6.0	4	—	—	—	—
	Biomass	119.3	35	—	—	△3.4	3
	Waste	8.0	6	0.2	1	△6.4	7
	Storage(battery)	70.5	31	—	—	—	—
Total		**2,725.1**	**415**	**23.3**	**60**	**△535.5**	**134**

Note: The totals are not necessarily equal due to independent rounding to two decimal places.

[29] These are aggregated, including facilities for which the commercial operation date is "uncertain."

[Reference] Transition of New and Added Installation, Suspension, and Decommissioning of Thermal Power Plants:

Figure 3-4 presents the aggregated capacity of thermal power plants for the coming 10 years, which offsets the new and added installation as well as suspension with decommissioning. A comparison is made between the 2023 and 2024 Supply Plans.

The offset capacity increases in FY 2024 due to the increase in new and added installations. After FY 2025, the offset capacity will decrease due to an increase in suspension and decommissioning. For FY 2027, the resumption of operation capacity will offset the suspension and decommissioning capacity; however, the offset capacity will remain flat in the state of greater suspension and decommissioning compared with new and added installations.

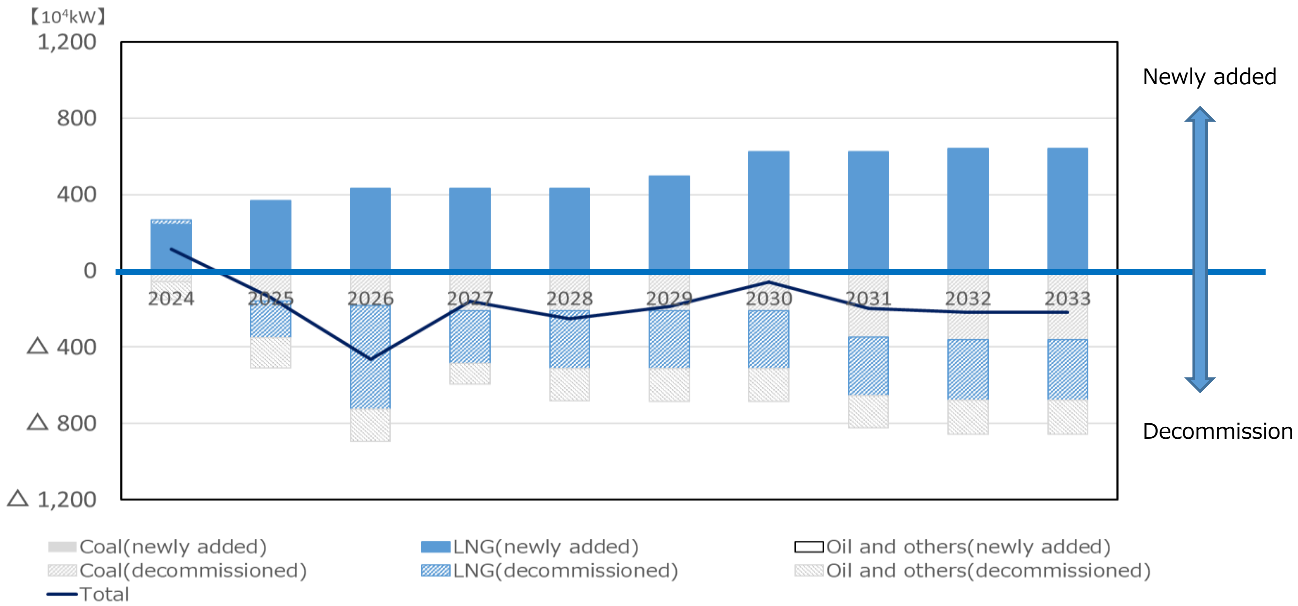


Figure 3-4 New and Added Installation, Suspension, and Decommissioning of Thermal Power Plants (Capacity, Aggregation from FY 2024)

5. Transition of Balancing Capacity

From the FY 2024 Supply Plan, the Organization requests the submission of a balancing capacity plan (e.g., output variance) to the generation company that owns such power plants. Figure 3-5 presents the transition of balancing capacity for the actual and projected figures:

Regarding the balancing capacity, increases and decreases are observed every year; however, almost the same level will be maintained as the actual figure from FY 2023. The balancing capacity is mainly composed of thermal power plants (coal and LNG-fired) and pumped-storage hydropower plants, and the same composition will remain at a similar level for the next decade. In addition, storage (battery) facilities will gradually increase.

Figure 3-5 aggregates the output variance submitted in the plan regarding balancing capacity. The method for calculating the output variance is based on the description in the “Guidelines for the Calculation of Demand and Supply Capacity” (Agency for Natural Resources and Energy: December 2023) and the “Procedures for Electricity Supply Plans of FY 2024” (Agency for Natural Resources and Energy: December 2023)

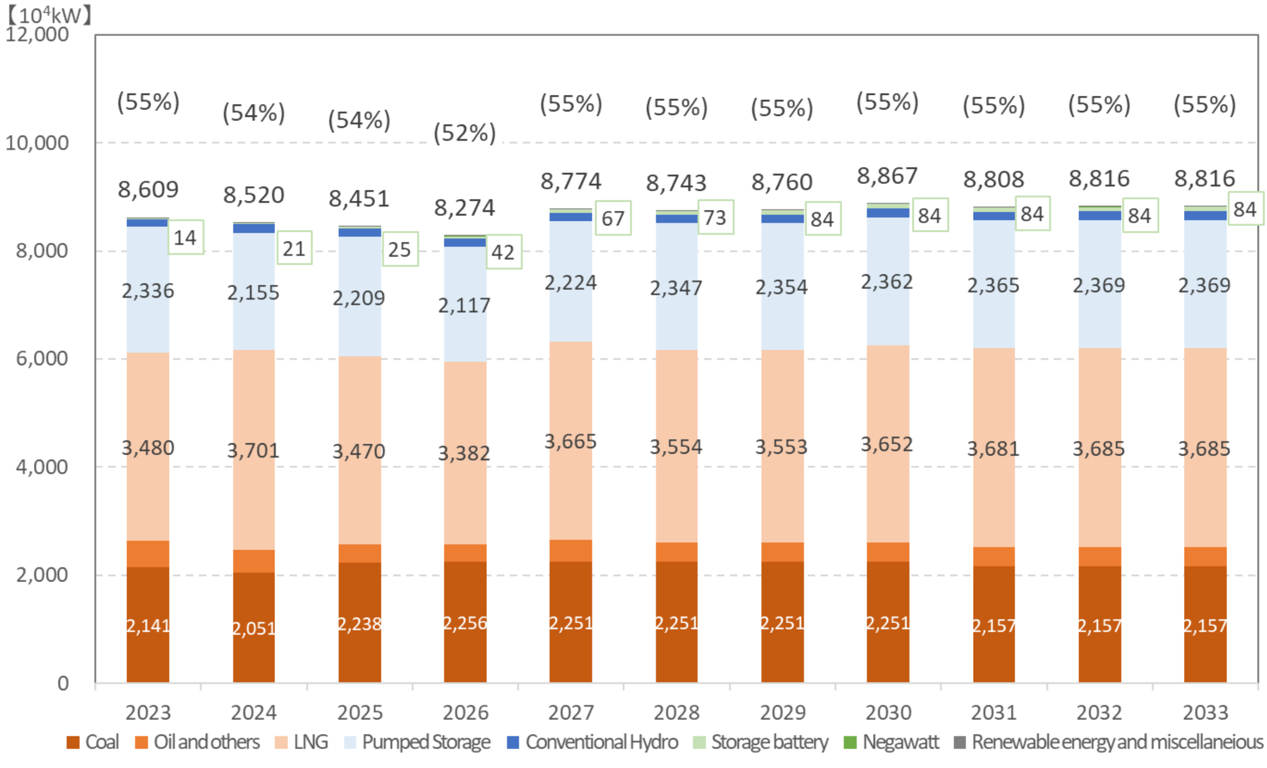


Figure 3-5 Transition of the Balancing Capacity

[Reference] Net Electrical Energy Generation (at the Sending End):
The net electrical energy generation (at the sending end) for the projected period is an estimation[30] of values calculated by the power generation source in each premise for each generation company. This estimation is not necessarily the same as net electrical energy generation.

Each generation company submits its electrical energy generation value, which is the sum of the energy generated by available generation facilities in the projected period. This amount is automatically summed in the merit order of operational cost. Furthermore, the value is based on future energy sales led by actual sales and future sales contracts without considering the effect of regulatory measures.

This estimation of net electrical energy generation may change according to the operating conditions of nuclear power plants, changes in generation sources (specified as "miscellaneous" in future trends), and the energy output's shedding of inefficient coal-fired thermal power generation according to the regulatory measures for generation efficiency promulgated under the Energy Conservation Act. Thus, the estimation is not necessarily the same as the electrical energy generation in the future and is likely to approximate the target value of the country's energy mix.
The calculation method and results of net electrical energy generation by power generation source are stated as follows:

(1) Renewables (Table 3-3)
For solar and wind power, each GT&D company calculates its energy generation based on the aggregation of projected values of generation facility integration according to the preliminary consultation and available connecting capacity of its transmission lines or the actual growth trend of the integration. For geothermal, biomass, and waste power generation sources, the company calculates its energy generation based on its development plan.

Table 3-3 Composition of the Transition of Electrical Energy Generated by Renewable Generation Sources (Nationwide, at the Sending End; 10^8 kWh)

Generation Source		2023	2024	2028	2033
Renewables		1,415	1,508	1,827	2,059
	Wind	108	119	217	324
	Solar	918	951	1,072	1,184
	Geothermal	26	26	30	31
	Biomass	317	373	462	474
	Waste	44	33	31	30
	Storage(battery)	1	5	15	16

[30] This estimation includes the electrical energy generated from generation facilities owned by generation companies and generation facilities, such as FIT generators, which retail companies, specified wholesale suppliers, and GT&D companies procure from sources other than non-EPCO companies.

(2) Hydro and Thermal (Table 3-4)

Each generation company calculates its energy generation based on its development plan. For thermal power generation, the energy generated from coal-fired thermal power, which has relatively low operation costs, has a large share due to its merit order ranking (by operation cost) without considering the effect of regulatory measures.

Table 3-4 Composition of the Transition of Electrical Energy Generated by Hydro and Thermal Generation Sources (Nationwide, at the Sending End; 10^8 kWh)

Generation Source		2023	2024	2028	2033
Hydro		793	795	840	857
	Conventional	696	744	793	801
	Pumped Storage	98	50	47	56
Thermal		5,886	5,784	5,493	5,260
	Coal	2,631	2,793	2,813	2,545
	LNG	2,995	2,781	2,475	2,490
	Oil and others [27]	260	211	206	226

(3) Nuclear (Table 3-5)

The generation company calculates its energy generation based on the plan developed for units that resumed operations at the end of February 2024.

Table 3-5 Composition of the Electrical Energy Transition Generated by Nuclear Generation Sources (Nationwide, at the Sending End; 10^8 kWh)

Generation Source	2023	2024	2028	2033
Nuclear	799	756	690	527

Table 3-6 sums items (1), (2), and (3) from above with "miscellaneous" energy generation.

Table 3-6 Composition of the Electrical Energy Transition Generated by All Generation Sources (Nationwide, at the Sending End; 10^8 kWh)

	2023	2024	2028	2033
Total	8,900	8,853	8,858	8,711

[Reference] Net Electrical Energy Generation for Each Regional Service Area:

Figure 3-6 presents each regional service area's net electrical energy generation in FY 2023:

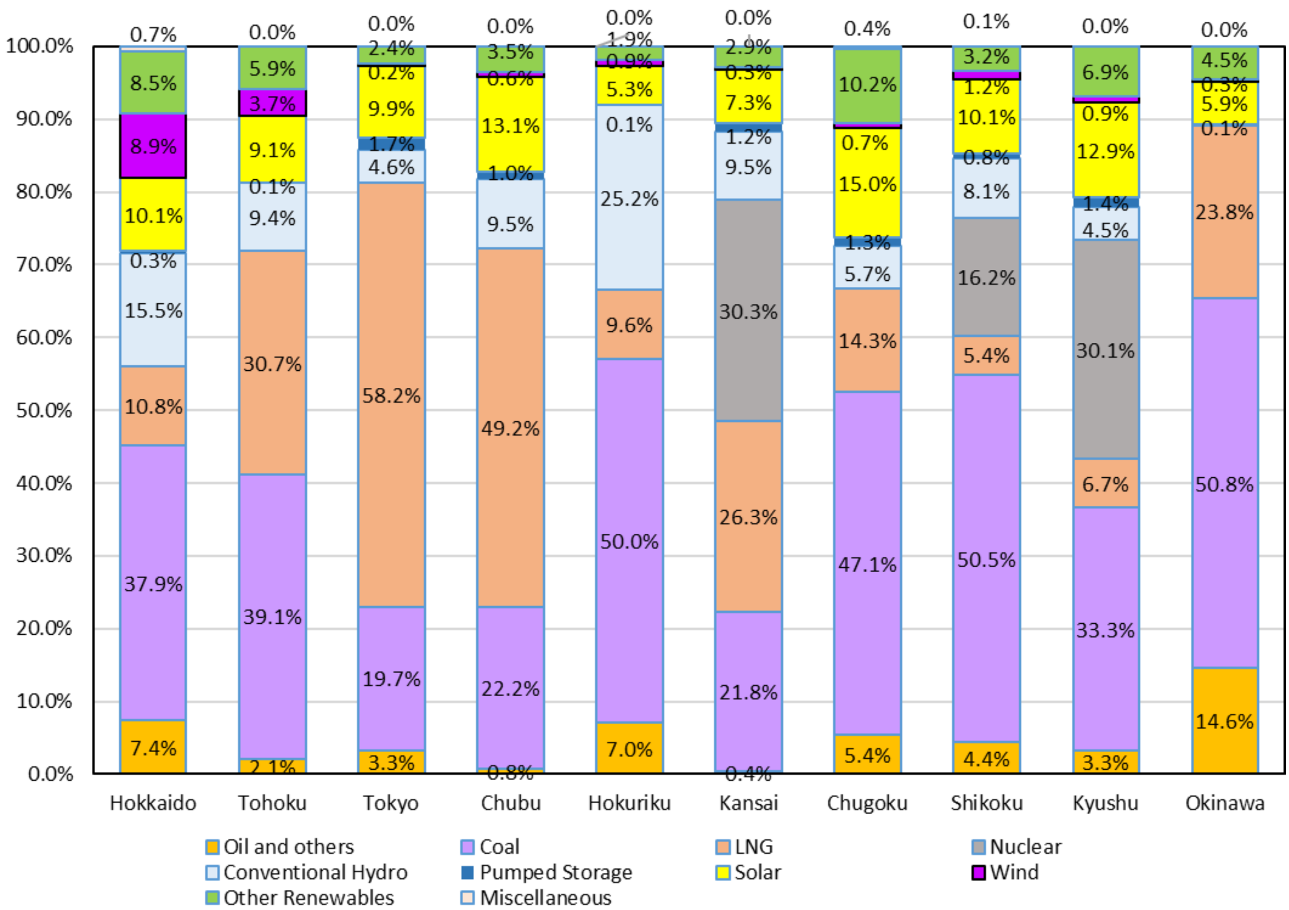


Figure 3-6 Composition of the Net Electrical Energy Generation (kWh) for Each Regional Service Area

[Reference] Transition of Capacity Factors by Power Generation Sources:

Table 3-7 and Figure 3-7 present the capacity factors by sources of power generation. The projection of the capacity factors is automatically calculated using the power generation sources and net electrical energy generation data provided to the Organization.

As noted, these values are calculated from a given projection; the capacity factors in this chapter differ from those in actual operations.

Table 3-7 Capacity Factors by Power Generation Source (Nationwide)

Power Generation Sources		2023	2024	2028	2033
Hydro		18.3%	18.4%	19.4%	19.8%
	Conventional	36.1%	38.7%	41.0%	41.2%
	Pumped Storage	4.1%	2.1%	1.9%	2.4%
Thermal		45.0%	44.0%	42.5%	40.2%
	Coal	57.4%	61.4%	64.2%	58.2%
	LNG	42.9%	38.8%	34.6%	34.0%
	Oil and others [27]	17.2%	14.6%	14.7%	16.1%
Nuclear		27.5%	26.1%	23.8%	18.2%
Renewables		18.3%	18.7%	18.8%	18.3%
	Wind	21.9%	22.0%	19.7%	20.6%
	Solar	14.0%	14.0%	13.8%	13.4%
	Geothermal	59.2%	60.1%	64.5%	64.1%
	Biomass	61.0%	66.1%	71.4%	73.2%
	Waste	38.3%	35.7%	35.5%	36.1%
	Storage(battery)	6.7%	18.7%	17.2%	16.8%

* These values are calculated from a given projection; note that the capacity factors in this chapter differ from those in actual operations.

