Organization for Cross-regional Coordination of Transmission Operators, Japan

Annual Report

- Fiscal Year 2021 -

March 2022

電力広域的運営推進機関

Organization for Cross-regional Coordination of Transmission Operators,JAPAN

Introduction

The Organization for Cross-regional Coordination of Transmission Operators, Japan (OCCTO), is responsible for promoting cross-regional coordination of electric power business, and in charge of broad range of business, including securing stable electricity supply, and fostering the utilization environment of the electric power network in a fair and effective manner. Among the business stated above, OCCTO aggregates and publishes the respective reports as an "Annual Report" according to the provisions of Article 181 of the Operational Rules of the Organization.

With regards to securing a stable electricity supply in both normal and abnormal conditions, the annual report contains "Outlook for Electricity Supply and Demand (Data for FY 2020)", "Report on the Quality of Electricity Supply (Data for FY 2020)", and "Outlook of Cross-regional Interconnection Lines (Data for FY 2020)".
With regards to fostering the utilization environment of the electric power network in a fair and effective manner, the Report covers "Actual Data of Preliminary Consultation, System Impact Study and Contract Applications in FY 2020".
With regards to the mid to long-term security of a stable electricity supply, the report includes "Projection and Challenges Regarding Electricity Supply-Demand and Network based on the Aggregation of the Electricity Supply Plan for the Period FY 2021 to 2030" and "Review of the Adequate Level of Balancing Capacity in Each Regional Service Area" (Evaluation of Proper Standard of Soliciting Balancing Capacity for FY 2022).

OCCTO considers that this report could assist the electricity business concerned or be used as a reference by those who have interests in the electric power business or a stable supply of electricity.

CONTENTS

I. Actual Electric Supply and Demand

Outlook for Electricity Supply and Demand

- Actual Data for FY 2020 -

October 2021

Organization for Cross-regional Coordination
of Transmission Operators, Japan

FOREWORD

The Organization for Cross-regional Coordination of Transmission Operators, Japan (hereinafter, the Organization), prepares and publishes its Annual Report according to the provisions of Article 181 of the Operational Rules regarding the matters specified below.

i. Actual electric supply and demand (including evaluation and analysis of quality of electricity in light of frequency, voltage, and blackouts of each regional service area)
ii. State of electric network
iii. Actual Network Access Business until the previous year.
iv. Forecast on electric demand and electric network (including forecast of improvement of restriction on network interconnection of generation facilities) for the next fiscal year and a mid- and long-term period based on a result of compiling of electricity supply plans and their issues.
v. Evaluation and verification of proper standards of reserve margin and balancing capacities of each regional service area based on the next article, as well as contents of review as needed

The Organization published the actual data for electricity supply–demand and network system utilization ahead of the Annual Report because of the completion of actual data collection up to fiscal year 2020 (FY 2020).

SUMMARY

This report is presented to review the outlook for electricity supply–demand and cross-regional interconnection lines in FY 2020, based on the provisions of Article 181 of the Operational Rules of the Organization.

The report comprises two parts: the electricity supply and demand situation, and the interconnection line situation.

Regarding supply and demand, the peak demand nationwide (16,465 x10^4 kW), was recorded in Augustust, and the monthly peak electric energy requirement nationwide, (86,470 GWh) was recorded in January.

The reserve margin against summer and winter peak demands was 11.8% and 9.0%, respectively.

Power exchange instructions were issued by the Organization 226 times, with 218 of them being dispatched for improvements in supply-demand tightness caused by the prolonged cold weather in winter 2020/2021.
In addition, long-cycle frequency control was implemented 58 times during the year.

There were 77 days for which instructions to shed power generation of renewables were issued during FY 2020, which occurred on isolated islands in addition to the Kyushu mainland.

We hope that the information of this report proves useful.

CONTENTS

Note:
Data for Chapter I include figures at the sending end, i.e., the electricity supplied to the public network system from power plants with energy deducted for station services.

Errata

20220831	P6 Table 1-4 Actual Annual Peak Demand	FY 2019/ 16.416→16,461

CHAPTER I: ACTUAL ELECTRICITY SUPPLY AND DEMAND

1. Regional Service Areas for 10 General Transmission and Distribution Companies, and the Definition of a Season

(1) Regional Service Areas for 10 General Transmission and Distribution Companies

A regional service area describes the specific area to which a general transmission and distribution (GT&D) company supplies electricity through cross-regional interconnection lines. Japan is divided into 10 regional service areas as shown in Figure 1-1. Regional service areas served by GT&D companies other than the Okinawa Electric Power Company (EPCO), are connected by cross-regional interconnection lines.

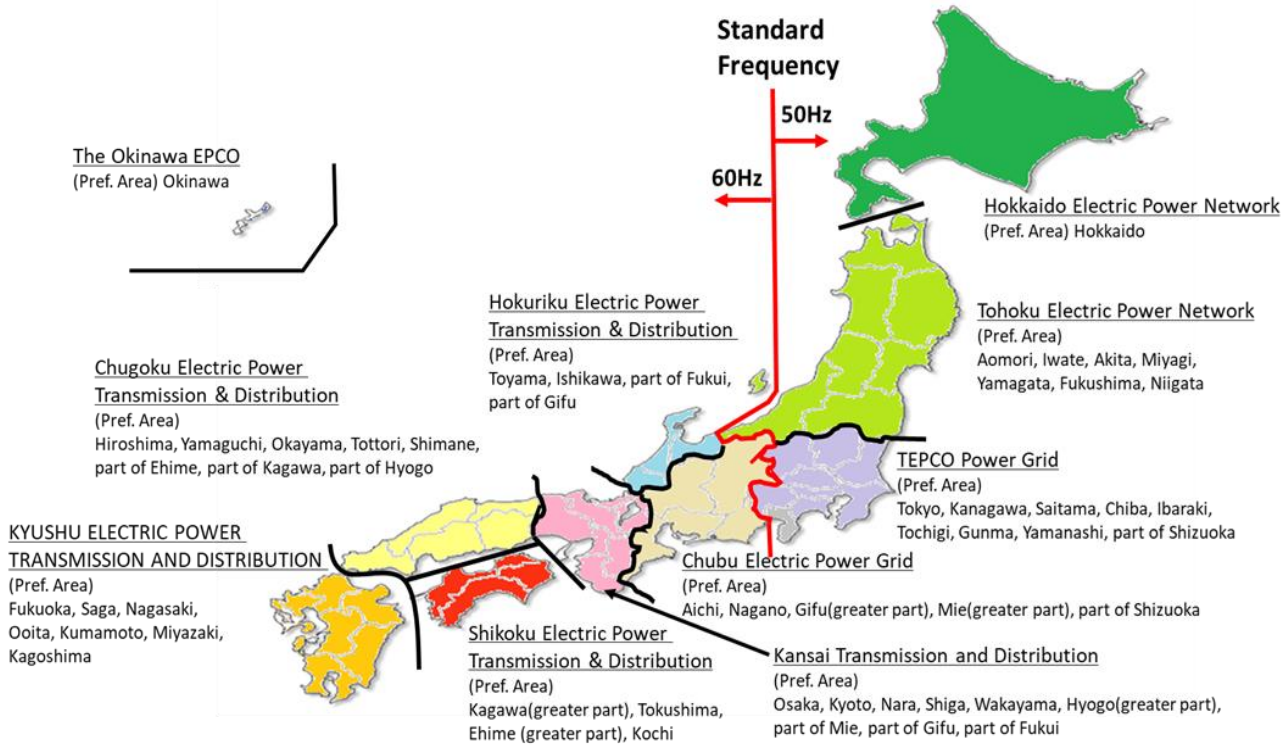

Figure 1-1: The 10 Regional Service Areas in Japan and their Prefectural Distribution

(2) Definition of Seasons

This report identifies two seasonal periods, namely the summer period (July–September) and the winter period (December–February).

This report also refers to the actual weather outlook for the previous year from the Seasonal Climate Report over Japan prepared by the Japan Meteorological Agency (JMA). The JMA defines the summer and winter periods as June– August and December–February, respectively.

Note that this definition of the summer period differs slightly from the one used in this report.

2. Outlook for Actual Weather Nationwide

(1) Weather During the Summer Period (June to August 2020)

Table 1-1 shows anomalies in the temperature and precipitation ratios from June to August in FY 2020.

(a) Heavy rainfall, which was later named the "Heavy Rain Event of July 2020," brought significant precipitation, mainly to the eastern and western regions caused by a prolonged and active Baiu front in July. The Okinawa/Amami region also had significant rainfall, caused by a stagnant Baiu front and a moist southerly air inflow.

(b) The mean temperature during the summer period was high nationwide, with warm air covering much of Japan. In particullar, the eastern and Okinawa/Amami regions were significantly affected. The eastern region experienced a severe heatwave caused by a covering of warm air from the Pacific high-pressure system in Augustust, while the Okinawa/Amami region was covered by warm air during the whole period.

(c) There were relatively few hours of sunshine during the summer period in the Okinawa/Amami region because of the wet air blowing in from the Baiu front and from typhoons.

Table 1-1: Anomalies in Temperature, Precipitation, and Sunshine Duration by Weather Region from June to August 2020

Weather Region	Mean Temperature Anomaly[°C]	Precipitation Ratio[%]	Sunshine Duration Ratio[%]
Northern	+1.2	110	99
Eastern	+1.1	137	98
Western	+0.6	146	98
Okinawa/Amami	+0.8	162	97

Source: Japan Meteorological Agency (JMA), Tokyo Climate Center.
Seasonal Climate Report over Japan for Summer (FY 2020).
http://ds.data.jma.go.jp/tcc/tcc/products/japan/climate/index.php?kikan=3mon&month=8&year=2020
http://www.data.jma.go.jp/gmd/cpd/cgi-bin/view/kikohyo/en.php?kikan=3mon&month=8&year=2020

(2) Weather During the Winter Period (December 2020 to February 2021)

Table 1-2 shows the anomalies in temperature and the ratios of rainfall and snowfall from December to February in FY 2020.

(a) Seasonal mean temperatures were very high in the eastern region, and rather high in the western and Okinawa/Amami regions. There were several days with wintry air in the first half of the period, and then some warm days caused by warm air flowing toward a low-pressure system moving through the northern region. The variation between the temperature in the first period and those in later period was large.

(b) Snowfall during the witner period was heavy because of the significantly cold air early on. In particular, the snowfall on the Japan Sea coast in the western region was significantly heavy. Later on, the precipitation on the Japan Sea coast in the eastern region was very high and that of the Japan Sea coast in the northern region was high because of the frequent occurrence of low-pressure systems around the northern part of Japan.

(c) There were significantly many hours of sunshine on the Pacific Sea and Japan Sea coasts in the western region caused by the weaker southward movement of cold air in a shorter winter pressre pattern during the latter half of the period. Sunshine duration ratio for the western region were at a record high for the Japan Sea and Pacific Sea coasts, (126% and 118%, respectively). They were the highest recorded since statistics started to be collected.

Table 1-2: Anomalies in Temperature, Precipitation, Sunshine Duration and Snowfall by Weather Region from December 2020 to February 2021

Weather Region	Mean Temperature Anomaly[°C]	Precipitation Ratio[%]	Sunshine Duration Ratio[%]	Snowfall Ratio[%]
Northern	-0.1	102	96	82
Eastern	+1.0	87	108	42
Western	+0.8	88	121	107
Okinawa/Amami	+0.4	133	106	-

Source：Japan Meteorological Agency, Tokyo Climate Center.
Seasonal Climate Report over Japan for Winter (FY 2020).
http://ds.data.jma.go.jp/tcc/tcc/products/japan/climate/index.php?kikan=3mon&month=2&year=2021
http://www.data.jma.go.jp/gmd/cpd/cgi-bin/view/kikohyo/en.php?kikan=3mon&month=2&year=2021

3. Actual Nationwide Peak Demand

Peak demand referes to the highest consumption of electricity during a given period, such as day, month, or year. Table 1-3 shows the monthly peak demand for regional service areas in FY 2020. Figures 1-2 and 1-3 show the nationwide monthly and annual peak demand by regional service areas, respectively. In this report, "peak demand" refers to the maximum hourly value of the electric energy requirement.

The values in red are the maximum monthly peak demand (i.e., the annual peak demand) and the values in blue are the minimum monthly peak demand for each regional service area.[1] The names of the regional service areas are indicated in the names of the GT&D companies.

The maximum monthly peak demand nationwide for FY 2020 was registered as 16,645 x10^4 kW in August, which was the highest for five years (Table 1-4 gives the sending-end data since FY 2016).

Table 1-3: Monthly Peak Demand for Regional Service Areas[2]

[10^4kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	404	356	362	390	431	420	384	445	490	541	510	504
Tohoku	1,054	944	1,104	1,089	1,412	1,384	988	1,115	1,409	1,480	1,430	1,198
Tokyo	4,055	3,335	4,345	4,497	5,604	5,570	3,661	3,943	4,722	5,094	4,862	4,337
Chubu	1,775	1,666	1,958	2,272	2,624	2,439	1,821	1,831	2,330	2,409	2,349	2,054
Hokuriku	397	338	401	442	513	513	350	394	499	534	523	426
Kansai	1,899	1,731	2,238	2,553	2,910	2,771	1,837	1,886	2,353	2,595	2,399	2,103
Chugoku	842	691	815	965	1,102	1,094	734	814	996	1,124	1,041	851
Shikoku	383	327	402	488	533	524	341	363	452	507	473	384
Kyushu	1,098	1,002	1,283	1,498	1,637	1,534	1,078	1,204	1,443	1,606	1,526	1,143
Okinawa	90	117	151	156	158	151	131	125	97	119	103	98
Nationwide	11,833	10,281	12,431	14,009	16,645	15,141	11,075	11,953	14,489	15,607	14,605	12,626

[1] A maximum and minimum value may appear to be the same, which is caused by rounding at the first decimal place. This applies throughout.

[2] "Nationwide peak demand" means the maximum of the aggregated demand in a given period for regional service areas of the 10 GT&D companies, not the addition of each regional peak demand.

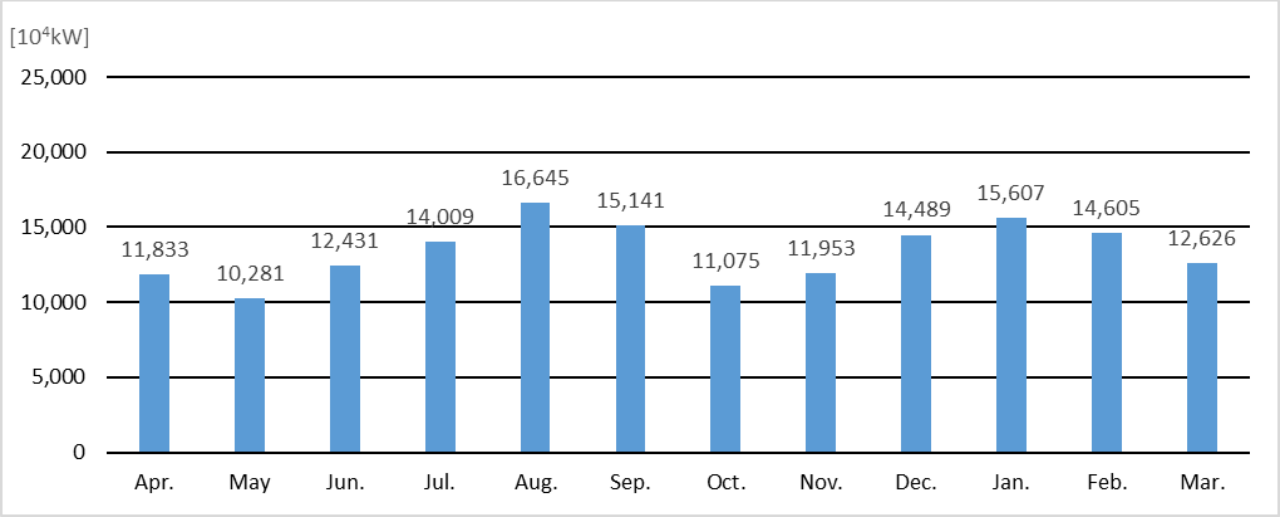

Figure 1-2: Nationwide Monthly Peak Demand

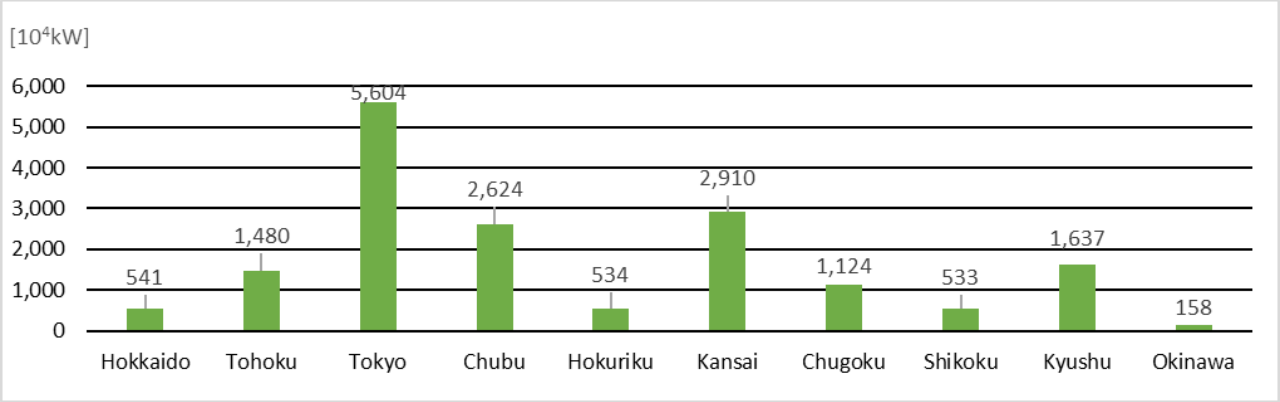

Figure 1-3: Annual Peak Demand for Regional Service Areas

Table 1-4: Actual Annual Peak Demand (from FY 2016 to FY 2020)

[10^4 kW]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Nationwide	15,589	15,577	16,482	16,461	16,645

4. Actual Nationwide Electric Energy Requirements

Table 1-5 shows the monthly electric energy requirements for regional service areas in FY 2020. Figures 1-4 and 1-5 show the nationwide monthly and annual electric energy requirements for regional service areas, respectively.

The values in red are the maximum monthly energy requirement and the values in blue are the minimum monthly energy requirement for each regional service area.

Actual annual nationwide electric energy requirements for FY 2020 was 867,842 GWh, which was the lowest for five years (Table 1-6 gives the sending-end data since FY 2016).

Table 1-5: Monthly and Annual Electric Energy Requirements for Regional Service Areas[3]

[GWh]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
Hokkaido	2,338	2,116	2,096	2,250	2,338	2,203	2,303	2,548	3,122	3,353	2,894	2,819	30,380
Tohoku	6,307	5,631	5,797	6,146	6,926	6,248	6,121	6,459	8,047	8,695	7,542	7,210	81,129
Tokyo	20,539	18,997	21,406	23,370	28,253	23,655	21,223	21,334	26,268	27,772	23,511	23,153	279,481
Chubu	9,729	8,677	9,874	11,011	12,460	11,166	10,244	10,215	11,970	12,606	11,179	11,172	130,303
Hokuriku	2,263	1,919	2,079	2,245	2,526	2,276	2,156	2,255	2,758	3,002	2,597	2,531	28,606
Kansai	10,432	9,622	10,932	12,092	14,350	11,847	10,611	10,637	12,821	13,590	11,651	11,702	140,287
Chugoku	4,475	4,010	4,455	4,908	5,542	4,918	4,497	4,626	5,647	5,969	5,020	5,029	59,096
Shikoku	2,030	1,903	2,104	2,311	2,697	2,173	2,002	2,024	2,476	2,650	2,234	2,226	26,828
Kyushu	6,192	5,879	6,692	7,328	8,554	6,764	6,296	6,343	7,921	8,231	6,786	6,727	83,714
Okinawa	524	624	787	885	883	764	683	604	597	601	501	565	8,020
Nationwide	64,827	59,379	66,223	72,545	84,529	72,013	66,137	67,045	81,627	86,470	73,915	73,134	867,842

[3] Here and elsewhere, the annual total may not equal the sum of 12 months due to independent rounding.

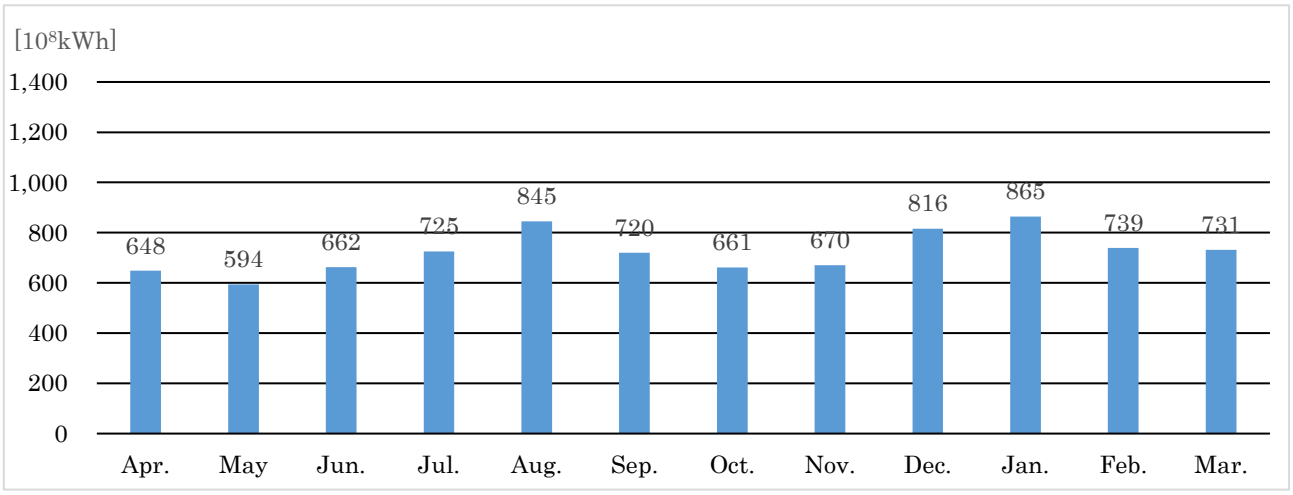

Figure 1-4: Nationwide Monthly Electric Energy Requirements

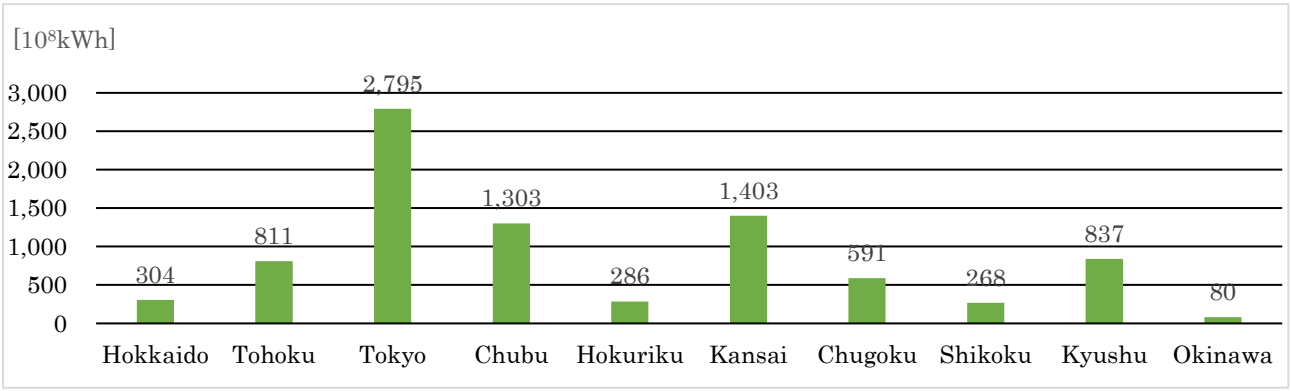

Figure 1-5: Annual Electric Energy Requirements for Regional Service Areas

Table 1-6: Actual Annual Electric Energy Requirement (from FY 2016 to FY 2020)

[GWh]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Nationwide	890,451	900,902	896,473	878,383	867,842

5. Nationwide Load Factor

The load factor describes the ratio of average demand to peak demand within a given period. Table 1-7 shows the monthly load factor for regional service areas in FY 2020, with Figures 1-6 and 1-7 showing the nationwide monthly and annual load factors for regional service areas, respectively. The values in red and blue are the highest and the the lowest load factors, respectively, for each regional service area.

The nationwide annual load factor for FY 2020 was 59.5%, which was the minimum figure for five years (Table 1-8 gives the sending-end data since FY 2016).

Table 1-7: Monthly and Annual Load Factors for Regional Service Areas[4]

[%]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
Hokkaido	80.4	79.8	80.5	77.6	72.9	72.9	80.6	79.5	85.6	83.3	84.5	75.2	64.1
Tohoku	83.1	80.2	72.9	75.8	65.9	62.7	83.3	80.5	76.8	79.0	78.5	80.9	62.6
Tokyo	70.3	76.6	68.4	69.9	67.8	59.0	77.9	75.1	74.8	73.3	72.0	71.8	56.9
Chubu	76.1	70.0	70.1	65.1	63.8	63.6	75.6	77.5	69.0	70.3	70.8	73.1	56.7
Hokuriku	79.2	76.3	72.0	68.2	66.2	61.7	82.8	79.5	74.3	75.6	73.9	79.9	61.2
Kansai	76.3	74.7	67.9	63.7	66.3	59.4	77.7	78.3	73.2	70.4	72.3	74.8	55.0
Chugoku	73.8	78.0	75.9	68.3	67.6	62.5	82.4	78.9	76.2	71.4	71.8	79.5	60.0
Shikoku	73.5	78.3	72.8	63.7	68.1	57.6	78.9	77.3	73.6	70.3	70.2	78.0	57.5
Kyushu	78.3	78.9	72.5	65.8	70.2	61.3	78.5	73.2	73.8	68.9	66.2	79.1	58.4
Okinawa	80.6	71.4	72.3	76.0	75.1	70.3	70.0	67.1	82.5	68.0	72.8	77.4	58.0
Nationwide	76.1	77.6	74.0	69.6	68.3	66.1	80.3	77.9	75.7	74.5	75.3	77.9	59.5

[4] "Nationwide load factor" refers to the load factor calculated for all of Japan. It is not simply the average of each regional load factor.

$$\text{Monthly Load Factor (\%)} = \frac{\text{Monthly Energy Requirement}}{\text{Monthly Peak Demand} \cdot \text{Calendar Hours (24H} \cdot \text{Monthly Days)}}$$

$$\text{Annual Load Factor (\%)} = \frac{\text{Annual Energy Requirement}}{\text{Annual Peak Demand} \cdot \text{Calendar Hours (24H} \cdot \text{Annual Days)}}$$

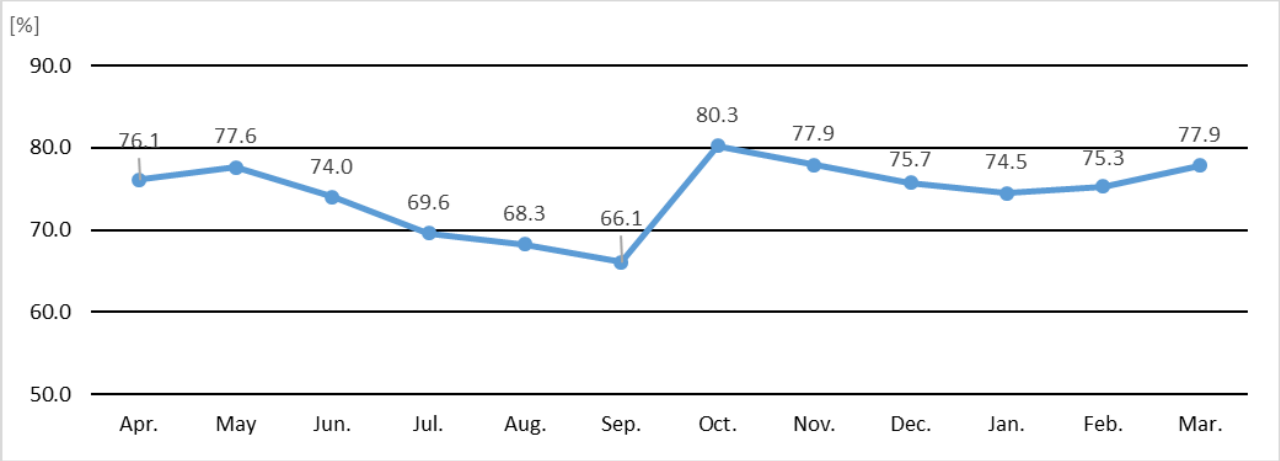

Figure 1-6: Nationwide Monthly Load Factor

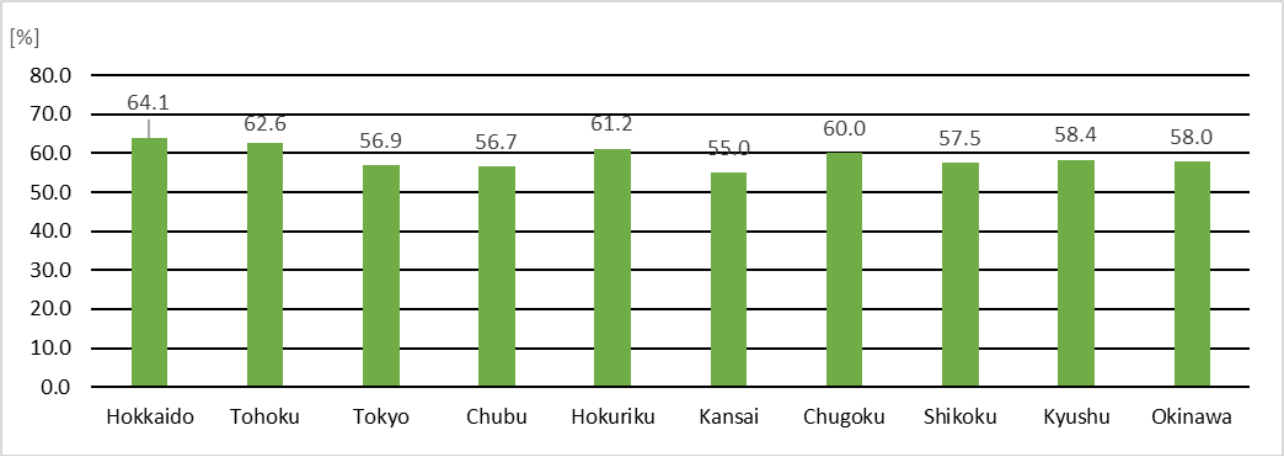

Figure 1-7: Annual Load Factor for Regional Service Areas

Table 1-8: Actual Annual Load Factor (from FY 2016 to FY 2020)

[%]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Nationwide	65.8	66.0	62.1	60.7	59.5

6. Nationwide Supply–Demand Status During Peak Demand

(1) Nationwide Supply–Demand Status During the Summer Peak Demand Period (July to September)

Table 1-9 shows the supply–demand status during the summer peak demand period for regional service areas in FY 2020.