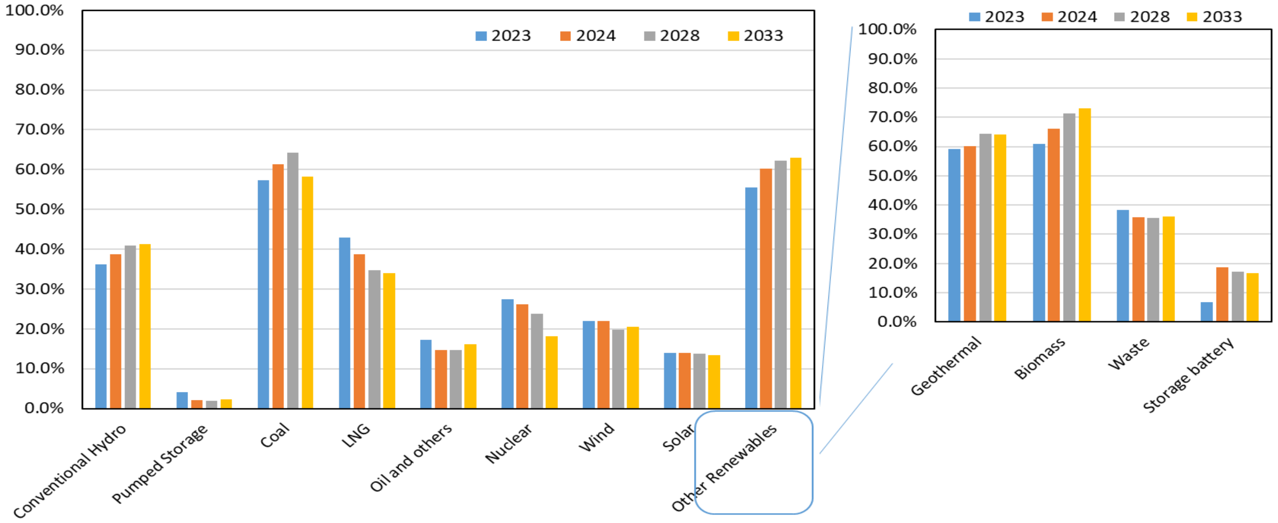


Figure 3-7 Capacity Factors by Power Generation Source (Nationwide)

IV. Development Plans for Transmission and Distribution Facilities

The Organization aggregates development plans[31] for cross-regional transmission lines and substations (transformers and AC/DC converters) up to FY 2033, as submitted by GT&D and transmission companies. Table 4-1 presents the development plans for cross-regional transmission lines and substations, while Figure 4-1 presents the outlook for nationwide electric systems. Items (1), (2), and (3) below list the development plans according to cross-regional transmission lines, major substations, and summaries, respectively.

Table 4-1 Development Plans for Cross-Regional Transmission Lines and Substations[32]

Increased Length of Transmission Lines [33]*[34]		443km (439 km)
	Overhead Lines*	356 km (381 km)
	Underground Lines	87 km (58 km)
Uprated Capacities of Transformers		30,648 MVA (30,163 MVA)
Uprated Capacities of AC/DC Converters [35]		1,200 MW (1,200 MW)
Decreased Length of Transmission Lines (Decommission)		△94 km (△104 km)
Derated Capacities of Transformers (Decommission)		△6,300 MVA (△5,600 MVA)

Enhancement plans for cross-regional transmission lines are summarized below.

Interconnection Facility Enhancement Plan Between Hokkaido and Honshu
(900 MW → 1,200 MW; in service: March 2028)

AC/DC Converter Stations	・Hokuto Converter Station: 300 MW→600 MW ・Imabetsu Converter Station: 300 MW→600 MW
275 kV DC Lines	・Hokuto Imabetsu DC Interconnection Line: 122 km ・Imabetsu Bulk Line extension: 50 km

[31] Development plans for transmission lines and substations must be submitted for voltages higher than 250 kV or within two classes of the highest voltage available in the regional service areas. (For the Okinawa EPCO, the requirement applies only for 132 kV or higher.) The totals are not necessarily equal due to independent rounding.
[32] The figures in parentheses are those from the previous year.
[33] Development plans corresponding to changes in the line category or circuit numbers that were not included when measuring the increased length of transmission lines were treated as "no change in the length of transmission lines."
[34] Increased length does not include the item with * because of an undetermined in-service date.
[35] The DC transmission system includes the installed capacity for the converter station on one side.

Interconnection Facility Enhancement Plan Between Tohoku and Tokyo
(in service: November 2027)

500kV Transmission Lines	・Miyagi-Marumori Bulk Line: 79 km ・Marumori-Iwaki Bulk Line: 64 km ・Soma-Futaba Bulk Line/ Connecting Point Change: 16 km ・Shinchi Access Line/ Miyagi-Marumori Switching Station lead-in: 1km ・Joban Bulk Line/ Miyagi-Marumori Switching Station Dπ lead-in: 1 km ・Fukushima Bulk Line/Mountain Line connecting point change: 1 km
Switching Stations	Miyagi-Marumori Switching Station: 10 circuits

Interconnection Facility Enhancement Plan Between Tokyo and Chubu
(2,100 MW→3,000 MW; in service: FY 2027)

Frequency Converter Stations	・Shin Sakuma FC station: 300 MW ・Higashi Shimizu Substation: 300 MW→900 MW
275 kV Transmission Lines	・Higashi Shimizu Line: 19 km ・Sakuma Higashi Bulk Line/ FC Branch Line: 3 km ・Sakuma-Toei Line/ FC Branch Line: 1 km ・Shin Toyone-Toei Line: 1 km ・Sakuma-Toei Line: 11km, 2km ・Sakuma Higashi Bulk Line: 123 km
500 kV Transformers	・Shin Fuji Substation: 750 MVA×1 ・Shizuoka Substation: 1,000 MVA×1 ・Toei Substation: 800MVA×1 →1,500 MVA×2
275 kV Transformers	・Shin Fuji Substation: 200MVA×1→0 MVA

Interconnection Facility Enhancement Plan Between Chubu and Kansai
(in service: not determined)
* Under review in the Cross-Regional Transmission Line Development Process[36]

500 kV Transmission Lines	・Sekigahara-Kita Oomi Line: 2 km ・Sangi Bulk Line/ Sekigahara Switching Station π lead-in: 0.2 km ・Kita Oomi Line/ Kita Oomi Switching Station π lead-in: 0.5 km
Switching Stations	・Sekigahara Switching Station: 6 circuits ・Kita Oomi Switching Station: 6 circuits

Interconnection Facility Enhancement Plan Between Chubu and Hokuriku
(To be decommissioned: Apil 2026)

BTB Converter Station Decommission	Minami Fukumitsu Converter Station: 300 MW→0 MW

[36] The planning process for cross-regional transmission lines is applied to the specific development plan of the master plan and implemented based on the long-term cross-regional development policy, power flows of cross-regional interconnection lines, and replacement plans of cross-regional transmission lines.

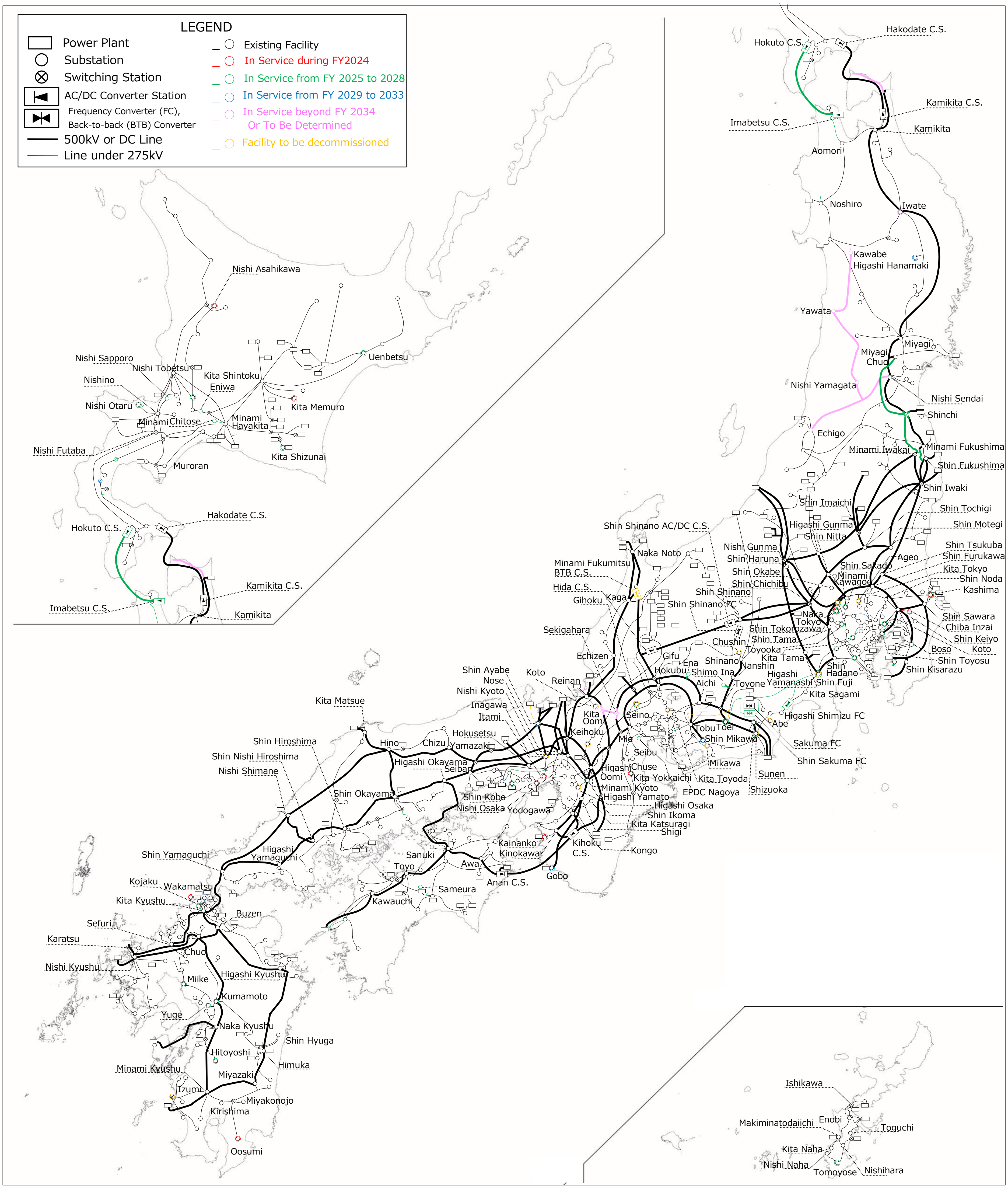


Figure 4-1 Power Grid Configuration in Japan

1. Development Plans for Major Transmission Lines

Table 4-2 Development Plans Under Construction

Company	Line[37]	Voltage	Length[38,39]	Circuit	Under construction	In service	Purpose[40]
Hokkaido Electric Power Network, Co., Inc.	Hokuto-Imabetsu DC Interconnection Line	DC-250 kV	98 km*3 24 km*2,3	1→2	Oct. 2023	Mar. 2028	Reliability upgrade*4
Tohoku Electric Power Network Co., Inc.	Soma-Futaba Bulk Line/connecting point change	500 kV	16 km	2	Sep. 2022	Apr. 2026(No.1) Jun. 2026(No.2)	Generator connection, Reliability upgrade*4
	Dewa Bulk Line	500 kV	96 km	2	Jun. 2022	Beyond FY 2031	Generator connection
	Miyagi-Marumori Bulk Line	500 kV	79 km	2	Sep. 2022	Nov. 2027	Generator connection, Reliability upgrade*4
	Miyagi-Marumori Switching Station	500 kV	-	10	Oct. 2022	Nov. 2027 (May 2026)	Generator connection, Reliability Upgrade*4
	Imabetsu Bulk Line extension	275 kV	50 km*3	2	Apr. 2023	Nov. 2027	Generator connection, Reliability upgrade, Aging Management*4
	Plant A Branch Line*1	275 kV	0.2 km	1	Jun. 2023	May 2024	Generator connection
	Akita-Kawabe Branch Line	275 kV	5 km	2	Aug. 2023	Beyond FY 2029	Generator connection
TEPCO Power Grid, Inc.	Shinjuku Line replacement	275 kV	22 km→ 21 km(No.1) 20 km→ 21 km(No.2) 20 km→ 21 km(No.3) *2*3	3	Sep. 2019	Aug. 2030(No.1) Nov. 2032(No.2) Dec. 2027(No.3)	Aging management
	Chiba Inzai Line	275 kV	11 km	2	Jun. 2020	May 2024	Demand coverage
	Johoku Line	275 kV	21 km*2	3	Sep. 2022	Feb. 2030	Economic upgrade
	Higashi Shimizu Line	275 kV	12 km 6 km (diversion)	2	Apr. 2023	Jan. 2027	Reliability upgrade*4
Chubu Electric Power Grid Co., Inc.	Shimo Ina Branch Line	500 kV	0.3 km	2	Jan. 2022	Oct. 2027	Demand coverage
	Ena Branch Line	500 kV	1 km	2	Sep. 2020	Oct. 2025	Demand coverage
	Higashi Nagoya -Tobu Line	275 kV	8 km*3	2	Apr. 2019	Nov. 2025	Aging management, Economic upgrade
Kansai Transmission & Distribution, Inc.	Himeji Access Line*1	275 kV	0.8 km*2	2	Mar. 2021	Jan. 2025	Generator connection
	Shin Kakogawa Line extnsion	275 kV	25 km*3	2	Jul. 2021	Jun. 2025	Generator connection, Aging management
	Himeji Access East Line improvement*1	275 kV	18 km→ 18 km*3	2	Feb. 2022	Dec. 203	Aging management

[37] *1 denotes the line renamed not to be identified as the fuel of the connecting power plant.
[38] *2 denotes "underground," otherwise "overhead."
[39] *3 denotes that changes in line category and circuit number are not included in Table 4-1.
[40] *4 indicates enforcement related to cross-regional interconnection lines.
*5 indicates that the case is under review in the cross-regional development master plan.

Demand coverage	Related to increase/decrease demand
Generator connection	Related to generator connection or decommission
Aging management	Related to aging management of facilities (including the proper update of facilities and with evaluation of obsolescence
Reliability upgrade	Related to improvement in the reliability or security of stable supply
Economic upgrade	Related to improvement in economies, such as reducing transmission loss, facility downsizing, or upgrading the stability of the system

Company	Line[37]	Voltage	Length [38,39]	Circuit	Under construction	In service	Purpose[40]
Shikoku Electrc Power Transmission & Distribution, Inc.	Ikata North Bulk Line	187 kV	19 km*3	2	Jan. 2024	Sep. 2028	Aging management
Kyushu Electric Power Transmission & Distribution Co., Inc.	Hibiki-Wakamatsu Line	220 kV	4 km	2	May 2023	Apr. 2025	Generator connection
	Shin Kokura Line	220 kV	15 km→ 15 km*2*3	3→2	May 2021	Oct. 2029	Aging management
J-POWER Transmission Network Co.,Ltd.	Ooma Bulk Line	500 kV	61 km	2	Jun. 2006	TBD	Generator connection
	Sakuma Higashi Bulk Line	275 kV	124 km→ 123 km*3	2	Jul. 2022	Mar. 2027(No.1) Apr. 2027(No.2)	Reliability upgrade*4
	Sakuma Higashi Bulk Line/ FC Branch Line	275 kV	3 km	2	Oct. 2023	Sep. 2027	Reliability upgrade*4
	Sakuma-Toei Line/ FC Branch Line	275 kV	1 km	2	Oct. 2023	Sep. 2027	Reliability upgrade*4
	Shin Toyone-Toei Line	275 kV	1 km	1	Oct. 2023	Aug. 2027	Reliability upgrade*4
	Sakuma-Toei Line	275 kV	11 km→ 11 km*3	2	Oct. 2023	Aug. 2027	Reliability upgrade*4
	Sakuma-Toei Line	275 kV	2 km	2	Oct. 2023	Aug. 2027	Reliability upgrade*4
Fukushima Souden	Abukumananbu Line	154 kV	24 km*2	1	Jul. 2020	Jun. 2024	Generator connection

Table 4-3 Development Plans in Planning Stages

Company	Line[37]	Voltage	Length[38,39]	Circuit	Under construction	In service	Purpose[40]
Hokkaido Electric Power Network, Inc.	Branch Line E *1	187 kV	2.4 km	2	May 2024	Aug. 2028	Demand coverage
	Branch Line F *1	275 kV	7.9 km	2	May 2024	Aug. 2028	Demand coverage
	Branch Line G *1	187 kV	5.8 km	2	May 2024	Aug. 2028	Demand coverage
	(prov.) Plant H Access Line*1	275 kV	0.1 km	1	Apr. 2026	Jul. 2027	Genrator connection
	(prov.) Minami Chitose UG Line	187 kV	13 km*2	2	Sep. 2024	Oct. 2027	Generator connection
	Kita Oshamanbe Switching Station	187 kV	-	5	Oct. 2024	Aug. 2028	Generator connection
	Hakodate Bulk Line/ Kita Oshamanbe S.S. π lead-in*1	187 kV	0.7 km	2	Jun. 2026	Aug. 2028	Generator connection
	(prov.) 187kV Nishi Yakumo Switching Station	187 kV	-	5	Oct. 2025	Aug. 2028	Generator connection
	(prov.) Hakodate Bulk Line/ 187kV Nishi Yakumo Switching Station	187 kV	0.1 km	2	Oct. 2027	May 2029	Generator connection
Tohoku Electric Power Network Co., Inc.	Marumori-Iwaki Bulk Line	500 kV	64 km	2	Apr. 2024	Nov. 2027	Generator connection, Reliability upgrade*4
	Joban Bulk Line/ Miyagi-Marumori Switching Station Dπ lead-in	500 kV	1 km	2	Jun. 2024	May 2026 (No.1) Jul. 2026 (No.2)	Generator connection, Reliability upgrade*4
	Shinchi Access Line/ Miyagi-Marumori Switching Station lead-in*1	500 kV	1 km	2	Sep. 2024	May 2026 (No.1) Jul. 2026 (No.2)	Generator connection, Reliability upgrade*4

Company	Line[37]	Voltage	Length[38,39]	Circuit	Under construction	In service	Purpose[40]
Tohoku Electric Power Network Co., Inc.	Yamagata Bulk Line uprating/ extension	275kV→500kV	53 km→103 km	2	Beyond FY 2026	Beyond FY 2031	Generator connection
	Northern Akita Prefecture HS Line	275 kV	0.2 km*2	2	Jul. 2024	Mar. 2028	Generator connection
	Akimori-Kawabe Branch Line	275 kV	0.3 km	2	Beyond FY 2027	Beyond FY 2029	Generator connection
	Asahi Bulk Line uprating	275kV→500kV	139km→138km	2	Beyond FY 2028	Beyond FY 2030	Generator connection
	Minami Yamagata Bulk Line uprating	275kV→500kV	23 km→23 km	2	Beyond FY 2029	Beyond FY 2030	Generator connection
TEPCO Power Grid, Inc.	Higashi Shinjuku Line replacement	275 kV	23km→5km (No.2) 23km→5km (No.3)*2*3	2	FY 2026	Nov. 2032 (No.2) Dec. 2027 (No.3)	Aging management
	MS18GHZ051500 Access Line (prov.)	275 kV	0.1 km	2	Mar. 2025	Jun. 2026	Generator connection
	G5100026 Access Line(prov.)	500 kV	0.5 km*2	2	Apr. 2024	Dec. 2028	Generator connection
	Shin Sodegaura Line	500 kV	0.1 km(No.1) 0.1 km(No.2)	2	Jan. 2028	Nov. 2028 (No.1) May 2029 (No.2)	Generator connection, Reliability upgrade
	Fukushima Bulk Line / Mountain Line connecting point change	500 kV	1 km(No.1) 1 km(No.2)	2	Jun. 2024	May 2025 (No.1) Aug. 2025 (No.2)	Generator connection, Reliability upgrade*4
	Kashima Kaihin Line /connecting point change	275 kV	0.2km(No.1) 0.2km(No.2) *2	2	Oct. 2024 (No.1) Sep. 2024 (No.2)	Apr. 2025 (No.1) Nov. 2024 (No.2)	Economic upgrade
	Chiba Inzai Line	275 kV	11 km(No.3) 11 km(No.4)*2	2	Apr. 2024	Feb. 2027 (No.3) Nov. 2025 (No.4)	Demand coverage
	Kita Musashino Line	275 kV	14 km*2, 3	2→3	Sep. 2024	May 2027	Reliability upgrade
Chubu Electric Power Grid Co., Inc.	Kita Yokkaichi Branch Line	275 kV	0.2 km 6 km*2	2	Dec. 2024	Jan. 2029 (No.1) Aug. 2029 (No.2)	Demand coverage, Economic upgrade
	Sekigahara-Kita Oomi Line	500 kV	2 km	2	TBD	TBD	Reliability upgrade *4, *5
	Sekigahara Switching Station	500 kV	—	6	TBD	TBD	Reliability upgrade *4, *5
	Sangi Bulk Line/ Sekigahara Switching Station π lead-in	500 kV	0.2 km	2	TBD	TBD	Reliability upgrade *4, *5
Kansai Transmission & Distribution, Inc.	Kita Oomi Line/ Kita Oomi Switching Station πlead-in	500 kV	0.5 km	2	TBD	TBD	Reliability upgrade *4, *5
	Kita Oomi Switching Station	500 kV	—	6	TBD	TBD	Reliability upgrade *4, *5
	Tsuruga Line/ North side improvement	275 kV	10 km→ 9 km*3	2	TBD	TBD	Aging management
Chugoku Electrc Power Transmission & Distribution, Inc.	Kasaoka Bulk Line extension	220 kV	15 km*3	2	Nov. 2024	Nov. 2027	Demand coverage Generator connection
Kyushu Electric Power Transmission & Distribution, Inc.	Sendai Nuclear North Line	220 kV	1 km→ 1 km	2	Dec. 2025	Nov. 2026	Economic upgrade
J-POWER Transmission Network Co.,Ltd.	Nabari Bulk Line Reihoku-Kunimi san Branch Line(prov.)	187 kV	0.1 km	1	FY 2025	FY 2026	Generator connection

Table 4-4 Decommissioning Plans

Company	Line[37]	Voltage	Length	Circuit	Decommission	Purpose[40]
Hokkaido Electric Power Network, Inc.	Plant D Access Line*1	275 kV	0.6 km	1	Jun. 2023	Generator conncection (withdrawal)
TEPCO Power Grid, Inc.	Kashima Thermal Power Line No.1, No.2	275 kV	△5.0 km	2	Dec. 2024	Economic upgrade
Kansai Electric Power Transmission and Distribution, Inc.	M Line decommission*1	275 kV	△28 km	2	FY 2028	Generator connection
Kyushu Electric Power Transmission and Distribution, Inc.	Sensatsu Switching Station	220 kV	-	4	Nov. 2026	Economic upgrade
J-POWER Transmission Network Co.,Ltd.	Shin Toyone-Toei Line	275 kV	△3 km	1	Apr. 2027	Reliability upgrade*4
	Sakuma Nishi Bulk Line	275 kV	△58 km	2	Apr. 2027	Economic upgrade

2. Development Plans for Major Substations

Table 4-5 Development Plans Under Construction

Company	Substation[41]	Voltage	Capacity	Unit	Under construction	In service	Purpose [40]
Hokkaido Electric Power Network, Inc.	Hokuto C.S.	—	300 MW	—	Sep. 2023	Mar. 2028	Reliability upgrade*4
	Imabetsu C.S.	—	300 MW	—	Sep. 2023	Mar. 2028	Reliability upgrade*4
Tohoku Electric Power Network, Inc.	Higashi Hanamaki	275/154 kV	300 MVA	1	Apr. 2023	Oct. 2028	Demand coverage
TEPCO Power Grid, Inc.	Chiba Inzai*6	275/66 kV	300 MVA×2	2	Jun. 2022	Jun. 2024	Demand coverage
	Kashima	275/66 kV	300 MVA	1	Aug. 2023	Jun. 2024	Generator connection
	Naka Tokyo	275/154 kV	200 MVA→ 300 MVA	2→2	Mar. 2024	Jan. 2025 (1B) Jun. 2025 (2B)	Aging management
Chubu Electric Power Grid Co., Inc.	Shimo Ina*6	500/154 kV	300 MVA×2	2	Oct. 2021	Oct. 2027	Demand coverage
	Ena*6	500/154 kV	200 MVA×2	2	Oct. 2022	Oct. 2027	Demand coverage
	Toei	500/275 kV	800 MVA×1→ 1,500 MVA×2	1→2	Jun. 2022	Oct. 2024 (N 2B) Mar. 2027 (1B)	Reliability upgrade*4
	Higashi Shimizu	—	300 MW→ 900 MW	—	May 2021	Mar. 2028	Reliability upgrade*4
Kansai Transmission and Distribution, Inc.	Itami	275/154 kV	300 MVA	1	Apr. 2023	Jun. 2024	Aging management
	Kainanko	275/77 kV	300 MVA×1、 200 MVA×2→ 300 MVA×2	3→2	Dec. 2022	May 2024	Aging management
	Shin Kobe	275/77 kV	300 MVA×1、 200 MVA×1→ 200 MVA×1	2→1	Feb. 2023	Mar. 2025	Aging management
Kyushu Electric Power Transmission & Distribution Co., Inc.	Yuge	220/110/ 66 kV	300/100/250 MVA	1	Feb. 2024	Jun. 2025	Demand coverage
	Wakamatsu	220/66 kV	250 MVA	1	Jan. 2023	Oct. 2024	Generator connection
	Oosumi	110/66 kV→ 220/110/ 66 kV	60 MVA→ 250/100/ 200 MVA	1→1	Apr. 2022	Feb. 2025	Generator connection
	Kojaku	220/66 kV	150 MVA→ 200 MVA	1→1	Oct. 2023	Jun. 2025	Aging management
The Okinawa Electric Power Co., Inc.	Tomoyose	132/66 kV	125 MVA×2→ 200 MVA×2	1→1	Jul. 2018	Jun. 2026(2B)	Aging management
J-POWER Transmission Network Co.,Ltd.	Minami Kawagoe	275/154 kV	264 MVA×3, 300 MVA×1→ 300 MVA×2, 450 MVA×1	4→3	Sep. 2023	Mar. 2024(6B) Mar. 2025(2B) Mar. 2026(1B)	Aging management
Fukushima souden	Abukumaminami*6	154/66/ 33 kV	170 MVA	1	Sep. 2022	Jun. 2024	Generator connection

[41] A substation with *6 denotes a newly installed substation or a converter station, including an uprated electric facility.

Table 4-6 Development Plans in Planning Stages

Company	Substation[33,37]	Voltage	Capacity	Unit	Under construction	In service	Purpose[36]
Hokkaido Electric Power Network, Inc.	Kita Memuro	187/66 kV	60 MVA→ 150 MVA	1→1	Aug. 2024	Mar. 2025	Aging management
	Nishi Asahikawa	187/66 kV	60 MVA→ 100 MVA	1→1	Apr. 2024	Oct. 2024	Aging management
	Kita Shizunai	187/66/11 kV	45 MVA→ 60 MVA	1→1	May 2024	Nov. 2025	Aging management, Generator connection
	Eniwa	187/66 kV	200 MVA	1	Jul. 2024	Jun. 2025	Demand coverage
	Nishi Sapporo	187/66 kV	200 MVA	1	May 2025	Jun. 2026	Demand coverage
	Nishi Otaru	187/66 kV	100 MVA→ 150 MVA	1→1	Sep. 2025	Jun. 2026	Aging management
	Nishi Otaru	187/66 kV	100 MVA→ 150 MVA	1→1	Nov. 2026	Jun. 2027	Aging management
	Minami Chitose*6	187/66 kV	450 MVA×2	2	May 2025	Oct. 2027	Demand coverage
	Uenbetsu	187/66 kV	75 MVA→ 100 MVA	1→1	Apr. 2026	May 2027	Aging management Generator connection
	Kita Ebetsu	187/66 kV	100 MVA→ 150 MVA	1→1	Jun. 2026	Jul. 2027	Aging management
Tohoku Electric Power Network Co., Inc.	Iwate	500/275 kV	1,000 MVA	1	Beyond FY 2025	Beyond FY 2028	Generator connection
	Echigo*6	500/275 kV	1,500 MVA×3	3	Beyond FY 2025	Beyond FY 2030	Generator connection
	Yawata*6	500/154 kV	750 MVA	1	Beyond FY 2027	Beyond FY 2031	Generator connection
	Kawabe*6	500/275kV	1,500 MVA×3	3	Beyond FY 2025	Beyond FY 2031 (Beyond FY 2029)	Generator connection
	Nishi Yamagata*6	275/154 kV →500/154 kV	300 MVA×2 →450 MVA×2	2→2	Beyond FY 2025	Beyond FY 2031 (Beyond FY 2030)	Generator connection
TEPCO Power Grid, Inc.	Shin Fuji	500/154 kV	750 MVA	1	Jul. 2024	Feb. 2027	Reliability upgrade*4
	Kashima	275/66 kV	200 MVA×2 →300 MVA×2	2→2	Jun. 2025	Feb. 2026 (7B) Feb. 2027 (8B)	Aging management
	Toyooka	275/154 kV	450 MVA	1	Aug. 2024	Jun. 2026	Demand coverage
	Shin Toyosu	275/66 kV	300 MVA	1	Oct. 2024	Jan. 2026	Demand coverage
	Koto	275/66 kV	150 MVA→ 300 MVA	1→1	Oct. 2025	Jun. 2026	Demand coverage
	Kita Sagami	275/66 kV	300 MVA×2	2	Aug. 2024	Jun. 2027	Demand coverage
	Kita Tama	275/66 kV	200 MVA×2 →300 MVA×2	2→2	Feb. 2025	Jun. 2026 (2B) Jun. 2027 (3B)	Aging management
	Chiba Inzai	275/66 kV	300 MVA×2	2	Oct. 2024	Nov. 2025 (4B) Feb. 2027 (1B)	Demand coverage
	Shin Tokorozawa	500/275 kV	1,000,MVA×2 →1,500 MVA×2	2→2	Jun. 2025	Apr. 2026 (4B) Jun. 2027 (5B)	Aging management
	Keihin	275/154 kV	450MVA	1	Apr. 2025	Mar. 2028	Generator connection
	Boso	275/154 kV	200MVA→ 450MVA	1→1	Mar. 2026	Nov. 2027	Demand coverage
	Shin Hanno	500/275 kV	1,500MVA	1	Nov. 2025	Mar. 2029	Demand coverage
Chubu Electric Power Grid Co., Inc.	Nakase	275/77 kV	150 MVA→ 250 MVA	1→1	Oct. 2024	Mar. 2025	Aging management
	Sunen	275/77 kV	150 MVA→ 250 MVA	1→1	Oct. 2025	Dec. 2026	Aging management
	Seino	275/154 kV	300 MVA →450 MVA	1→1	Oct. 2025	Sep. 2026	Aging management
	Shizuoka	500/275 kV	1,000 MVA	1	Feb. 2025	Mar. 2027	Reliability upgrade*4

Company	Substation [33,37]	Voltage	Capacity	Unit	Under construction	In service	Purpose [36]
	Kita Yokkaichi*6	275/154 kV	450 MVA×3	3	Oct. 2024	Jan. 2029	Demand coverage, Economic upgrade
	Shin Mikawa	500/275 kV	1,500 MVA	1	Mar. 2031	Jan. 2033	Generator connection
Kansai Transmission and Distribution, Inc.	Gobo	500/154 kV	750 MVA×2	2	Aug. 2024	Nov. 2027	Generator connection
	Shin Ikoma	275/77 kV	300 MVA				
	Shin Ayabe	500/275 kV →500/77 kV	1,000 MVA				
	Takasago	275/77 kV					
Kyushu Electric Power Transmission & Distribution Co., Inc.	Kumamoto	500/220 kV	1,000 MVA	1	Dec. 2024	Jun. 2027	Demand coverage
	Hitoyoshi	220/110/66kV	300/150/150MVA	1	Feb. 2025	Dec. 2026	Generator connection
	Demizu	220/66 kV	250 MVA	1	Jun. 2026	Nov. 2027	Generator connection
	Miike	220/110/66kV	180/180/120MVA → 250/200/250MVA	1→1	Jan. 2025	Jun. 2026	Aging management
	Hitoyoshi	220/110/66kV	180/180/120MVA → 250/200/250MVA	1	Feb. 2026	Oct. 2027	Aging management
J-POWER Transmission Network Co.,Ltd.	Shin Satkuma FC*6	—	300 MW	—	Mar. 2025	Mar. 2028	Reliability upgrade*4
	Sameura*6	187/13 kV	25 MVA	1	Feb. 2025	Oct. 2025	Demand coverage

Table 4-7 Decommissioning Plans

Company	Substation	Voltage	Capacity	Unit	Decommission	Purpose
TEPCO Power Grid, Inc.	Ageo	275/66 kV	300 MVA	1	Jun. 2024	Economic upgrade
	Shin Fuji	275/154 kV	200 MVA	1	Oct. 2026	Economic upgrade*4
	Shin Tokorozawa	500/275 kV	1,000 MVA	1	Dec. 2027	Aging management
Chubu Electric Power Grid Co., Inc.	Abe	275/77 kV	250 MVA	1	Apr. 2025	Economic upgrade
	Mikawa	275/154 kV	450 MVA	1	Apr. 2025	Aging management
	Minami Fukumitsu	—	300 MW	—	Apr. 2026	Aging management*4
	Seino	275/154 kV	300 MVA	1	Sep. 2026	Aging management
	Chushin	275/154 kV	300 MVA	1	Nov. 2026	Aging management
	Sunen	275/77 kV	150 MVA	1	Feb. 2027	Aging management
Kansai Transmission and Distribution, Inc.	Shin Ayabe	275/77 kV	200 MVA×2, 300 MVA×2	4	Sep. 2029	Aging management
	Koto	275/77 kV	100 MVA×2	2	Oct. 2024	Aging management
	Higashi Osaka	275/154 kV	300 MVA	1	Jul. 2025	Aging management
	Inagawa	500/154 kV	750 MVA	1	Mar. 2026	Aging management
	Konan	275/77 kV	100 MVA	1	Oct. 2025	Aging management
J-POWER Transmission Network Co.,Ltd.	Nagoya	275/154 kV	300 MVA×3	3	Feb. 2025	Economic upgrade

3. Summary of Development Plans for Transmission Lines and Substations

Tables 4-8 to 4-11 summarize the development or extension plans of major transmission lines and substations (transformers and converter stations) up to FY 2032. These are submitted by GT&D and transmission companies.