The actual nationwide summer peak demand for FY 2020 was 16, 645 x10^4 kW, which was registered at 15:00 on August 20, with a reserve margin at the time of 11.8%. This was the highest figure for the past five years, (Table 1-10 gives the sending-end data since FY 2016).

Table 1-9: Supply–Demand Status during the Summer Peak Demand Period for Nationwide and Regional Service Areas[5]

Area	Peak Demand [10^4kW]	Occurrence Date & Time			Daily Maximum Temperature [℃]	Supply Capacity [10^4kW]	Reserve Capacity [10^4kW]	Reserve Margin [%]	Daily Energy Supply [10^4kWh]	Daily Load Facter [%]
Hokkaido	431	8/28	Fr	16:00～17:00	33.1	477	46	10.7	8,543	82.6
Tohoku	1,412	8/28	Fr	14:00～15:00	33.8	1,527	115	8.2	26,660	78.7
Tokyo	5,604	8/21	Fr	14:00～15:00	36.0	6,198	594	10.6	103,413	76.9
Chubu	2,624	8/20	Thur.	14:00～15:00	37.6	2,845	220	8.4	48,099	76.4
Hokuriku	513	8/20	Thur.	13:00～14:00	36.8	549	36	7.1	9,550	77.6
Kansai	2,910	8/21	Fr	14:00～15:00	38.6	3,104	193	6.6	53,236	76.2
Chugoku	1,102	8/21	Fr	14:00～15:00	37.1	1,215	114	10.3	20,409	77.2
Shikoku	533	8/20	Thur.	14:00～15:00	35.8	613	80	15.0	9,832	76.9
Kyushu	1,637	8/21	Fr	13:00～14:00	34.3	1,855	218	13.3	30,670	78.0
Okinawa	158	8/18	Tue.	14:00～15:00	33.9	202	44	27.9	3,106	82.0
Nationwide	16,645	8/20	Thur.	14:00～15:00	-	18,608	1,964	11.8	310,303	77.7

Table 1-10: Actual Supply–Demand Status for Summer Peak Demand (from FY 2016 to FY 2020)

FY	Peak Demand [10^4kW]	Occurrence Date & Time			Daily Maximum Temperature [℃]	Supply Capacity [10^4kW]	Reserve Capacity [10^4kW]	Reserve Margin [%]	Daily Energy Supply [10^4kWh]	Daily Load Facter [%]
2016	15,589	8/9	Tue.	14:00～15:00	-	17,764	2,176	14.0	297,969	79.6
2017	15,550	8/24	Thur.	14:00～15:00	-	17,716	2,165	13.9	300,493	80.5
2018	16,482	8/3	Fri.	14:00～15:00	-	18,749	2,267	13.8	315,434	79.7
2019	16,461	8/2	Fri.	14:00～15:00	-	18,584	2,122	12.9	314,988	79.7
2020	16,645	8/20	Thur.	14:00～15:00	-	18,608	1,964	11.8	310,303	77.7

[5] The daily maximum temperatures are provided by the JMA based on the data for the cities where the headquarters of the GT&D companies (except for the Okinawa EPCO) are located. (For the regional service area of the Okinawa EPCO, the data from Naha, the prefectural capital of Okinawa, were used instead).

$$\text{Daily Load Factor (\%)} = \frac{\text{Daily Energy Requirement}}{\text{Daily Peak Demand} \times 24\text{H}}$$

"Supply capacity" in the table above refers to the maximum power that can be generated during peak demand. This capacity is the addition of installed generating capacity including the deducted portion, such as generator suspension for maintenance work, derating with a decrease in river flow, and unplanned generator outages.

(2) Nationwide Supply–Demand Status During the Winter Peak Demand Period (December to February)

Table 1-11 shows the supply–demand status during the winter peak demand period for regional service areas in FY 2020.

The actual nationwide winter peak demand for FY 2020 was 15, 607 x10^4 kW, which occurred at 10:00 on January 8, with a reserve margin at the time of 9.0%. This was the highest figure for the past five years, (Table 1-12 gives the sending-end data since FY 2016).

The reserve margin in five areas was below 3%, (the minimum acceptable margin criteria. The margins were 2.2% (at 11:00 on January 8) for Hokuriku, 1.5% (at 11:00 on January 12) for Kansai, 1.3% (at 10;00 on January 8) for Chugoku, 2.3% (at 19:00 on January 8), and 2.4% (at 19:00 on January 7).

Table 1-11: Supply–Demand Status During the Winter Peak Demand Period for Regional Service Areas[5]

Area	Peak Demand [10^4kW]	Occurrence Date & Time			Daily Mean Temperature [℃]	Supply Capacity [10^4kW]	Reserve Capacity [10^4kW]	Reserve Margin [%]	Daily Energy Supply [10^4kWh]	Daily Load Facter [%]
Hokkaido	541	1/19	Tue.	11:00～12:00	-7.2	615	74	13.6	11,865	91.3
Tohoku	1,480	1/8	Fri.	09:00～10:00	-2.8	1,534	54	3.7	32,248	90.8
Tokyo	5,094	1/12	Tue.	16:00～17:00	3.4	5,405	311	6.1	103,519	84.7
Chubu	2,409	1/8	Fri.	09:00～10:00	0.0	2,558	148	6.2	49,287	85.2
Hokuriku	534	1/8	Fri.	10:00～11:00	-1.5	546	12	2.2	11,604	90.6
Kansai	2,595	1/12	Tue.	10:00～11:00	3.2	2,635	40	1.5	51,234	82.3
Chugoku	1,124	1/8	Fri.	09:00～10:00	-1.6	1,138	14	1.3	23,932	88.7
Shikoku	507	1/8	Fri.	18:00～19:00	-0.5	519	12	2.3	10,717	88.1
Kyushu	1,606	1/7	Thur.	18:00～19:00	1.3	1,645	39	2.4	32,493	84.3
Okinawa	119	1/9	Sat.	18:00～19:00	11.6	156	37	31.3	2,394	83.9
Nationwide	15,607	1/8	Fri.	09:00～10:00	-	17,012	1,406	9.0	329,833	88.1

Table 1-12: Actual Supply–Demand Status for Winter Peak Demand (from FY 2016 to FY 2020)

FY	Peak Demand [10^4kW]	Occurrence Date & Time			Daily Mean Temperature [℃]	Supply Capacity [10^4kW]	Reserve Capacity [10^4kW]	Reserve Margin [%]	Daily Energy Supply [10^4kWh]	Daily Load Facter [%]
2016	14,914	1/24	Tue.	18:00～19:00	-	16,354	1,440	9.7	314,968	88.0
2017	15,577	1/25	Thur.	18:00～19:00	-	16,915	1,339	8.6	330,605	88.4
2018	14,603	1/10	Thur.	09:00～10:00	-	16,104	1,501	10.3	308,436	88.0
2019	14,619	2/7	Fri.	09:00～10:00	-	16,808	2,189	15.0	303,347	86.5
2020	15,607	1/8	Fri.	09:00～10:00	-	17,012	1,406	9.0	329,833	88.1

7. Nationwide Lowest Demand Period

Table 1-13 shows the status of the lowest demand period for nationwide and regional service areas (FY 2020).

Table 1-13: Lowest Demand Period for Nationwide and Regional Service Areas[6]

	Bottom Demand [10^4kW]	Occurrence Date & Time			Daily Mean Temperature [℃]	Daily Energy Supply [10^4kWh]
Hokkaido	227	8/31	Mon.	01:00～02:00	17.4	6,992
Tohoku	596	5/5	Tue.	00:00～01:00	17.6	15,925
Tokyo	1,877	5/3	Sun.	06:00～07:00	20.7	52,843
Chubu	826	5/6	Wed.	06:00～07:00	17.8	22,762
Hokuriku	182	5/4	Mon.	07:00～08:00	22.1	4,841
Kansai	941	5/3	Sun.	06:00～07:00	19.5	26,114
Chugoku	408	5/4	Mon.	00:00～01:00	20.2	10,819
Shikoku	191	9/28	Mon.	01:00～02:00	21.7	6,445
Kyushu	623	5/4	Mon.	00:00～01:00	20.3	16,898
Okinawa	56	4/26	Sun.	06:00～07:00	18.3	1,611
Nationwide	6,065	5/3	Sun.	06:00～07:00	-	162,845

[6] The daily mean temperatures are provided by the JMA based on the data for the cities where the headquarters of the GT&D companies (except for the Okinawa EPCO) are located. (For the regional service area of the Okinawa EPCO, the data for Naha, the prefectural capital of Okinawa, were used instead).

8. Nationwide Peak Daily Energy Supply

Tables 1-14 and 1-15 show the summer (July to September 2020) and winter (December 2020 to February 2021) peak daily energy supply for nationwide and regional service areas in FY 2020, respectively.[7]

Table 1-14: Summer Peak Daily Energy Supply for Nationwide and Regional Service Areas

Area	Peak Daily Energy Supply [10^4kWh]	Occurrence Date		Daily Mean Temperature [˚C]
Hokkaido	8,543	8/28	Fri.	27.3
Tohoku	26,660	8/28	Fri.	29.1
Tokyo	103,413	8/21	Fri.	30.1
Chubu	48,099	8/20	Thur.	31.5
Hokuriku	9,650	9/3	Thur.	31.9
Kansai	53,236	8/21	Fri.	31.8
Chugoku	20,546	8/20	Thur.	31.0
Shikoku	9,832	8/20	Thur.	30.7
Kyushu	30,936	8/20	Thur.	30.6
Okinawa	3,132	7/14	Tue.	29.8
Nationwide	310,303	8/20	Thur.	-

Table 1-15: Winter Peak Daily Energy Supply for Nationwide and Regional Service Areas

Area	Peak Daily Energy Supply [10^4kWh]	Occurrence Date		Daily Mean Temperature [˚C]
Hokkaido	11,865	1/19	Tue.	-7.2
Tohoku	32,248	1/8	Fri.	-2.8
Tokyo	103,519	1/12	Tue.	3.4
Chubu	49,287	1/8	Fri.	0.0
Hokuriku	11,604	1/8	Fri.	-1.5
Kansai	53,602	1/8	Fri.	0.2
Chugoku	23,932	1/8	Fri.	-1.6
Shikoku	10,717	1/8	Fri.	-0.5
Kyushu	34,099	1/8	Fri.	-0.5
Okinawa	2,394	1/9	Sat.	11.6
Nationwide	329,833	1/8	Fri.	-

[7] See footnote 6.

9. Instructions, Requests Issued and Controls Implemented by the Organization

Instructions and Requests

According to the provisions of paragraph 1 of Article 28-44 of the Electricity Business Act (hereafter, the Act), the Organization may, when it finds it necessary to improve the electricity supply–demand status, require members such as EPCOs to undertake certain necessary actions, if the status of the electricity supply–demand from an electricity business conducted by a member has worsened or is likely to worsen.

During FY 2020, the Organization issued instructions to GT&D companies on 226 occasions for them to exchange power according to the provisions of items 1 to 3, paragraph 1 of Article 111 of the Operational Rules (See Table 1-16). The instructions included measures for the improvement of supply–demand status during the winter of 2020/21. The number of issuances by the Organization was more than in any year since 2015. Further, the Organization issued instructions and requests on three occasions to retail companies and electric power suppliers for them to procure additional supply capacity according to the provisions of paragraphs 1 and 2 of the Article. This followed the output curtailment of thermal power generation triggered by a shortage of generation fuels during the winter of 2020/21. For the details of the instructions and requests, please see <Reference> Detailes of Actual Power Exchange Instructions, and Instructions and Requests to Generation Companies and Retail Companies Issued by the Organization.[8] The specific instructions are stated below.

(1) Instructions for the improvement of supply–demand status (from April to November 2020, and February 2021)

The Organization has issued instructions to the GT&D companies that supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity in the corresponding area, following the unexpected demand growth caused by higher temperatures, decreasing solar power output, and the shutdown of generators triggered by earthquakes.

- Tohoku EPCO Network
  August 28: 400 MW at most following unexpected demand growth caused by higher temperatures, (one instruction)
- Kyushu EPCO Transmission & Distribution
  September 24：1600 MW at most, following unexpected decrease in solar power output, (three intructions)
- Shikoku EPCO Transmission & Distribution
  November 25： 400 MW at most, following unexpected decrease in solar power output, (one instruction)
- Tohoku EPCO Network
  February 14： 3440 MW, following supply capacity shortage caused by the shutdown of several

[8] http://www.occto.or.jp/oshirase/shiji/index.html (in Japanese only)

generators triggered by an earthquake, (three instructions)

(2) Instructions and Requests for improvement of supply–demand status during winter of 2020/21 (from December 2020 to January 2021)

Following prolonged cold weather, the electricity demand during the winter of 2020/21 was higher than for a normal year. To meet the demand, fossil-fueled thermal generators, mainly liquified natural gas (LNG)-fired, were operated more extensively than in a normal year. Consequently, the risk of a deficiency in LNG fuel has emerged. Output curtailment of thermal generation led to a supply capacity deficiency nationwide. Further, the demand increase caused by the cold weather led to deficiencies in the balancing capacity of GT&D companies in several regional service areas that deals with energy imbalances. As a result, it was necessity to exchange power through cross-regional interconnection lines. More specifically, the Organization issued instructions to the GT&D companies involved in power exchange for them to improve supply-demand status, and the instructions to generation companies and retail companies for them to procure additional supply capacity.

a. Instructions to GT&D companies.

The Organization issued the instructions on 218 occasions in total during the winter of 2020/21(from December 15, 2020 to January 16, 2021) as indicated in Table 1-17. The issuance of the instructions to exchange power was carefully implemented. The considerations included 1) that there were several areas of deficient supply capacity, 2) a period of deficient supply capacity could extend for many hours, and 3) other areas that were regarded as areas having reserve capacity might not have sufficient capacity. In this way, the instructions could be issued to both sending and receiving companies within a short period.

b. Instructions to generation companies and retail companies, and requests to electric power suppliers.

Output curtailment of thermal generation led to a supply capacity deficiency nationwide. The Organization issued instructions to generation companies and retail companies who owned nonbalancing capacity generators for them to increase their generation according to the provisions of item v, paragraph 1 of Article 28-44 of the Act, and item v, paragraph 1 of Article 111 of the Operational Ruls. In addition, the Organization requested electric power suppliers to increase their generation according to the provisions of paragraph 2 of Article 111 of the Operational Rules.

- The period of instruction and request issuance was from January 6 (ASAP) to 24:00 on January 26
  (issued on three occasions for the above period, including two repeat calls)
- Instructions were issued to 85 members on one occasion, 101 members on two occasions, and 103 members on three occasions.
- Requests were issued to 6 companies on one occasion, 69 companies on two occasions, and 71 companies on three occasions.

Table 1-16: Actual Instructions to GT&D Companies Issued by the Organization (FY 2016 to FY 2020)

[occasions]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Nationwide	2	10	25	6	226

Table 1-17: Actual Instructions to GT&D Companies Issued by the Organization
(from December 12 to January 16 by regional service area)

[occasions]

Tohoku	Tokyo	Chubu	Hokuriku	Kansai	Chugoku	Shikoku	Kyushu	Nationwide
1	9	1	22	94	42	25	24	218

Controls

The Organization implemented long-cycle cross-regional frequency control[9] to send surplus electric energy generated from renewable energy-generating facilities in the Kyushu EPCO area to the Chugoku and Shikoku EPCO areas through cross-regional interconnection lines by utilizing their available transfer capability (ATC) according to the provisions of Article 132 of the Operational Rules. The Organization received the request for control by the Kyushu EPCO for measures against the shortage of ability to reduce power supply.[10] Such controls were implemented on 56 occasions during FY 2020.

[9] This refers to frequency control by utilizing the balancing capacity of members that are GT&D companies of other regional service areas through interconnection lines. This is used when the balancing capacity for redundancy becomes or might become insufficient in a regional service area.

[10] This refers to ability to decrease the power supply from generators such as thermal power generators. The output of renewable energy can fluctuate over a short period. It is then essential to control the output of thermal power generators according to such fluctuations. Among such output controls, the capacity to vary the output of generators is generally called the “balancing capacity for redundancy”.

10. Output Shedding of Renewable energy-generating Facilities Operated by EPCOs other than GT&D Companies

GT&D companies may order renewable energy-generating facilities from other EPCOs to shed their output in cases of expected oversupply of demand for its regional service areas after shedding the output of generators other than the renewable-energy-generating facilities of the GT&D company, according to the provisions of the Ministerial Ordinance of Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electric Utilities.

Tables 1-18 and 1-19 show the actual output shedding of renewable-energy-generating facilities in FY 2020 for the Kyushu mainland and isolated islands, respectively.[11] "Shedding Instructed" in Table 1-18 indicates the total effect of the instructions issued on both the day ahead which is shed by offline control, and on the current day, which is shed by online control. The actual shed capacity is expressed in parentheses for that day. A bar in parentheses indicates that there was no output shedding for that day. Necessary output shedding for the isolated island is indicated in Table 1-19. It is calculated by deducting the demand from the supply capacity, and procured by offline control.

Output shedding of renewable-energy-generating facilities was implemented in cases the balancing capacity for redundancy might become insufficient. The shedding period was from 09:00 to 16:00 in each implementation for the isolated islands, and from 8:00 to 16:00 on the Kyushu mainland, except for a few cases.

Instructions for output shedding were only issued for the regional service area of Kyushu GT&D. In FY 2020, instructions were issued on 77 days, which was a decrease on the previous year's 93 days, in the midst of the increasing capacity of variable renewable energy such as solar power and wind power. On 17 days, there was no actual shedding.

The Organization confirms and verifies whether the output shedding of renewable-energy-generating facilities that Kyushu EPCO implemented to facilities of EPCOs according to the provisions of Article 180 of the Operational Rules. The result of the confirmation and verification was that it was appropriate.

[11] http://www.occto.or.jp/oshirase/shutsuryokuyokusei/index.html (in Japanese only).

Table 1-18: Instructed and Actual Output Shedding of Renewable-energy-generating Facilities for FY 2020 (Kyushu Mainland, 10^4 kW)[12]

Date	Shedding Instructed (Actually shed)	Date	Shedding Instructed (Actually shed)
2020/4/2(Thur.)	133.7(92.0)	2020/6/7(Sun.)	26.1(42.2)
2020/4/3(Fri.)	126.0(38.0)	2020/6/20(Sat.)	41.5(-)
2020/4/4(Sat.)	192.7(196.7)	2020/6/22(Mon.)	28.9(41.4)
2020/4/5(Sun.)	185.8(186.5)	2020/7/19(Sun.)	62.4(-)
2020/4/6(Mon.)	129.2(104.7)	2020/9/27(Sun.)	110.9(23.4)
2020/4/7(Tue.)	138.3(97.9)	2020/10/18(Sun.)	58.3(-)
2020/4/8(Wed.)	119.2(96.5)	2020/10/24(Sat.)	68.2(-)
2020/4/9(Thur.)	96.0(56.2)	2020/10/25(Sun.)	85.7(35.4)
2020/4/10(Fri.)	151.0(54.1)	2020/10/31(Sat.)	55.0(-)
2020/4/11(Sat.)	100.5(106.1)	2021/1/3(Sun.)	36.8(9.5)
2020/4/14(Tue.)	154.6(142.9)	2021/1/31(Sun.)	24.1(-)
2020/4/15(Wed.)	35.9(45.8)	2021/2/7(Sun.)	151.4(88.8)
2020/4/16(Thur.)	195.9(144.7)	2021/2/10(Wed.)	53.6(-)
2020/4/18(Sat.)	227.9(186.8)	2021/2/16(Tue.)	65.2(-)
2020/4/20(Mon.)	148.7(55.9)	2021/2/20(Sat.)	122.0(76.2)
2020/4/22(Wed.)	190.3(186.4)	2021/2/21(Sun.)	195.2(192.7)
2020/4/24(Fri.)	80.3(111.3)	2021/2/23(Tue.)	126.4(88.9)
2020/4/25(Sat.)	245.2(230.1)	2021/2/24(Wed.)	100.8(75.0)
2020/4/26(Sun.)	56.6(-)	2021/3/3(Wed.)	94.3(-)
2020/4/27(Mon.)	152.5(109.9)	2021/3/10(Wed.)	85.5(50.8)
2020/4/28(Tue.)	140.3(93.5)	2021/3/11(Thur.)	25.3(-)
2020/4/29(Wed.)	209.3(179.2)	2021/3/13(Sat.)	97.7(-)
2020/4/30(Thur.)	135.7(137.4)	2021/3/14(Sun.)	189.0(75.2)
2020/5/1(Fri.)	84.2(78.7)	2021/3/15(Mon.)	57.5(21.6)
2020/5/2(Sat.)	156.3(87.5)	2021/3/17(Wed.)	54.4(51.1)
2020/5/4(Mon.)	236.2(65.5)	2021/3/18(Thur.)	120.5(-)
2020/5/5(Tue.)	252.2(148.7)	2021/3/22(Mon.)	166.4(24.5)
2020/5/6(Wed.)	258.1(140.5)	2021/3/23(Tue.)	167.1(197.8)
2020/5/7(Thur.)	170.5(171.1)	2021/3/24(Wed.)	140.1(74.9)
2020/5/8(Fri.)	189.0(136.7)	2021/3/25(Thur.)	216.3(214.6)
2020/5/10(Sun.)	138.7(-)	2021/3/26(Fri.)	272.3(266.0)
2020/5/11(Mon.)	151.7(175.3)	2021/3/27(Sat.)	385.7(297.5)
2020/5/12(Tue.)	213.8(18.3)	2021/3/28(Sun.)	187.9(-)
2020/5/13(Wed.)	183.3(163.1)	2021/3/29(Mon.)	227.4(193.7)
2020/5/14(Thur.)	164.8(116.6)	2021/3/31(Wed.)	212.9(200.1)
2020/5/17(Sun.)	243.1(193.1)		
2020/5/19(Tue.)	184.8(139.5)		
2020/5/20(Wed.)	109.0(67.0)		
2020/5/21(Thur.)	172.0(70.2)		
2020/5/22(Fri.)	123.3(-)		
2020/5/23(Sat.)	111.5(-)		
2020/5/24(Mon.)	203.5(125.3)		

[12] The instructions were issued for the hours between 08:00 and 16:00, other than the 11:00–15:00 period on April 11 and the 12:00–14:30 period on April 15. Date expressed in blue refer to days with no actural shedding.

Table 1-19: Output Shedding Needed for FY 2020 (Isolated islands of Kyushu, kW)

Date	Tanegashima	Iki	Tokunoshima	Tsushima	Date	Tanegashima	Iki	Tokunoshima	Tsushima
2020/4/4(Sat.)	590	1,420			2020/10/1(Thur.)	1,100			
2020/4/5(Sun.)	4,450	730			2020/10/4(Sun.)	500			
2020/4/6(Mon.)		130			2020/10/6(Tue.)	1,340			
2020/4/7(Tue.)		700			2020/10/10(Sat.)	500			
2020/4/8(Wed.)		510	510		2020/10/13(Tue.)		810		
2020/4/9(Thur.)		700			2020/10/14(Wed.)		1,450		
2020/4/10(Fri.)			380		2020/10/15(Thur.)		310		
2020/4/13(Mon.)	4,990				2020/10/20(Tue.)		1,060		
2020/4/14(Tue.)	4,870	1,320			2020/10/23(Fri.)	300	1,460		
2020/4/16(Thur.)	4,560	950	300		2020/10/24(Sat.)		1,470		
2020/4/17(Fri.)			450		2020/10/25(Sun.)	1,520	400		
2020/4/18(Sat.)	3,640	2,810		890	2020/10/26(Mon.)	1,070			
2020/4/20(Mon.)	3,470	1,350			2020/10/27(Tue.)	510			
2020/4/21(Tue.)		2,350			2020/10/31(Sat.)	380	720		
2020/4/22(Wed.)	1,100	2,280			2020/11/3(Tue.)	1,370	370		
2020/4/23(Thur.)	1,550				2020/11/4(Wed.)	580			
2020/4/24(Fri.)	4,550	2,060			2020/11/8(Sun.)		630		
2020/4/25(Sat.)	3,300	2,950	210		2020/11/9(Mon.)	710	450		
2020/4/26(Sun.)	1,160	2,270			2020/11/13(Fri.)		300		
2020/4/27(Mon.)	2,150	820			2020/11/14(Sat.)		1,430		
2020/4/28(Tue.)	4,120	1,320			2020/11/21(Sat.)		360		
2020/4/29(Wed.)	4,980	2,810	1,680		2020/12/23(Wed.)	660			
2020/4/30(Thur.)	3,760	1,270	110		2021/1/3(Sun.)	570			
2020/5/1(Fri.)	1,700	290			2021/1/30(Sat.)	160			
2020/5/2(Sat.)	170				2021/1/31(Sun.)	1,680			
2020/5/4(Mon.)	2,280	130			2021/2/5(Fri.)	340			
2020/5/5(Tue.)	3,520				2021/2/7(Sun.)	2,860	630		
2020/5/6(Wed.)	1,040	2,240			2021/2/8(Mon.)	1,520			
2020/5/7(Thur.)	4,080	2,220			2021/2/9(Tue.)	1,370			
2020/5/8(Fri.)	1,530	540			2021/2/15(Mon.)	1,030			
2020/5/11(Mon.)	2,330	1,710			2021/2/20(Sat.)	3,530	1,730	190	
2020/5/12(Tue.)	520	1,550			2021/2/21(Sun.)	3,320	1,550	560	
2020/5/13(Wed.)	3,900	1,790			2021/2/22(Mon.)	1,020	140		
2020/5/14(Thur.)	3,370				2021/2/23(Tue.)	3,320			
2020/5/19(Tue.)	2,610	2,680			2021/2/24(Wed.)	2,680			
2020/5/20(Wed.)	2,710	1,570			2021/2/28(Sun.)		270		
2020/5/21(Thur.)		1,490			2021/3/5(Fri.)	1,710			
2020/5/22(Fri.)		1,360			2021/3/8(Mon.)		300		
2020/5/23(Sat.)		1,100			2021/3/10(Wed.)	1,730	840		
2020/5/24(Sun.)	1,040	470			2021/3/11(Thur.)	710			
2020/5/25(Mon.)	1,460				2021/3/13(Sat.)	3,800			
2020/5/27(Wed.)		870			2021/3/14(Sun.)	4,240	830		
2020/5/28(Thur.)	3,970	1,740			2021/3/15(Mon.)	3,470		150	
2020/5/29(Fri.)	2,550				2021/3/16(Tue.)	1,640			
2020/6/2(Tue.)	1,180	1,240			2021/3/17(Wed.)		840		
2020/6/7(Sun.)		1,400			2021/3/18(Thur.)		1,660		
2020/6/21(Sun.)		910			2021/3/22(Mon.)	970	210		
2020/6/22(Mon.)		260			2021/3/23(Tue.)	4,140	850		
2020/6/23(Tue.)	200				2021/3/25(Thur.)		850		
2020/9/20(Sun.)		1,100			2021/3/26(Fri.)	4,260	1,000	780	
2020/9/21(Mon.)	1,550	650			2021/3/27(Sat.)	3,220			
2020/9/22(Tue.)		1,210			2021/3/28(Sun.)		1,180		
2020/9/27(Sun.)	990	660			2021/3/29(Mon.)	4,700	1,480		
					2021/3/31(Wed.)		2,370		
Period of Instruction	09:00-16:00				Period of Instruction	09:00-16:00			

CONCLUSION

Actual Electricity Supply–Demand

For the actual electricity supply–demand, data on the peak demand, the electric energy requirement, the load factor, and supply–demand status during the peak demand period and the lowest demand period, and peak daily energy supply have been collected. In addition, instructions with respect to power exchanges (according to the provisions of paragraph 1 of Article 28-44 of the Electricity Business Act,) and actual output shedding of renewable-energy-generating facilities (according to the provisions of the Ministerial Ordinance of the Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electric Utilities) have been aggregated.

Actual Utilization of Cross-regional Interconnection Lines

For the actual utilization of cross-regional interconnection lines, data on the utilization, the maintenance work, the forced outages, the employment of transmission margin, and the ATC have been collected.

<Reference> Detailes of the Actual Power Exchange Instructions, with Instructions and Requests to Generation Companies and Retail Companies Issued by the Oraganization.

Details of the actual power exchange instructions, with instructions and requests to generation companies and retail companies issued by the Organization in FY 2020 are listed below. They include measures for avoiding a repeat of the supply–demand tightness during the winter of 2020/2021.

Actual Power Exchange Instructions by the Organization

1	Issued at	15:13 on August 28, 2020
	Instruction	・Tokyo PG shall supply 400 MW of electricity at most to Tohoku NW from 16:00 to 17:30 on August 28. ・Tohoku NW shall be supplied 400 MW of electricity at most by Tokyo PG from 16:00 to 17:30 on August 28.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of unexpected demand growth caused by higher temperature.
2	Issued at	09:24 on September 24, 2020
	Instruction	・Chubu PG shall supply 300 MW of electricity to Kyushu T&D from 10:00 to 12:00. ・ChugokuNW shall ネ supply 400 MW of electricity to Kyushu T&D from 10:00 to 12:00. ・Kyushu T&D shall be supplied 700 MW of electricity by Chubu PG and Chugoku NW from 10:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of Decemberreased output of solar power and demand increase caused by change in weather.
3	Issued at	10:19 on September. 24, 2020
	Instruction	・Kansai T&D shall supply 500 MW of electricity at most to Kyushu T&D from 11:00 to 12:00. ・Kyushu T&D shall be supplied 500 MW of electricity at most by Kansai T&D from 11:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of Decemberreased output of solar power and demand increase caused by change in weather.
4	Issued at	11:19 on September 24, 2020
	Instruction	・Chubu PG shall supply 800 MW of electricity at most to Kyushu T&D from 12:00 to 17:00 on September 24. ・Kansai T&D shall supply 500 MW of electricity at most to Kyushu T&D from 12:00 to 17:00 on September 24. ・Chugoku NW shall supply 700 MW of electricity at most to Kyushu T&D from 12:00 to 17:00 on September 24. ・Kyushu T&D shall be supplied 1600 MW of electricity at most by Chubu PG, Kansai T&D, and Chugoku NW from 12:00 to 17:00 on September 24.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of Decemberreased output of solar power and demand increase caused by change in weather.
5	Issued at	09:22 on November 25, 2020
	Instruction	・Chugoku NW shall supply 400 MW of electricity at most to Shikoku T&D from 10:00 to 11:30. ・Shikoku T&D Chugoku NW shall be supplied 400 MW of electricity at most by Chugoku NW from 10:00 to 11:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of Decemberreased output of solar power and demand increase caused by change in weather.
6	Issued at	09:05 on December 15, 2020
	Instruction	・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from 09:30 to 12:00. ・Chugoku NW shall supply 500 MW of electricity to Kansai T&D from 09:30 to 12:00. ・Shikoku T&D shall supply 400 MW of electricity to Kansai T&D from 09:30 to 12:00. ・Kyushu T&D shall supply 50 MW of electricity to Kansai T&D from 09:30 to 12:00. ・Kansai T&D shall supply 1000 MW of electricity by Hokuriku T&D, Chugoku NW, Shikoku T&D, and Kyushu T&D from 09:30 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of unexpected demand growth and expected Decemberrease of supply capacity in some generation plants caused by lower temperature.

7	Issued at	11:41 on December 15, 2020
	Instruction	・Tokyo PG shall supply 350 MW of electricity at most to Kansai T&D from 15:00 to 16:00. ・Chubu PG shall supply 9 MW of electricity to Kansai T&D from 13:30 to 14:00. ・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from 12:00 to 16:00. ・Chugoku NW shall supply 30 MW of electricity to Kansai T&D from 12:00 to 16:00. ・Shikoku T&D shall supply 30 MW of electricity at most to Kansai T&D from 12:00 to 15:30. ・Kyushu T&D shall supply 80 MW of electricity at most to Kansai T&D from 12:00 to 16:00. ・Kansai T&D shall supply 1300 MW of electricity at most by Tokyo PG, Chubu PG, Hokuriku T&D, Chugoku NW, Shikoku T&D and Kyushu T&D from 12:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of unexpected demand growth and expected Decemberrease of supply capacity in some generation plants caused by lower temperature.
8	Issued at	15:40 on December 15, 2020
	Instruction	・Tokyo PG shall supply 500 MW of electricity at most to Kansai T&D from 16:00 to 19:30. ・Chubu PG shall supply 2 MW of electricity to Kansai T&D from 19:30 to 20:00. ・Hokuriku T&D shall supply 20 MW of electricity at most to Kansai T&D from 16:00 to 20:30. ・Chugoku NW shall supply 30 MW of electricity to Kansai T&D from 16:00 to 20:30. ・Shikoku T&D shall supply 190 MW of electricity at most to Kansai T&D from 16:00 to 20:30. ・Kyushu T&D shall supply 600 MW of electricity at most to Kansai T&D from 16:00 to 20:30. ・Kansai T&D shall be supplied 1000 MW of electricity at most by Tokyo PG, Chubu PG, Hokuriku T&D, Chugoku NW, Shikoku T&D and Kyushu T&D from 16:00 to 20:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of unexpected demand growth and expected Decemberrease of supply capacity in some generation plants caused by lower temperature.
9	Issued at	19:37 on December 15, 2020
	Instruction	・Hokuriku T&D shall supply 20 MW of electricity at most to Kansai T&D from 20:30 to 24:00. ・Chugoku NW shall supply 10 MW of electricity to Kansai T&D from 20:30 to 21:30. ・Shikoku T&D shall supply 400 MW of electricity at most to Kansai T&D from 20:30 to 24:00. ・Kyushu T&D shall supply 500 MW of electricity at most to Kansai T&D from 20:30 to 23:00. ・Kansai T&D shall be supplied 900 MW of electricity at most by Tokyo PG, Chubu PG, Hokuriku T&D, Chugoku NW, Shikoku T&D and Kyushu T&D from 20:30 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of unexpected demand growth and expected Decemberrease of supply capacity in some generation plants caused by lower temperature.
10	Issued at	22:23 on December 15, 2020
	Instruction	・Tokyo PG shall supply 1490 MW of electricity at most to Kansai T&D from 00:00 to 08:30 on December 16. ・Hokuriku T&D shall supply 100 MW of electricity at most to Kansai T&D from 00:00 to 03:00 on December 16. ・Shikoku T&D shall supply 40 MW of electricity at most to Kansai T&D from 00:00 to 00:30 on December 16. ・Kyushu T&D shall supply 200 MW of electricity at most to Kansai T&D from 03:00 to 08:00 on December 16. ・Kansai T&D shall be supplied 1500 MW of electricity at most by Tokyo PG, Chubu PG, Hokuriku T&D, Chugoku NW, Shikoku T&D and Kyushu T&D from 00:00 to 08:00 on December 16.
	Background	Securng supply capacity for the day is necessary by the power exchange through cross-regional interconnection lines due to Decemberreaseof supply capacity in some generation plants.
11	Issued at	07:00 on December 16, 2020
	Instruction	・Tokyo PG shall supply 600 MW of electricity at most to Kansai T&D from 08:00 to 11:00. ・Hokuriku T&D shall supply 100 MW of electricity to Kansai T&D from 08:00 to 12:00. ・Chugoku NW shall supply 100 MW of electricity to Kansai T&D from 11:00 to 12:00. ・Shikoku T&D shall supply 150 MW of electricity at most to Kansai T&D from 10:00 to 12:00. ・Kyushu T&D shall supply 300 MW of electricity at most to Kansai T&D from 08:00 to 11:00. ・Kansai T&D shall be supplied 870 MW of electricity at most by Tokyo PG, Hokuriku T&D, Chugoku NW, Shikoku T&D and Kyushu T&D from 08:00 to 12:00.
	Background	Securng supply capacity for the day is necessary by the power exchange through cross-regional interconnection lines due to Decemberreaseof supply capacity in some generation plants.

12	Issued at	16:02 on December 16, 2020
	Instruction	・Tokyo PG shall supply 430 MW of electricity at most to Chubu PG from 16:30 to 18:00. ・Hokuriku T&D shall supply 150 MW of electricity at most to Chubu PG from16:30 to 18:30. ・Chugoku NW shall supply 60 MW of electricity at most to Chubu PG from17:00 to 18:30. ・Chubu PG shall be supplied 600 MW of electricity at most by Tokyo PG, Hokuriku T&D and Chugoku NW from16:30 to 18:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of generator shutdown due to transmission line outage in the regional service area.
13	Issued at	11:41 on December 27, 2020
	Instruction	・Hokkaido NW shall supply 30 MW of electricity at most to Kansai T&D from 16:30 to 17:30. ・Chubu PG shall supply 150 MW of electricity at most to Kansai T&D from 12:00 to 24:00. ・Hokuriku T&D shall supply 500 MW of electricity at most to Kansai T&D from 12:00 to 24:00. ・Chugoku NW shall supply 50 MW of electricity to Kansai T&D from 12:00 to 24:00. ・Kyushu T&D shall supply 100 MW of electricity at most to Kansai T&D from 12:00 to 23:00. ・Kansai T&D shall be supplied 2000 MW of electricity at most by Hokkaido NW, Chubu PG, Chugoku NW, and Kyushu T&D from 12:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators in the regional service area of Kansai T&D which is necessary for supply-demand balance due to prolonged cold weather. Further, the Organization shall implement additional instructions to supply capacity of balancing generators is continuously saved.
14	Issued at	20:11 on December 27, 2020
	Instruction	・Hokkaido NW shall supply 300 MW of electricity at most to Kansai T&D from 08:00 to 12:00 on December 28. ・Chubu PG shall supply 1750 MW of electricity at most to Kansai T&D from 00:00 to 14:00 on December 28. ・Hokuriku T&D shall supply 250 MW of electricity to Kansai T&D from 00:00 to 14:00 on December 28. ・Chugoku NW shall supply 50 MW of electricity to Kansai T&D from 10:00 to 14:00 on December 28. ・Shikoku T&D shall supply 100 MW of electricity at most to Kansai T&D from 12:00 to 14:00 on December 28. ・Kyushu T&D shall supply 200 MW of electricity at most to Kansai T&D from 00:30 to 11:30 on December 28. ・Kansai T&D shall be supplied 2000 MW of electricity at most by Hokkaido NW, Chubu PG, Hokuriku T&D, Chugoku NW, Shikoku T&D, and Kyushu T&D from 00:00 to 14:00 on December 28.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
15	Issued at	01:36 on January 3, 2021
	Instruction	・Chubu PG shall supply 600 MW of electricity at most to Tokyo PG from 02:00 to 08:00. ・Hokuriku T&D shall supply 200 MW of electricity to Tokyo PG from 07:30 to 10:00. ・Chugoku NW shall supply 30 MW of electricity to Tokyo PG from 09:00 to 10:00. ・Kyushu T&D shall supply 300 MW of electricity at most to Tokyo PG from 07:30 to 09:30. ・Tokyo PG shall be supplied 600 MW of electricity at most by Chubu PG, Hokuriku T&D, Chugoku NW, and Kyushu T&D from 02:00 to 10:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Tokyo PG due to prolonged cold weather.
16	Issued at	11:05 on January 3, 2021
	Instruction	・Hokkaido NW shall supply 100 MW of electricity to Tokyo PG from 11:30 to 22:00. ・Tohoku NW shall supply 200 MW of electricity to Tokyo PG from 11:30 to 16:30. ・Chubu PG shall supply 600 MW of electricity at most to Tokyo PG from 11:30 to 22:00. ・Hokuriku T&D shall supply 200 MW of electricity to Tokyo PG from 11:30 to 21:30. ・Chugoku NW shall supply 50 MW of electricity to Tokyo PG from 11:30 to 12:30. ・Shikoku T&D shall supply 50 MW of electricity to Tokyo PG from 11:30 to 12:30. ・Kyushu T&D shall supply 100 MW of electricity to Tokyo PG from 16:30 to 21:00. ・Tokyo PG shall be supplied 900 MW of electricity at most by Hokkaido NW, Tohoku NW, Chubu PG, Hokuriku T&D, Chugoku NW, Shikoku T&D, and Kyushu T&D from 11:30 to 22:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Tokyo PG due to prolonged cold weather.

17	Issued at	21:08 on January 3, 2021
	Instruction	・Hokkaido NW shall supply 100 MW of electricity to Tokyo PG from 00:00 to 14:00 on January 4. ・Tohoku NW shall supply 300 MW of electricity at most to Tokyo PG from 0:00 to 01:30 on January 4. ・Chubu PG shall supply 900 MW of electricity at most to Tokyo PG from 00:00 to 14:00 on January 4. ・Hokuriku T&D shall supply 100 MW of electricity at most to Tokyo PG from 07:00 to 10:00 on January 4. ・Tokyo PG shall be supplied 1000 MW of electricity at most by Hokkaido NW, Tohoku NW, Chubu PG, and Hokuriku T&D from 00:00 to 14:00 on January 4.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Tokyo PG due to prolonged cold weather.
18	Issued at	13:18 on January 4, 2021
	Instruction	・Hokkaido NW shall supply 100 MW of electricity to Tokyo PG from 18:00 to 24:00. ・Tohoku NW shall supply 600 MW of electricity at most to Tokyo PG from 14:00 to 24:00. ・Chubu PG shall supply 500 MW of electricity at most to Tokyo PG from 21:30 to 24:00. ・Hokuriku T&D shall supply 100 MW of electricity to Tokyo PG from 14:30 to 24:00. ・Shikoku T&D shall supply 100 MW of electricity to Tokyo PG from 15:30 to 16:00. ・Kyushu T&D shall supply 250 MW of electricity at most to Tokyo PG from 15:30 to 21:30. ・Tokyo PG shall be supplied 600 MW of electricity at most by Hokkaido NW, Tohoku NW, Chubu PG, Hokurku T&D, Shikoku T&D, and Kyushu T&D from 14:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Tokyo PG due to prolonged cold weather.
19	Issued at	20:39 on January 5, 2021
	Instruction	・Hokkaido NW shall supply 100 MW of electricity to Kansai T&D from 22:00 to 23:00. ・Tohoku NW shall supply 150 MW of electricity at most to Kansai T&D from 22:30 to 24:00. ・Hokuriku T&D shall supply 200 MW of electricity to Kansai T&D from 21:30 to 24:00. ・Kansai T&D shall be supplied 350 MW of electricity at most by Hokkaido NW, Tohoku NW, and Hokuriku T&D from 21:30 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
20	Issued at	23:13 on January 5, 2021
	Instruction	・Tohoku NW shall supply 350 MW of electricity at most to Kansai T&D from 03:00 to 05:30 on January 6. ・Hokuriku T&D shall supply 200 MW of electricity to Kansai T&D from 00:00 to 06:00 on January 6. ・Shikoku T&D shall supply 140 MW of electricity to Kansai T&D from 00:00 to 04:30 on January 6. ・Kyushu T&D shall supply 100 MW of electricity to Kansai T&D from 00:00 to 02:30 on January 6. ・Kansai T&D shall be supplied 690 MW of electricity at most by Tohoku NW, Hokuriku T&D, Shikoku T&D, and Kyushu T&D from 00:00 to 06:00 on January 6.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
21	Issued at	04:17 on January 6, 2021
	Instruction	・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from 06:00 to 08:00. ・Kansai T&D shall be supplied 50 MW of electricity at most by Hokuriku T&D from 06:00 to 08:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
22	Issued at	07:12 on January 6, 2021
	Instruction	・Kyushu T&D shall supply 100 MW of electricity to Tohoku NW from 08:00 to 09:00. ・Tohoku NW shall be supplied 100 MW of electricity by Kyushu T&D from 08:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of increasing demand by cold temperature in the regional service area of Tohoku NW.

23	Issued at	10:21 on January 6, 2021
	Instruction	・Chugoku NW shall supply 30 MW of electricity to kansai T&D from 11:00 to 16:00. ・Kyushu T&D shall supply 100 MW of electricity to kansai T&D from 11:00 to 13:00. ・Kansai T&D shall be supplied 130 MW of electricity by Chugoku NW and Kyushu T&D from 11:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
24	Issued at	15:43 on January 6, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity at most to Kansai T&D from 16:30 to 20:00. ・Shikoku T&D shall supply 110 MW of electricity to Kansai T&D from 17:00 to 20:00. ・Kyushu T&D shall supply 100 MW of electricity at most to Kansai T&D from 16:00 to 20:00. ・Kansai T&D shall be supplied 310 MW of electricity at most by Hokkaido NW, Shikoku T&D, and Kyushu T&D from 16:00 to 20:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
25	Issued at	18:50 on January 6, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity at most to Kansai T&D from 20:00 to 22:00. ・Kansai T&D shall be supplied 140 MW of electricity at most by Hokkaido NW from 20:00 to 22:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
26	Issued at	22:29 on January 6, 2021
	Instruction	・Tohoku NW shall supply 100 MW of electricity to Tokyo PG from 03:00 to 04:00 on January 7. ・Chubu PG shall supply 210 MW of electricity to Tokyo PG from 00:00 to 06:00 on January 7. ・Tokyo PG shall be supplied 310 MW of electricity at most by Tohoku NW, and Chubu PG from 00:00 to 06:00 on January 7.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Tokyo PG due to prolonged cold weather.
27	Issued at	04:38 on January 7, 2021
	Instruction	・Chubu PG shall supply 100 MW of electricity at most to Tokyo PG from 06:00 to 11:00. ・Tokyo PG shall be supplied 100 MW of electricity at most by Chubu PG from 06:00 to 11:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Tokyo PG due to prolonged cold weather.
28	Issued at	10:18 on January 7, 2021
	Instruction	・Chubu PG shall supply 180 MW of electricity at most to Kansai T&D from 11:00 to 14:00. ・Kansai T&D shall be supplied 180 MW of electricity at most by Chubu PG from 11:00 to 14:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
29	Issued at	11:22 on January 7, 2021
	Instruction	・Kyushu T&D shall supply 100 MW of electricity to Kansai T&D from 12:00 to 13:00. ・Kansai T&D shall be supplied 100 MW of electricity by Kyushu T&D from 12:00 to 13:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
30	Issued at	11:58 on January 7, 2021
	Instruction	・Kyushu T&D shall supply 100 MW of electricity at most to Kansai T&D from 13:00 to 14:30. ・Kansai T&D shall be supplied 100 MW of electricity at most by Kyushu T&D from 13:00 to 14:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.

31	Issued at	13:46 on January 7, 2021
	Instruction	・Chubu PG shall supply 180 MW of electricity to Hokuriku T&D from 14:00 to 15:00. ・Hokuriku T&D shall be supplied 180 MW of electricity by Chubu PG from 14:00 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
32	Issued at	14:28 on January 7, 2021
	Instruction	・Chubu PG shall supply 210 MW of electricity to Hokuriku T&D from 15:00 to 16:00. ・Hokuriku T&D shall be supplied 210 MW of electricity by Chubu PG from 15:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
33	Issued at	15:37 on January 7, 2021
	Instruction	・Hokkaido NW shall supply 50 MW of electricity to Hokuriku T&D from 16:00 to 17:00. ・Chubu PG shall supply 250 MW of electricity to Hokuriku T&D from 16:00 to 17:00. ・Hokuriku T&D shall be supplied 300 MW of electricity by Hokkaido NW and Chubu PG from 16:00 to 17:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
34	Issued at	16:26 on January 7, 2021
	Instruction	・Hokkaido NW shall supply 190 MW of electricity to Chugoku NW from 17:00 to 18:00. ・Chugoku NW shall be supplied 190 MW of electricity by Hokkaido NW from 17:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
35	Issued at	16:35 on January 7, 2021
	Instruction	・Kansai T&D shall supply 350 MW of electricity to Hokuriku T&D from 17:00 to 18:00. ・Hokuriku T&D shall be supplied 300 MW of electricity by Kansai T&D from 17:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
36	Issued at	16:39 on January 7, 2021
	Instruction	・Kansai T&D shall supply 50 MW of electricity to Shikoku T&D from 17:00 to 18:00. ・Shikoku T&D shall be supplied 50 MW of electricity by Kansai T&D from 17:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
37	Issued at	17:39 on January 7, 2021
	Instruction	・Chubu PG shall supply 250 MW of electricity to Hokuriku T&D from 18:00 to 19:00. ・Hokuriku T&D shall be supplied 250 MW of electricity by Chubu PG from 18:00 to 19:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
38	Issued at	17:39 on January 7, 2021
	Instruction	・Hokkaido NW shall supply 190 MW of electricity to Chugoku NW from 18:00 to 19:00. ・Tokyo PG shall supply 400 MW of electricity to Chugoku NW from 18:00 to 19:00. ・Chugoku NW shall be supplied 590 MW of electricity by Hokkaido NW and Tokyo PG from 18:00 to 19:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
39	Issued at	17:39 on January 7, 2021
	Instruction	・Chubu PG shall supply 100 MW of electricity to Shikoku T&D from 18:00 to 19:00. ・Shikoku T&D shall be supplied 100 MW of electricity by Chubu PG from 18:00 to 19:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.

40	Issued at	18:38 on January 7, 2021
	Instruction	・Hokkaido NW shall supply 190 MW of electricity at most to Hokuriku T&D from 19:00 to 20:00. ・Hokuriku T&D shall be supplied 190 MW of electricity at most by Hokkaido NW from 19:00 to 20:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
41	Issued at	18:38 on January 7, 2021
	Instruction	・Tokyo PG shall supply 600 MW of electricity to Chugoku NW from 19:00 to 20:00. ・Chubu PG shall supply 700 MW of electricity to Chugoku NW from 19:00 to 20:00. ・Chugoku NW shall be supplied 1300 MW of electricity by Tokyo PG and Chubu PG from 19:00 to 20:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
42	Issued at	19:41 on January 7, 2021
	Instruction	・Hokkaido NW shall supply 50 MW of electricity to Hokuriku T&D from 20:00 to 21:00. ・Hokuriku T&D shall be supplied 50 MW of electricity by Hokkaido NW from 20:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
43	Issued at	19:41 on January 7, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity at most to Chugoku NW from 20:00 to 21:00. ・Chubu PG shall supply 700 MW of electricity to Chugoku NW from 20:00 to 21:00. ・Chugoku NW shall be supplied 840 MW of electricity at most by Hokkaido NW and Chubu PG from 20:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
44	Issued at	20:32 on January 7, 2021
	Instruction	・Hokkaido NW shall supply 190 MW of electricity at most to Chugoku NW from 21:00 to 24:00. ・Chubu PG shall supply 1000 MW of electricity to Chugoku NW from from 21:00 to 24:00. ・Chugoku NW shall be supplied 1190 MW of electricity at most by Hokkaido NW and Chubu PG from21:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
45	Issued at	22:25 on January 7, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity to Chugoku NW from 23:00 to 24:00. ・Chugoku NW shall be supplied 140 MW of electricity by Hokkaido NW from 23:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
46	Issued at	23:35 on January 7, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity at most to Chugoku NW from 00:00 to 04:00 on January 8. ・Tohoku NW shall supply 250 MW of electricity at most to Chugoku NW from 03:00 to 04:00 on January 8. ・Chubu PG shall supply 200 MW of electricity to Chugoku NW from 00:00 to 04:00 on January 8. ・Hokuriku T&D shall supply 30 MW of electricity to Chugoku NW from 00:00 to 04:00 on January 8. ・Chugoku NW shall be supplied 550 MW of electricity at most by Hokkaido NW, Tohoku NW, Chubu PG, and Hokuriku T&D from 00:00 to 04:00 on January 8.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
47	Issued at	00:36 on January 8, 2021
	Instruction	・Tohoku NW shall supply 680 MW of electricity at most to Tokyo PG from 01:00 to 02:00. ・Tokyo PG shall be supplied 680 MW of electricity at most by Tohoku NW from 01:00 to 02:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Tokyo PG due to prolonged cold weather.

48	Issued at	01:15 on January 8, 2021
	Instruction	・Tohoku NW shall supply 1260 MW of electricity at most to Tokyo PG from 02:00 to 04:00. ・Tokyo PG shall be supplied 1260 MW of electricity at most by Tohoku NW from 02:00 to 04:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Tokyo PG due to prolonged cold weather.
49	Issued at	03:16 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity to Chugoku NW from 04:00 to 05:30. ・Chubu PG shall supply 400 MW of electricity to Chugoku NW from 04:00 to 05:30. ・Chugoku NW shall be supplied 540 MW of electricity by Hokkaido NW, and Chubu PG from 04:00 to 05:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
50	Issued at	03:25 on January 8, 2021
	Instruction	・Tohoku NW shall supply 1570 MW of electricity at most to Tokyo PG from 04:00 to 05:30. ・Tokyo PG shall be supplied 1570 MW of electricity at most by Tohoku NW from 04:00 to 05:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Tokyo PG due to prolonged cold weather.
51	Issued at	04:34 on January 8, 2021
	Instruction	・Chubu PG shall supply 500 MW of electricity to Chugoku NW from 05:00 to 06:30. ・Chugoku NW shall be supplied 500 MW of electricity by Chubu PG from 05:00 to 06:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
52	Issued at	05:04 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity to Chugoku NW from 05:30 to 08:00. ・Tohoku NW shall supply 590 MW of electricity at most to Chugoku NW from 05:30 to 08:00. ・Chugoku NW shall be supplied 730 MW of electricity at most by Hokkaido NW and Tohoku NW from 05:30 to 08:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
53	Issued at	06:40 on January 8, 2021
	Instruction	・Chubu PG shall supply 1200 MW of electricity to Kansai T&D from 8:00 to 10:00. ・Kansai T&D shall be supplied 1200 MW of electricity by Chubu PG from 8:00 to 10:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
54	Issued at	08:17 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity at most to Chugoku NW from 09:00 to 11:00. ・Chugoku NW shall be supplied 140 MW of electricity at most by Hokkaido NW from 09:00 to 11:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
55	Issued at	09:39 on January. 8, 2021
	Instruction	・Chubu PG shall supply 700 MW of electricity to Kansai T&D from 10:00 to 11:00. ・Kansai T&D shall be supplied 700 MW of electricity by Chubu PG from 10:00 to 11:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
56	Issued at	09:39 on January 8, 2021
	Instruction	・Chubu PG shall supply 1000 MW of electricity to Chugoku NW from 10:00 to 11:00. ・Chugoku NW shall be supplied 1000 MW of electricity by Chubu PG from 10:00 to 11:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.

57	Issued at	09:44 on January 8, 2021
	Instruction	・Shikoku T&D shall supply 50 MW of electricity to Chugoku NW from 10:00 to 11:00. ・Chugoku NW shall be supplied 50 MW of electricity by Chubu PG from 10:00 to 11:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
58	Issued at	10:40 on January 8, 2021
	Instruction	・Chubu PG shall supply 150 MW of electricity to Hokuriku T&D from 11:00 to 12:00. ・Hokuriku T&D shall be supplied 50 MW of electricity by Chubu PG from 11:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
59	Issued at	10:40 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 50 MW of electricity to Kansai T&D from 11:00 to 12:00. ・Chubu PG shall supply 50 MW of electricity to Kansai T&D from 11:00 to 12:00. ・Kansai T&D shall be supplied 100 MW of electricity by Hokkaido NW and Chubu PG from 11:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
60	Issued at	10:40 on January 8, 2021
	Instruction	・Chubu PG shall supply 1700 MW of electricity to Chugoku NW from 11:00 to 12:00. ・Shikoku T&D shall supply 50 MW of electricity to Chugoku NW from 11:00 to 12:00. ・Chugoku NW shall be supplied 1750 MW of electricity by Chubu PG and Shikoku T&D from 11:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
61	Issued at	11:43 on January 8, 2021
	Instruction	・Chubu PG shall supply 150 MW of electricity to Hokuriku T&D from 12:00 to 13:00. ・Hokuriku T&D shall be supplied 150 MW of electricity by Chubu PG from 12:00 to 13:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
62	Issued at	11:43 on January 8, 2021
	Instruction	・Chubu PG shall supply 100 MW of electricity to Kansai T&D from 12:00 to 13:00. ・Kansai T&D shall be supplied 100 MW of electricity by Chubu PG from 12:00 to 13:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
63	Issued at	11:43 on January 8, 2021
	Instruction	・Chubu PG shall supply 1650 MW of electricity at most to Chugoku NW from 12:00 to 13:00. ・Shikoku T&D shall supply 50 MW of electricity to Chugoku NW from 12:00 to 13:00. ・Chugoku NW shall be supplied 1700 MW of electricity at most by Chubu PG and Shikoku T&D from 12:00 to 13:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
64	Issued at	12:32 on January 8, 2021
	Instruction	・Chubu PG shall supply 150 MW of electricity to Hokuriku T&D from 13:00 to 14:00. ・Hokuriku T&D shall be supplied 150 MW of electricity by Chubu PG from 13:00 to 14:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
65	Issued at	12:32 on January 8, 2021
	Instruction	・Chubu PG shall supply 200 MW of electricity to Hokuriku T&D from 13:00 to 14:00. ・Kansai T&D shall be supplied 200 MW of electricity by Chubu PG from 13:00 to 14:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.