Table 4-8 Development Plans for Major Transmission Lines

Category	Voltage	Lines	Length [42]	Extended Length [43]	Total Length	Total Extended Length
Newly Installed or Extended	500 kV	Overhead	524 km*	1,047 km*	524 km*	1,048 km*
		Underground	1 km	1 km		
	275 kV	Overhead	△183 km	△366 km	△134 km	△248 km
		Underground	49 km	119 km		
	220 kV	Overhead	4 km	7 km	4 km	7 km
		Underground	0 km	0 km		
	187 kV	Overhead	11 km	21 km	25 km	48 km
		Underground	13 km	27 km		
	154 kV	Overhead	0 km	0 km	24 km	24 km
		Underground	24 km	24 km		
	Total	Overhead	356 km*	709 km*	443 km*	879 km*
		Underground	87 km	171 km		
To be Decommissioned	275 kV	Overhead	△94 km	△185 km	△94 km	△185 km
		Underground	0 km	0 km		
	220 kV	Overhead	0 km	0 km	0 km	0 km
		Underground	0 km	0 km		
	Total	Overhead	△94 km	△185 km	△94 km	△185 km
		Underground	0 km	0 km		

[42] Length denotes the increased length due to newly installed or extended plans and the decreased length due to decommissioning. Development plans corresponding to changes in the line category or number of circuits were not included in the increased length of transmission lines shown in Table 4-8 and are treated as "no change in length." Due to independent rounding, the total and overall lengths are not necessarily equal.

[43] The total length denotes the aggregation of length multiplied by the number of circuits. Development plans that correspond to changes in the line category or number of circuits are not included in the increased length of transmission lines in Table 4-8 and are treated as "no change in length."

Table 4-9 Revised Plans for Line Category and the Numbers of Circuits[44]

Voltage	Length Extended	Total Extended Length
500 kV	0 km	0 km
275 kV	276 km*	587 km*
220 kV	30 km	45 km
187 kV	19 km	38 km
DC 250 kV	122 km	245 km
Total	447 km	914 km

Table 4-10 Development Plans for Major Substations

Category [45]	Voltage [46]	Increased Numbers	Increased Capacity
Newly Installed or Extended	500 kV	22 [11]	22,100 MVA [10,750 MVA]
	275 kV	14 [5]	5,158 MVA [1,950 MVA]
	220 kV	5 [0]	1,560 MVA [0 MVA]
	187 kV	5 [3]	1,645 MVA [925 MVA]
	154 kV	1 [1]	170 MVA [170 MVA]
	132 kV	0 [0]	75 MVA [0 MVA]
	110 kV	△1 [0]	△60 MVA [0 MVA]
	Total	46 [20]	30,648 MVA [13,795 MVA]
To be Decommissioned	500 kV	△2	△1,750 MVA
	275 kV	△18	△4,550 MVA
	Total	△20	△6,300 MVA

The figures in square brackets indicate increases in the number of transformers resulting from new substation installations.

Table 4-11 Development Plans for AC/DC Converter Stations

Category	Company and Number of Sites		Capacity[47]
Newly Installed or Extended	Hokkaido Electric Power Network, Inc.	2	300 MW×2
	Chubu Electric Power Grid Co.,Inc.	1	600 MW
	J-POWER Transmission Network Co., Ltd.	1	300 MW
To be Decommissioned	Chubu Electric Power Grid Co.,Inc.	1	△300 MW

44 Table 4-9 aggregates the extended and total extended lengths that correspond to the revised plans for line category and number of circuits.
45 Decommissioning plans with transformer installations are included in "Newly Installed" or "Extended," while negative values are included in the increased numbers or increased capacity.
46 Voltage class by upstream voltage.
47 For DC transmission, the capacities of both converter stations are included.

4. Aging Management of Existing Transmission and Distribution Facilities

Existing transmission and distribution facilities installed after the economic expansion (from the 1960s to the 1970s) are nearing replacement. While the replacement of facilities is an increasing trend, significant facilities will not be replaced. Proper decisions for the replacement schedule are inevitable for securing a stable electricity supply in the future. Figures 4-2 to 4-4 present the actual installation years of existing transmission and distribution facilities:

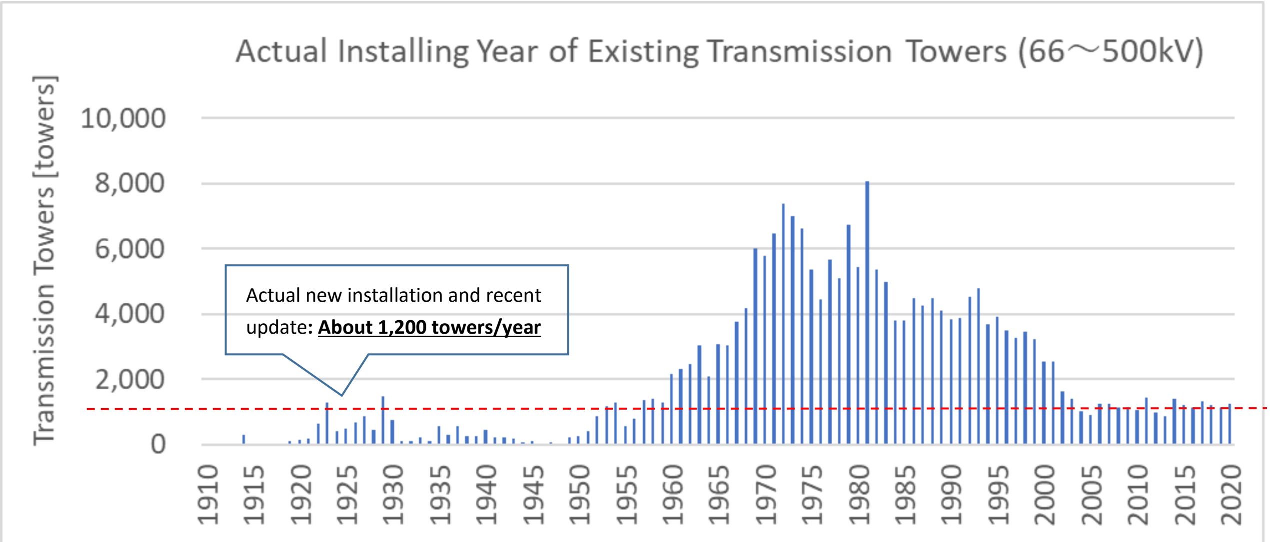


Figure 4-2 Actual Installation Years of Existing Transmission Towers (66–500 kV)

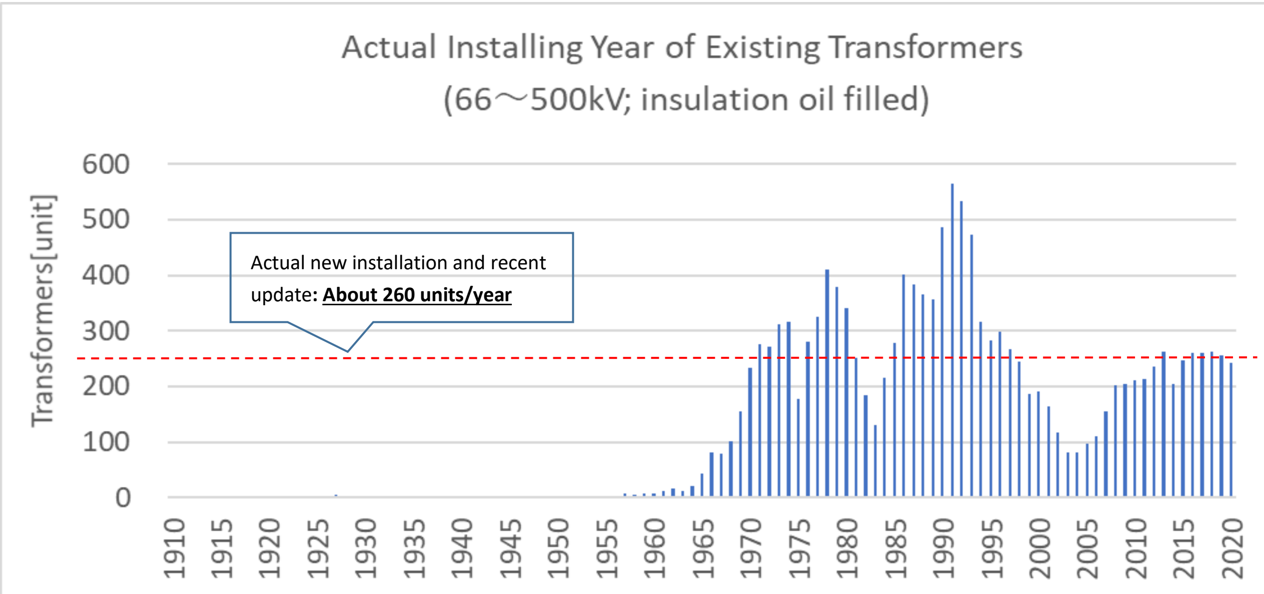


Figure 4-3 Actual Installation Years of Existing Transformers (66–500 kV; Insulating Oil-Filled)

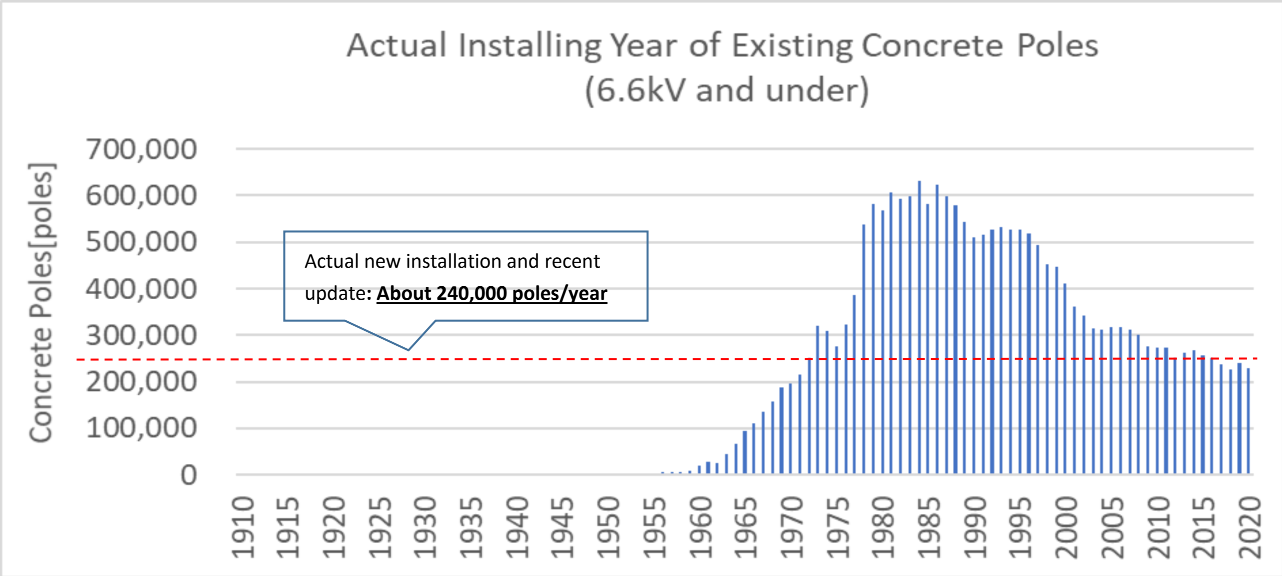


Figure 4-4 Actual Installation Years of Existing Distribution Concrete Poles (Under 6.6 kV)

V. Cross-Regional Operation

Retail companies procure the supply capacity for customers in their regional service areas. Four figures illustrate the scheduled procurement from external service areas during August 2023; Figures 5-1 and 5-2 show the supply capacity and the ratio of the supply capacity, respectively. Figures 5-3 and 5-4 show the energy supply and the ratio of the energy supply, respectively, in FY 2023. These figures are shown for calculating values offset procurement (received) and sales (sent) for each regional service area.

Higher ratios for procurement from external regional service areas are observed in the Tokyo and Chugoku areas. By contrast, higher sales to external regional service areas are observed in the Tohoku, Kansai, and Shikoku areas.

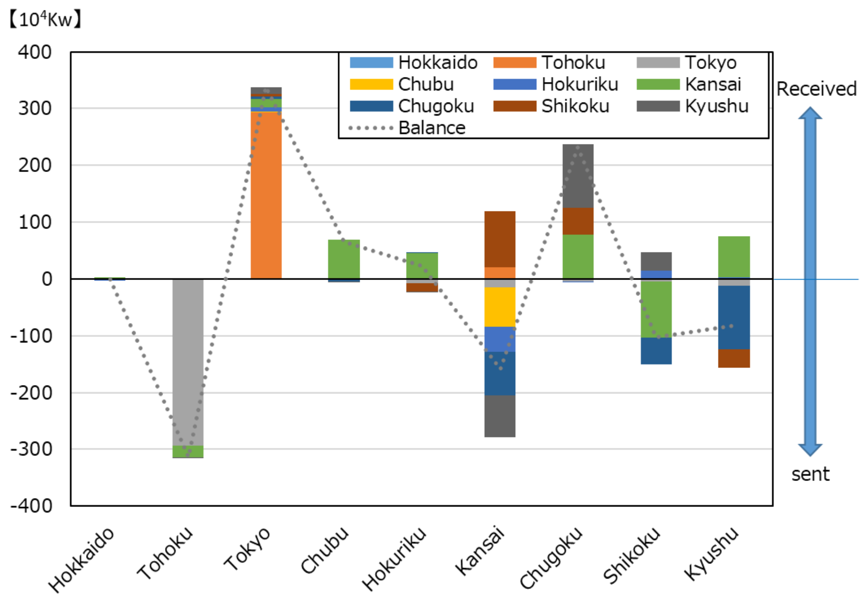


Figure 5-1 Scheduled Procurement of Supply Capacity from External Regional Service Areas

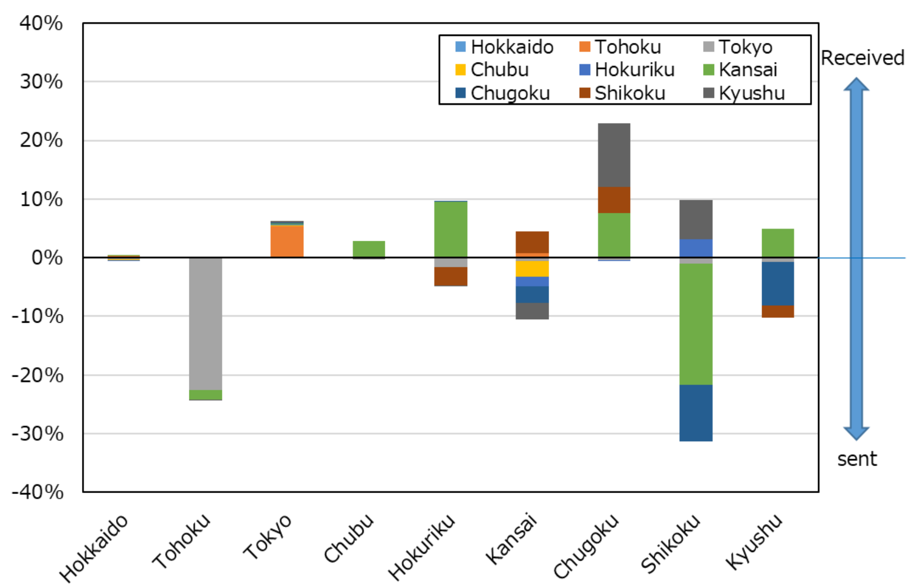


Figure 5-2 Ratio of Scheduled Procurement of Supply Capacity from External Regional Service Areas