66	Issued at	12:32 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 50 MW of electricity to Chugoku NW from 13:00 to 14:00. ・Chubu PG shall supply 1350 MW of electricity to Chugoku NW from 13:00 to 14:00. ・Shikoku T&D shall supply 50 MW of electricity to Chugoku NW from 13:00 to 14:00. ・Chugoku NW shall be supplied 1450 MW of electricity Hokkaido NW, Chubu PG, and Shikoku T&D from 13:00 to 14:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
67	Issued at	13:37 on January 8, 2021
	Instruction	・Chubu PG shall supply 250 MW of electricity to Hokuriku T&D from 14:00 to 15:00. ・Hokuriku T&D shall be supplied 250 MW of electricity by Chubu PG from 14:00 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
68	Issued at	13:37 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 50 MW of electricity to Kansai T&D from 14:00 to 15:00. ・Chubu PG shall supply 250 MW of electricity to Kansai T&D from 14:00 to 15:00. ・Kansai T&D shall be supplied 300 MW of electricity by Hokkaido NW and Chubu PG from 14:00 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
69	Issued at	13:37 on January 8, 2021
	Instruction	・Chubu PG shall supply 500 MW of electricity to Chugoku NW from 14:00 to 15:00. ・Shikoku T&D shall supply 50 MW of electricity to Chugoku NW from 14:00 to 15:00. ・Chugoku NW shall be supplied 550 MW of electricity by Chubu PG, and Shikoku T&D from 14:00 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
70	Issued at	14:02 on January 8, 2021
	Instruction	・Tokyo PG shall supply 700 MW of electricity to Kansai T&D from 14:30 to 15:00. ・Kansai T&D shall be supplied 700 MW of electricity by Chubu PG from 14:30 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
71	Issued at	14:41 on January 8, 2021
	Instruction	・Tokyo PG shall supply 100 MW of electricity to Hokuriku T&D from 15:00 to 16:00. ・Chubu PG shall supply 200 MW of electricity to Hokuriku T&D from 15:00 to 16:00. ・Kansai T&D shall be supplied 300 MW of electricity by Tokyo PG and Chubu PG from 15:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
72	Issued at	14:41 on January 8, 2021
	Instruction	・Chubu PG shall supply 150 MW of electricity to Hokuriku T&D from 15:00 to 16:00. ・Kansai T&D shall be supplied 150 MW of electricity by Chubu PG from 15:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
73	Issued at	14:41 on January 8, 2021
	Instruction	・Tokyo PG shall supply 560 MW of electricity at most to Chugoku NW from 15:00 to 16:00. ・Shikoku T&D shall supply 50 MW of electricity to Chugoku NW from 15:00 to 16:00. ・Chugoku NW shall be supplied 610 MW of electricity at most by Tokyo PG and Shikoku T&D from 15:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.

74	Issued at	14:41 on January 8, 2021
	Instruction	・Tokyo PG shall supply 200 MW of electricity to Kyushu T&D from 15:30 to 16:00. ・Kyushu T&D shall be supplied 200 MW of electricity by Tokyo PG from 15:30 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
75	Issued at	15:36 on January 8, 2021
	Instruction	・Chubu PG shall supply 250 MW of electricity to Hokuriku T&D from 16:00 to 17:00. ・Hokuriku T&D shall be supplied 250 MW of electricity by Chubu PG from 16:00 to 17:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
76	Issued at	15:36 on January 8, 2021
	Instruction	・Tokyo PG shall supply 150 MW of electricity at most to Kansai T&D from 16:00 to 17:00. ・Chubu PG shall supply 450 MW of electricity at most to Kansai T&D from 16:00 to 17:00. ・Kansai T&D shall be supplied 600 MW of electricity at most by Tokyo PG and Chubu PG from 16:00 to 17:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
77	Issued at	15:36 on January 8, 2021
	Instruction	・Chubu PG shall supply 300 MW of electricity at most to Chugoku NW from 16:00 to 17:00. ・Chugoku NW shall be supplied 300 MW of electricity at most by Chubu PG from 16:00 to 17:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
78	Issued at	15:36 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 50 MW of electricity to Kyushu T&D from 16:00 to 17:00. ・Tokyo PG shall supply 450 MW of electricity at most to Kyushu T&D from 16:00 to 17:00. ・Kyushu T&D shall be supplied 500 MW of electricity at most by Hokkaido NW and Tokyo PG from 16:00 to 17:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
79	Issued at	16:39 on January 8, 2021
	Instruction	・Chubu PG shall supply 100 MW of electricity to Hokuriku T&D from 17:00 to 18:00. ・Hokuriku T&D shall be supplied 100 MW of electricity by Chubu PG from 17:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
80	Issued at	16:39 on January 8, 2021
	Instruction	・Tokyo PG shall supply 450 MW of electricity at most to Kansai T&D from 17:00 to 18:00. ・Chubu PG shall supply 300 MW of electricity at most to Kansai T&D from 17:00 to 18:00. ・Kansai T&D shall be supplied 500 MW of electricity by Tokyo PG and Chubu PG from 17:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
81	Issued at	16:39 on January 8, 2021
	Instruction	・Tokyo PG shall supply 400 MW of electricity to Chugoku NW from 17:00 to 18:00. ・Chugoku NW shall be supplied 400 MW of electricity by Tokyo PG from 17:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.

82	Issued at	16:39 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity at most to Kyushu T&D from 17:00 to 18:00. ・Tokyo PG shall supply 350 MW of electricity at most to Kyushu T&D from 17:00 to 18:00. ・Kyushu T&D shall be supplied 440 MW of electricity at most by Hokkaido NW and Tokyo PG from 17:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
83	Issued at	17:41 on January 8, 2021
	Instruction	・Tokyo PG shall supply 320 MW of electricity at most to Kansai T&D from 18:00 to 19:00. ・Chubu PG shall supply 170 MW of electricity at most to Kansai T&D from 18:00 to 19:00. ・Kansai T&D shall be supplied 500 MW of electricity at most by Tokyo PG and Chubu PG from 18:00 to 19:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
84	Issued at	17:41 on January 8, 2021
	Instruction	・Tokyo PG shall supply 400 MW of electricity to Chugoku NW from 18:00 to 19:00. ・Chugoku NW shall be supplied 400 MW of electricity by Tokyo PG from 18:00 to 19:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
85	Issued at	17:41 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 170 MW of electricity at most to Kyushu T&D from 18:00 to 19:00. ・Tokyo PG shall supply 500 MW of electricity to Kyushu T&D from 18:00 to 19:00. ・Kyushu T&D shall be supplied 670 MW of electricity at most by Hokkaido NW and Tokyo PG from 18:00 to 19:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
86	Issued at	18:31 on January 8, 2021
	Instruction	・Chubu PG shall supply 200 MW of electricity to Kansai T&D from 19:00 to 20:00. ・Kansai T&D shall be supplied 200 MW of electricity by Chubu PG from 19:00 to 20:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
87	Issued at	18:31 on January 8, 2021
	Instruction	・Tokyo PG shall supply 900 MW of electricity at most to Chugoku NW from 19:00 to 20:00. ・Chubu PG shall supply 100 MW of electricity to Chugoku NW from 19:00 to 20:00. ・Chugoku NW shall be supplied 1000 MW electricity at most by Tokyo PG and Chubu PG from 19:00 to 20:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
88	Issued at	18:31 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 190 MW of electricity at most to Kyushu T&D from 19:00 to 20:00. ・Tohoku NW shall supply 220 MW of electricity at most to Kyushu T&D from 19:00 to 20:00. ・Tokyo PG shall supply 190 MW of electricity at most to Kyushu T&D from 19:00 to 20:00. ・Kyushu T&D shall be supplied 500 MW of electricity at most by Hokkaido NW, Tohoku NW, and Tokyo PG from 19:00 to 20:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
89	Issued at	19:26 on January 8, 2021
	Instruction	・Tokyo PG shall supply 500 MW of electricity to Kansai T&D from 20:00 to 21:00. ・Kansai T&D shall be supplied 500 MW of electricity by Tokyo PG from 20:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.

90	Issued at	19:26 on January 8, 2021
	Instruction	・Tohoku NW shall supply 240 MW of electricity at most to Chugoku NW from 20:00 to 21:00. ・Tokyo PG shall supply 630 MW of electricity at most to Chugoku NW from 20:00 to 21:00. ・Chugoku NW shall be supplied 670 MW electricity at most by Tohoku NW and Tokyo PG from 20:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
91	Issued at	19:26 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 190 MW of electricity at most to Kyushu T&D from 20:00 to 21:00. ・Tohoku NW shall supply 2 MW of electricity to Kyushu T&D from 20:00 to 21:00. ・Kyushu T&D shall be supplied 200 MW of electricity at most by Hokkaido NW and Tohoku NW from 20:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
92	Issued at	20:39 on January 8, 2021
	Instruction	・Chubu PG shall supply 660 MW of electricity at most to Kansai T&D from 21:00 to 22:00. ・Kansai T&D shall be supplied 660 MW of electricity at most by Chubu PG from 21:00 to 22:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
93	Issued at	20:39 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 190 MW of electricity at most to Chugoku NW from 21:00 to 22:00. ・Tohoku NW shall supply 500 MW of electricity at most to Chugoku NW from 21:00 to 22:00. ・Tokyo PG shall supply 990 MW of electricity at most to Chugoku NW from 21:00 to 22:00. ・Chubu PG shall supply 360 MW of electricity at most to Chugoku NW from 21:00 to 22:00. ・Hokuriku T&D shall supply 50 MW of electricity at most to Chugoku NW from 21:00 to 22:00. ・Chugoku NW shall be supplied 1800 MW of electricity at most by Hokkaido NW, Tohoku NW, Tokyo PG, Chubu PG, and Hokuriku T&D from 21:00 to 22:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
94	Issued at	21:41 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 120 MW of electricity at most to Chugoku NW from 22:00 to 23:00. ・Chubu PG shall supply 750 MW of electricity at most to Chugoku NW from 22:00 to 23:00. ・Hokuriku T&D shall supply 50 MW of electricity to Chugoku NW from 22:00 to 23:00. ・Chugoku NW shall be supplied 920 MW of electricity at most by Chubu PG and Hokuriku T&D from 22:00 to 23:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
95	Issued at	22:22 on January 8, 2021
	Instruction	・Hokkaido NW shall supply 190 MW of electricity to Chugoku NW from 23:00 to 24:00. ・Chubu PG shall supply 200 MW of electricity to Chugoku NW from 23:00 to 24:00. ・Hokuriku T&D shall supply 100 MW of electricity to Chugoku NW from 23:00 to 24:00. ・Chugoku NW shall be supplied 500 MW of electricity by Hokkaido NW, Chubu PG and Hokuriku T&D from 23:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
96	Issued at	23:21 on January 8, 2021
	Instruction	・Hokuriku T&D shall supply 100 MW of electricity to Chugoku NW from 0:00 to 01:00 on January 9. ・Chugoku NW shall be supplied100 MW of electricity by Hokuriku T&D from 0:00 to 01:00 on January 9.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.

97	Issued at	00:29 on January 9, 2021
	Instruction	・Hokuriku T&D shall supply 150 MW of electricity to Chugoku NW from 1:00 to 01:30. ・Chugoku NW shall be supplied150 MW of electricity by Hokuriku T&D from 1:00 to 01:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
98	Issued at	00:52 on January 9, 2021
	Instruction	・Tohoku NW shall supply 500 MW of electricity at most to Chugoku NW from 01:30 to 02:30. ・Tokyo PG shall supply 1000 MW of electricity at most to Chugoku NW from 01:30 to 03:00. ・Chugoku NW shall be supplied 1000 MW of electricity at most by Tohoku NW and Tokyo PG from 01:30 to 03:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
99	Issued at	02:29 on January 9, 2021
	Instruction	・Tokyo PG shall supply 1500 MW of electricity at most to Chugoku NW from 03:00 to 04:00. ・Chugoku NW shall be supplied 1500 MW of electricity at most by Tokyo PG from 03:00 to 04:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
100	Issued at	03:31 on January 9, 2021
	Instruction	・Tokyo PG shall supply 1000 MW of electricity at most to Chugoku NW from 04:00 to 05:00. ・Chubu PG shall supply 500 MW of electricity to Chugoku NW from 04:00 to 05:00. ・Chugoku NW shall be supplied 1500 MW of electricity at most by Tokyo PG and Chubu PG from 04:00 to 05:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
101	Issued at	04:20 on January 9, 2021
	Instruction	・Tokyo PG shall supply 630 MW of electricity at most to Kansai T&D from 05:00 to 06:00. ・Kansai T&D shall be supplied 630 MW of electricity at most by Tokyo PG from 05:00 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
102	Issued at	04:20 on January 9, 2021
	Instruction	・Tokyo PG shall supply 500 MW of electricity to Chugoku NW from 05:00 to 06:00. ・Chugoku NW shall be supplied 500 MW of electricity by Tokyo PG from 05:00 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
103	Issued at	04:20 on January 9, 2021
	Instruction	・Chubu PG shall supply 500 MW of electricity to Kyushu T&D from 05:00 to 06:00. ・Kyushu T&D shall be supplied 500 MW of electricity by Chubu PG from 05:00 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
104	Issued at	05:08 on January 9, 2021
	Instruction	・Tohoku NW shall supply 120 MW of electricity to Kansai T&D from 10:30 to 11:00. ・Tokyo PG shall supply 660 MW of electricity at most to Kansai T&D from 06:00 to 09:00. ・Chubu PG shall supply 500 MW of electricity at most to Kansai T&D from 09:00 to 11:00. ・Kansai T&D shall be supplied 660 MW of electricity at most by Tohoku NW, Tokyo PG and Chugoku PG from 06:00 to 11:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.

105	Issued at	05:08 on January 9, 2021
	Instruction	・Tohoku NW shall supply 320 MW of electricity at most to Chugoku NW from 9:00 to 11:00. ・Tokyo PG shall supply 450 MW of electricity at most to Chugoku NW from 6:00 to 10:00. ・Chubu PG shall supply 100 MW of electricity at most to Chugoku NW from 9:00 to 10:30. ・Chugoku NW shall be supplied 500 MW of electricity at most by Tohoku NW, Tokyo PG and Chubu PG from 06:00 to 11:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
106	Issued at	05:08 on January 9, 2021
	Instruction	・Tohoku NW shall supply 500 MW of electricity at most to Kyushu T&D from 6:00 to 11:00. ・Tokyo PG shall supply 370 MW of electricity at most to Kyushu T&D from 6:00 to 09:00. ・Kyushu T&D shall be supplied 610 MW of electricity by Tohoku NW and Tokyo PG from 6:00 to 11:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
107	Issued at	06:25 on January 9, 2021
	Instruction	・Hokuriku T&D shall supply 200 MW of electricity to Kansai T&D from 07:00 to 09:00. ・Shikoku T&D shall supply 60 MW of electricity at most to Kansai T&D from 08:00 to 09:00. ・Kansai T&D shall be supplied 260 MW of electricity at most by Hokuriku T&D and Shikoku T&D from 07:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
108	Issued at	08:13 on January 9, 2021
	Instruction	・Hokuriku T&D shall supply 100 MW of electricity to Kansai T&D from 09:00 to 10:00. ・Kansai T&D shall be supplied 100 MW of electricity by Hokuriku T&D from 09:00 to 10:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
109	Issued at	09:20 on January 9, 2021
	Instruction	・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from 10:00 to 11:00. ・Kansai T&D shall be supplied 50 MW of electricity by Hokuriku T&D from 10:00 to 11:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
110	Issued at	11:05 on January 9, 2021
	Instruction	・Tohoku NW shall supply 200 MW of electricity at most to Kansai T&D from 14:00 to 15:00. ・Chubu PG shall supply 700 MW of electricity to Kansai T&D from 11:30 to 15:00. ・Kansai T&D shall be supplied 50 MW of electricity at most by Tohoku NW and Chubu PG from 11:30 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
111	Issued at	11:05 on January 9, 2021
	Instruction	・Tohoku NW shall supply 300 MW of electricity at most to Kyushu T&D from 11:30 to 15:00. ・Tokyo PG shall supply 100 MW of electricity to Kyushu T&D from 13:00 to 13:30. ・Chubu PG shall supply 100 MW of electricity at most to Kyushu T&D from 11:30 to 14:00. ・Kyushu T&D shall be supplied 380 MW of electricity at most by Tohoku NW, Tokyo PG and Chubu PG from 11:30 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
112	Issued at	11:11 on January 9, 2021
	Instruction	・Shikoku T&D shall supply 70 MW of electricity at most to Kansai T&D from 11:30 to 15:00. ・Kansai T&D shall be supplied 50 MW of electricity at most by Shikoku T&D from 11:30 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.

113	Issued at	13:41 on January 9, 2021
	Instruction	・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from 15:00 to 17:00. ・Kansai T&D shall be supplied 50 MW of electricity by Hokuriku T&D from 15:00 to 17:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
114	Issued at	14:19 on January 9, 2021
	Instruction	・Tokyo PG shall supply 770 MW of electricity at most to Kansai T&D from 15:00 to 17:00. ・Chubu PG shall supply 500 MW of electricity to Kansai T&D from 15:00 to 16:00. ・Kansai T&D shall be supplied 900 MW of electricity at most by Tokyo PG and Chubu PG from 15:00 to 17:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
115	Issued at	14:19 on January 9, 2021
	Instruction	・Tohoku NW shall supply 500 MW of electricity at most to Kyushu T&D from 15:00 to 17:00. ・Tokyo PG shall supply 650 MW of electricity at most to Kyushu T&D from 15:00 to 17:00. ・Kyushu T&D shall be supplied 900 MW of electricity at most by Tohoku NW and Tokyo PG from 15:00 to 17:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
116	Issued at	16:08 on January 9, 2021
	Instruction	・Tokyo PG shall supply 520 MW of electricity at most to Kansai T&D from 17:00 to 19:00. ・Kansai T&D shall be supplied 520 MW of electricity at most by Tokyo PG from 17:00 to 19:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
117	Issued at	16:08 on January 9, 2021
	Instruction	・Tokyo PG shall supply 570 MW of electricity at most to Kyushu T&D from 17:00 to 19:00. ・Kyushu T&D shall be supplied 570 MW of electricity at most by Tokyo PG from 17:00 to 19:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
118	Issued at	18:39 on January 9, 2021
	Instruction	・Tokyo PG shall supply 570 MW of electricity at most to Kansai T&D from 19:00 to 21:00. ・Kansai T&D shall be supplied 570 MW of electricity at most by Tokyo PG from 19:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
119	Issued at	18:39 on January 9, 2021
	Instruction	・Tohoku NW shall supply 330 MW of electricity at most to Kyushu T&D from 20:00 to 21:00. ・Tokyo PG shall supply 570 MW of electricity at most to Kyushu T&D from 19:00 to 21:00. ・Kyushu T&D shall be supplied 570 MW of electricity at most by Tohoku NW and Tokyo PG from 19:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
120	Issued at	20:42 on January 9, 2021
	Instruction	・Tohoku NW shall supply 450 MW of electricity at most to Kansai T&D from 21:00 to 24:00. ・Tokyo PG shall supply 350 MW of electricity at most to Kansai T&D from 21:00 to 24:00. ・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from from 21:00 to 24:00. ・Kansai T&D shall be supplied 850 MW of electricity at most by Tohoku NW, Tokyo PG and Hokuriku T&D from 21:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.

121	Issued at	20:42 on January 9, 2021
	Instruction	・Tohoku NW shall supply 430 MW of electricity at most to Kyushu T&D from 21:00 to 24:00. ・Kyushu T&D shall be supplied 430 MW of electricity at most by by Tohoku NW from 21:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
122	Issued at	23:25 on January 9, 2021
	Instruction	・Tokyo PG shall supply 600 MW of electricity at most to Kansai T&D from 00:00 to 06:00 on January 10. ・Hokuriku T&D shall supply 100 MW of electricity to Kansai T&D from from 00:00 to 06:00 on January 10. ・Kansai T&D shall be supplied 700 MW of electricity at most by Tokyo PG and Hokuriku T&D from 00:00 to 06:00 on January 10.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
123	Issued at	23:25 on January 9, 2021
	Instruction	・Tokyo PG shall supply 250 MW of electricity at most to Kyushu T&D from 03:00 to 06:00. ・Kyushu T&D shall be supplied 250 MW of electricity at most by by Tokyo PG from 03:00 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
124	Issued at	03:15 on January 10, 2021
	Instruction	・Hokuriku T&D shall supply 100 MW of electricity to Kansai T&D from from 05:00 to 06:00. ・Kansai T&D shall be supplied 100 MW of electricity by Hokuriku T&D from 05:00 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
125	Issued at	05:38 on January 10, 2021
	Instruction	・Tokyo PG shall supply 410 MW of electricity at most to Kansai T&D from 06:00 to 09:00. ・Chubu PG shall supply 550 MW of electricity to Kansai T&D from 07:00 to 09:00. ・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from from 06:00 to 09:00. ・Kansai T&D shall be supplied 970 MW of electricity at most by Tokyo PG, Chubu PG and Hokuriku T&D from 06:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
126	Issued at	05:38 on January 10, 2021
	Instruction	・Tokyo PG shall supply 440 MW of electricity at most to Kyushu T&D from 06:00 to 09:00. ・Kyushu T&D shall be supplied 440 MW of electricity at most by by Tokyo PG from 06:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
127	Issued at	06:23 on January 10, 2021
	Instruction	・Tokyo PG shall supply 370 MW of electricity at most to Kansai T&D from 08:00 to 09:00. ・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from from 08:00 to 09:00. ・Kansai T&D shall be supplied 420 MW of electricity at most by Tokyo PG and Hokuriku T&D 08:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
128	Issued at	06:23 on January 10, 2021
	Instruction	・Hokuriku T&D shall supply 50 MW of electricity to Kyushu T&D from from 07:00 to 08:00. ・Kyushu T&D shall be supplied 50 MW of electricity by Hokuriku T&D 07:00 to 08:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.

129	Issued at	07:43 on January 10, 2021
	Instruction	・Tokyo PG shall supply 180 MW of electricity to Kansai T&D from 09:00 to 09:30. ・Chubu PG shall supply 550 MW of electricity at most to Kansai T&D from 09:00 to 10:00. ・Hokuriku T&D shall supply 200 MW of electricity to Kansai T&D from from 09:00 to 09:30. ・Kansai T&D shall be supplied 930 MW of electricity at most by Tokyo PG, Chubu PG and Hokuriku T&D from 09:00 to 10:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
130	Issued at	07:43 on January 10, 2021
	Instruction	・Tokyo PG shall supply 690 MW of electricity at most to Kyushu T&D from 09:00 to 12:00. ・Chubu PG shall supply 550 MW of electricity at most to Kyushu T&D from 09:30 to 12:00. ・Hokuriku T&D shall supply 200 MW of electricity to Kyushu T&D from from 09:30 to 12:00. ・Kyushu T&D shall be supplied 1440 MW of electricity at most by Tokyo PG, Chubu PG and Hokuriku T&D from 09:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
131	Issued at	08:20 on January 10, 2021
	Instruction	・Shikoku T&D shall supply 140 MW of electricity to Kansai T&D from 09:30 to 10:00. ・Kansai T&D shall be supplied 140 MW of electricity by Shikoku T&D from 09:30 to 10:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
132	Issued at	09:02 on January 10, 2021
	Instruction	・Hokuriku T&D shall supply 100 MW of electricity to Kyushu T&D from from 11:00 to 12:00. ・Kyushu T&D shall be supplied 100 MW of electricity by Hokuriku T&D 11:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
133	Issued at	11:00 on January 10, 2021
	Instruction	・Tokyo PG shall supply 340 MW of electricity at most to Kyushu T&D from 12:00 to 15:00. ・Chubu PG shall supply 550 MW of electricity to Kyushu T&D from 12:00 to 15:00. ・Hokuriku T&D shall supply 250 MW of electricity to Kyushu T&D from from 12:00 to 15:00. ・Kyushu T&D shall be supplied 1140 MW of electricity at most by Tokyo PG, Chubu PG and Hokuriku T&D from 12:00 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
134	Issued at	12:05 on January 10, 2021
	Instruction	・Shikoku T&D shall supply 140 MW of electricity at most to Kansai T&D from 14:30 to 16:00. ・Kansai T&D shall be supplied 140 MW of electricity at most by Shikoku T&D from 14:30 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
135	Issued at	14:13 on January 10, 2021
	Instruction	・Tokyo PG shall supply 670 MW of electricity at most to Kyushu T&D from 15:00 to 16:00. ・Chubu PG shall supply 550 MW of electricity to Kyushu T&D from 15:00 to 16:00. ・Hokuriku T&D shall supply 350 MW of electricity to Kyushu T&D from from 15:00 to 16:00. ・Kyushu T&D shall be supplied 1570 MW of electricity at most by Tokyo PG, Chubu PG and Hokuriku T&D from 15:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.

136	Issued at	15:10 on January 10, 2021
	Instruction	・Tokyo PG shall supply 290 MW of electricity at most to Kansai T&D from 16:00 to 18:00. ・Chubu PG shall supply 550 MW of electricity to Kansai T&D from 16:00 to 18:00. ・Hokuriku T&D shall supply 350 MW of electricity at most to Kansai T&D from from 16:00 to 18:00. ・Kansai T&D shall be supplied 1000 MW of electricity at most by Tokyo PG, Chubu PG and Hokuriku T&D from 16:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
137	Issued at	15:10 on January 10, 2021
	Instruction	・Tokyo PG shall supply 1090 MW of electricity at most to Kyushu T&D from 16:00 to 18:00. ・Kyushu T&D shall be supplied 1090 MW of electricity at most by by Tokyo PG from 16:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
138	Issued at	17:22 on January 10, 2021
	Instruction	・Tokyo PG shall supply 640 MW of electricity at most to Kansai T&D from 18:00 to 21:00. ・Kansai T&D shall be supplied 640 MW of electricity at most by by Tokyo PG from 18:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
139	Issued at	17:22 on January 10, 2021
	Instruction	・Tokyo PG shall supply 590 MW of electricity at most to Kyushu T&D from 18:00 to 21:00. ・Kyushu T&D shall be supplied 590 MW of electricity at most by Tokyo PG from 18:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
140	Issued at	20:38 on January 10, 2021
	Instruction	・Hokuriku T&D shall supply 50 MW of electricity to Kyushu T&D from from 22:00 to 24:00. ・Kyushu T&D shall be supplied 50 MW of electricity at most by Hokuriku T&D from 22:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
141	Issued at	22:51 on January 10, 2021
	Instruction	・Tokyo PG shall supply 600 MW of electricity to Kansai T&D from 23:30 to 24:00. ・Kansai T&D shall be supplied 600 MW of electricity by Tokyo PG from 23:30 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
142	Issued at	23:09 on January 10, 2021
	Instruction	・Tokyo PG shall supply 600 MW of electricity to Kansai T&D from 00:00 to 01:00 on January 11. ・Kansai T&D shall be supplied 600 MW of electricity by Tokyo PG from 00:00 to 01:00 on January 11.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
143	Issued at	00:08 on January 11, 2021
	Instruction	・Tohoku NW shall supply 600 MW of electricity to Kansai T&D from 01:00 to 02:00. ・Kansai T&D shall be supplied 600 MW of electricity by Tohoku NW from 01:00 to 02:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
144	Issued at	00:47 on January 11, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity at most to Kansai T&D from 02:00 to 08:00. ・Kansai T&D shall be supplied 140 MW of electricity at most by Hokkaido NW from 02:00 to 08:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.

145	Issued at	00:55 on January 11, 2021
	Instruction	・Chubu PG shall supply 470 MW of electricity to Kansai T&D from 01:30 to 02:00. ・Kansai T&D shall be supplied 470 MW of electricity by Chubu PG from 01:30 to 02:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
146	Issued at	01:26 on January 11, 2021
	Instruction	・Tohoku NW shall supply 450 MW of electricity to Kansai T&D from 02:00 to 03:00. ・Chubu PG shall supply 660 MW of electricity at most to Kansai T&D from 02:00 to 03:00. ・Kansai T&D shall be supplied 1110 MW of electricity at most by Tohoku NW and Chubu PG from 02:00 to 03:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
147	Issued at	01:53 on January 11, 2021
	Instruction	・Tohoku NW shall supply 450 MW of electricity at most to Kansai T&D from 03:00 to 06:00. ・Tokyo PG shall supply 300 MW of electricity at most to Kansai T&D from 03:00 to 04:00. ・Chubu PG shall supply 790 MW of electricity at most to Kansai T&D from 03:00 to 06:00. ・Kansai T&D shall be supplied 1240 MW of electricity at most by Tohoku NW, Tokyo PG and Chubu PG from 03:00 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
148	Issued at	04:54 on January 11, 2021
	Instruction	・Tohoku NW shall supply 720 MW of electricity at most to Kansai T&D from 06:00 to 08:00. ・Tokyo PG shall supply 900 MW of electricity at most to Kansai T&D from 08:00 to 09:00. ・Chubu PG shall supply 1170 MW of electricity at most to Kansai T&D from 06:00 to 09:00. ・Kansai T&D shall be supplied 1670 MW of electricity at most by Tohoku NW, Tokyo PG and Chubu PG from 06:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
149	Issued at	05:00 on January 11, 2021
	Instruction	・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from 05:30 to 07:00. ・Kansai T&D shall be supplied 50 MW of electricity by Hokuriku T&D from 05:30 to 07:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
150	Issued at	08:01 on January 11, 2021
	Instruction	・Tohoku NW shall supply 280 MW of electricity at most to Kansai T&D from 09:30 to 12:00. ・Tokyo PG shall supply 1190 MW of electricity at most to Kansai T&D from 09:00 to 12:00. ・Chubu PG shall supply 400 MW of electricity at most to Kansai T&D from 09:00 to 12:00. ・Kansai T&D shall be supplied 1590 MW of electricity at most by Tohoku NW, Tokyo PG and Chubu PG from 09:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
151	Issued at	11:38 on January 11, 2021
	Instruction	・Tohoku NW shall supply 950 MW of electricity at most to Kansai T&D from 12:00 to 15:00. ・Tokyo PG shall supply 790 MW of electricity at most to Kansai T&D from 12:00 to 14:00. ・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from 12:00 to 15:00. ・Kansai T&D shall be supplied 1340 MW of electricity at most by Tohoku NW, Tokyo PG and Hokuriku T&D from 12:00 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.

152	Issued at	12:51 on January 11, 2021
	Instruction	・Tohoku NW shall supply 250 MW of electricity at most to Kansai T&D from 13:30 to 15:00. ・Kansai T&D shall be supplied 250 MW of electricity at most by Tohoku NW from 13:30 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
153	Issued at	14:20 on January 11, 2021
	Instruction	・Tohoku NW shall supply 800 MW of electricity at most to Kansai T&D from 15:00 to 18:00. ・Chubu PG shall supply 400 MW of electricity to Kansai T&D from 15:00 to 16:00. ・Hokuriku T&D shall supply 200 MW of electricity at most to Kansai T&D from 15:00 to 17:00. ・Kansai T&D shall be supplied 1400 MW of electricity at most by Tohoku NW, Chubu PG and Hokuriku T&D from 15:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
154	Issued at	16:52 on January 11, 2021
	Instruction	・Tohoku NW shall supply 250 MW of electricity at most to Kansai T&D from 18:00 to 21:00. ・Chubu PG shall supply 550 MW of electricity to Kansai T&D from 20:00 to 21:00. ・Kansai T&D shall be supplied 750 MW of electricity at most by Tohoku NW and Chubu PG from 18:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
155	Issued at	19:47 on January 11, 2021
	Instruction	・Tohoku NW shall supply 780 MW of electricity at most to Kansai T&D from 21:00 to 24:00. ・Tokyo PG shall supply 630 MW of electricity at most to Kansai T&D from 22:00 to 23:00. ・Chubu PG shall supply 550 MW of electricity to Kansai T&D from 21:00 to 24:00. ・Kansai T&D shall be supplied 1590 MW of electricity at most by Tohoku NW, Tokyo PG and Chubu PG from 21:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
156	Issued at	23:21 on January 11, 2021
	Instruction	・Tokyo PG shall supply 1320 MW of electricity to Kansai T&D from 00:00 to 00:30 on January 12. ・Chubu PG shall supply 500 MW of electricity to Kansai T&D from 00:00 to 00:30 on January 12. ・Hokuriku T&D shall supply 70 MW of electricity to Kansai T&D from 00:00 to 00:30 on January 12. ・Kansai T&D shall be supplied 1890 MW of electricity by Tokyo PG, Chubu PG and Hokuriku T&D from 00:00 to 00:30 on January 12.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
157	Issued at	23:21 on January 11, 2021
	Instruction	・Tokyo PG shall supply 410 MW of electricity to Shikoku T&D from 00:00 to 00:30 on January 12. ・Shikoku T&D shall be supplied 410 MW of electricity by Tokyo PG from 00:00 to 00:30 on January 12.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
158	Issued at	23:54 on January 11, 2021
	Instruction	・Tokyo PG shall supply 640 MW of electricity at most to Kansai T&D from 00:30 to 03:00. ・Chubu PG shall supply 500 MW of electricity to Kansai T&D from 00:30 to 03:00. ・Hokuriku T&D shall supply 70 MW of electricity to Kansai T&D from 00:30 to 03:00. ・Kansai T&D shall be supplied 1210 MW of electricity at most by Tokyo PG, Chubu PG and Hokuriku T&D from 00:30 to 03:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.

159	Issued at	23:54 on January 11, 2021
	Instruction	・Tokyo PG shall supply 400 MW of electricity at most to Shikoku T&D from 00:30 to 03:00. ・Shikoku T&D shall be supplied 400 MW of electricity at most by Tokyo PG from 00:30 to 03:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
160	Issued at	00:56 on January 12, 2021
	Instruction	・Tohoku NW shall supply 130 MW of electricity at most to Shikoku T&D from 01:30 to 03:00. ・Shikoku T&D shall be supplied 130 MW of electricity at most by Chugoku NW from 01:30 to 03:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
161	Issued at	01:16 on January 12, 2021
	Instruction	・Hokuriku T&D shall supply 100 MW of electricity to Kansai T&D from 02:00 to 03:00. ・Kansai T&D shall be supplied 100 MW of electricity by Hokuriku T&D from 02:00 to 03:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
162	Issued at	02:04 on January 12, 2021
	Instruction	・Tokyo PG shall supply 830 MW of electricity at most to Kansai T&D from 03:00 to 06:00. ・Chubu PG shall supply 500 MW of electricity to Kansai T&D from 03:00 to 06:00. ・Hokuriku T&D shall supply 100 MW of electricity to Kansai T&D from 03:00 to 06:00. ・Kansai T&D shall be supplied 1430 MW of electricity at most by Tokyo PG, Chubu PG and Hokuriku T&D from 03:00 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
163	Issued at	02:04 on January 12, 2021
	Instruction	・Tokyo PG shall supply 190 MW of electricity at most to Shikoku T&D from 03:00 to 06:00. ・Shikoku T&D shall be supplied 190 MW of electricity at most by Tokyo PG from 03:00 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
164	Issued at	02:04 on January 12, 2021
	Instruction	・Tokyo PG shall supply 130 MW of electricity at most to Chugoku NW from 04:30 to 06:00. ・Chugoku NW shall be supplied 130 MW of electricity at most by Tokyo PG from 04:30 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
165	Issued at	04:16 on January 12, 2021
	Instruction	・Tohoku NW shall supply 430 MW of electricity at most to Kansai T&D from 06:00 to 08:00. ・Kansai T&D shall be supplied 430 MW of electricity at most by Tohoku NW from 06:00 to 08:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
166	Issued at	04:16 on January 12, 2021
	Instruction	・Tohoku NW shall supply 540 MW of electricity at most to Shikoku T&D from 06:00 to 08:00. ・Shikoku T&D shall be supplied 540 MW of electricity at most by Tohoku NW from 06:00 to 08:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
167	Issued at	04:16 on January 12, 2021
	Instruction	・Tohoku NW shall supply 500 MW of electricity to Chugoku NW from 06:00 to 08:00. ・Chugoku NW shall be supplied 500 MW of electricity by Tohoku NW from 06:00 to 08:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.

168	Issued at	08:52 on January 12, 2021
	Instruction	・Chubu PG shall supply 300 MW of electricity to Kansai T&D from 09:30 to 11:00. ・Kansai T&D shall be supplied 300 MW of electricity by Chubu PG from 09:30 to 11:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
169	Issued at	09:51 on January 12, 2021
	Instruction	・Tohoku NW shall supply 130 MW of electricity at most to Shikoku T&D from 10:30 to 12:00. ・Shikoku T&D shall be supplied 130 MW of electricity at most by Tohoku NW from 10:30 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
170	Issued at	11:20 on January 12, 2021
	Instruction	・Chubu PG shall supply 150 MW of electricity to Shikoku T&D from 12:00 to 14:00. ・Kyushu T&D shall supply 300 MW of electricity to Shikoku T&D from 12:00 to 14:00. ・Shikoku T&D shall be supplied 450 MW of electricity by Chubu PG and Kyushu T&D from 12:00 to 14:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
171	Issued at	11:33 on January 12, 2021
	Instruction	・Tohoku NW shall supply 110 MW of electricity at most to Kansai T&D from 12:00 to 13:30. ・Kansai T&D shall be supplied 110 MW of electricity at most by Tohoku NW from 12:00 to 13:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
172	Issued at	13:10 on January 12, 2021
	Instruction	・Chubu PG shall supply 500 MW of electricity to Kansai T&D from 14:00 to 16:00. ・Kansai T&D shall be supplied 500 MW of electricity by Chubu PG from 14:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
173	Issued at	13:22 on January 12, 2021
	Instruction	・Tohoku NW shall supply 160 MW of electricity at most to Shikoku T&D from 14:00 to 16:00. ・Shikoku T&D shall be supplied 160 MW of electricity at most by Tohoku NW from 14:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
174	Issued at	14:05 on January 12, 2021
	Instruction	・Tohoku NW shall supply 380 MW of electricity at most to Kansai T&D from 14:30 to 16:00. ・Kansai T&D shall be supplied 380 MW of electricity at most by Tohoku NW from 14:30 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
175	Issued at	15:19 on January 12, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity at most to Kansai T&D from 16:00 to 20:00. ・Tohoku NW shall supply 400 MW of electricity to Kansai T&D from 16:00 to 16:30. ・Kansai T&D shall be supplied 450 MW of electricity at most by Hokkaido NW and Tohoku NW from 16:00 to 20:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
176	Issued at	15:19 on January 12, 2021
	Instruction	・Hokkaido NW shall supply 140 MW of electricity to Shigoku T&D from 20:00 to 24:00. ・Shikoku T&D shall be supplied 140 MW of electricity by Hokkaido NW from 20:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.

177	Issued at	16:16 on January 12, 2021
	Instruction	・Hokkaido NW shall supply 300 MW of electricity at most to Kansai T&D from 17:00 to 19:00. ・Tokyo PG shall supply 500 MW of electricity to Kansai T&D from 17:00 to 19:00. ・Chubu PG shall supply 300 MW of electricity to Kansai T&D from 17:00 to 19:00. ・Kansai T&D shall be supplied 830 MW of electricity at most by Hokkaido NW, Tokyo PG and Chubu PG from 17:00 to 19:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
178	Issued at	18:23 on January 12, 2021
	Instruction	・Tohoku NW shall supply 410 MW of electricity at most to Chugoku NW from 20:00 to 22:00. ・Chubu PG shall supply 300 MW of electricity at most to Chugoku NW from 19:00 to 22:00. ・Chugoku NW shall be supplied 710 MW of electricity at most by Tohoku NW and Chubu PG from 19:00 to 22:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
179	Issued at	18:23 on January 12, 2021
	Instruction	・Tohoku NW shall supply 130 MW of electricity at most to Shikoku T&D from 19:00 to 22:00. ・Chubu PG shall supply 80 MW of electricity at most to Shikoku T&D from 19:00 to 20:00. ・Shikoku T&D shall be supplied 190 MW of electricity at most by Tohoku NW and ChubuPG from 19:00 to 22:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
180	Issued at	21:19 on January 12, 2021
	Instruction	・Tohoku NW shall supply 1010 MW of electricity at most to Chugoku NW from 22:00 to 24:00. ・Tokyo PG shall supply 830 MW of electricity at most to Chugoku NW from 22:00 to 24:00. ・Chubu PG shall supply 30 MW of electricity at most to Chugoku NW from 22:00 to 24:00. ・Hokuriku T&D shall supply 110 MW of electricity to Chugoku NW from 23:00 to 24:00. ・Chugoku NW shall be supplied 1880 MW of electricity at most by Tohoku NW, Tokyo PG, Chubu PG, and Hokuriku T&D from 22:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
181	Issued at	21:19 on January 12, 2021
	Instruction	・Tohoku NW shall supply 400 MW of electricity at most to Shikoku T&D from 22:00 to 24:00. ・Shikoku T&D shall be supplied 400 MW of electricity at most by Tohoku NW from 22:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
182	Issued at	23:34 on January 12, 2021
	Instruction	・Tokyo PG shall supply 800 MW of electricity at most to Kansai T&D from 00:00 to 06:00 on January 13. ・Chubu PG shall supply 500 MW of electricity at most to Kansai T&D from 00:00 to 06:00 on January 13. ・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from 00:00 to 01:30 on January 13. ・Kansai T&D shall be supplied 1350 MW of electricity at most by Tokyo PG, Chubu PG and Hokuriku T&D from 00:00 to 06:00 on January 13.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
183	Issued at	23:34 on January 12, 2021
	Instruction	・Chubu PG shall supply 1000 MW of electricity at most to Chugoku NW from 00:00 to 06:00 on January 13. ・Chugoku NW shall be supplied 1000 MW of electricity at most by Chubu PG from 00:00 to 06:00 on January 13.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.

184	Issued at	23:34 on January 12, 2021
	Instruction	・Tohoku NW shall supply 700 MW of electricity at most to Shikoku T&D from 00:00 to 06:00 on January 13. ・Tokyo PG shall supply 300 MW of electricity at most to Shikoku T&D from 00:30 to 06:00 on January 13. ・Shikoku T&D shall be supplied 700 MW of electricity at most by Tohoku NW and Tokyo PG from 00:00 to 06:00 on January 13.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
185	Issued at	05:11 on January 13, 2021
	Instruction	・Chubu PG shall supply 410 MW of electricity at most to Shikoku T&D from 06:00 to 09:00. ・Kansai T&D shall be supplied 410 MW of electricity at most by Chubu PG from 06:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
186	Issued at	05:11 on January 13, 2021
	Instruction	・Tohoku NW shall supply 470 MW of electricity at most to Chugoku NW from 06:00 to 08:00. ・Tokyo PG shall supply 1240 MW of electricity at most to Chugoku NW from 06:00 to 09:00. ・Chubu PG shall supply 550 MW of electricity at most to Chugoku NW from 06:00 to 09:00. ・Chugoku NW shall be supplied 1500 MW of electricity at most by Tohoku NW, Tokyo PG, and Chubu PG from 06:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
187	Issued at	05:11 on January 13, 2021
	Instruction	・Tohoku NW shall supply 700 MW of electricity at most to Shikoku T&D from 06:00 to 08:00. ・Tokyo PG shall supply 150 MW of electricity at most to Shikoku T&D from 08:00 to 09:00. ・Shikoku T&D shall be supplied 700 MW of electricity at most by Tohoku NW and Tokyo PG from 06:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
188	Issued at	05:44 on January 13, 2021
	Instruction	・Tokyo PG shall supply 150 MW of electricity to Shikoku T&D from 08:00 to 09:00. ・Shikoku T&D shall be supplied 150 MW of electricity by Tokyo PG from 08:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
189	Issued at	08:01 on January 13, 2021
	Instruction	・Tokyo PG shall supply 810 MW of electricity at most to Kansai T&D from 10:00 to 12:00. ・Chubu PG shall supply 800 MW of electricity at most to Kansai T&D from 09:00 to 12:00. ・Kansai T&D shall be supplied 1210 MW of electricity at most by Tokyo PG and Chubu PG from 09:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
190	Issued at	08:01 on January 13, 2021
	Instruction	・Tokyo PG shall supply 1360 MW of electricity at most to Chugoku NW from 09:00 to 10:30. ・Chubu PG shall supply 200 MW of electricity at most to Chugoku NW from 09:00 to 10:00. ・Chugoku NW shall be supplied 1500 MW of electricity at most byTokyo PG, and Chubu PG from 09:00 to 10:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
191	Issued at	08:01 on January 13, 2021
	Instruction	・Tokyo PG shall supply 460 MW of electricity at most to Shikoku T&D from 09:00 to 12:00. ・Shikoku T&D shall be supplied 460 MW of electricity at most by Tokyo PG from 09:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.

192	Issued at	08:53 on January 13, 2021
	Instruction	・Tokyo PG shall supply 340 MW of electricity at most to Shikoku T&D from 10:30 to 12:00. ・Shikoku T&D shall be supplied 340 MW of electricity at most by Tokyo PG from 10:30 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
193	Issued at	10:20 on January 13, 2021
	Instruction	・Kyushu T&D shall supply 400 MW of electricity to Kansai T&D from 11:30 to 12:00. ・Kansai T&D shall be supplied 400 MW of electricity by Kyushu T&D from 11:30 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
194	Issued at	11:16 on January 13, 2021
	Instruction	・Tokyo PG shall supply 1320 MW of electricity at most to Kansai T&D from 12:00 to 15:00. ・Chubu PG shall supply 1280 MW of electricity at most to Kansai T&D from 12:00 to 14:30. ・Kyushu T&D shall supply 350 MW of electricity at most to Kansai T&D from 12:00 to 13:30. ・Kansai T&D shall be supplied 2040 MW of electricity at most by Tokyo PG, Chubu PG and Kyushu T&D from 12:00 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
195	Issued at	11:16 on January 13, 2021
	Instruction	・Tokyo PG shall supply 60 MW of electricity at most to Shikoku T&D from 14:30 to 15:00. ・Chubu PG shall supply 200 MW of electricity at most to Shikoku T&D from 12:00 to 15:00. ・Kyushu T&D shall supply 470 MW of electricity at most to Shikoku T&D from 12:00 to 14:00. ・Shikoku T&D shall be supplied 470 MW of electricity at most by Tokyo PG, Chubu PG and Kyushu T&D from 12:00 to 15:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
196	Issued at	14:10 on January 13, 2021
	Instruction	・Tokyo PG shall supply 130 MW of electricity at most to Shikoku T&D from 16:00 to 18:00. ・Chubu PG shall supply 470 MW of electricity at most to Shikoku T&D from 15:00 to 16:00. ・Shikoku T&D shall be supplied 470 MW of electricity at most by Tokyo PG and Chubu PG from 15:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
197	Issued at	14:10 on January 13, 2021
	Instruction	・Tokyo PG shall supply 1580 MW of electricity at most to Kyushu T&D from 15:00 to 18:00. ・Chubu PG shall supply 100 MW of electricity at most to Kyushu T&D from 15:00 to 16:00. ・Kyushu T&D shall be supplied 1600 MW of electricity at most by Tokyo PG and Chubu PG from 15:00 to 18:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kyushu T&D due to prolonged cold weather.
198	Issued at	19:28 on January 13, 2021
	Instruction	・Tokyo PG shall supply 400 MW of electricity at most to Chugoku NW from 21:00 to 23:00. ・Chubu PG shall supply 1000 MW of electricity at most to Chugoku NW from 21:00 to 24:00. ・Hokuriku T&D shall supply 50 MW of electricity at most to Chugoku NW from 22:00 to 23:00. ・Chugoku NW shall be supplied 1000 MW of electricity at most by Tokyo PG, Chubu PG and Hokuriku T&D from 21:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.

199	Issued at	19:28 on January 13, 2021
	Instruction	・Tokyo PG shall supply 460 MW of electricity at most to Shikoku T&D from 20:30 to 24:00. ・Shikoku T&D shall be supplied 460 MW of electricity at most by Tokyo PG from 20:30 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
200	Issued at	19:54 on January 13, 2021
	Instruction	・Tohoku NW shall supply 800 MW of electricity at most to Kansai T&D from 20:30 to 24:00. ・Tokyo PG shall supply 780 MW of electricity at most to Kansai T&D from 20:30 to 24:00. ・Kansai T&D shall be supplied 1130 MW of electricity at most by Tohoku NW and Tokyo PG from 20:30 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
201	Issued at	22:32 on January 13, 2021
	Instruction	・Chubu PG shall supply 400 MW of electricity at most to Kansai T&D from 00:00 to 08:00 on January 14. ・Hokuriku T&D shall supply 50 MW of electricity at most to Kansai T&D from 00:00 to 01:00 on January 14. ・Kansai T&D shall be supplied 450 MW of electricity at most by Chubu PG and Hokuriku T&D from 00:00 to 08:00 on January 14.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
202	Issued at	01:54 on January 14, 2021
	Instruction	・Hokuriku T&D shall supply 100 MW of electricity at most to Kansai T&D from 02:30 to 06:00. ・Kansai T&D shall be supplied 100 MW of electricity at most by Hokuriku T&D from 02:30 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
203	Issued at	08:12 on January 14, 2021
	Instruction	・Chubu PG shall supply 740 MW of electricity at most to Kansai T&D from 09:00 to 11:30. ・Kyushu T&D shall supply 1040 MW of electricity at most to Kansai T&D from 09:00 to 12:00. ・Kansai T&D shall be supplied 1680 MW of electricity at most by Chubu PG and Kyushu T&D from 09:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
204	Issued at	11:22 on January 14, 2021
	Instruction	・Chubu PG shall supply 740 MW of electricity at most to Kansai T&D from 12:00 to 16:00. ・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from 12:30 to 13:30. ・Shikoku T&D shall supply 200 MW of electricity to Kansai T&D from 12:00 to 13:00. ・Kyushu T&D shall supply 810 MW of electricity at most to Kansai T&D from 12:00 to 16:00. ・Kansai T&D shall be supplied 1520 MW of electricity at most by Chubu PG, Hokuriku T&D, Shikoku T&D and Kyushu T&D from 12:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
205	Issued at	14:37 on January 14, 2021
	Instruction	・Hokuriku T&D shall supply 100 MW of electricity to Kansai T&D from 15:30 to 16:00. ・Kansai T&D shall be supplied 100 MW of electricity by Hokuriku T&D from 15:30 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
206	Issued at	15:28 on January 14, 2021
	Instruction	・Hokuriku T&D shall supply 100 MW of electricity at most to Kansai T&D from 16:00 to 21:00. ・Kyushu T&D shall supply 850 MW of electricity at most to Kansai T&D from 16:00 to 17:00. ・Kansai T&D shall be supplied 950 MW of electricity by Hokuriku T&D and Kyushu T&D from 16:00 to 21:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.

207	Issued at	19:58 on January 14, 2021
	Instruction	・Chubu PG shall supply 800 MW of electricity at most to Kansai T&D from 22:30 to 24:00. ・Hokuriku T&D shall supply 50 MW of electricity to Kansai T&D from 21:00 to 23:00. ・Kansai T&D shall be supplied 800 MW of electricity at most by Chubu PG and Hokuriku T&D from 21:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
208	Issued at	22:17 on January 14, 2021
	Instruction	・Tokyo PG shall supply 600 MW of electricity to Kansai T&D from 00:00 to 06:00 on January. 15. ・Chubu PG shall supply 400 MW of electricity at most to Kansai T&D from 00:00 to 06:00 on January. 15. ・Kansai T&D shall be supplied 1000 MW of electricity at most by Tokyo PG and Chubu PG from 00:00 to 06:00 on January. 15.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
209	Issued at	22:17 on January 14, 2021
	Instruction	・Chubu PG shall supply 300 MW of electricity at most to Chugoku NW from 03:00 to 06:00 on January. 15. ・Kyushu T&D shall supply 500 MW of electricity to Chugoku from 00:00 to 03:00 on January. 15. ・Chugoku NW shall be supplied 500 MW of electricity at most by Chubu PG and Kyushu T&D from 00:00 to 06:00 on January. 15.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Chugoku NW due to prolonged cold weather.
210	Issued at	07:34 on January 15, 2021
	Instruction	・Kyushu T&D shall supply 970 MW of electricity at most to Kansai T&D from 09:00 to 11:30. ・Kansai T&D shall be supplied 970 MW of electricity at most by Kyushu T&D from 09:00 to 11:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
211	Issued at	11:13 on January 15, 2021
	Instruction	・Tokyo PG shall supply 1000 MW of electricity to Kansai T&D from 12:00 to 13:00. ・Kyushu T&D shall supply 690 MW of electricity at most to Kansai T&D from 14:30 to 16:00. ・Kansai T&D shall be supplied 1000 MW of electricity at most by Tokyo PG and Kyushu T&D from 12:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Kansai T&D due to prolonged cold weather.
212	Issued at	20:47 on January 15, 2021
	Instruction	・Kyushu T&D shall supply 300 MW of electricity to Hokuriku T&D from 22:00 to 24:00. ・Hokuriku T&D shall be supplied 300 MW of electricity by Kyushu T&D from 22:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
213	Issued at	20:47 on January 15, 2021
	Instruction	・Kyushu T&D shall supply 200 MW of electricity to Shikoku T&D from 22:00 to 24:00. ・Shikoku T&D shall be supplied 200 MW of electricity by Kyushu T&D from 22:00 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
214	Issued at	22:29 on January 15, 2021
	Instruction	・Kyushu T&D shall supply 200 MW of electricity to Hokuriku T&D from 00:00 to 03:00 on January 16. ・Hokuriku T&D shall be supplied 200 MW of electricity by Kyushu T&D from 00:00 to 03:00 on January 16.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.

215	Issued at	22:29 on January 15, 2021
	Instruction	・Kyushu T&D shall supply 150 MW of electricity at most to Shikoku T&D from 00:00 to 03:00 on January 16. ・Shikoku T&D shall be supplied 150 MW of electricity at most by Kyushu T&D from 00:00 to 03:00 on January 16.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
216	Issued at	04:14 on January 16, 2021
	Instruction	・Kyushu T&D shall supply 200 MW of electricity to Hokuriku T&D from 08:30 to 09:00. ・Hokuriku T&D shall be supplied 200 MW of electricity by Kyushu T&D from 08:30 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
217	Issued at	06:49 on January 16, 2021
	Instruction	・Kyushu T&D shall supply 200 MW of electricity to Hokuriku T&D from 08:00 to 09:00. ・Hokuriku T&D shall be supplied 200 MW of electricity by Kyushu T&D from 08:00 to 09:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
218	Issued at	08:03 on January 16, 2021
	Instruction	・Tokyo PG shall supply 250 MW of electricity at most to Hokuriku T&D from 10:30 to 12:00. ・Kyushu T&D shall supply 300 MW of electricity at most to Hokuriku T&D from 09:00 to 10:30. ・Hokuriku T&D shall be supplied 300 MW of electricity at most by Tokyo PG and Kyushu T&D from 09:00 to 12:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
219	Issued at	11:01 on January 16, 2021
	Instruction	・Tokyo PG shall supply 400 MW of electricity at most to Hokuriku T&D from 12:00 to 16:00. ・Hokuriku T&D shall be supplied 400 MW of electricity at most by Tokyo PG from 12:00 to 16:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
220	Issued at	14:48 on January 16, 2021
	Instruction	・Tokyo PG shall supply 200 MW of electricity to Hokuriku T&D from 17:00 to 20:00. ・Hokuriku T&D shall be supplied 200 MW of electricity by Tokyo PG from 17:00 to 20:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
221	Issued at	14:48 on January 16, 2021
	Instruction	・Tokyo PG shall supply 300 MW of electricity to Shikoku T&D from 16:00 to 20:00. ・Shikoku T&D shall be supplied 300 MW of electricity by Tokyo PG from 16:00 to 20:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.
222	Issued at	20:17 on January 16, 2021
	Instruction	・Kyushu T&D shall supply 250 MW of electricity at most to Hokuriku T&D from 21:30 to 24:00. ・Hokuriku T&D shall be supplied 250 MW of electricity at most by Kyushu T&D from 21:30 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Hokuriku T&D due to prolonged cold weather.
223	Issued at	20:17 on January 16, 2021
	Instruction	・Kyushu T&D shall supply 100 MW of electricity to Shikoku T&D from 21:30 to 24:00. ・Shikoku T&D shall be supplied 100 MW of electricity by Kyushu T&D from 21:30 to 24:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity for balancing generators which is necessary for supply-demand balance in the regional service area of Shikoku T&D due to prolonged cold weather.

224	Issued at	01:36 on February 14, 2021
	Instruction	・Hokkaido NW shall supply 250 MW of electricity at most to Tohoku NW from 02:00 to 06:00. ・Chubu PG shall supply 1000 MW of electricity at most to Tohoku NW from 02:00 to 06:00. ・Kansai T&D shall supply 490 MW of electricity at most to Tohoku NW from 02:30 to 05:00. ・Tohoku NW shall be supplied 1440 MW of electricity at most by Hokkaido NW, Chubu PG and Kansai T&D from 02:00 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity in the regional service area of Tohoku NW due to earthquake.
225	Issued at	02:23 on February 14, 2021
	Instruction	・Tokyo PG shall supply 200 MW of electricity to Tohoku NW from 03:00 to 06:00. ・Tohoku NW shall be supplied 200 MW of electricity by Tokyo PG from 03:00 to 06:00.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity in the regional service area of Tohoku NW due to earthquake.
226	Issued at	04:51 on February 14, 2021
	Instruction	・Tokyo PG shall supply 175 MW of electricity at most to Tohoku NW from 06:00 to 08:30. ・Tohoku NW shall be supplied 175 MW of electricity at most by Tokyo PG from 06:00 to 08:30.
	Background	The supply–demand status may degrade without power exchanges through cross-regional interconnection lines because of shortage of supply capacity in the regional service area of Tohoku NW due to earthquake.

Actual Instructions and Requests to Generation Companies and Retail Companies by the Organization

[1]	Issued on	January 6, 2021
	Areas	・Hokkaido NW ・Tohoku NW ・Tokyo PG ・Chubu PG ・Hokuriku T&D ・Kansai T&D ・Chugoku NW ・Shikoku T&D ・Kyushu T&D
	Period	From January 6 (ASAP) to January 8 at 24:00 (in case of extending the period, it shall be informed individually)
	Companies	Generation companies and retail companies in the above stated areas (9 of 10 areas except Okinawa EPCO) (Subject companies shall be individually informed by the Organization)
	Instructions and Requests	<Subject companies in the regional areas of Tokyo PG and Kansai T&D> ・Generators shall be operated at their maximum power. ・Member companies of Japan Electric Power eXchange (JEPX) shall bring surplus power to the market which is generated by the instruction and request above. Further, generators shall be operated regardless of contract volume of the market. ・Operation of generators in actual condition shall be controlled by each transmission operating companies. <Subject companies in other areas> ・Member companies of JEPX shall bring surplus power to the market which is generated by the instruction and request above.
[2]	Issued on	January 8, 2021
	Areas	・Hokkaido NW ・Tohoku NW ・Tokyo PG ・Chubu PG ・Hokuriku T&D ・Kansai T&D ・Chugoku NW ・Shikoku T&D ・Kyushu T&D
	Period	From January 8 (ASAP) to January 15 at 24:00 (in case of extending the period, it shall be informed individually)
	Companies	Generation companies and retail companies in the above stated areas (9 of 10 areas except Okinawa EPCO) (Subject companies shall be individually informed by the Organization)
	Instructions and Requests	<Subject companies in the regional areas of Tokyo PG, Hokuriku T&D, Kansai T&D, Chugoku NW and Kyushu T&D> ・Generators shall be operated at their maximum power. ・Member companies of Japan Electric Power eXchange (JEPX) shall bring surplus power to the market which is generated by the instruction and request above. Further, generators shall be operated regardless of contract volume of the market. ・Operation of generators in actual condition shall be controlled by each transmission operating companies. <Subject companies in other areas> ・Member companies of JEPX shall bring surplus power to the market which is generated by the instruction and request above.