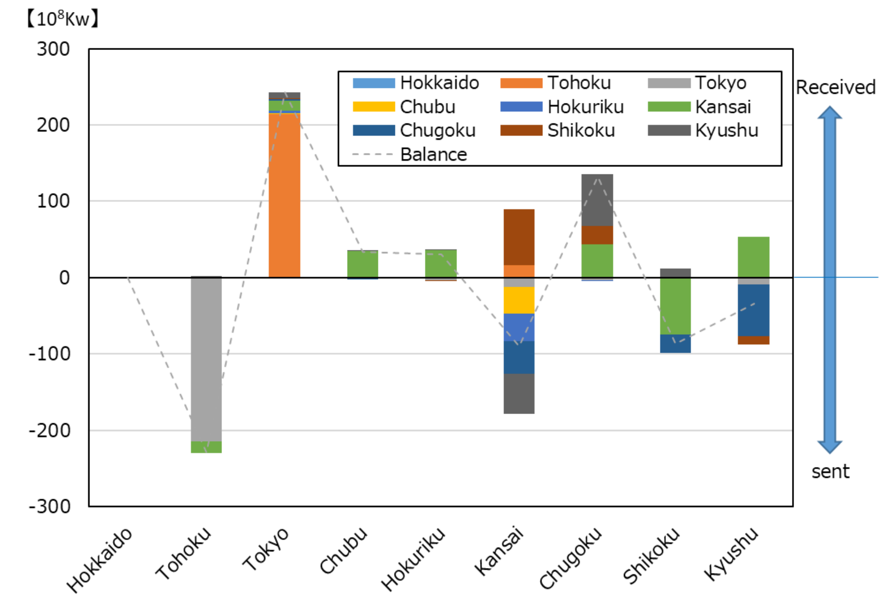


Figure 5-3 Scheduled Procurement of Energy Supply from External Regional Service Areas

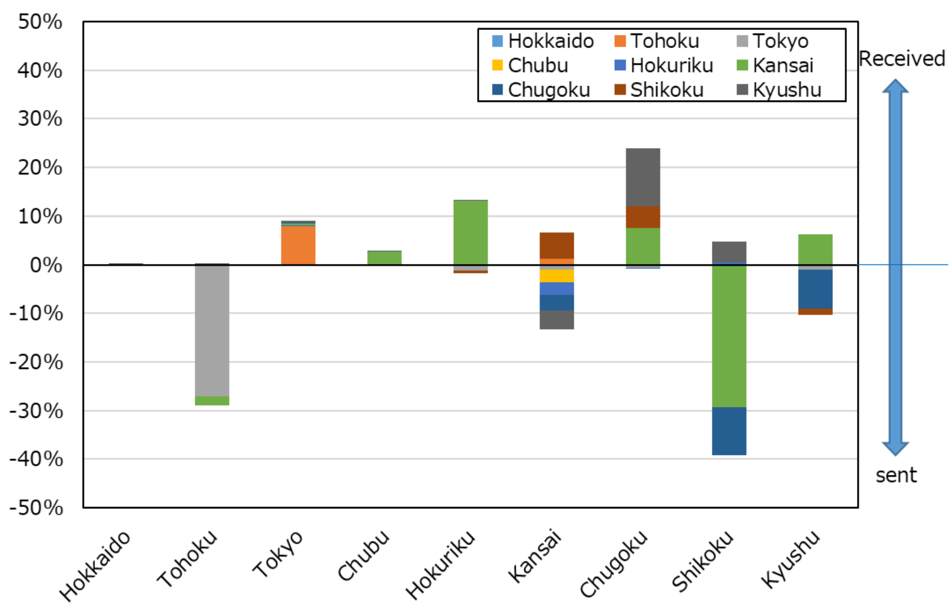


Figure 5-4 Ratio of Scheduled Procurement of Energy Supply from External Regional Service Areas

VI. Analysis of the Characteristics of EPCOs

1. Distribution of Retail Companies by Business Scale (Retail Demand)

In total, 680 retail companies submitted their electricity supply plans, which were classified by the corresponding companies' business scale of the retail demand forecast. Figures 6-1 and 6-2 present the distributions of the business scale of retail demand and the accumulated retail demand forecast by said companies, respectively. Retail companies under 1 GW account for the majority throughout the projected period; however, more than half of the accumulated retail demand was accounted for by retail companies whose businesses are 10 GW and over.

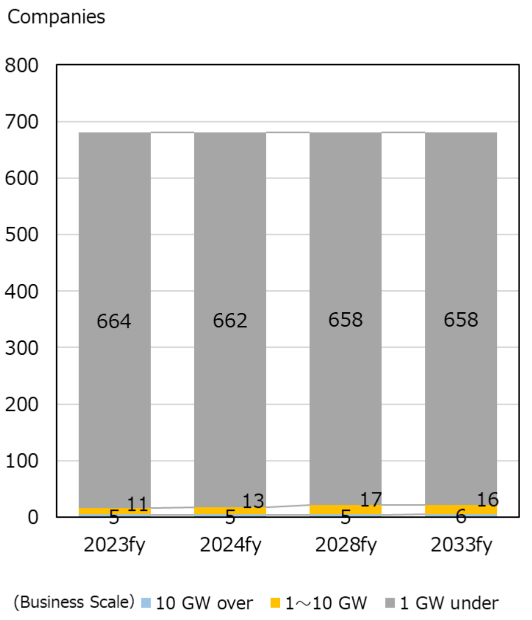


Figure 6-1 Distribution of the Retail Demand by Retail Companies by Business Scale

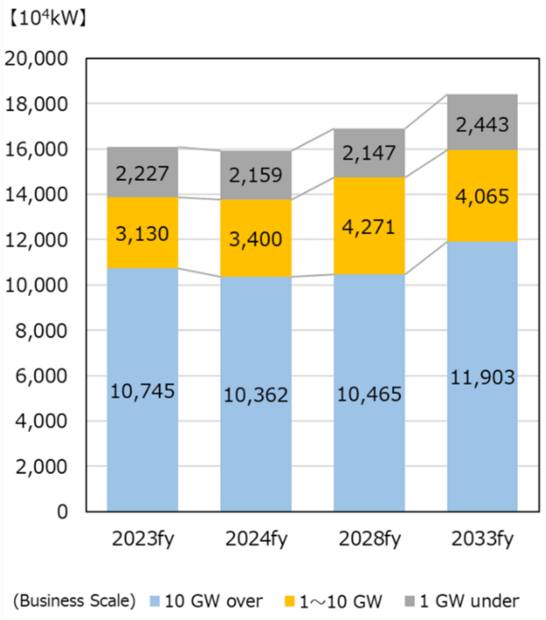


Figure 6-2 Distribution by Accumulated Retail Demand by Retail Companies

Retail companies are classified by the corresponding companies' business scale of the retail energy sales forecast. Figures 6-3 and 6-4 present the distributions of the business scale of retail company energy sales and their accumulated energy sales forecast, respectively. Similarly, retail companies, under 1 TWh account for the majority throughout the projected period; however, over half of accumulated retail energy sales were accounted for by retail companies whose businesses are 10 TWh and over.

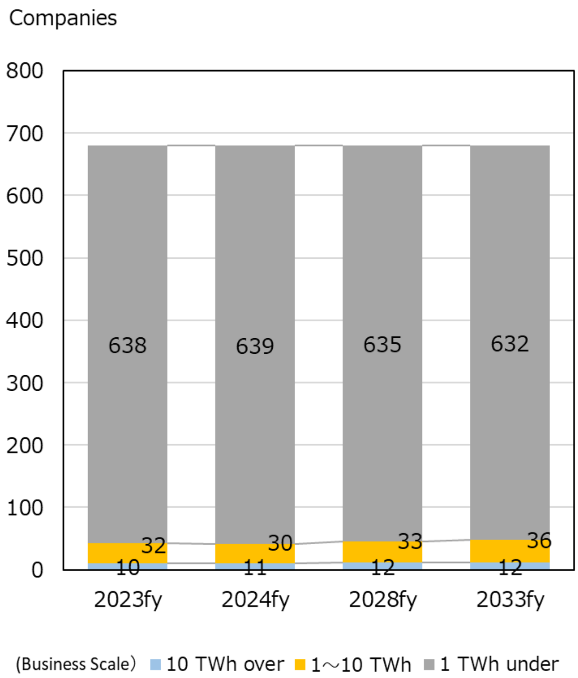


Figure 6-3 Distribution of Retail Company Energy Sales by Business Scale

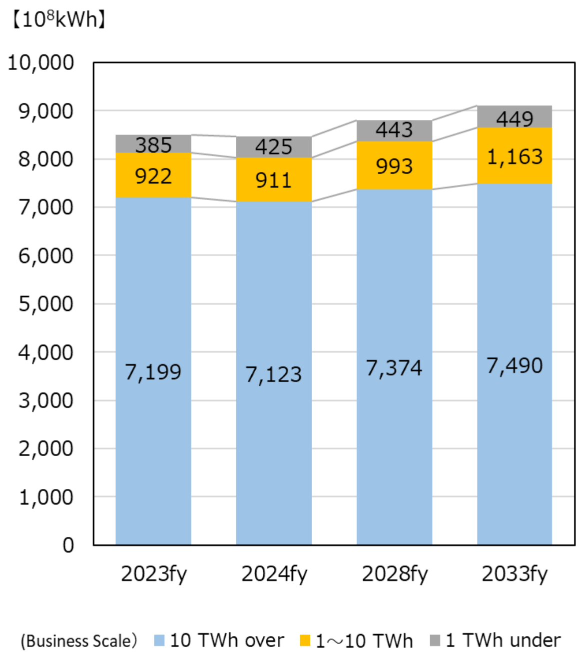


Figure 6-4 Distribution by Retail Companies of Accumulated Energy Sales

2. Retail Companies' Business Areas

Figure 6-5 presents the ratio of retail companies by the number of areas in which they plan to conduct business, while Figure 6-6 presents the number of retail companies by their business planning areas as of August 2024. Half of the retail companies have planned their business activities in a single area.

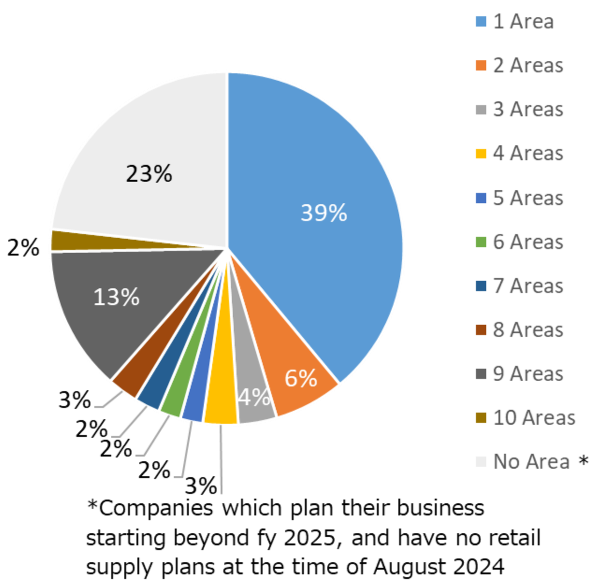


Figure 6-5 Ratio of Retail Companies by the Number of Planned Business Areas as of August 2024

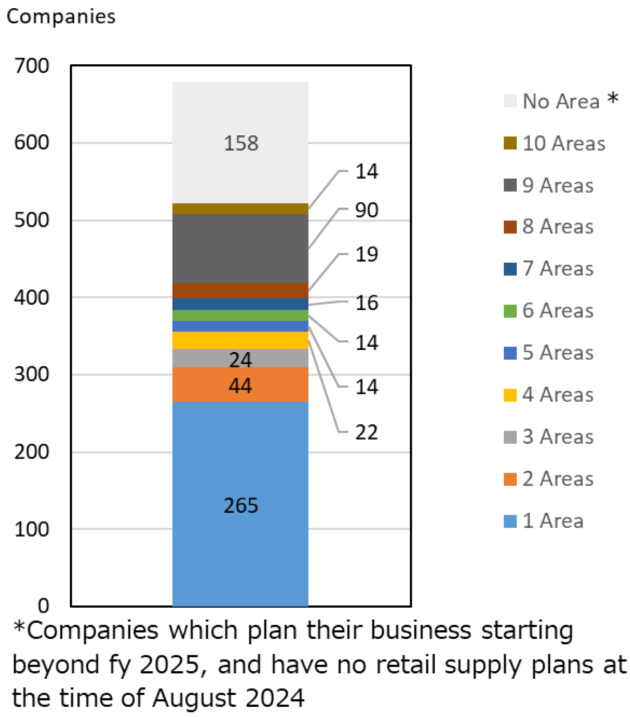


Figure 6-6 Number of Retail Companies by Their Planned Business Areas as of August 2024

Figure 6-7 presents the number and retail demand of retail companies in each regional service area for GT&D companies as of August 2024. The number of retail companies has decreased compared with FY 2023; however, some areas exhibit an increased number.

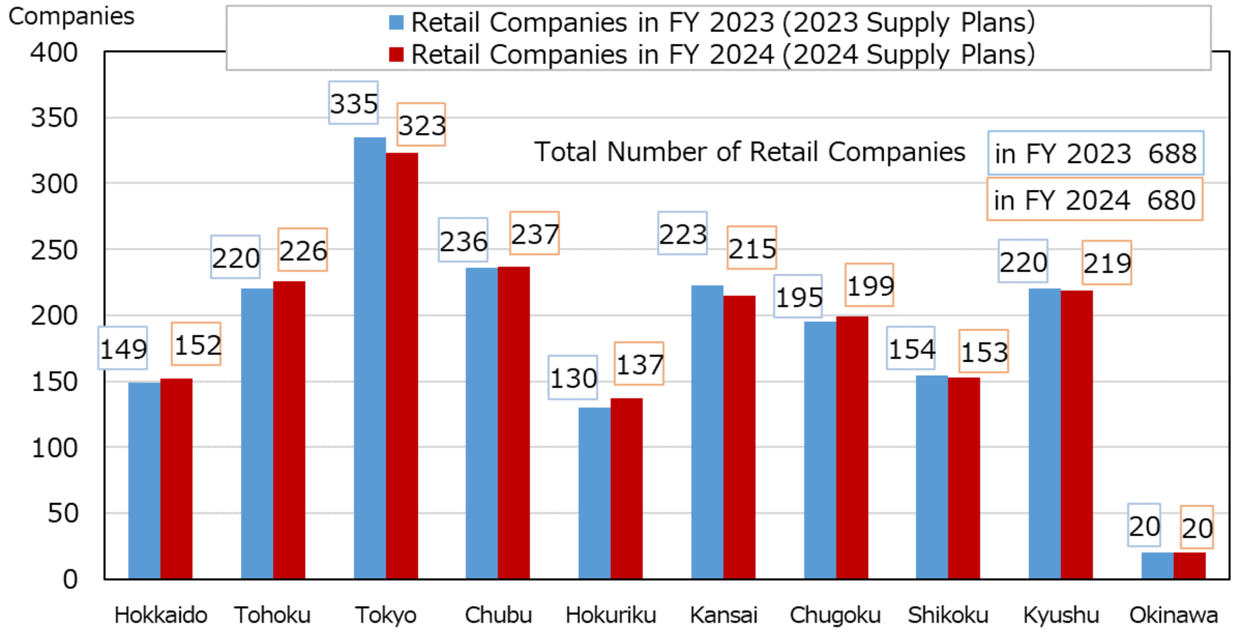


Figure 6-7 Number and Retail Demand of Retail Companies in Each Regional Service Area

3. Supply Capacity Procurement by Retail Companies

Figure 6-8 presents the transition of the procured supply capacity (i.e., bilateral contracts) in regional service areas by retail company. For FY 2024, the bilateral contracts are made in a certain capacity; however, after FY 2025, they are projected to decrease. The generation departments of former general electric utility companies are selling their energy production trades based on the wholesale standard menu for one to five years. Such trades have been applied to retail departments of the same business group[48]; therefore, the ratio of the procured supply capacity will decrease for the retail departments of the former general electric utility companies. By contrast, the procured supply capacity of other retail companies is projected to remain the same during the 10-year period.