[3]	Issued on	January 14, 2021
	Areas	・Hokkaido NW ・Tohoku NW ・Tokyo PG ・Chubu PG ・Hokuriku T&D ・Kansai T&D ・Chugoku NW ・Shikoku T&D ・Kyushu T&D
	Period	From January 15 (ASAP) to January 31 at 24:00[13] (in case of extending the period, it shall be informed individually)
	Companies	Generation companies and retail companies in the above stated areas (9 of 10 areas except Okinawa EPCO) (Subject companies shall be individually informed by the Organization)
	Instructions and Requests	<Subject companies in the regional areas of Tokyo PG, Hokuriku T&D, Kansai T&D, Chugoku NW, Shikoku T&D and Kyushu T&D> ・Generators shall be operated at their maximum power. ・Member companies of Japan Electric Power eXchange (JEPX) shall bring surplus power to the market which is generated by the instruction and request above. Further, generators shall be operated regardless of contract volume of the market. ・Operation of generators in actual condition shall be controlled by each transmission operating companies. <Subject companies in other areas> ・Member companies of JEPX shall bring surplus power to the market which is generated by the instruction and request above.

[13] Following improvement in the supply–demand condition, the Organization has shortened and terminated the period for instructions and requests to 24:00 h on Januaryuary 26, which was originally issued for the period from Januaryuary 15 to Januaryuary 31.
https://www.occto.or.jp/oshirase/shiji/2021_0126_jukyushiji.html

Report on the Quality of Electricity Supply

- Data for Fiscal Year 2020 -

March 2022

電力広域的運営推進機関
Organization for Cross-regional Coordination of Transmission Operators,JAPAN

Introduction

Part of the role of the Organization for Cross-regional Coordination of Transmission Operators, Japan (OCCTO) is to evaluate supply reliability conditions in securing a stable electricity supply. For this purpose, OCCTO continuously gathers and publishes actual data on the quality of electricity supply according to the provisions of Article 181 of OCCTO's Operational Rules.

This report aggregates actual data for frequency, voltage, and interruptions under the title "Quality of Electricity Supply" and presents their evaluation of the data, which are collected from each regional service area for the 2020 fiscal year (FY 2020). With these data, OCCTO evaluates and analyzes whether frequencies or voltages have been maintained within certain parameters, or whether the occurrence of supply interruption has become more frequent. In addition, regarding supply interruption, although the data conditions are not uniform, a comparison with some European Union (EU) countries and major states in the United States (US) was conducted as a reference. OCCTO's objective is to facilitate the use of the aggregated data, evaluations, and analyses as a reference for the electricity business.

The data presented in the report were submitted by general transmission and distribution companies and aggregated by OCCTO according to the provisions of Article 268 of OCCTO's Network Codes.

SUMMARY

The quality of nationwide electricity supply in FY 2020 was reviewed in this report based on the provisions of Article 181 of OCCTO's Operational Rules.
Three aspects of the quality of electricity supply were evaluated in this report, namely, frequency, standard voltage, and interruption.
Although indices are available for evaluating each of these items, this report used the same indices as those published in previous years to allow for historical comparison.

Frequency
The frequency was analyzed using the frequency time-kept ratio, which is the ratio of time that the metered frequency is maintained within a given target control range. Four areas were grouped into synchronized frequency regions: Hokkaido, Eastern Japan, Central and Western Japan, and Okinawa. The transmission operators in the Eastern and Western areas of Japan use 50 Hz and 60 Hz, respectively.
For this report, the frequency time-kept ratios in these four synchronized regions were reviewed, and no deviation beyond the target control range was recognized.

Standard Voltage
The standard voltage was evaluated using the number of points where the standard voltage did not satisfy the target values, as defined by the enforcement regulations of the Electricity Business Act (hereafter, the Act), which sets the targets for transmission operators to maintain a standard voltage supply within a certain range of values.
Transmission operators handed in their data at OCCTO's request. Nationwide, no violation of standard voltage was observed among 6,589 points for 100 V and 6,525 points for 200 V.

Interruption
Finally, interruptions were monitored from three perspectives, the number of supply disturbances by the place of occurrence, the number of supply disturbances by cause, i.e., beyond the given standards in time duration and lost capacity, and System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI) values for low-voltage (LV) customers.
The first analysis indicated that the total number of supply disturbances was 14,348, which was almost the same as in FY 2019.
The second analysis divided the causes into two factors, i.e., maintenance problems or natural disasters, the latter being irrelevant to maintenance problems.
These analyses indicate that the total number of reported supply disturbances was 19, also similar to the number of disturbances in the previous year. The number of supply disturbances caused by natural disasters was 5, which was similar to the previous year.
The final analysis was the historical monitoring of SAIFI and SAIDI values, which were both at lower levels compared with the data from the past 5 years.

For reference, the report also compares SAIFI and SAIDI values with those of some EU countries and US states, although comparison is not straightforward given that index definitions are not identical across EU countries and US states.

We hope that this report will help to understand the quality of electricity supply in Japan.

CONTENTS

I. Frequency Data

1. Standard Frequency in Japan

General transmission and distribution companies must endeavor to maintain the frequency value of the electricity supply at the levels specified by the Ordinance of the Ministry of Economy, Trade and Industry, in principle according to the provisions of Article 26 of the Act. Figure 1 shows the regional service areas of the 10 general transmission and distribution companies and their standard frequency.

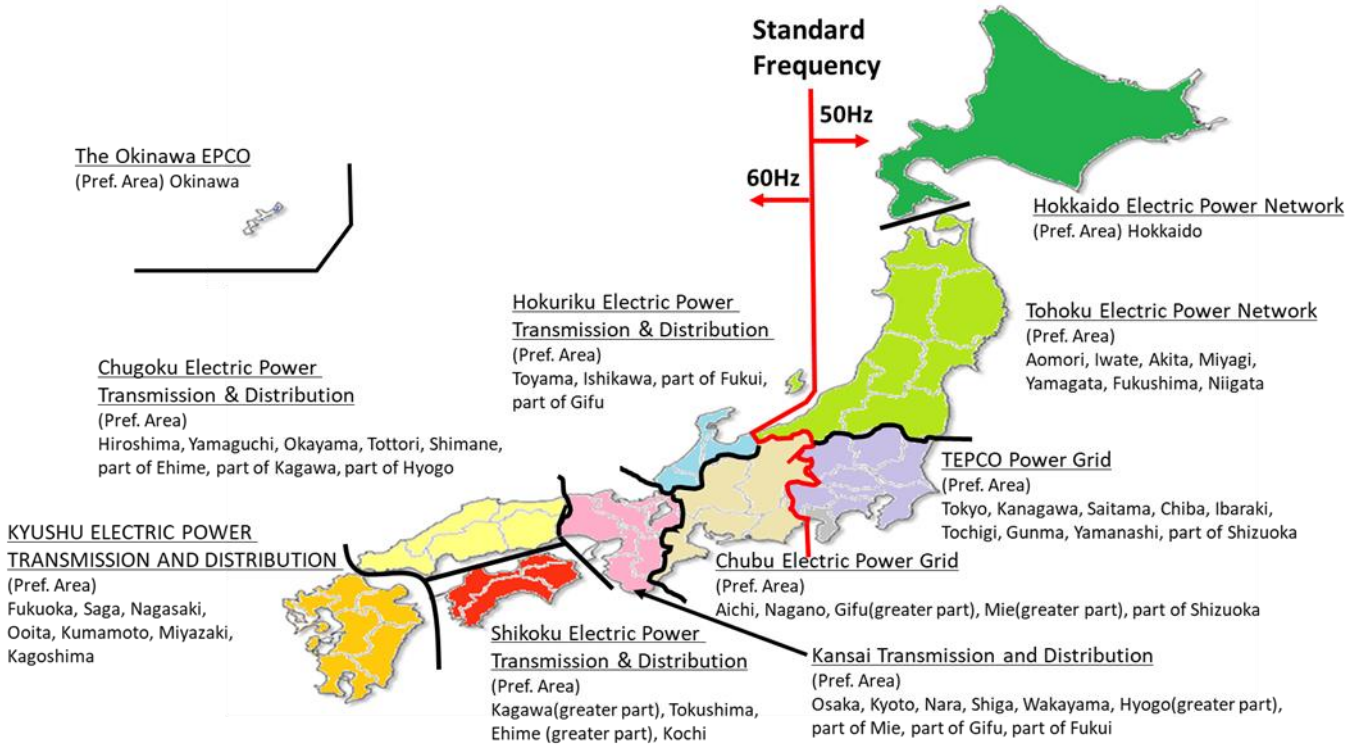

Figure 1　Regional service areas of the 10 general transmission and distribution companies and their standard frequency

2. Frequency Time-kept Ratio

The time-kept ratio is the criterion of maintained frequency. The time-kept ratio means the ratio of time that the metered frequency is maintained within a given variance of the standard, and is calculated by the following formula:

$$\text{Frequency Time-kept ratio}(\%) = \frac{\text{time that the metered frequency is maintained within a given variance of the standard}}{\text{total time in a given period}} \times 100$$

3. Frequency Control Rule [1]

According to the indices of the time-kept ratio formula, Table 1 shows the frequency control rule under normal conditions for the regional service areas.

Table 1　Frequency Control Rule under Normal Condition for the Regional Service Areas

Areas	Hokkaido	Tohoku, Tokyo	Chubu, Hokuriku, Kansai, Chugoku, Shikoku, Kyushu	Okinawa
Frequency Standard	50Hz	50Hz	60Hz	60Hz
Control Target(for Standard)	±0.3Hz	±0.2Hz	±0.2Hz	±0.3Hz
Target Time Kept Ratio within ±0.1Hz	—	—	95% over	—

[1] According to item 2 of Article 38 of the Ministerial Ordinance of the Act, frequency value defined by Ministerial Order is deemed to the same frequency that general transmission and distribution companies supplies; general transmission and distribution company sets respectively its frequency control target by its code, standard or manual.

4. Frequency Time-kept Ratio by Frequency-synchronized Region (FY 2016–2020)

Tables 2–5 show the frequency time-kept ratio by frequency-synchronized region from FY 2016 to 2020 and Figures 2–5 show the trend of maintaining the frequency within 0.1 Hz variance.

The frequency time-kept ratio set by general transmission and distribution companies was recorded as 100% in all regions for FY 2020. In the Central and Western Japan region, the target frequency time-kept ratio within 0.1 Hz variance for FY 2020 was 98.50%, which was slightly lower than that of the previous year, but above the target time-kept ratio of 95.00%.

【Criteria】

Control Target ··· 100.00%

Target Time Kept Ratio within ±0.1Hz ··· 95.00% Over

Table 2 Frequency Time Kept Ratio (Hokkaido, FY 2016–2020) [%]

Variance	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Within 0.1 Hz	99.96	99.97	99.86	99.98	99.93
Within 0.2 Hz	100.00	100.00	99.95	100.00	100.00
Within 0.3 Hz	100.00	100.00	99.98	100.00	100.00
Beyond 0.3 Hz	0.00	0.00	0.02	0.00	0.00

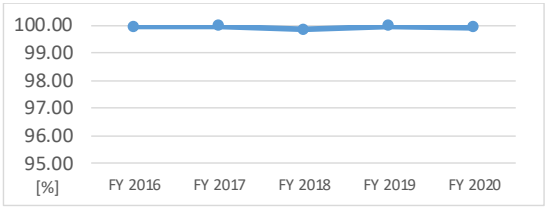

Figure 2 Frequency Time Kept Ratio within 0.1 Hz (Hokkaido, FY 2016-2020)

Table 3 Frequency Time Kept Ratio (Eastern region,[2] FY 2016–2020) [%]

Variance	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Within 0.1 Hz	99.78	99.80	99.84	99.83	99.71
Within 0.2 Hz	100.00	100.00	100.00	100.00	100.00
Within 0.3 Hz	100.00	100.00	100.00	100.00	100.00
Beyond 0.3 Hz	0.00	0.00	0.00	0.00	0.00

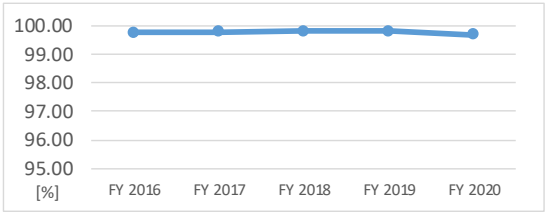

Figure 3 Frequency Time Kept Ratio within 0.1 Hz (Eastern region,[2] FY 2016-2020)

Table 4 Frequency Time Kept Ratio (Central & Western region,[3] FY 2016–2020) [%]

Variance	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Within 0.1 Hz	99.08	99.17	99.13	99.02	98.50
Within 0.2 Hz	100.00	100.00	100.00	100.00	100.00
Within 0.3 Hz	100.00	100.00	100.00	100.00	100.00
Beyond 0.3 Hz	0.00	0.00	0.00	0.00	0.00

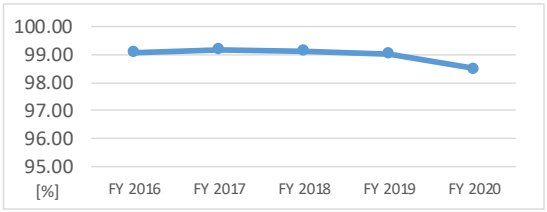

Figure 4 Frequency Time Kept Ratio (Central & Western region,[3] FY 2016–2020)

Table 5 Frequency Time Kept Ratio (Okinawa, FY 2016–2020) [%]

Variance	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Within 0.1 Hz	99.94	99.92	99.89	99.89	99.92
Within 0.2 Hz	100.00	100.00	100.00	100.00	100.00
Within 0.3 Hz	100.00	100.00	100.00	100.00	100.00
Beyond 0.3 Hz	0.00	0.00	0.00	0.00	0.00

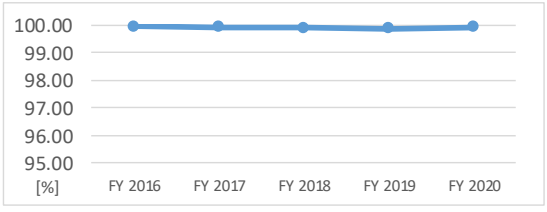

Figure 5 Frequency Time Kept Ratio (Okinawa, FY 2016–2020)

[2] Eastern region includes the regional service areas of the Tohoku Electric Power Network and TEPCO Power Grid. Actual data were collected from the area of TEPCO Power Grid.

[3] Central and Western regions of Japan include the regional service areas of Chubu Electric Power Grid, Hokuriku Electric Transmission & Distribution, Kansai Transmission & Distribution, Chugoku Electric Power Transmission & Distribution, Shikoku Electric Power Transmission & Distribution, and Kyushu Electric Power Transmission & Distribution. Actual data were collected from the area of Kansai Transmission & Distribution.

II. Voltage Data

1. Japanese Voltage Standard

General transmission and distribution companies should endeavor to maintain the voltage value of the electricity supply at the levels specified by the provisions of Article 26 of the Act. Table 6 shows the voltage standard and nationwide target voltage control.

Table 6 Voltage Standard and Target Voltage Control

Voltage Standard	Target Voltage Control
100 V	within ±6 V of 101 V
200 V	within ±20 V of 202 V

2. Voltage Measurements

According to the provisions of Article 39 of the Ordinance of the Act, general transmission and distribution companies should measure voltage during the period designated by the Director General of the Regional Bureau of Economy, Trade, and Industry, who administers regional service areas or supply points (for Hokuriku EPCO, this is the Director General of Chubu Bureau of Economy, Trade, and Industry, Electricity and Gas Department Hokuriku) once over 24 consecutive hours at selected measuring points, unless otherwise stated. General transmission and distribution companies calculate the average of 30 minutes, including the maximum and the minimum values, and review whether these values deviated from the average or not.

3. Nationwide Voltage Deviation Ratio (FY 2016–2020)

Table 7 shows the total measured points, deviated measured points, and nationwide deviation ratio from FY 2016 to 2020.

For the FY 2020 data, the general transmission and distribution companies reported that the voltage standard was maintained adequately and no deviation was observed with respect to the voltage standard.

Table7 Voltage Deviation Measurement (Nationwide, FY 2016-2020) [points]

Voltage		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
100V	Total Measured Points	6,590	6,593	6,603	6,596	6,589
	Deviated Points	0	0	0	0	0
200V	Total Measured Points	6,532	6,534	6,533	6,529	6,525
	Deviated Points	0	0	0	0	0

III. Interruption Data

1. Data of Number of Supply Disturbances Where Interruption Originated

(1) Indices and Definition of Supply Disturbances

The criteria for supply interruption include the number of supply disturbances where interruption originated, indicating where and how many supply disturbances occurred, according to the electric facilities in the system.

A "supply disturbance" means interruption of electricity supply or emergency restriction of electricity use due to malfunction or misuse of electric facilities.[4] The case in which electricity supply is resumed by automatic reclosing[5] of the transmission line is not applicable to supply disturbance.[6]

[4] Electric facilities include machinery, apparatus, dams, conduits, reservoirs, electric lines, and other facilities installed for the generation, transformation, transmission, distribution, or consumption of electricity as defined by the Article 38 of the Act.

[5] The automatic reclosing of a transmission line means the reconnection of a transmission line by re-switching of the circuit breaker after a given period, when an accident such as a lightning strike occurs to the transmission or distribution line and isolated fault section by opening of the circuit breaker due to the action of a protective relay.

[6] According to the provision of Item viii, Paragraph 2 of Article 1 of Reporting Rules of the Electricity Business, supply disturbance means the interruption of electricity supply or emergency restriction of electricity use for electricity consumers (excluding a person who manages the corresponding electric facility; hereafter, the same shall apply in this article) due to malfunction, misuse, or disoperation of the electric facility. However, the case in which electricity supply is resumed by automatic reclosing of the transmission line is not applicable to supply disturbance.

(2) Data on Number of Supply Disturbances Nationwide and by Regional Service Area (FY 2016–2020)

Table 8 and Figure 6 show the number of supply disturbances nationwide, where the interruptions originated in the period FY 2016–2020. Tables 9–18 and Figures 7–16 show the data from regional service areas. Furthermore, the category "Involving Accidents" in the tables indicates the number of supply disturbances that were induced from accidents of electric facilities other than from the corresponding general transmission and distribution companies. The table columns are blank for zero values or if the data are not available. An analysis of the FY 2020 data indicates the following points.

- The total number of supply disturbances was 14,348, which was almost the same as the number of disturbances recorded in the previous year (14,842).
- The high-voltage (HV) overhead lines in the regional service area of TEPCO PG had significant damage caused by Typhoon No. 15 (Faxai) and Typhoon No. 19 (Hagibis) in FY 2019, but supply disturbances were reduced to almost half in the area for FY 2020 as shown in Table 11. By contrast, the number of supply disturbances that occurred at HV overhead lines increased mainly in the service regional areas of Tohoku Electric Power Network and Kyushu Electric Power Transmission and Distribution. The disturbances in Tohoku area are specifically attributable to the blizzard and heavy snowfall mainly on the Japan Sea side of the area from December 2020 to January 2021,[7] and to damage caused by Fukushima offshore earthquake on February 13, 2021[8]. For the Kyushu area, the disturbances are attributable to the heavy rainfall of July 2020,[9] and damage caused by Typhoon No. 10(Haishen), which went up north on the East China Sea in September 2020.[10]

Table 8 Number of Supply Disturbances Where Interruption Originated (Nationwide, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations		70	45	65	56	48	56.8
Transmission Lines & Extra High Voltage Lines	Overhead	230	278	409	246	274	287.4
	Under-ground	9	14	10	13	9	11.0
	Total	239	292	419	259	283	298.4
High Voltage Lines	Overhead	10,235	12,679	20,729	13,958	13,539	14,228.0
	Under-ground	215	216	265	227	201	224.8
	Total	10,450	12,895	20,994	14,185	13,740	14,452.8
Demand Facilities			1				0.2
Involvng Accidents		269	343	359	372	277	324.0
Total Disturbances		11,028	13,576	21,837	14,872	14,348	15,132.2

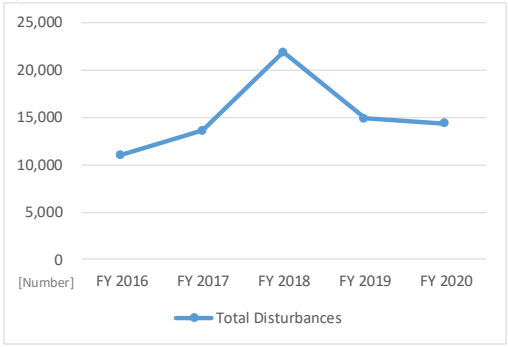

Figure 6 Transition of Supply Disturbances (Nationwide, FY 2016–2020)

[7] http://www.bousai.go.jp/updates/r2oyuki12/pdf/r2_oyuki12_05.pdf
http://www.bousai.go.jp/updates/r3oyuki01/pdf/r3_oyuki01_06.pdf

[8] http://www.bousai.go.jp/updates/r3fukushima_eq_0213/pdf/r3fukushima_eq_higai01.pdf

[9] http://www.bousai.go.jp/updates/r2_07ooame/pdf/r20703_ooame_08.pdf

[10] http://www.bousai.go.jp/updates/r2typhoon10/pdf/r2_typhoon10_08.pdf

For footnotes No.7 through No.10, see also Section 2 of Chapter 1 Disasters in FY 2020 of "White Paper on Disaster Management 2021".
http://www.bousai.go.jp/en/documentation/white_paper/pdf/2021/SF1-2.pdf

Table 9 Number of Supply Disturbances Where Interruption Originated (Hokkaido, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations		1		5	2	2	2.0
Transmission Lines & Extra High Voltage Lines	Overhead	24	30	25	12	21	22.4
	Underground				1	1	0.4
	Total	24	30	25	13	22	22.8
High Voltage Lines	Overhead	1,289	1,144	1,139	600	801	994.6
	Underground	13	19	13	15	15	15.0
	Total	1,302	1,163	1,152	615	816	1,009.6
Demand Facilities							
Involvng Accidents		28	17	12	11	10	15.6
Total Disturbances		1,355	1,210	1,194	641	850	1,050.0

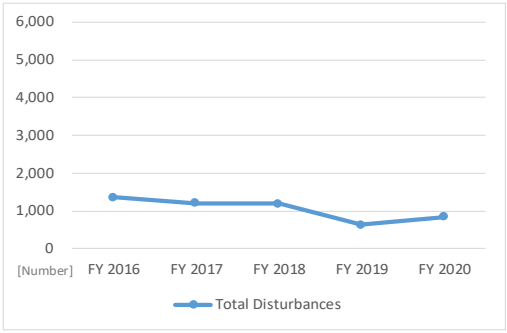

Figure 7 Transition of Supply Disturbances (Hokkaido, FY 2016–2020)

Table 10 Number of Supply Disturbances Where Interruption Originated (Tohoku, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations		8	4	9	8	9	7.6
Transmission Lines & Extra High Voltage Lines	Overhead	11	16	11	16	31	17.0
	Underground		1				0.2
	Total	11	17	11	16	31	17.2
High Voltage Lines	Overhead	1,403	1,957	1,478	1,646	2,528	1,802.4
	Underground	12	5	11	7	13	9.6
	Total	1,415	1,962	1,489	1,653	2,541	1,812.0
Demand Facilities							
Involvng Accidents		22	26	20	29	17	22.8
Total Disturbances		1,456	2,009	1,529	1,706	2,598	1,859.6

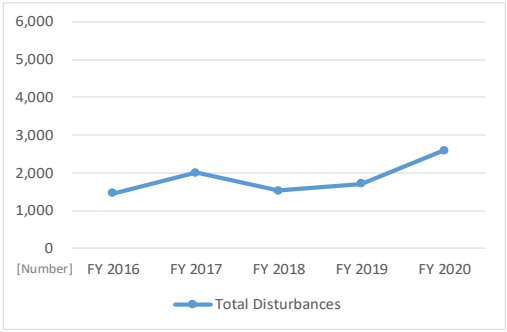

Figure 8 Transition of Supply Disturbances (Tohoku, FY 2016–2020)

Table 11 Number of Supply Disturbances Where Interruption Originated (Tokyo, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations		14	17	16	17	5	13.8
Transmission Lines & Extra High Voltage Lines	Overhead	16	24	38	21	10	21.8
	Underground	2	4		4	3	2.6
	Total	18	28	38	25	13	24.4
High Voltage Lines	Overhead	2,204	2,311	3,841	5,186	2,472	3,202.8
	Underground	75	65	100	97	75	82.4
	Total	2,279	2,376	3,941	5,283	2,547	3,285.2
Demand Facilities							
Involvng Accidents		93	96	107	134	74	100.8
Total Disturbances		2,404	2,517	4,102	5,459	2,639	3,424.2

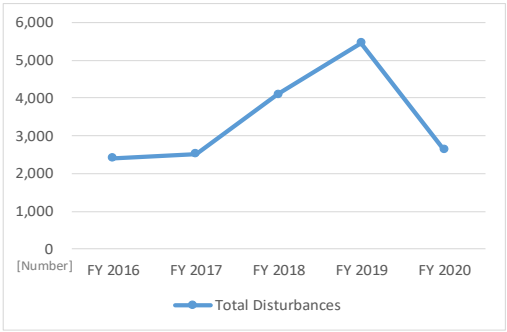

Figure 9 Transition of Supply Disturbances (Tokyo, FY 2016–2020)

Table 12 Number of Supply Disturbances Where Interruption Originated (Chubu, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations		6	3	6	10	4	5.8
Transmission Lines & Extra High Voltage Lines	Overhead	16	9	26	19	15	17.0
	Underground					1	0.2
	Total	16	9	26	19	16	17.2
High Voltage Lines	Overhead	1,069	1,607	4,053	1,570	1,359	1,931.6
	Underground	5	11	39	6	4	13.0
	Total	1,074	1,618	4,092	1,576	1,363	1,944.6
Demand Facilities							
Involvng Accidents		40	49	66	60	71	57.2
Total Disturbances		1,136	1,679	4,190	1,665	1,454	2,024.8

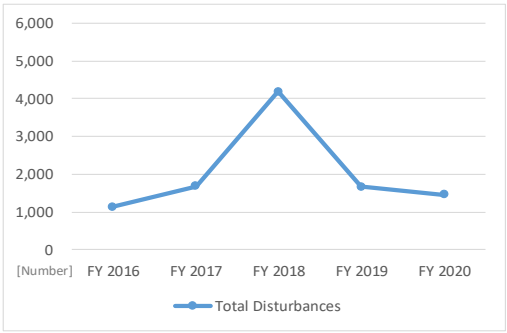

Figure 10 Transition of Supply Disturbances (Chubu, FY 2016–2020)

Table 13 Number of Supply Disturbances Where Interruption Originated (Hokuriku, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations		3	1		2	3	1.8
Transmission Lines & Extra High Voltage Lines	Overhead	7	4	7	2	3	4.6
	Underground			2	2		0.8
	Total	7	4	9	4	3	5.4
High Voltage Lines	Overhead	303	542	385	199	444	374.6
	Underground	10	5	3	1	4	4.6
	Total	313	547	388	200	448	379.2
Demand Facilities							
Involvng Accidents		17	15	21	10	10	14.6
Total Disturbances		340	567	418	216	464	401.0

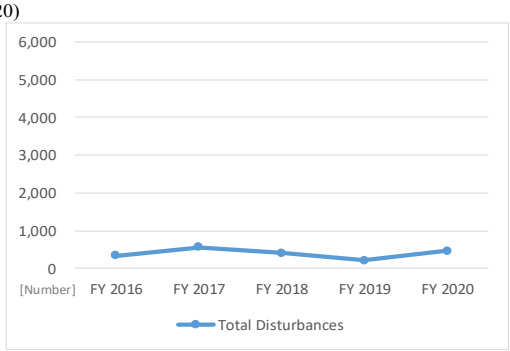

Figure 11 Transition of Supply Disturbances (Hokuriku, FY 2016–2020)

Table 14 Number of Supply Disturbances Where Interruption Originated (Kansai, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations		13	9	8	3	6	7.8
Transmission Lines & Extra High Voltage Lines	Overhead	80	102	190	82	84	107.6
	Underground	3	7	6	3	4	4.6
	Total	83	109	196	85	88	112.2
High Voltage Lines	Overhead	1,171	1,695	5,270	1,300	1,254	2,138.0
	Underground	63	48	56	50	50	53.4
	Total	1,234	1,743	5,326	1,350	1,304	2,191.4
Demand Facilities							
Involvng Accidents			65	70	64	44	48.6
Total Disturbances		1,330	1,926	5,600	1,502	1,442	2,360.0

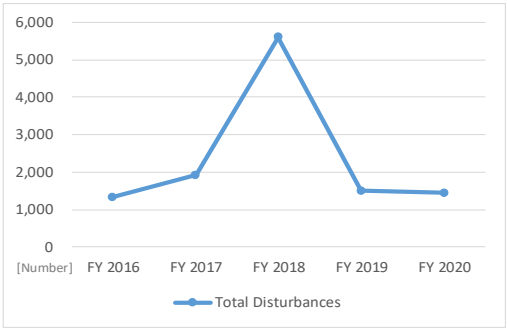

Figure 12 Transition of Supply Disturbances (Kansai, FY 2016–2020)

Table 15 Number of Supply Disturbances Where Interruption Originated (Chugoku, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations		7	2	8	6	3	5.2
Transmission Lines & Extra High Voltage Lines	Overhead	16	16	14	17	11	14.8
	Underground		1	1	1		0.6
	Total	16	17	15	18	11	15.4
High Voltage Lines	Overhead	960	1,066	1,172	1,015	1,163	1,075.2
	Underground	13	24	20	16	12	17.0
	Total	973	1,090	1,192	1,031	1,175	1,092.2
Demand Facilities			1				0.2
Involvng Accidents		25	33	31	35	32	31.2
Total Disturbances		1,021	1,143	1,246	1,090	1,221	1,144.2

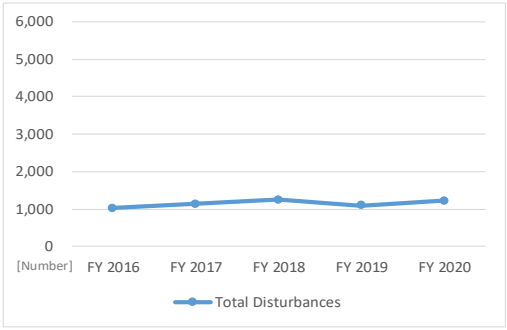

Figure 13 Transition of Supply Disturbances (Chugoku, FY 2016–2020)

Table 16 Number of Supply Disturbances Where Interruption Originated (Shikoku, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations			6	4	2	5	3.4
Transmission Lines & Extra High Voltage Lines	Overhead	5	3	4	4	1	3.4
	Underground						
	Total	5	3	4	4	1	3.4
High Voltage Lines	Overhead	357	630	616	439	447	497.8
	Underground	4	9	8	6	6	6.6
	Total	361	639	624	445	453	504.4
Demand Facilities							
Involvng Accidents		6	5	5	7	6	5.8
Total Disturbances		372	653	637	458	465	517.0

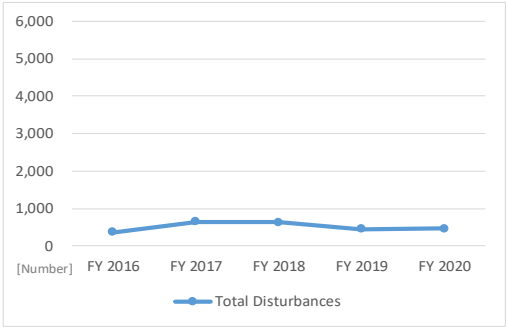

Figure 14 Transition of Supply Disturbances (Shikoku, FY 2016–2020)

Table 17 Number of Supply Disturbances Where Interruption Originated (Kyushu, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations		15	3	1	4	7	6.0
Transmission Lines & Extra High Voltage Lines	Overhead	21	32	42	38	42	35.0
	Underground	4		1			1.0
	Total	25	32	43	38	42	36.0
High Voltage Lines	Overhead	1,237	1,349	1,888	1,547	2,614	1,727.0
	Underground	18	30	15	22	17	20.4
	Total	1,255	1,379	1,903	1,569	2,631	1,747.4
Demand Facilities							
Involvng Accidents		20	23	16	19	13	18.2
Total Disturbances		1,315	1,437	1,963	1,630	2,693	1,807.6

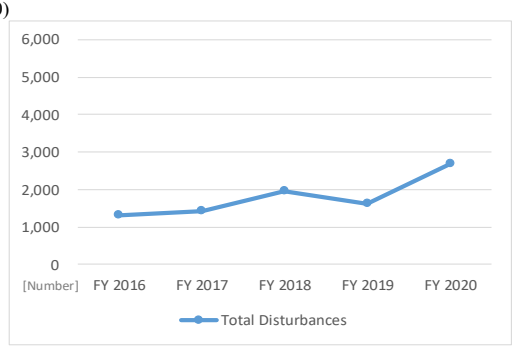

Figure 15 Transition of Supply Disturbances (Kyushu, FY 2016–2020)

Table 18 Number of Supply Disturbances Where Interruption Originated (Okinawa, FY 2016–2020)

Occurrence in		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years average
Disturbance of General Transmission & Distribution Companies' Facilities							
Substations		3		8	2	4	3.4
Transmission Lines & Extra High Voltage Lines	Overhead	34	42	52	35	56	43.8
	Underground		1		2		0.6
	Total	34	43	52	37	56	44.4
High Voltage Lines	Overhead	242	378	887	456	457	484.0
	Underground	2			7	5	2.8
	Total	244	378	887	463	462	486.8
Demand Facilities							
Involvng Accidents		18	14	11	3		9.2
Total Disturbances		299	435	958	505	522	543.8

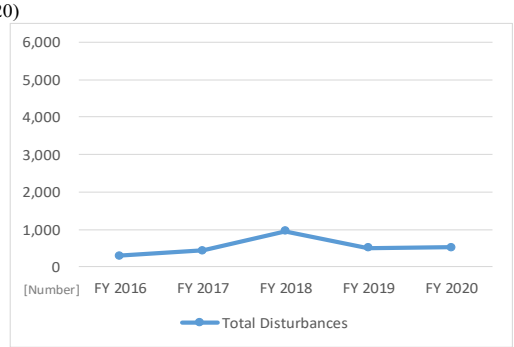

Figure 16 Transition of Supply Disturbances (Okinawa, FY 2016–2020)

2. Number of Supply Disturbances Where Interruptions Originated with Their Causes

(1) Data on Supply Disturbances over a Certain Scale

For the data on supply disturbances where the interruption originated as described in the previous section, disturbances over a certain scale were reported with their causes. This section analyzes these causes.