[48] This group is composed of the retail department of the former general electric utilities and the retail company whose capital are dominated by the former general electric utilities.

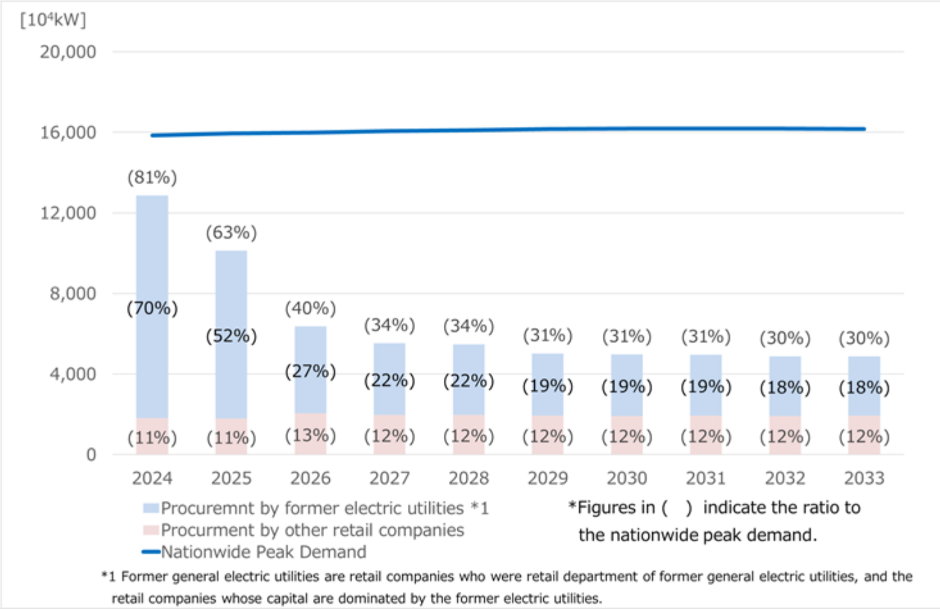


Figure 6-8 Ratio of Secured Supply Capacity to Forecast Retail Demand for Former General Electric Utility Companies (in August, at the Sending End)

4. Distribution of Generation Companies by Business Scale (Installed Capacity)

In total, 1,108 generation companies submitted electricity supply plans, which were classified by the corresponding companies' business scale of the installed capacity. Figure 6-9 presents the distribution by business scale, while Figure 6-10 presents the installed capacity operated by the corresponding companies.

Generation companies with an installed capacity under 10 GW account for the majority throughout the projected period; however, more than half of the accumulated supply capacity was accounted for by generation companies with an installed capacity of 10 GW and over.

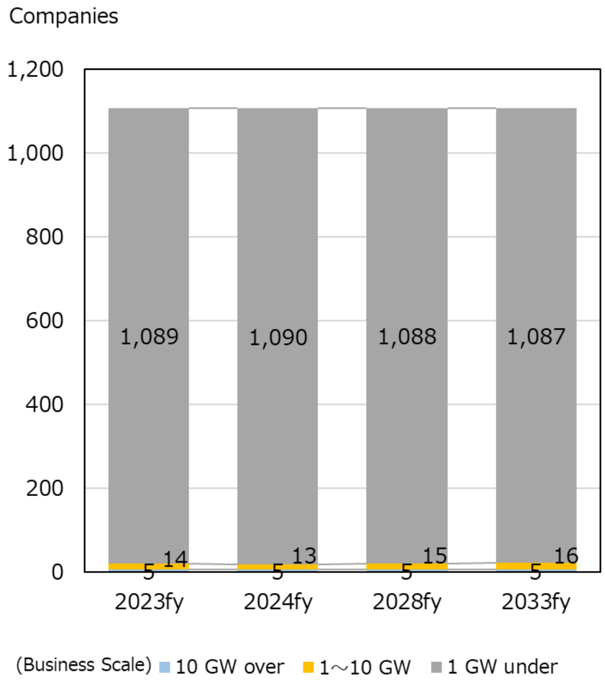


Figure 6-9 Distribution by Business Scale of a Generation Company's Installed Capacity

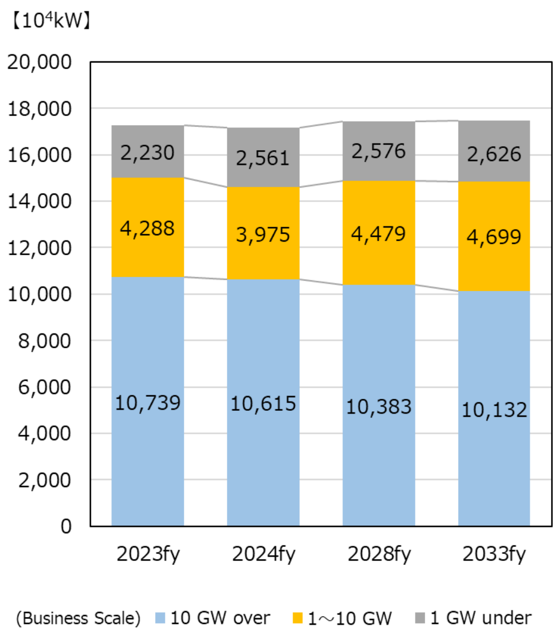


Figure 6-10 Distribution by a Generation Company's Accumulated Installed Capacity

Similarly, generation companies are classified by the business scale of the corresponding company's energy supply forecast. Figure 6-11 presents the distribution according to the business scale of the energy supply, while Figure 6-12 presents the distribution according to the corresponding company's accumulated energy supply forecast.
Generation companies with an energy supply under 1 TWh account for the majority throughout the projected period; however, more than half of the accumulated energy supply was accounted for by generation companies with an energy supply of 10 TWh and over.

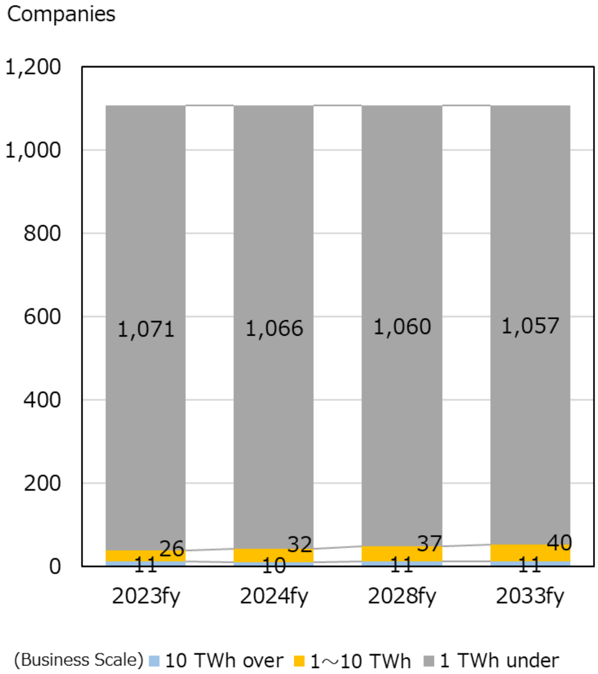


Figure 6-11 Generation Companies' Distribution of Energy Supply by Business Scale

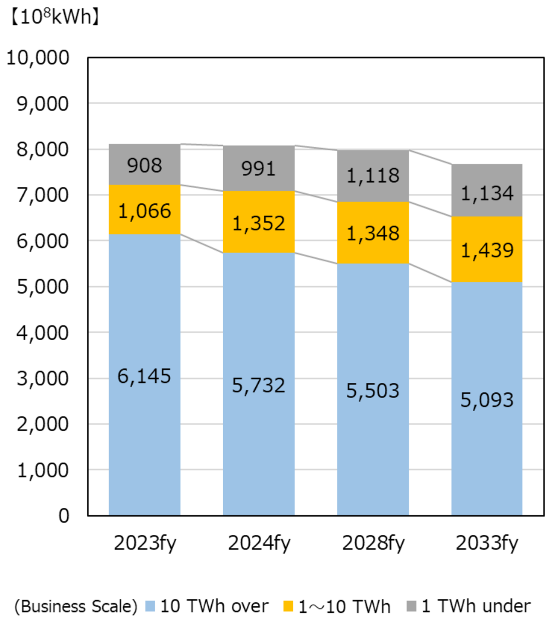
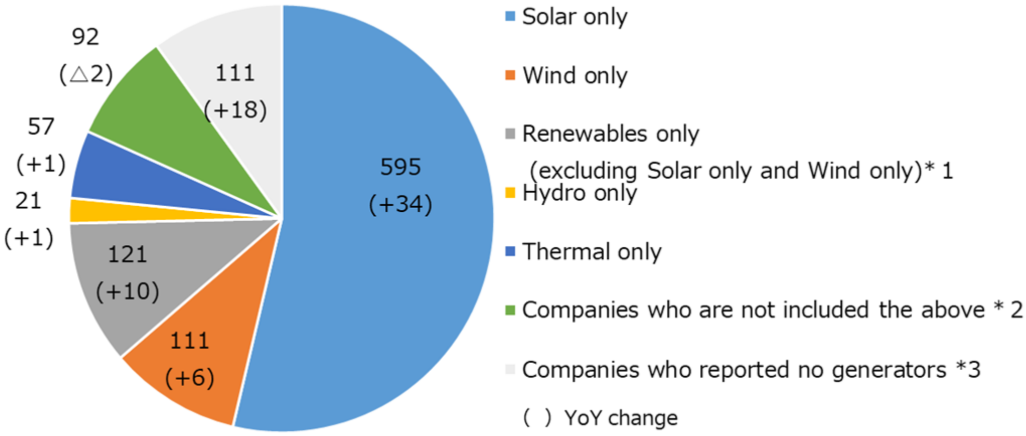


Figure 6-12 Generation Companies' Distribution by Accumulated Energy Supply

Figure 6-13 presents the number of generation companies at the end of FY 2024 by the power generation sources of their generators. The number of generation companies that use renewable energy (particularly solar power) is increasing, with new generation companies leading with a stronger introduction of renewable energy.



*1 Subject to the companies which own only geothermal, biomass and waste, or companies which own several types of Renewables generating facilities including solar and wind
*2 Include the companies which own only multifuel facilities of fossil fuel and biomass etc.
*3 Companies which plan their business starting beyond fy 2025, and have no generators in fy 2024

Figure 6-13 Number of Generation Companies by Power Generation Sources

5. Generation Companies' Business Areas

Figure 6-14 presents the ratio of generation companies to the number of areas in which they plan to conduct business, while Figure 6-15 presents the number of generation companies by their business planning areas as of August 2024.

Eighty percent of generation companies plan their business in a single area.

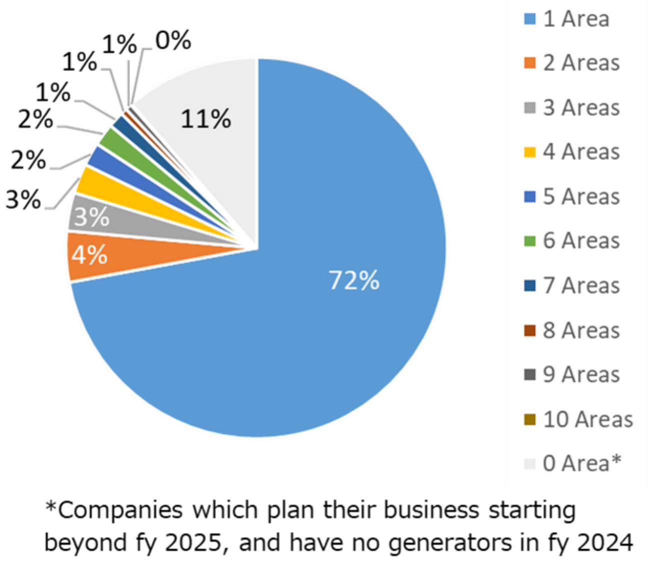


Figure 6-14 Ratio of Generation Companies by the Number of Planned Business Areas

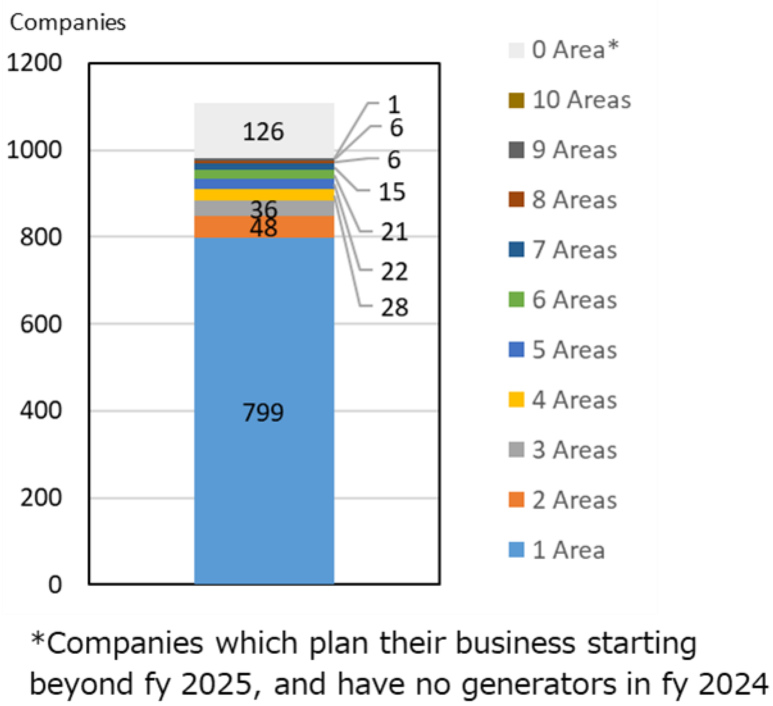


Figure 6-15 Number of Generation Companies by Their Business Planning Areas

Figure 6-16 presents the number and installed capacity of generation companies in each regional service area for GT&D companies in August 2024. In some regional service areas, the number of generation companies has increased compared with FY 2023.

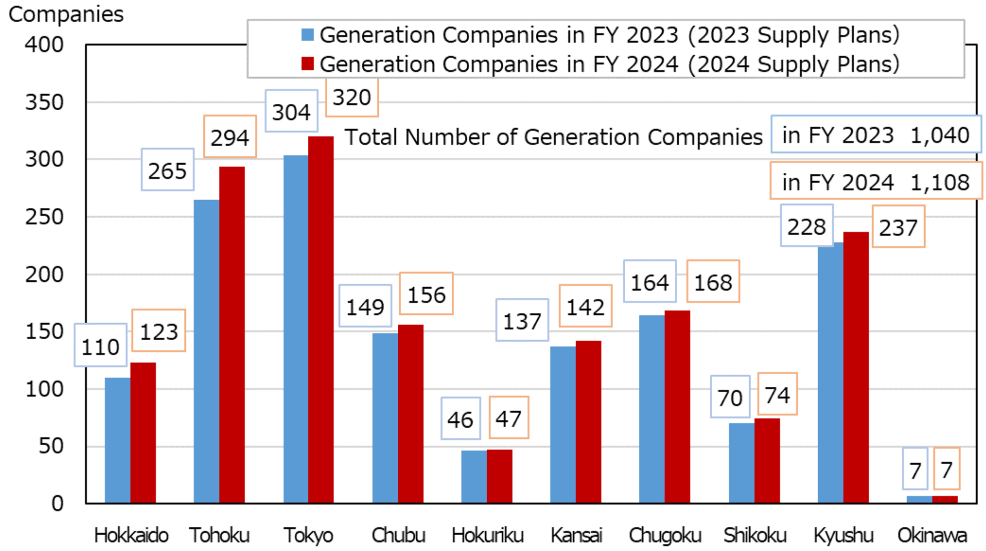


Figure 6-16 Number and Installed Capacities of Generation Companies in Each Regional Service Area

VII. Findings and Current Challenges

Current challenges that relate to the aggregation of electricity supply plans are described as follows:

1. Challenges regarding the procurement of supply and balancing capacity in the mid-to-long term

The concept of the obligation to procure supply and balancing capacity for retail companies has changed, as the necessary supply capacity nationwide has been secured in the capacity market since FY 2024. Additionally, the procured supply capacity of retail companies with long-term bilateral contracts has tended to decrease, as the generation departments of former general electric utility companies have sold their generated energy in the standard menu for one to five years due to them not discriminating between their retail departments and other retail companies (see Figure 6-8).