A supply disturbance over a certain scale applies to the following. Figure 17 illustrates the number of supply disturbances indicating where interruptions originated versus the scale of interruption. Table 19 shows the nationwide data for FY 2020[11]. The columns in the table was left blank if value was zero or data are unavailable. It should be noted that supply disturbances that was caused by blackout are not included in the statistics.

- Capacity lost by disturbance was 7,000–70,000 kW with a duration longer than 1 hour
- Capacity lost by disturbance was over 70,000 kW with a duration longer than 10 minutes

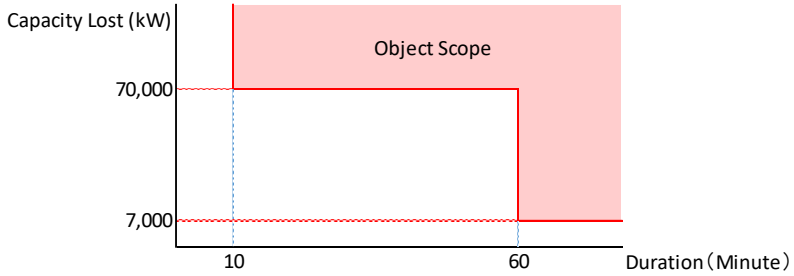

Figure 20 Image of Supply Disturbances over a Certain Scale

Table 19 Number of Supply Disturbances Where Interruption Originated by Scale of Interruption (Nationwide, FY 2020) [Number]

Scale of Disturbance [Duration & Capacity lost] / Occurrence at		10 min. till 30 min.		30 min. till 1 hour		1hour till 3 hours			Longer than 3 hours			Total Disturbance
		70,000kW to 100,000kW under	100,000kW over[8]	70,000kW to 100,000kW under	100,000kW over[8]	7,000kW to 70,000kW under	70,000kW to 100,000kW under	100,000kW over[8]	7,000kW to 70,000kW under	70,000kW to 100,000kW under	100,000kW over[8]	
Accidents of Facilities of General Transmission /Distribution Companies												
Substations						2		1	1			4
Transmission Lines & Extra High Voltage Lines	Overhead					7			6			13
	Under-ground								2			2
	Total					7			8			15
High Voltage Distribution Lines	Overhead											
	Under-ground											
	Total											
Demand Facilities												
Involved Accidents												
Total Disturbance						9		1	9			19

[11] Supply disturbance over a certain scale of 10 minutes and longer was reported for different destinations according to lost capacity under the provisions of Article 3 of the Reporting Rules of the Electricity Business. In the case the lost capacity is 70,000–100,000 kW, the loss is reported to the Director of Regional Industrial Safety and the Inspection Department that directs the area the disturbed electric facility is sited. In the case the lost capacity is over 100,000 kW, the loss is reported to the Ministry of Economy, Trade, and Industry. Thus, the reporting destination differs according to the lost capacity, Table 19 presents the number of disturbances by lost capacity.

(2) Classification and Description of Causes of Supply Disturbances over a Certain Scale

Table 20 classifies and describes the causes of supply disturbances.

Table 20 Classification and Description of the Causes of Supply Disturbances

Classification of Causes		Description
Facility fault		Due to imperfect production (improper design, fabrication, or material of electric facilities) or imperfect installation (improper operation of construction or maintenance work).
Maintenance fault		Due to imperfect maintenance (improper operation of patrols, inspections or cleaning), natural deterioration (deterioration of material or mechanism of electric facilities not due to production, installations or maintenance), or overloading (current over the rated capacity).
Accident/malice		Due to accident by worker, intentional act, or accident by public (stone throwing, wire theft, etc.). In case of accompanying electric shock, instances are classified under “Electric shock (worker)” or “Electric shock (public).”
Physical contact		Due to physical contact by tree, wildlife, or others (kite, model airplane).
Corrosion		Due to corrosion by leakage of current from DC electric railroad or by chemical action.
Vibration		Due to vibration from traffic of heavy vehicle traffic or construction work.
Involving an accident		Due to accident involving the electric facilities of another company.
Improper fuel		Due to accident with improper fuel of notably different ingredients from that designated.
Electric fire		Due to accident with electric fire caused by facility fault, maintenance fault, natural disaster, accident, or work without permission.
Electric shock (worker)		Due to workers’ accident from electric shock caused by misuse of equipment, malfunction of electric facilities, accident by injured or third person, etc.
Electric shock (public)		Due to accident with electric shock of public by misuse of equipment, malfunction of electric facilities, accident by injured or third person, etc.
Natural disaster	Thunderbolt	Due to direct or indirect lightning strike.
	Rainstorm	Due to rain, wind, or rainstorm (including contact with fallen branches, etc.)
	Snowstorm	Due to snow, frazil, hail, sleet, or snowstorm.
	Earthquake	Due to earthquake.
	Flood	Due to flood, storm surge, or tsunami
	Landslide	Due to rock fall, avalanche, landslide, or ground subsidence.
	Dust/gas	Due to briny air, volcanic dust and ash, fog, offensive gas, or smoke and soot.
Unknown		Due to causes that remain unknown despite investigation.
Miscellaneous		Due to causes not categorized above.

(3) Number and Causes of Supply Disturbances over a Certain Scale (FY 2016–2020)

For the number of supply disturbances where interruption originated over a certain scale, Table 21 and Figure 18 show the nationwide data; Tables 22–31 show the data from each regional service area for the period FY 2016–2020.[12,13]

For the FY 2020 data, the number and the causes of supply disturbances over a certain scale were analyzed. Nationwide, there were 19 cases of supply disturbance over a certain scale, which was similar to 18 cases in the previous year, and to the 5-year average of 21.8.

Table 21 Causes of Disturbances over a Certain Scale (Nationwide, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault	2	1	4	1	1	1.8
Maintenance fault	1	4	1	1	1	1.6
Accident/Malice	1	1	1	4	4	2.2
Physical contact	4	2	2	5	6	3.8
Involved accident	1		1	1		0.6
Electric shock(worker)						
Subtotal	9	8	9	12	12	10.0
Natural Disaster						
Thunderbolt	3	2	1	2	2	2.0
Rainstorm	3	3	17			4.6
Snowstorm	2	2				0.8
Earthquake	6			3	3	2.4
Dust/Gas	2		2			0.8
Subtotal	16	7	20	5	5	10.6
Unknown				1	1	0.4
Miscellaneous	1		2	1	1	1.0
Total Disturbances	26	15	31	18	19	21.8

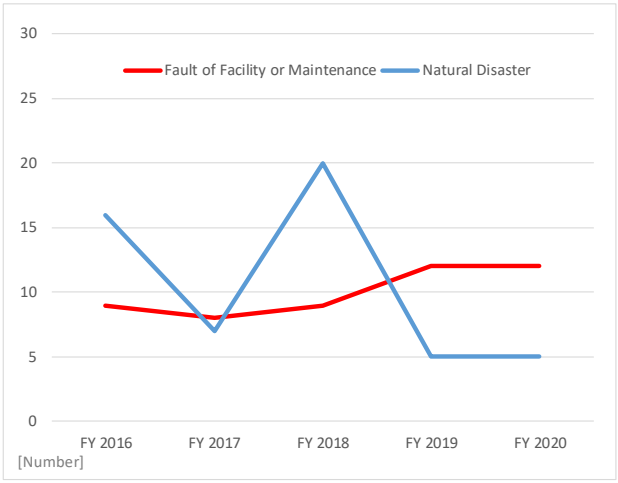

Figure 18 Transition of Disturbances by Causes (Nationwide, FY 2015–2019)

Table 22 Causes of Disturbances over a Certain Scale (Hokkaido, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault			1		1	0.4
Maintenance fault	1		1			0.4
Accident/Malice						
Physical contact			1			0.2
Involved accident						
Electric shock(worker)						
Subtotal	1		3		1	1.0
Natural Disaster						
Thunderbolt				1		0.2
Rainstorm	2					0.4
Snowstorm		1				0.2
Earthquake						
Dust/Gas						
Subtotal	2	1		1		0.8
Unknown						
Miscellaneous			1			0.2
Total Disturbances	3	1	4	1	1	2.0

Table 23 Causes of Disturbances over a Certain Scale (Tohoku, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault						
Maintenance fault						
Accident/Malice	1					0.2
Physical contact	2					0.4
Involved accident						
Electric shock(worker)						
Subtotal	3					0.6
Natural Disaster						
Thunderbolt				1		0.2
Rainstorm						
Snowstorm		1				0.2
Earthquake					3	0.6
Dust/Gas						
Subtotal		1		1	3	1.0
Unknown						
Miscellaneous						
Total Disturbances	3	1		1	3	1.6

[12] Causes of the disturbances that did not occur in the period FY 2016–2020 are omitted from the tables.
[13] Column of the tables left blank if zero or the data are not available.

Table 24 Causes of Disturbances over a Certain Scale (Tokyo, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault	1	1				0.4
Maintenance fault						
Accident/Malice			1	1	2	0.8
Physical contact	1	1	1	1	1	1.0
Involved accident						
Electric shock(worker)						
Subtotal	2	2	2	2	3	2.2
Natural Disaster						
Thunderbolt	1	1	1	2	2	1.4
Rainstorm				3	3	1.2
Snowstorm						
Earthquake						
Dust/Gas						
Subtotal	1	1	1	5	5	2.6
Unknown					1	0.2
Miscellaneous			1		1	0.4
Total Disturbances	3	3	4	7	5	4.4

Table 25 Causes of Disturbances over a Certain Scale (Chubu, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault						
Maintenance fault						
Accident/Malice					1	0.2
Physical contact				2		0.4
Involved accident						
Electric shock(worker)						
Subtotal				2	1	0.6
Natural Disaster						
Thunderbolt	1				1	0.4
Rainstorm			1			0.2
Snowstorm	2					0.4
Earthquake						
Dust/Gas			2			0.4
Subtotal	3		3		1	1.4
Unknown						
Miscellaneous				1		0.2
Total Disturbances	3		3	3	2	2.2

Table 26 Causes of Disturbances over a Certain Scale (Hokuriku, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault						
Maintenance fault						
Accident/Malice						
Physical contact						
Involved accident						
Electric shock(worker)						
Subtotal						
Natural Disaster						
Thunderbolt						
Rainstorm						
Snowstorm						
Earthquake						
Dust/Gas						
Subtotal						
Unknown						
Miscellaneous						
Total Disturbances						

Table 27 Causes of Disturbances over a Certain Scale (Kansai, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault			3			0.6
Maintenance fault		3			1	0.8
Accident/Malice		1			1	0.4
Physical contact		1		2	4	1.4
Involved accident	1		1			0.4
Electric shock(worker)						
Subtotal	1	5	4	2	6	3.6
Natural Disaster						
Thunderbolt				1	1	0.4
Rainstorm	1	3	10	1		3.0
Snowstorm						
Earthquake						
Dust/Gas						
Subtotal	1	3	10	2	1	3.4
Unknown						
Miscellaneous						
Total Disturbances	2	8	14	4	7	7.0

Table 28 Causes of Disturbances over a Certain Scale (Chugoku, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault						
Maintenance fault						
Accident/Malice						
Physical contact						
Involved accident						
Electric shock(worker)						
Subtotal						
Natural Disaster						
Thunderbolt		1				0.2
Rainstorm			2			0.4
Snowstorm						
Earthquake	1					0.2
Dust/Gas				1		0.2
Subtotal	1	1	2	1		1.0
Unknown						
Miscellaneous	1					0.2
Total Disturbances	2	1	2	1		1.2

Table 29 Causes of Disturbances over a Certain Scale (Shikoku, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault						
Maintenance fault		1				0.2
Accident/Malice						
Physical contact						
Involved accident						
Electric shock(worker)						
Subtotal		1				0.2
Natural Disaster						
Thunderbolt						
Rainstorm						
Snowstorm						
Earthquake						
Dust/Gas						
Subtotal						
Unknown						
Miscellaneous						
Total Disturbances		1				0.2

Table 30 Causes of Disturbances over a Certain Scale (Kyushu, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault	1					0.2
Maintenance fault						
Accident/Malice						
Physical contact	1					0.2
Involved accident						
Electric shock(worker)						
Subtotal	2					0.4
Natural Disaster						
Thunderbolt						
Rainstorm			2			0.4
Snowstorm						
Earthquake	5					1.0
Dust/Gas	2					0.4
Subtotal	7		2			1.8
Unknown						
Miscellaneous						
Total Disturbances	9		2			2.2

Table 31 Causes of Disturbances over a Certain Scale (Okinawa, FY 2016–2020) [Number]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
Fault of Facility or Maintenance						
Facility Fault						
Maintenance fault						
Accident/Malice						
Physical contact					1	0.2
Involved accident						
Electric shock(worker)						
Subtotal					1	0.2
Natural Disaster						
Thunderbolt	1					0.2
Rainstorm			2	1		0.6
Snowstorm						
Earthquake						
Dust/Gas						
Subtotal	1		2	1		0.8
Unknown						
Miscellaneous						
Total Disturbances	1		2	1	1	1.0

3. Data of Interruptions for LV Customers

(1) Indices of System Average Interruption for LV Customers

The criteria for customer interruption include two indices that indicate frequency and duration of forced or planned outages that occurred for one customer and over one year.

$$\text{System Average Interruption Frequency Index (SAIFI/number)} = \frac{\text{Low voltage customers affected by interruption}}{\text{Low voltage customers served at the beginning of the fiscal year}}$$

$$\text{System Average Interruption Duration Index (SAIDI/minute)} = \frac{\text{Interruption duration (min)} \times \text{Low voltage customers affected by interruption}}{\text{Low voltage customers served at the beginning of the fiscal year}}$$

Table 32 shows the definitions of terms relating to outage.

Table 32 Definition of Outage-related Terms

Term	Definition
Forced outage	Supply interruption occurred to end-use customers by accident, such as the malfunction of the electric facility, excluding resumption of electricity supply by automatic reclosing.[14][15]
Planned outage	Electric power company interrupts its electricity supply in planned manner to construct, improve, and maintain its electric facility.

[14] See footnote 5 for definitions.
[15] See footnote 6 for definitions.

(2) Data on System Average Interruption Nationwide and by Regional Service Area (FY 2016–2020)

Table 33 and Figure 19 show the nationwide data for system average interruptions for FY 2016–2020. Tables 34–43 and Figures 20–29 show the data for each regional service area. Table 44 shows the nationwide data for system average interruptions for FY 2020.[16]

The actual data on system average interruption for LV customers are summarized below.

・Regarding the nationwide SAIFI and SAIDI, data for FY 2020 were lower compared with both data from the previous year and the average for the previous 5 years. This was attributable to the reduced formation of typhoons. In FY 2020, 7 typhoons approached Japan, with the climatological average being 11.4 for a normal year.[17] In addition, no typhoon has made landfall on Japan proper in the 12 years since 2008, with the climatological average being 2.7 for a normal year.[18]

・Regarding the data by regional service area, the Tohoku Network area and Kyushu Transmission and Distribution area suffered damage from natural disasters. For the Tohoku area, such damage was specifically attributable to the blizzard and heavy snowfall mainly on the Japan Sea side of the area from December 2020 to January 2021, and damage caused by Fukushima offshore earthquake on February 13, 2021. For the Kyushu area, such damage is attributable to the heavy rainfall of July 2020, and Typhoon No. 10(Haishen), which went up north on the East China Sea in September 2020.

Table 33 Indices of System Average Interruption (Nationwide, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.14	0.11	0.28	0.19	0.13	0.17
	Planned	0.03	0.03	0.03	0.04	0.04	0.03
	Total ●	0.18	0.14	0.31	0.23	0.17	0.21
SAIDI [Minute]	Forced	21	12	221	82	24	72
	Planned	4	3	4	3	3	3
	Total ●	25	16	225	86	27	76

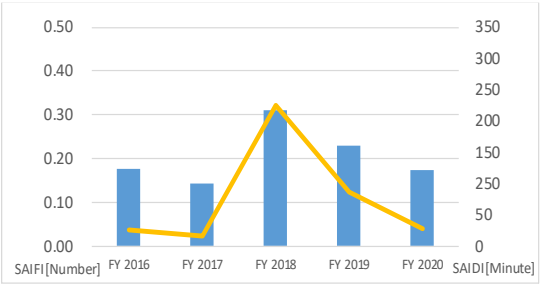

Figure 19 System Average Interruption Indices of LV Customers (Nationwide, FY 2016–2020)

[16] Alpha (α) is shown if the data are a fraction less than a unit. For SAIFI, α falls to 0 <α< 0.005, for SAIDI, α falls to 0 <α< 0.5.

[17] https://www.data.jma.go.jp/fcd/yoho/typhoon/statistics/accession/accession.html

[18] https://www.data.jma.go.jp/fcd/yoho/typhoon/statistics/landing/landing.html
Also see Figure 3.3 of "Annual Report on the Activities of the RSMC Tokyo - Typhoon Center 2020".
https://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/AnnualReport/2020/Text/Text2020.pdf

Table 34 Indices of System Average Interruption (Hokkaido, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.17	0.13	1.19	0.11	0.09	0.34
	Planned	α	0.01	α	α	α	0.01
	Total 🔵	0.17	0.14	1.19	0.11	0.09	0.34
SAIDI [Minute]	Forced	35	10	2,154	4	5	441
	Planned	1	α	α	α	α	1
	Total 🟡	36	10	2,154	4	5	442

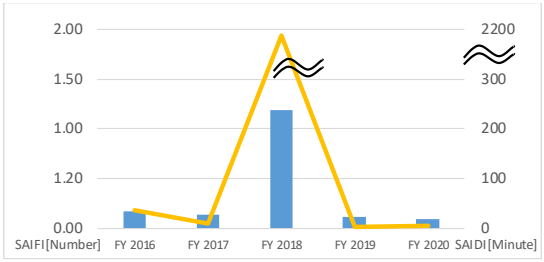

Figure 20 System Average Interruption Indices of LV Customers (Hokkaido, FY 2016–2020)

Table 35 Indices of System Average Interruption (Tohoku, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.11	0.13	0.09	0.11	0.16	0.12
	Planned	0.03	0.02	0.02	0.02	0.02	0.02
	Total 🔵	0.14	0.15	0.11	0.12	0.18	0.14
SAIDI [Minute]	Forced	24	10	7	15	25	16
	Planned	4	3	2	2	4	3
	Total 🟡	28	13	10	17	29	19

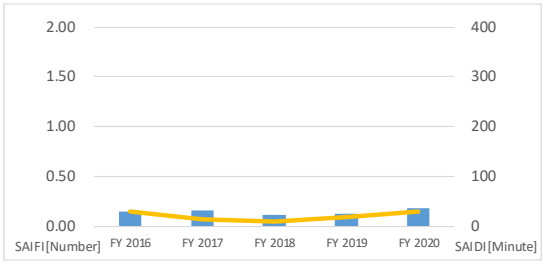

Figure 21 System Average Interruption Indices of LV Customers (Tohoku, FY 2016–2020)

Table 36 Indices of System Average Interruption (Tokyo, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.13	0.09	0.13	0.33	0.11	0.16
	Planned	0.02	0.01	0.01	0.03	0.06	0.02
	Total 🔵	0.15	0.10	0.14	0.36	0.17	0.18
SAIDI [Minute]	Forced	7	6	19	200	7	48
	Planned	1	1	3	1	1	1
	Total 🟡	8	7	22	201	8	49

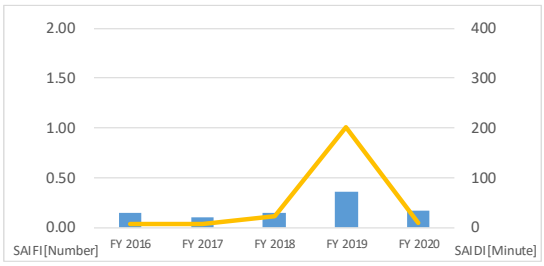

Figure 22 System Average Interruption Indices of LV Customers (Tokyo, FY 2016–2020)

Table 37 Indices of System Average Interruption (Chubu, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.17	0.08	0.39	0.11	0.07	0.16
	Planned	0.06	0.06	0.06	0.06	0.05	0.06
	Total 🔵	0.23	0.14	0.45	0.17	0.13	0.22
SAIDI [Minute]	Forced	5	10	348	32	6	80
	Planned	7	7	8	8	7	7
	Total 🟡	12	17	356	40	12	87

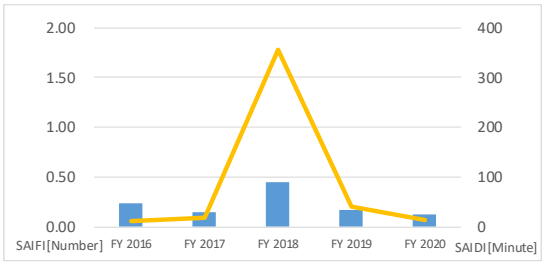

Figure 23 System Average Interruption Indices of LV Customers (Chubu, FY 2016–2020)

Table 38 Indices of System Average Interruption (Hokuriku, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.06	0.09	0.06	0.03	0.06	0.06
	Planned	0.10	0.09	0.09	0.09	0.08	0.09
	Total 🔵	0.16	0.17	0.15	0.13	0.14	0.15
SAIDI [Minute]	Forced	4	11	9	3	7	7
	Planned	17	15	15	16	15	15
	Total 🟡	21	26	24	19	22	22

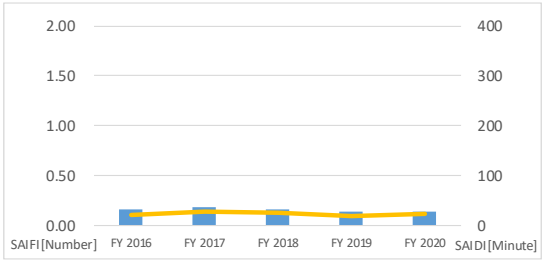

Figure 24 System Average Interruption Indices of LV Customers (Hokuriku, FY 2016–2020)

Table 39 Indices of System Average Interruption (Kansai, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.07	0.12	0.40	0.10	0.09	0.15
	Planned	0.01	0.01	0.01	0.01	0.01	0.01
	Total ●	0.09	0.13	0.41	0.11	0.10	0.17
SAIDI [Minute]	Forced	4	14	396	5	7	85
	Planned	1	1	1	1	1	1
	Total ●	5	15	397	6	8	86

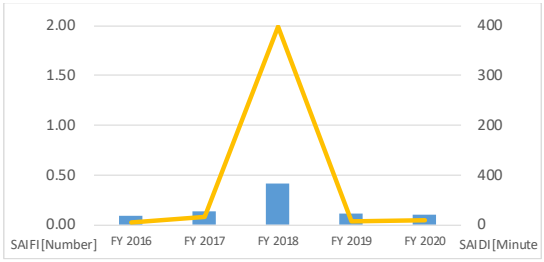

Figure 25 System Average Interruption Indices of LV Customers (Kansai, FY 2016–2020)

Table 40 Indices of System Average Interruption (Chugoku, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.15	0.12	0.14	0.13	0.15	0.14
	Planned	0.11	0.11	0.09	0.09	0.10	0.10
	Total ●	0.26	0.23	0.23	0.21	0.25	0.24
SAIDI [Minute]	Forced	6	7	24	10	20	13
	Planned	12	12	10	9	11	11
	Total ●	18	19	33	19	31	24

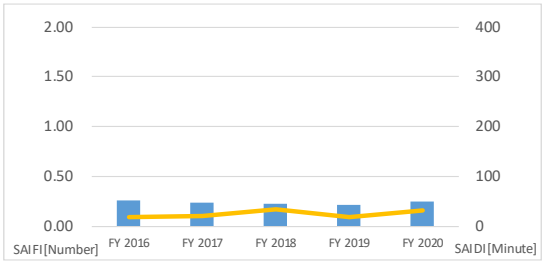

Figure 26 System Average Interruption Indices of LV Customers (Chugoku, FY 2016–2020)

Table 41 Indices of System Average Interruption (Shikoku, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.09	0.19	0.20	0.13	0.14	0.15
	Planned	0.18	0.16	0.14	0.14	0.14	0.15
	Total ●	0.27	0.36	0.34	0.27	0.28	0.30
SAIDI [Minute]	Forced	6	21	32	8	10	15
	Planned	20	17	15	15	15	16
	Total ●	26	38	47	23	24	32

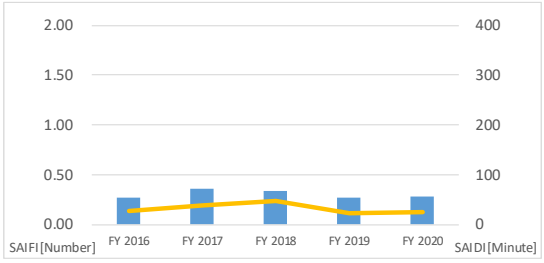

Figure 27 System Average Interruption Indices of LV Customers (Shikoku, FY 2016–2020)

Table 42 Indices of System Average Interruption (Kyushu, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.24	0.08	0.14	0.08	0.21	0.15
	Planned	0	0	0	0	0	0
	Total ●	0.24	0.08	0.14	0.08	0.21	0.15
SAIDI [Minute]	Forced	128	25	103	15	139	82
	Planned	0	0	0	0	0	0
	Total ●	128	25	103	15	139	82

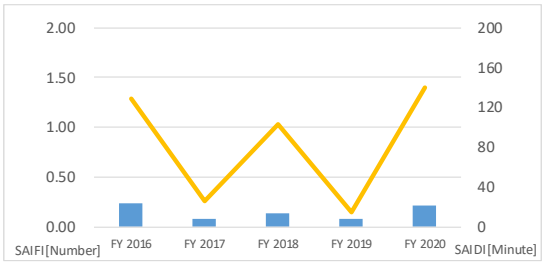

Figure 28 System Average Interruption Indices of LV Customers (Kyushu, FY 2016–2020)

Table 43 Indices of System Average Interruption (Okinawa, FY 2016–2020)

		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	5-years Average
SAIFI [Number]	Forced	0.57	0.98	3.62	1.11	1.12	1.48
	Planned	0.08	0.07	0.07	0.05	0.06	0.07
	Total ●	0.65	1.05	3.69	1.17	1.18	1.55
SAIDI [Minute]	Forced	35	117	1,269	215	90	345
	Planned	8	7	6	6	11	8
	Total ●	43	124	1,275	221	101	353

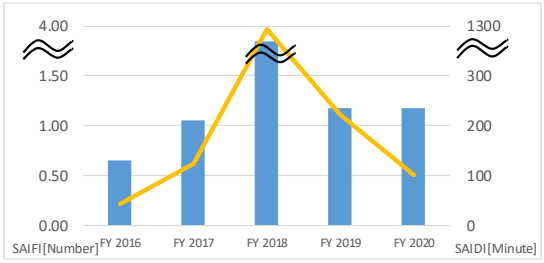

Figure 29 System Average Interruption Indices of LV Customers (Okinawa, FY 2016–2020)

Table 44 System Average Disturbances where Interruptions Were Caused by Outages (Nationwide, FY 2020)[19,]

		Hokkaido	Tohoku	Tokyo	Chubu	Hokuriku	Kansai	Chugoku	Shikoku	Kyushu	Okinawa	Nationwide
SAIFI [Number]	Forced Outage											
	Generators	0.02	0.02	0.06	0.01	0.01	0.03	0.02	0.02	0.01	0.19	
	HV Lines	0.06	0.14	0.05	0.06	0.05	0.06	0.12	0.11	0.20	0.92	
	LV Lines	α	α	α	α	α	α	α	α	α	0.01	
	Subtotal	0.09	0.16	0.11	0.07	0.06	0.09	0.15	0.14	0.21	1.12	0.13
	Planned Outage											
	Generators	α	α	α	0.00	α	α	α	0.00	0.00	α	
	HV Lines	α	0.02	0.05	0.04	0.07	0.01	0.08	0.09	0.00	0.02	
	LV Lines	α	α	α	0.01	0.01	0.01	0.02	0.05	0.00	0.04	
	Subtotal	α	0.02	0.06	0.05	0.08	0.01	0.10	0.14	0.00	0.06	0.04
	Total Outage											
	Generators	0.02	0.02	0.06	0.01	0.01	0.03	0.02	0.02	0.01	0.19	
	HV Lines	0.06	0.16	0.10	0.10	0.12	0.06	0.20	0.20	0.20	0.94	
	LV Lines	α	0.01	α	0.02	0.02	0.01	0.02	0.06	α	0.05	
	Total	0.09	0.18	0.17	0.13	0.14	0.10	0.25	0.28	0.21	1.18	0.17
SAIDI [Minute]	Forced Outage											
	Generators	1	4	4	α	α	1	1	α	1	7	
	HV Lines	4	20	4	5	6	5	18	8	137	79	
	LV Lines	α	1	α	1	1	α	1	1	1	4	
	Subtotal	5	25	7	6	7	7	20	10	139	90	24
	Planned Outage											
	Generators	α	α	α	0	α	α	α	0	0	α	
	HV Lines	α	3	1	5	13	1	10	11	0	8	
	LV Lines	α	1	α	1	1	α	1	3	0	3	
	Subtotal	α	4	1	7	15	1	11	15	0	11	3
	Total Outage											
	Generators	1	4	4	α	α	1	1	α	1	7	
	HV Lines	4	23	4	10	19	6	28	20	137	87	
	LV Lines	α	2	α	2	3	1	2	4	1	7	
	Total	5	29	8	12	22	8	31	24	139	101	27

* Nationwide values are calculated by weighing the values of whole regional service areas.