Under these circumstances, severe supply–demand is observed in some years and areas in the mid-to-long term. This is also observed in most of the unsuccessful bids in the capacity market's main auction belonging to LNG-fired generators,[49] the offset capacity between new and added installations, and suspension and decommissioning. Furthermore, this observation is also led by trends such as the LNG-fired capacity of unsuccessful bids, ineffective coal-fired generators, and aged oil-fired generators being suspended and decommissioned toward the realization of the goal of carbon neutrality by 2050 (see Figure 3-4).

By listening to generation companies, the Organization understands that predictability for businesses has reduced because of difficulties in developing generation and fuel procurement plans, which are based on traditional long-term bilateral contracts with retail companies under the altered business circumstances.

However, generation companies are essentially expected to develop their business plans and expand their business upon their initiative in the mid-to-long term while providing a secure supply, realizing carbon neutrality, and utilizing their supply and balancing capacities

To contribute to the business expansion of generation companies, the Organization has implemented an investigation of future supply–demand scenarios, which promotes concrete generator development, and of long-term decarbonization capacity auctions, which will lead to improved predictability for generator investment. Thus, the Organization hopes to cooperate with the government and investigate concrete measures for the aforementioned challenges.

Additionally, the Organization will investigate concrete measures against the procurement of balancing capacity in the mid-to-long term, such as requirement settings of grid codes for balancing capacity and the procurement of balancing capacity by using the capacity market scheme. This is because the Organization expects shortages of balancing resources due to the increasing use of renewable energy and the suspension and decommissioning of thermal

[49] Contract result of the main auction of the capacity market (actual supply–demand for FY 2027) [written only in Japanese].
https://www.occto.or.jp/market-board/market/oshirase/2023/files/240124_mainauction_youryouyakujokekka_kouhyou_jitsujukyu2027.pdf

generators, which are the major balancing resources.
Furthermore, the Organization aims to investigate the co-optimization market (i.e., the simultaneous contracted market for electrical energy and balancing capacity), which will contribute to developing a steady and sustainable supply–demand, and a market system—even under increasing uncertainty for securing supply–demand operations triggered by the maximum introduction of renewable energy in the future. Lastly, the Organization hopes that the government will investigate measures for introducing the market's institutional aspects.

2. Challenges regarding changes to the supply–demand structure and network congestion

The demand for the aggregation of supply plans for FY 2024 is forecast to increase throughout the forecast period due to a growth in demand triggered by new and added installations of data centers and semiconductor factories.[50] In the future, there may be a possibility to change the structure of electricity demand to reflect progress toward electric vehicles, storage facilities (batteries), and the production of hydrogen for the demand side. The increasing trend of electricity demand is expected to occur in response to the increase in the number of customers who seek CO_2-free energy, the electrification of nonelectrified facilities, and a reduced amount of energy generated for autoproducers themselves.
On the supply side, the new integration of renewable energy generators into the network is increasing based on the Japanese concept of "connect and manage," which involves integrating more generators without enhancing the existing electricity network. In the aggregated FY 2024 Supply Plan, the trend of renewable energy (e.g., solar and wind power) is expected to grow steadily and successively (see Figure 3-1). Furthermore, existing aged thermal generators are projected to be forced to be suspended, decommissioned, and replaced with carbon-neutral generators (e.g., hydrogen and ammonia-fired thermal generators) based on the results of the long-term decarbonization capacity auction and the fading out of ineffective coal-fired generators.
The aforementioned changes emerging on the demand and supply sides will lead to a change in the power flow in the electricity network. In addition, network congestion due to the capacity constraints of transmission lines and transformers is predicted to occur and spread, triggered by the operation of variable renewable energy (VRE), the output of which fluctuates greatly by season and weather, and balancing capacity, which compensates for the fluctuations in VRE.
T To cope with the conditions, the Organization will endeavor to pursue accurate demand forecasts and grasp network conditions, such as the potential development of generators that collaborate with each GT&D company. Furthermore, the Organization will strive to mitigate network congestion through redispatching; however, challenges are posed by the possible shortage of alternative generators to dispatch for said process as well as the difficulty of providing incentives for generator siting. Regarding this point, the Organization has stated that it is important to

[50] Electricity Demand Forecast for Nationwide and Each Regional Service Area [written only in Japanese]. https://www.occto.or.jp/juyousoutei/2023/files/240124_juyousoutei.pdf

suppress the total cost, including network investments, as well as to optimize the siting of generators and demand in the long-term policy of cross-regional network development (the master plan for cross-regional networks, published March 2023). For the market-led congestion management of the network, the pace of which is expected to increase for concrete investigations, the Organization hopes to cooperate with the government on the institutional aspects.
Moreover, the value of electricity is segmented into electrical energy (kWh), supply capacity (kW), and balancing capacity (delta kW), which are traded in a specific market. Thus, evaluations are expected of the effects of supply and balancing capacity by network congestion, with the price signal as the countermeasure, as well as the mechanisms of inducting generators and demand siting. The Organization is closely watching the trends of future network congestion in terms of electrical energy, supply capacity, and balancing capacity while cooperating with GT&D companies. Moreover, it is developing mechanisms for managing congestion and sending price signals. The Organization hopes that the government will develop energy policy and the institutional structure, which should lead to the optimization of the entire electricity system through the combination of generators and demand.

3. Challenges regarding changes in the supply–demand balance and coordinated scheduled maintenance

The volume of coordinated scheduled maintenance[51] has significantly increased due to generator shutdown, among other factors,[52] compared with the aggregation of the FY 2023 Supply Plan (see Figure 2-4). In that volume are the generators that successfully bid in the main auction of the capacity market, coordinated their scheduled maintenance before two years of actual supply–demand, and increased their maintenance volume after the coordination of scheduled maintenance among the bid capacity.[53]
At a committee meeting in November 2023, the Organization highlighted that supply–demand in the off-peak period (spring and autumn) sometimes becomes more severe than during the peak period (summer and winter). This is due to the supply capacity decreasing through increased scheduled maintenance, as opposed to decreased demand.[54] Under these circumstances, a possibility of a tight supply–demand balance exists if the demand increases due to severe weather or a supply capacity shortage due to a generator shutdown.
Conversely, by listening to generation and GT&D companies, the Organization has learned that the workforce required for generator maintenance will grow, while the scheduled coordination will

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[51] Includes factors other than generation facilities, such as simultaneous maintenance with transmission and distribution facilities.
[52] Includes submitting the supply capacity as zero due to an undetermined restoration date upon submission of the supply plan.
[53] In the requirement rules for the capacity market, if capacity providers make the scheduled maintenance period longer than the submitted maintenance schedule and this threatens the supply reliability, such capacity providers may be penalized. Source: Item 1, Paragraph 1 of Article 16, Terms and Conditions for Supply Capacity Procurement Contract (published in Janauary 2024) [written only in Japanese].
https://www.occto.or.jp/market-board/market/jitsujukyukanren/files/240124_kakuhokeiyaku.pdf
[54] Source: Material 3, 92nd meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation (November 17, 2023) [written only in Japanese].
https://www.occto.or.jp/iinkai/chouseiryoku/2023/files/chousei_92_03.pdf

become more difficult after the coordination is implemented two years before the actual supply–demand. Under these circumstances, effective measures for responding to the possible change in supply–demand balance after the coordination of scheduled maintenance must be investigated. Therefore, the Organization has implemented the verification of supply–demand and kW monitoring as before to grasp the coordination of scheduled generator maintenance as well as the change in conditions after an incremental auction. If there is a possibility of a tight supply–demand balance, the Organization will deepen its investigations to ensure that it can publish more accurate information for grasping the preparedness and action of EPCOs, especially during the off-peak period.

For generation and retail companies, the Organization hopes to thoroughly grasp and analyze this information and coordinate maintenance schedules in case of a tight supply–demand, thus ensuring the security of supply as responsible EPCOs, as well as to consider occasions for the chance of sales.

It might be possible that the security of supply cannot be maintained by the business efforts of EPCOs in the case of generator shutdown due to, among other events, a major natural disaster one year before the actual supply–demand. To ensure preparedness for this possibility, a strategic generator reserve scheme is under review by the government.

The Organization is designated to be the host of the procurement process of the strategic generator reserve and has proceeded to investigate the introduction of the scheme in cooperation with the government. The Organization hopes that the government will investigate the measures for the introduction as well as measures of the early operation process of the scheme in parallel.

VIII. Conclusions

1. Electricity Demand Forecast

The AAGR of peak demand nationwide in the mid-to-long term is forecast to increase by 0.3%. The AAGR is forecast to be positive, which is attributable to several major increasing factors, such as economic growth and a boost in demand through new and added installations of data centers and semiconductor factories. This is notwithstanding decreasing factors, such as a shrinking population, and efforts to reduce electricity use.

2. Electricity Supply and Demand

The Organization applied EUE as a reliability criterion to the electric supply plan. For FY 2024, whole areas fall within the target outage volume, while for FY 2025, the Hokkaido, Tokyo, and Kyushu service areas are outside of the criteria due to suspension and decommissioning or the scheduled maintenance of generators. In the long term, the calculated results for the EUE indices exceed the target for Hokkaido and Tokyo from FY 2026 to 2029; Tohoku for FY 2026, 2028, and 2029; Kyushu from FY 2026 to 2033; and Okinawa in FY 2026 and 2028 due to the suspension or decommissioning of generation facilities.

The conventional approach's supply–demand balance evaluation reveals that the reserve margin is secured for 10% in FY 2024 and 2025 in every area and for all months.

For the evaluation of energy supply requirements, the energy supply will be 1.3 TWh/month in volume below the forecast energy requirement (equivalent to 1.8% against the forecast energy requirement) in some months of FY 2024.

As stated above, for FY 2025, the Organization shall coordinate with the government and corresponding EPCOs regarding supply–demand measures, such as the coordination of maintenance schedules, considering the necessity of the incremental auction discussed at the governmental council as well as its results.

Beyond FY 2026, the Organization shall carefully re-examine the supply capacity in future supply plans based on the continuous watch on generation facility development in the mid to long term. It will also determine the necessity of incremental auctions as required with coordinated results of the maintenance schedule, which is implemented two years in advance of the actual supply.

3. Analysis of the Transition of Power Generation Sources Nationwide

Renewable energy, such as solar and wind power, is projected to increase regarding the transition of installed power generation capacity and net electricity generation. Supply capacity (kW) and electrical energy (kWh) are automatically calculated in the supply plan with given estimations.

4. Development Plans for Transmission and Distribution Facilities

Regarding the development plans for major transmission lines and substations, significant new generators that include renewable energy as well as newly demanded facility access lines are planned for the Hokkaido and Tohoku service areas. In addition, development plans are required for cross-regional interconnection lines, including the facilities necessary for cross-regional operation.

5. Cross-Regional Operation

The aggregated results for procuring supply capacity (planned as of August 2024) or energy from external service areas (planned for FY 2024) are stated as follows: Higher ratios for procurement from external regional service areas are observed in the Tokyo and Chugoku service areas, whereas higher sales to external regional service areas are observed in the Tohoku, Kansai, and Shikoku service areas.

6. Analysis of EPCOs' Characteristics

Distributions are calculated for retail and generation companies according to business scale and business areas, and they are aggregated to the projection for 10 years. For FY 2024, the supply capacity of retail companies is procured at a certain level; however, after FY 2025, they are projected to decrease. That is attributable to the indiscriminate treatment of the generation departments of former general electric utility companies between the retail companies of said utilities and other retail companies.

7. Findings and Challenges

The Organization has communicated its opinions to METI regarding three significant challenges that concern the aggregation of electricity supply plans for FY 2024.

Appendices regarding the aggregation of electricity supply plans are attached as follows:

APPENDIX 1 Short-Term Supply–Demand Balance for FY 2024 and 2025

i) Projection for FY 2024

Tables A1-1 presents the peak demand, while Table A1-2 presents the monthly supply capacity (including the generator development plans according to the provisions of Article 48 of the Act) for each regional service area in FY 2024.

Table A1-3 presents monthly projections of supply capacity for each regional service area recalculated with power exchanges, while Table A1-4 presents the cross-regional reserve margin calculated from the supply capacity shown in Table A1-3. In Okinawa, the figures in these tables are at the smallest reserve margin. Furthermore, Table A1-5 presents the monthly peak demand, supply capacity, reserve capacity, and reserve margin at the designated time in the Okinawa service area.

Table A1-1 Monthly Peak Demand Forecast for Each Regional Service Area in FY 2024 (10^4kW at the Sending End)

[10^4kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	395	353	359	408	418	387	387	444	481	501	499	453
Tohoku	1,053	978	1,068	1,277	1,301	1,151	1,022	1,149	1,286	1,335	1,330	1,225
Tokyo	3,713	3,593	4,186	5,395	5,395	4,549	3,827	3,945	4,358	4,752	4,752	4,174
50Hz areas Total	5,161	4,924	5,613	7,080	7,114	6,087	5,236	5,538	6,125	6,588	6,581	5,852
Chubu	1,774	1,778	2,002	2,409	2,409	2,162	1,855	1,848	2,137	2,314	2,314	2,013
Hokuriku	365	336	391	475	475	420	347	376	449	487	487	417
Kansai	1,709	1,766	2,045	2,647	2,647	2,209	1,830	1,807	2,242	2,411	2,411	2,004
Chugoku	710	716	828	1,039	1,039	908	756	795	978	995	995	845
Shikoku	322	330	384	478	478	423	358	340	459	459	459	379
Kyushu	976	1,076	1,213	1,538	1,538	1,342	1,123	1,151	1,382	1,448	1,448	1,197
60Hz areas Total	5,856	6,002	6,863	8,586	8,586	7,464	6,269	6,317	7,647	8,114	8,114	6,855
Interconnected	11,017	10,926	12,476	15,666	15,700	13,551	11,505	11,855	13,772	14,702	14,695	12,707
Okinawa	102	129	147	156	154	152	134	112	96	104	96	94
Nationwide	11,119	11,055	12,623	15,821	15,854	13,704	11,639	11,967	13,868	14,806	14,790	12,801

Table A1-2 Monthly Projected Supply Capacity for Each Regional Service Area in FY 2024 (10^4kW at the Sending End)

[10^4kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	508	483	499	501	578	539	530	555	617	607	608	537
Tohoku	1,639	1,702	1,652	2,049	2,087	1,795	1,577	1,708	1,957	2,007	1,989	1,856
Tokyo	4,224	3,976	4,477	5,840	5,818	5,387	3,995	3,959	5,255	5,462	5,433	5,346
50Hz areas Total	6,372	6,161	6,628	8,390	8,482	7,722	6,103	6,223	7,829	8,076	8,030	7,739
Chubu	2,106	2,224	2,477	2,825	2,807	2,532	2,190	2,080	2,328	2,546	2,568	2,503
Hokuriku	474	443	459	536	521	474	428	419	475	481	475	494
Kansai	2,236	2,315	2,449	2,955	2,999	2,933	2,394	2,438	2,707	2,656	2,753	2,486
Chugoku	727	822	979	1,220	1,227	1,052	881	799	1,021	1,160	1,120	1,079
Shikoku	666	710	768	740	732	655	714	556	637	680	703	584
Kyushu	1,466	1,462	1,681	1,919	1,931	1,842	1,639	1,611	1,871	1,894	1,883	1,705
60Hz areas Total	7,675	7,975	8,813	10,195	10,218	9,488	8,247	7,902	9,039	9,417	9,502	8,853
Interconnected	14,047	14,137	15,441	18,584	18,700	17,210	14,350	14,125	16,868	17,493	17,532	16,592
Okinawa	172	184	194	213	215	203	200	185	189	173	164	167
Nationwide	14,219	14,321	15,635	18,797	18,915	17,413	14,550	14,311	17,057	17,666	17,696	16,759

Table A1-3 Monthly Projected Supply Capacity Recalculated with Power Exchange for Each Regional Service Area in FY 2024 (10^4kW at the Sending End)

[10^4kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	494	472	453	493	535	492	481	504	605	603	598	564
Tohoku	1,318	1,308	1,343	1,544	1,546	1,462	1,194	1,305	1,616	1,606	1,593	1,611
Tokyo	4,645	4,476	4,924	6,385	6,412	5,777	4,472	4,482	5,477	5,717	5,690	5,489
50Hz areas Total	6,457	6,257	6,720	8,422	8,494	7,730	6,147	6,292	7,698	7,926	7,880	7,664
Chubu	2,263	2,329	2,538	2,851	2,863	2,746	2,418	2,282	2,563	2,728	2,753	2,622
Hokuriku	474	440	495	562	565	533	455	466	538	574	577	542
Kansai	2,220	2,313	2,592	3,133	3,146	2,806	2,398	2,245	2,689	2,842	2,868	2,610
Chugoku	923	938	1,050	1,230	1,235	1,153	991	988	1,173	1,173	1,184	1,101
Shikoku	418	450	508	566	568	537	469	422	550	541	546	494
Kyushu	1,291	1,409	1,538	1,821	1,828	1,705	1,472	1,430	1,657	1,708	1,723	1,559
60Hz areas Total	7,590	7,880	8,720	10,162	10,206	9,480	8,203	7,833	9,170	9,567	9,652	8,928
Interconnected	14,047	14,137	15,441	18,584	18,700	17,210	14,350	14,125	16,868	17,493	17,532	16,592
Okinawa	172	184	194	213	215	203	200	185	189	173	164	167
Nationwide	14,219	14,321	15,635	18,797	18,915	17,413	14,550	14,311	17,057	17,666	17,696	16,759

Table A1-4 Monthly Projected Cross-Regional Reserve Margin for Each Regional Service Area in FY 2024

Note: Power exchanges through cross-regional interconnection lines and generation facilities are not included at the sending end of the electricity supply plans.

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	23.4%	46.4%	50.8%	24.0%	25.3%	36.4%	27.1%	28.2%	20.3%	15.4%	16.0%	24.4%
Tohoku	16.4%	16.0%	21.3%	18.2%	24.1%	36.4%	25.2%	28.2%	20.3%	15.4%	16.0%	24.1%
Tokyo	16.4%	12.0%	12.3%	8.7%	9.7%	18.9%	22.0%	8.5%	15.0%	15.3%	15.0%	21.1%
Chubu	26.8%	24.8%	28.1%	18.7%	20.8%	22.0%	22.0%	14.8%	15.3%	15.3%	15.0%	21.1%
Hokuriku	26.8%	27.5%	28.1%	18.7%	20.8%	22.0%	22.0%	14.8%	15.3%	15.3%	15.0%	21.7%
Kansai	26.8%	27.5%	28.1%	18.7%	20.8%	22.0%	22.0%	14.8%	15.3%	15.3%	15.0%	21.7%
Chugoku	26.8%	27.5%	28.1%	18.7%	20.8%	22.0%	22.0%	14.8%	15.3%	15.3%	15.0%	21.7%
Shikoku	26.8%	27.5%	28.1%	18.9%	22.4%	22.0%	22.0%	14.8%	15.3%	15.3%	15.0%	39.4%
Kyushu	33.0%	30.2%	28.1%	18.7%	20.8%	29.9%	44.7%	23.3%	15.3%	15.3%	15.0%	21.7%
Okinawa	42.6%	42.6%	27.7%	30.5%	26.9%	22.1%	41.5%	44.4%	72.6%	61.9%	60.4%	81.3%

* Reserve margins with the same value are shown in the same background color after utilization of cross-regional interconnection line.

Table A1-5 Monthly Projected Supply–Demand Balance in Okinawa in FY 2024 (10^4kW at the Sending End)

[10^4kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Peak Demand	102	129	149	157	157	152	134	112	96	104	96	94
Supply Capacity	177	189	197	217	220	211	204	190	191	175	166	171
Reserve Capacity	74	60	48	59	63	59	70	78	95	70	71	77
Reserve Margin	72.5%	46.3%	32.5%	37.8%	40.1%	38.6%	52.3%	70.0%	99.4%	67.5%	73.6%	82.0%

ii) Projection for FY 2025

Table A1-6 presents the peak demand, while Table A1-7 presents the monthly supply capacity (including the generator development plans according to the provisions of Article 48 of the Act) for each regional service area in FY 2025.

Table A1-8 presents the monthly projection of the supply capacity for each regional service area recalculated with power exchanges, while Table A1-9 presents the cross-regional reserve margin calculated from the supply capacity shown in Table A1-8. For Okinawa, the figures in these tables are at the smallest reserve margin. Furthermore, Table A1-10 presents the monthly peak demand, supply capacity, reserve capacity, and reserve margin at the designated time in the Okinawa service area.

Table A1-6 Monthly Peak Demand Forecast for Each Regional Service Area in FY 2025 (10^4kW at the Sending End)

[10^4kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	397	355	361	411	420	390	390	447	483	503	501	455
Tohoku	1,059	983	1,073	1,284	1,308	1,158	1,027	1,155	1,293	1,342	1,336	1,232
Tokyo	3,773	3,652	4,245	5,455	5,455	4,609	3,886	4,004	4,416	4,810	4,810	4,233
50Hz areas Total	5,229	4,990	5,679	7,150	7,183	6,157	5,303	5,606	6,192	6,655	6,647	5,920
Chubu	1,776	1,780	2,005	2,412	2,412	2,165	1,858	1,850	2,140	2,318	2,318	2,016
Hokuriku	365	336	391	475	475	420	347	376	449	487	487	417
Kansai	1,719	1,778	2,058	2,656	2,656	2,223	1,840	1,815	2,249	2,417	2,417	2,012
Chugoku	710	715	827	1,038	1,038	907	756	794	977	994	994	844
Shikoku	321	328	382	475	475	421	356	338	457	457	457	377
Kyushu	980	1,080	1,217	1,544	1,544	1,347	1,128	1,159	1,391	1,458	1,458	1,205
60Hz areas Total	5,871	6,017	6,879	8,600	8,600	7,483	6,285	6,332	7,663	8,131	8,131	6,870
Interconnected	11,100	11,007	12,558	15,750	15,783	13,640	11,588	11,938	13,855	14,786	14,778	12,790
Okinawa	103	130	148	156	155	153	135	113	97	105	96	94
Nationwide	11,203	11,136	12,706	15,907	15,939	13,793	11,722	12,050	13,951	14,891	14,874	12,885

Table A1-7 Monthly Projected of Supply Capacity for Each Regional Service Area in FY 2025 (10^4kW at the Sending End)

[10^4kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	531	515	526	536	520	468	474	522	622	606	622	531
Tohoku	1,587	1,469	1,605	1,900	1,978	1,779	1,592	1,657	1,810	1,912	1,914	1,731
Tokyo	4,023	3,836	4,470	5,823	5,848	5,457	3,806	4,025	5,118	5,286	5,119	4,929
50Hz areas Total	6,141	5,820	6,602	8,259	8,346	7,704	5,872	6,205	7,550	7,805	7,655	7,191
Chubu	2,176	2,165	2,388	2,692	2,746	2,587	2,446	2,218	2,269	2,292	2,565	2,520
Hokuriku	558	548	535	640	647	611	535	541	607	599	591	523
Kansai	2,129	2,193	2,484	2,914	2,977	2,792	2,217	2,269	2,747	2,880	2,914	2,786
Chugoku	899	1,007	1,165	1,322	1,308	1,133	941	875	1,097	1,154	1,131	1,080
Shikoku	603	632	709	867	859	796	669	626	731	808	797	770
Kyushu	1,312	1,310	1,657	1,899	1,848	1,763	1,592	1,503	1,691	1,753	1,667	1,577
60Hz areas Total	7,677	7,855	8,938	10,334	10,386	9,683	8,398	8,033	9,143	9,485	9,665	9,256
Interconnected	13,818	13,674	15,539	18,592	18,732	17,387	14,270	14,237	16,692	17,290	17,321	16,447
Okinawa	165	182	206	203	217	206	192	177	160	168	168	173
Nationwide	13,983	13,857	15,745	18,795	18,949	17,593	14,462	14,414	16,853	17,458	17,489	16,620

Table A1-8 Monthly Projected Supply Capacity Recalculated with Power Exchange for Each Regional Service Area in FY 2025 (10^4kW at the Sending End)

[10^4kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	474	460	483	506	496	476	459	504	582	581	586	560
Tohoku	1,264	1,153	1,253	1,503	1,543	1,471	1,209	1,301	1,558	1,550	1,563	1,515
Tokyo	4,502	4,284	4,958	6,387	6,437	5,856	4,308	4,511	5,320	5,555	5,627	5,206
50Hz areas Total	6,240	5,897	6,695	8,396	8,475	7,803	5,976	6,315	7,460	7,686	7,775	7,281
Chubu	2,292	2,327	2,569	2,824	2,846	2,751	2,427	2,289	2,578	2,677	2,714	2,693
Hokuriku	471	439	500	557	561	534	453	465	540	580	576	556
Kansai	2,219	2,324	2,637	3,113	3,134	2,824	2,404	2,246	2,710	2,878	2,859	2,687
Chugoku	916	935	1,060	1,216	1,225	1,153	988	983	1,177	1,184	1,176	1,127
Shikoku	414	442	519	677	669	611	549	506	551	548	541	510
Kyushu	1,265	1,311	1,560	1,809	1,822	1,712	1,474	1,434	1,676	1,737	1,680	1,592
60Hz areas Total	7,578	7,777	8,845	10,196	10,257	9,584	8,295	7,922	9,233	9,603	9,545	9,166
Interconnected	13,818	13,674	15,539	18,592	18,732	17,387	14,270	14,237	16,692	17,290	17,321	16,447
Okinawa	165	182	206	203	217	206	192	177	160	168	168	173
Nationwide	13,983	13,857	15,745	18,795	18,949	17,593	14,462	14,414	16,853	17,458	17,489	16,620

Table A1-9 Monthly Projected Cross-Regional Reserve Margin for Each Regional Service Area in FY 2025

Note: Power exchanges through cross-regional interconnection lines and generation facilities are not included at the sending end of the electricity supply plans.

[%]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	19.3%	29.6%	33.9%	23.2%	18.0%	22.0%	17.7%	12.7%	20.5%	15.5%	17.0%	23.0%
Tohoku	19.3%	17.3%	16.8%	17.1%	18.0%	27.1%	17.7%	12.7%	20.5%	15.5%	17.0%	23.0%
Tokyo	19.3%	17.3%	16.8%	17.1%	18.0%	27.1%	10.9%	12.7%	20.5%	15.5%	17.0%	23.0%
Chubu	29.1%	30.7%	28.1%	17.1%	18.0%	27.1%	30.7%	23.7%	20.5%	15.5%	17.1%	33.6%
Hokuriku	29.1%	30.7%	28.2%	17.2%	18.0%	27.1%	30.7%	23.7%	20.5%	19.1%	18.3%	33.6%
Kansai	29.1%	30.7%	28.2%	17.2%	18.0%	27.1%	30.7%	23.7%	20.5%	19.1%	18.3%	33.6%
Chugoku	29.1%	30.7%	28.2%	17.2%	18.0%	27.1%	30.7%	23.7%	20.5%	19.1%	18.3%	33.6%
Shikoku	29.1%	34.6%	35.8%	42.5%	40.7%	45.0%	54.1%	49.6%	20.5%	19.8%	18.3%	35.2%
Kyushu	29.1%	21.3%	28.2%	17.2%	18.0%	27.1%	30.7%	23.7%	20.5%	19.1%	15.2%	32.1%
Okinawa	60.1%	40.7%	38.8%	29.8%	39.7%	34.7%	42.3%	57.3%	66.2%	60.5%	74.2%	83.8%

* Reserve margins with the same value are shown in the same background color after utilization of cross-regional interconnection line.

Table A1-10 Monthly Projected Supply–Demand Balance in Okinawa in FY 2025 (10^4kW at the Sending End)

[10^4kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Peak Demand	103	130	150	158	158	153	135	113	97	105	96	94
Supply Capacity	170	187	209	207	222	215	196	182	163	170	170	177
Reserve Capacity	67	58	59	49	64	62	61	69	66	65	74	82
Reserve Margin	64.7%	44.3%	39.5%	31.1%	40.4%	40.3%	45.1%	61.5%	68.7%	62.4%	76.5%	87.4%

APPENDIX 2 Long-Term Supply–Demand Balance for 10 Years: FY 2024–2033

Tables A2-1 and A2-2 present a 10-year projection of the annual peak demand and annual supply capacity for each regional service area from FY 2024 to 2033, respectively. For Okinawa, the figures in these tables are at the smallest reserve margin. Tables A2-3 and A2-4 present a 10-year projection of the annual peak demand and annual supply capacity for winter peak areas of Hokkaido, Tohoku, and Hokuriku, respectively. Furthermore, Table A2-5 presents Okinawa's annual projected supply–demand balance.

Table A2-1 Annual Peak Demand Forecast for Each Regional Service Area (in August, 10^4kW at the Sending End)

[10^4kW]

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Hokkaido	418	420	424	425	432	443	447	446	446	445
Tohoku	1,301	1,308	1,307	1,306	1,305	1,304	1,303	1,301	1,300	1,299
Tokyo	5,395	5,455	5,507	5,564	5,604	5,631	5,645	5,655	5,664	5,666
50Hz areas Total	7,114	7,183	7,238	7,295	7,341	7,378	7,395	7,402	7,410	7,410
Chubu	2,409	2,412	2,406	2,400	2,393	2,388	2,381	2,375	2,368	2,362
Hokuriku	475	475	475	474	474	473	473	473	472	472
Kansai	2,647	2,656	2,655	2,661	2,666	2,665	2,661	2,656	2,652	2,646
Chugoku	1,039	1,038	1,040	1,044	1,058	1,083	1,092	1,100	1,103	1,103
Shikoku	478	475	473	470	467	465	462	459	456	454
Kyushu	1,538	1,544	1,551	1,556	1,557	1,560	1,558	1,556	1,553	1,551
60Hz areas Total	8,586	8,600	8,600	8,605	8,615	8,634	8,627	8,619	8,604	8,588
Interconnected	15,700	15,783	15,838	15,900	15,956	16,012	16,022	16,021	16,014	15,998
Okinawa	154	155	159	160	161	162	163	164	165	166
Nationwide	15,854	15,939	15,997	16,060	16,117	16,173	16,185	16,185	16,179	16,163

Table A2-2 Annual Projected Supply Capacity for Each Regional Service Area (in August, 10^4kW at the Sending End)

[10^4kW]

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Hokkaido	535	496	485	546	525	547	546	557	558	559
Tohoku	1,546	1,543	1,481	1,625	1,472	1,471	1,485	1,479	1,473	1,468
Tokyo	6,412	6,437	5,909	6,265	6,320	6,353	6,436	6,427	6,419	6,403
50Hz areas Total	8,494	8,475	7,875	8,437	8,317	8,371	8,467	8,463	8,450	8,429
Chubu	2,863	2,846	2,729	2,703	2,699	2,694	2,715	2,699	2,684	2,669
Hokuriku	565	561	539	534	535	534	539	538	535	533
Kansai	3,146	3,134	3,011	2,997	3,007	3,007	3,034	3,019	3,006	2,990
Chugoku	1,235	1,225	1,180	1,176	1,193	1,222	1,245	1,250	1,250	1,247
Shikoku	568	669	538	544	540	540	542	541	542	543
Kyushu	1,828	1,822	1,759	1,753	1,756	1,760	1,777	1,769	1,760	1,753
60Hz areas Total	10,206	10,257	9,755	9,706	9,730	9,758	9,852	9,817	9,777	9,735
Interconnected	18,700	18,732	17,630	18,143	18,047	18,129	18,319	18,280	18,227	18,164
Okinawa	215	217	212	227	212	227	227	228	228	230
Nationwide	18,915	18,949	17,842	18,369	18,259	18,357	18,546	18,507	18,455	18,394

* The supply capacity for Okinawa in FY 2024 and 2025 indicates that the supply capacity falls to the smallest reserve margin.

Table A2-3 Annual Peak Demand Forecast for Winter Peak Areas of Hokkaido, Tohoku, and Hokuriku

(in January, 10^4kW at the Sending End)

[10^4kW]

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Hokkaido	501	503	508	515	519	526	529	529	529	528
Tohoku	1,335	1,342	1,341	1,340	1,338	1,337	1,336	1,335	1,334	1,333
Hokuriku	487	487	486	486	485	485	485	485	484	484

Table A2-4 Annual Projected Supply Capacity for Winter Peak Areas of Hokkaido, Tohoku, and Hokuriku
(in January, 10^4kW at the Sending End)

[10^4kW]

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Hokkaido	603	581	636	597	619	626	634	637	637	637
Tohoku	1,606	1,550	1,687	1,813	1,723	1,734	1,744	1,760	1,764	1,777
Hokuriku	574	580	681	687	670	639	638	639	639	639

Table A2-5 Annual Projected Supply–Demand Balance in Okinawa (10^4kW at the Sending End)

[10^4kW]

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Peak Demand	157	158	159	160	161	162	163	164	165	166
Supply Capacity	220	222	212	227	212	227	227	228	228	230
Reserve Capacity	63	64	53	67	51	66	65	64	63	65
Reserve Margin	40.1%	40.4%	33.2%	41.9%	32.0%	40.5%	39.8%	39.1%	38.4%	39.0%