[19] Electric facilities such as generating plants, substations, transmission lines, or extra high voltage lines. Alpha (α) is shown if the data are a fraction less than a unit.

IV. Conclusion

Frequency

The criterion for maintained frequency is the frequency time-kept ratio, which is the ratio of time that the metered frequency is maintained within a given variance of the standard. The frequency time-kept ratio within the target variance of the standard for frequency-synchronized regions for FY 2020 was achieved at 100%.

Voltage

The criteria of maintained voltage include the number of measured points where the metered voltage deviates from the above-stated standard and the deviation ratio, which is the ratio of deviated points against the total number of measured points. No deviation from the voltage standard was observed nationwide in FY 2020.

Supply Disturbances and Interruption for LV Customers

The criteria of supply interruption include the number of supply disturbances and the system average interruption indices, SAIFI and SAIDI. In FY 2020, the total number of supply disturbances nationwide was similar to the previous year. The TEPCO PG area, which had significant supply disturbances on overhead HV lines caused by natural disasters such as Typhoon No.15 and No.19 in the previous year, saw its number of supply disturbances reduced to the half, however, the supply disturbances on overhead HV lines for the Tohoku Network area and the Kyushu Transmission and Distribution area were significantly increased. For the Tohoku area, they were specifically attributable to the blizzard and heavy snowfall mainly on the Japan Sea side of the area from December 2020 to January 2021, and damage caused by the Fukushima offshore earthquake on February 13, 2021. For the Kyushu area, it is attributable to the heavy rainfall of July 2020, and damage caused by Typhoon No. 10(Haishen), which went up north on the East China Sea in September 2020.

The number of supply disturbances over a certain scale for FY 2020 was 19, which was similar to the previous year of 18 and almost at the same level as 21.8 average for the past 5 years. There was no area that recorded a significant number.

Considering the data on interruptions for LV customers, the SAIFI and SAIDI data nationwide for FY 2020 were significantly improved from the previous year. Some areas suffered damage caused by natural disasters such as earthquakes, heavy rainfall, and typhoons, though, this improvement is largely attributable to there being no typhoon landfalls in FY 2020.

Based on the analysis and the results indicating that the frequency and voltage have remained within the target variance, OCCTO concludes that the quality of the electricity supply was adequately maintained nationwide in FY 2020. OCCTO will continue to collect and publish information on the quality of electricity in the future.

<Reference > Comparison of Average System Interruptions in Japan with Various Countries and US States for 2016–2020

Table 47 and Figure 30 show the SAIDI values and Table 48 and Figure 31 show the SAIFI values for Japan and various EU countries and US states for the period 2016–2020. The data for EU countries are cited from the report[20] of the Council of European Energy Regulators; those for major US states are from the report[21] of the Public Utilities Commission in each state. These data were aggregated and analyzed by OCCTO.[22]

The monitoring conditions, such as observed voltage, annual monitoring period (whether starting from January or April),[23] and data including/excluding natural disasters, vary across EU countries and US states. Therefore, interruption data may not be directly comparable between Japan and EU countries and US states. However, we can see that both SAIDI and SAIFI values for Japan are lower than those for the selected EU countries and US states. In addition, for Japan, only the data for LV customers are monitored. However, because there are very few customers who are supplied by means other than the LV network, it is estimated that interruptions of such customers would have only a marginal effect on the interruption data.

Data for California and EU countries were not available at the time of preparing this report, as their dates of publication were reported as "to be determined."

[20] Source: "CEER Benchmarking Report 6.1 on the Continuity of Electricity and Gas Supply Data update 2015/2016"
https://www.ceer.eu/documents/104400/-/-/963153e6-2f42-78eb-22a4-06f1552dd34c
This report is published roughly every 3 years using the updated data for the previous 3 years.

[21] Sources:
State of California: California Public Utilities Commission, "Electric System Reliability Annual Reports"
http://www.cpuc.ca.gov/General.aspx?id=4529
State of Texas: Public Utility Commission of Texas,
"Annual Service Quality Report pursuant to PUC Substantive Rule in S.25.81,"
http://www.puc.texas.gov/industry/electrici/reports/sqr/default.aspx
State of New York: Department of Public Service, "Electric Reliability Performance Reports."
http://www3.dps.ny.gov/W/PSCWeb.nsf/All/D82A200687D96D3985257687006F39CA?OpenDocument

[22] Values for states are calculated for California and Texas by weighting the numbers of customers of major electric power companies according to their reliability reports.(For California, SDG&E, PG&E, and SCE are used; for Texas, all electric power companies are used in the calculation.)

[23] The fiscal year (April 1 to March 31) is used for Japan, while the calendar year (January 1 to December 31) is used for other countries/states.

Table 47 SAIDI of Japan and Various Countries/US States for FY 2016–2020 by Forced and Planned Outages

(Minutes/Year: Customer)

Country/State			Year					Condition		
			2016	2017	2018	2019	2020	Event of	Observed Voltage	Natural Disaster
JAPAN			25	16	225	86	76	except auto re-closing	LV	Include
		Forced	21	12	221	82	72			
		Planned	4	3	4	3	3			
U.S.A.	California		219	308	266	737	-	5 minutes and longer	All	Include
		Forced	124	244	201	690	-			
		Planned	95	64	65	48	-			
	Texas		214	522	175	335	356			
		Forced	205	509	158	319	343			
		Planned	9	13	17	15	13			
	New York		137	270	409	228	538			
		Forced	-	-	-	-	-			
		Planned	-	-	-	-	-			
EU	Germany		24	-	-	-	-	3 minutes and longer	All	Include
		Forced	13	-	-	-	-			
		Planned	10	-	-	-	-			
	Italy		144	-	-	-	-		All	Include
		Forced	65	-	-	-	-			
		Planned	79	-	-	-	-			
	France		71	-	-	-	-		All	Include
		Forced	53	-	-	-	-			
		Planned	18	-	-	-	-			
	Spain		66	-	-	-	-		All	Include
		Forced	54	-	-	-	-			
		Planned	12	-	-	-	-			
	UK		55	-	-	-	-		All	Exclude
		Forced	47	-	-	-	-			
		Planned	8	-	-	-	-			
	Sweden		94	-	-	-	-		All	Include
		Forced	76	-	-	-	-			
		Planned	19	-	-	-	-			
	Finland		81	-	-	-	-		except LV	Include
		Forced	68	-	-	-	-			
		Planned	13	-	-	-	-			
	Norway		129	-	-	-	-		All	Include
		Forced	88	-	-	-	-			
		Planned	41	-	-	-	-			

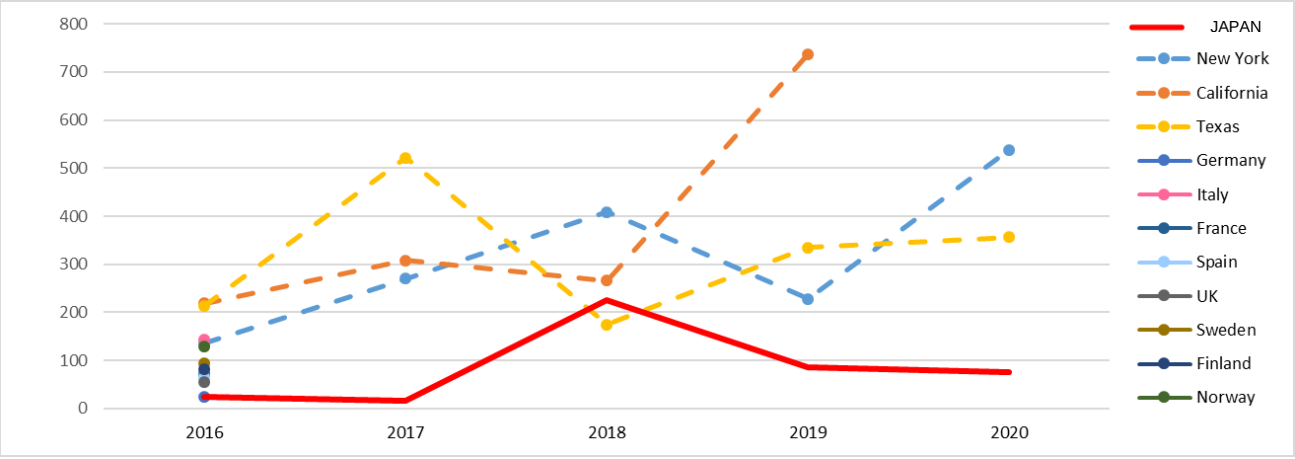

Figure 30 SAIDI of Japan and Various Countries/US States for FY 2016–2020 (Minutes/Year: Customer)

Table 48 SAIFI of Japan and Various Countries/US States for FY 2016–2020 by Forced and Planned Outages

(Number/Year: Customer)

Country/State			Year					Condition		
			2016	2017	2018	2019	2020	Event of	Observed Voltage	Natural Disaster
JAPAN			0.18	0.14	0.31	0.23	0.21	except auto re-closing	LV	Include
		Forced	0.14	0.11	0.28	0.19	0.17			
		Planned	0.03	0.03	0.03	0.04	0.03			
U.S.A.	California		1.31	1.46	1.45	1.53	-	5 minutes and longer	All	Include
		Forced	1.05	1.26	0.94	1.37	-			
		Planned	0.26	0.20	0.50	0.16	-			
	Texas		1.55	1.61	1.54	1.82	1.69			
		Forced	1.48	1.51	1.40	1.68	1.57			
		Planned	0.07	0.15	0.13	0.14	0.12			
	New York		0.79	0.85	1.01	0.88	1.06			
		Forced	-	-	-	-	-			
		Planned	-	-	-	-	-			
EU	Germany		0.59	-	-	-	-	3 minutes and longer	All	Include
		Forced	0.51	-	-	-	-			
		Planned	0.08	-	-	-	-			
	Italy		2.17	-	-	-	-		All	Include
		Forced	1.76	-	-	-	-			
		Planned	0.41	-	-	-	-			
	France		0.22	-	-	-	-		All	Include
		Forced	0.08	-	-	-	-			
		Planned	0.14	-	-	-	-			
	Spain		1.18	-	-	-	-		All	Include
		Forced	1.09	-	-	-	-			
		Planned	0.09	-	-	-	-			
	UK		0.57	-	-	-	-		All	Exclude
		Forced	0.53	-	-	-	-			
		Planned	0.04	-	-	-	-			
	Sweden		1.33	-	-	-	-		All	Include
		Forced	1.17	-	-	-	-			
		Planned	0.16	-	-	-	-			
	Finland		1.58	-	-	-	-		except LV	Include
		Forced	1.42	-	-	-	-			
		Planned	0.15	-	-	-	-			
	Norway		1.89	-	-	-	-		All	Include
		Forced	1.59	-	-	-	-			
		Planned	0.30	-	-	-	-			

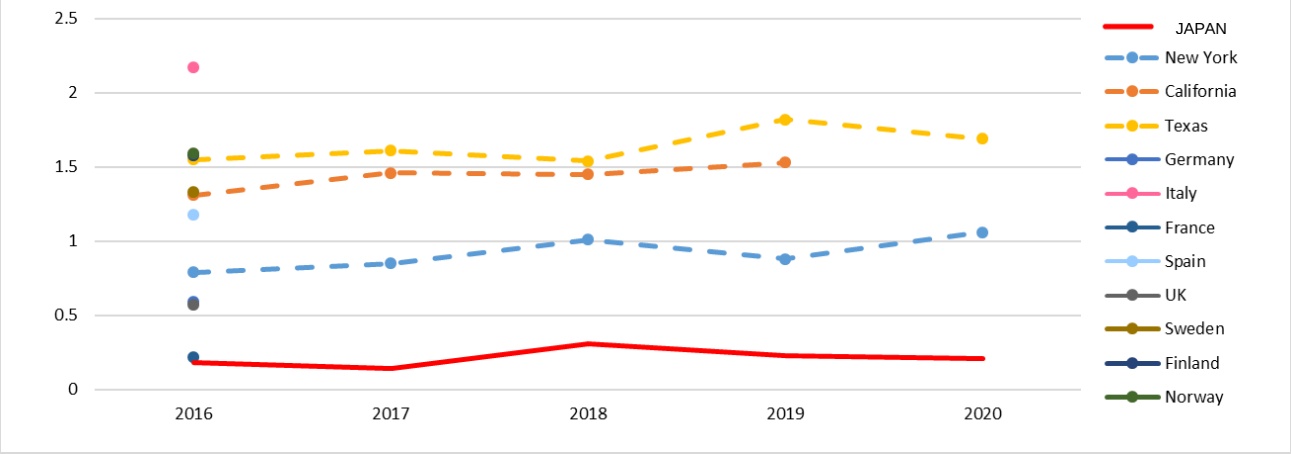

Figure 31 SAIFI of Japan and Various Countries/US States for FY 2016–2020 (Number/Year: Customer)

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Organization for Cross-regional Coordination of
Transmission Operators, Japan
http://www.occto.or.jp/en/index.html

II. State of Electric Network

Outlook for Cross-regional Interconnection Lines

- Actual Data for FY 2020 -

October 2021

Organization for Cross-regional Coordination
of Transmission Operators, Japan

FOREWORD

The Organization for Cross-regional Coordination of Transmission Operators, Japan (hereinafter, the Organization), prepares and publishes its Annual Report according to the provisions of Article 181 of the Operational Rules regarding the matters specified below.

i. Actual electric supply and demand (including evaluation and analysis of quality of electricity in light of frequency, voltage, and blackouts of each regional service area)
ii. State of electric network
iii. Actual Network Access Business until the previous year.
iv. Forecast on electric demand and electric network (including forecast of improvement of restriction on network interconnection of generation facilities) for the next fiscal year and a mid- and long-term period based on a result of compiling of electricity supply plans and their issues.
v. Evaluation and verification of proper standards of reserve margin and balancing capacities of each regional service area based on the next article, as well as contents of review as needed

The Organization published the actual data for electricity supply–demand and network system utilization ahead of the Annual Report because of the completion of actual data collection up to fiscal year 2020 (FY 2020).

SUMMARY

This report is presented to review the outlook for electricity supply–demand and cross-regional interconnection lines in FY 2020, based on the provisions of Article 181 of the Operational Rules of the Organization.

The report comprises two parts: the electricity supply and demand situation, and the interconnection line situation.

Regarding cross-regional interconnection lines, the total volume of utilization of the interconnection lines was 100,007 GWh, which was a significant increase from the 87,471 GWh in FY 2019.

There were 385 interconnection line maintenance events, requiring 534 days-worth of work in FY 2020.

We hope that the information of this report proves useful.

CONTENTS

Note:
Data for Chapter I include figures at the sending end, i.e., the electricity supplied to the public network system from power plants with energy deducted for station services.

CHAPTER II: ACTUAL UTILIZATION OF CROSS-REGIONAL INTERCONNECTION LINES

1. Cross-regional Interconnection Lines and their Management

(1) Cross-regional Interconnection Lines

Cross-regional interconnection lines comprise transmission lines at 250 kV or more and AC/DC convertors that regularly connect the regional service areas of members that are GT&D companies. Electric power supplies outside each service area are made available through the interconnection lines. The Organization directs members to supply electricity through the cross-regional interconnection lines and secure the supply–demand balance in cases of insufficient supply capacity in each regional service area. Figure 2-1 and Table 2-1 show the cross-regional interconnection lines in Japan.

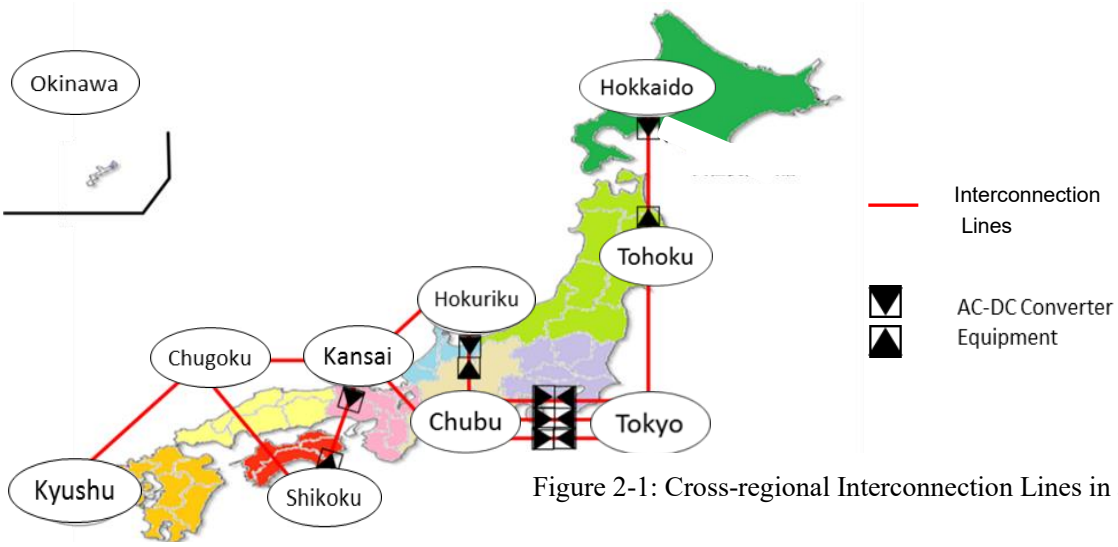

Figure 2-1: Cross-regional Interconnection Lines in Japan

Table 2-1: Summary of Cross-regional Interconnection Lines (at the end of FY 2020)

Interconnection Lines	Areas・Directions				Corresponding Facilities	AC/DC
Interconnection facilities between Hokkaido and Honshu	Forward	Hokkaido	→	Tohoku	Hokkaido-Honshu HVDC Link, New Hokkaido-Honshu HVDC Link	DC
	Counter	Tohoku	→	Hokkaido		
Interconnection line between Tohoku and Tokyo	Forward	Tohoku	→	Tokyo	Soma–Futaba bulk line, Iwaki bulk line	AC
	Counter	Tokyo	→	Tohoku		
Interconnection facilities between Tokyo and Chubu	Forward	Tokyo	→	Chubu	Sakuma FC Shin Shinano FC Higashi Shimizu FC Hida–Shinano FC	DC
	Counter	Chubu	→	Tokyo		
Interconnection line between Chubu and Kansai	Forward	Chubu	→	Kansai	Mie–Higashi Omi line	AC
	Counter	Kansai	→	Chubu		
Interconnection facilities between Chubu and Hokuriku	Forward	Chubu	→	Hokuriku	Interconnection facilities of Minami Fukumitsu HVDC BTB Converter Station and Minami Fukumitsu Substation	DC
	Counter	Hokuriku	→	Chubu		
Interconnection line between Hokuriku and Kansai	Forward	Hokuriku	→	Kansai	Echizen–Reinan line	AC
	Counter	Kansai	→	Hokuriku		
Interconnection lines between Kansai and Chugoku	Forward	Kansai	→	Chugoku	Seiban–Higashi Okayama line, Yamazaki–Chizu line	AC
	Counter	Chugoku	→	Kansai		
Interconnection facilities between Kansai and Shikoku	Forward	Kansai	→	Shikoku	Interconnection facilities between Kihoku and Anan AC/DC Converter Station	DC
	Counter	Shikoku	→	Kansai		
Interconnection line between Chugoku and Shikoku	Forward	Chugoku	→	Shikoku	Honshi interconnection line	AC
	Counter	Shikoku	→	Chugoku		
Interconnection line between Chugoku and Kyushu	Forward	Chugoku	→	Kyushu	Kanmon interconnection line	AC
	Counter	Kyushu	→	Chugoku		

(2) Management of Cross-regional Interconnection Lines

The Organization manages the interconnection lines according to its Operational Rules. The Organization has currently revised cross-regional interconnection utilization rules from those based on a first-come, first-served principle to being based on an "implicit auction scheme"[1] with respect to the effective utilization of interconnection lines, security of fairness and transparency among interconnection line users, and environmental development of the energy trading market. An implicit auction scheme allocates all capabilities of the interconnection lines through the energy trading market, rather than directly allocate the position or right of utilization through auctions. The rule revision is described in Figure 2-2.

.

Termination of capability allocation plans and changes of timing at capability registration

Figure 2-2 describes the before-and-after introduction of the implicit auction scheme. Before introduction, the capability allocation was implemented on an accumulated first-come, first-served basis, and the resulting ATC at 10:00 on the day before was used for day-ahead spot trading in the energy market. After the introduction, virtually all the ATC was traded in the day-ahead spot market. With this arrangement, there are no capability allocation plans, with the capability being registered after the day-ahead spot market, according to the revision of cross-regional interconnection lines from a first-come, first-served basis to the implicit auction scheme.

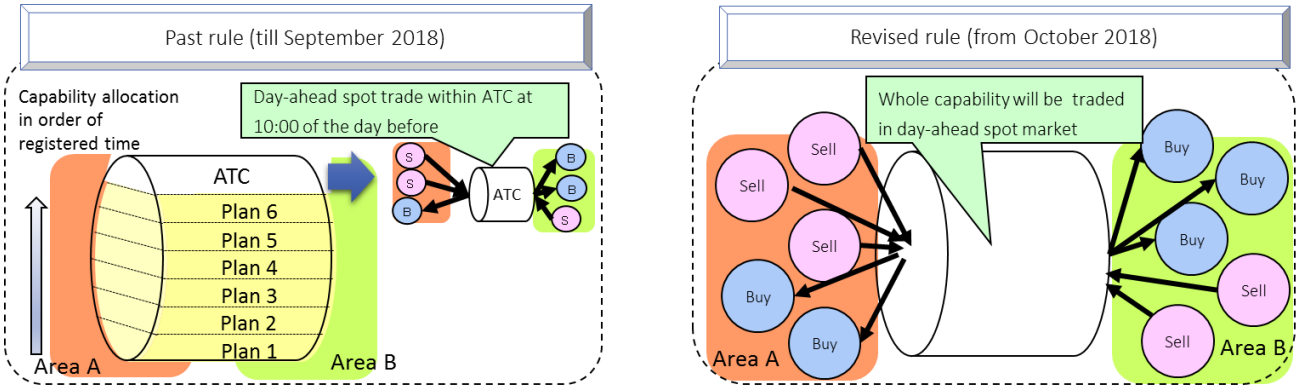

Figure 2-2: Management of Interconnection Lines

[1] http://www.occto.or.jp/occtosystem/kansetsu_auction/kansetsu_auction_gaiyou.html (in Japanese only).

2. Actual Utilization of Cross-regional Interconnection Lines

The following section records the actual utilization of cross-regional interconnection lines that were managed according to the provisions of Article 124 of the Operational Rules.

(1) Actual Utilization of Cross-regional Interconnection Lines in FY 2020

Table 2-2 and Figure 2-3 show the monthly and annual utilization of cross-regional interconnection lines for regional service areas in FY 2020.

Table 2-2: Monthly and Annual Utilization of Cross-regional Interconnection Lines for Regional Service Areas

[GWh]

		Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
Hokkaido - Honshu	→Tohoku (Forward)	121	207	136	65	39	28	32	48	71	157	27	18	947
	→Hokkaido (Counter)	28	7	7	111	96	74	124	143	144	61	142	217	1,154
Tohoku-Tokyo	→Tokyo (Forward)	2,580	2,761	2,992	3,357	3,881	2,473	2,525	2,202	2,395	3,217	1,653	1,361	31,396
	→Tohoku (Counter)	20	14	30	32	34	48	25	34	76	45	106	77	541
Tokyo-Chubu	→Chubu (Forward)	5	14	60	78	129	272	203	164	225	237	64	47	1,497
	→Tokyo (Counter)	334	398	305	423	336	148	87	62	97	271	240	314	3,016
Chubu-Kansai	→Kansai (Forward)	55	72	293	135	414	238	362	373	993	949	354	176	4,413
	→Chubu (Counter)	796	1,972	1,197	2,273	1,359	1,688	1,202	586	246	432	641	892	13,285
Chubu-Hokuriku	→Hokuriku (Forward)	4	1	13	0	5	9	11	0	18	24	1	4	91
	→Chubu (Counter)	1	17	228	27	11	70	43	5	0	3	0	54	458
Hokuriku - Kanasai	→Kansai (Forward)	338	330	80	490	549	206	67	55	85	263	217	543	3,223
	→Hokuriku (Counter)	8	11	18	27	14	29	61	131	234	31	50	6	620
Kansai-Chugoku	→Chugoku (Forward)	55	38	38	62	38	24	26	22	50	161	37	32	584
	→Kansai (Counter)	826	943	861	980	1,174	1,566	971	1,118	1,102	767	978	1,131	12,416
Kansai-Shikoku	→Shikoku (Forward)	8	1	1	0	0	0	0	1	0	0	0	0	10
	→Kansai (Counter)	761	589	801	904	886	983	947	945	654	283	377	494	8,623
Chugoku - Shikoku	→Shikoku (Forward)	13	18	29	29	15	9	15	14	29	58	7	8	245
	→Chugoku (Counter)	108	52	100	126	117	349	273	202	31	25	42	19	1,445
Chugoku - Kyushu	→Kyushu (Forward)	5	4	7	17	19	18	5	8	12	50	11	20	177
	→Chugoku (Counter)	1,091	1,217	1,098	1,123	1,520	1,464	1,260	1,264	1,532	1,288	1,403	1,604	15,864

* Based on the scheduled power flows of cross-regional interconnection lines. The values are shown before offsetting is performed.
* The values in red and blue represent the annual maximum and minimum capabilities for each line and direction, respectively.

Figure 2-3: Monthly Utilization of Cross-regional Interconnection Lines for Regional Service Areas

(2) Actual Utilization of Cross-regional Interconnection Lines from FY 2011 to FY 2020

Table 2-3 and Figure 2-4 show the annual utilization of cross-regional interconnection lines for regional service areas from FY 2011 to FY 2020.

Table 2-3 Annual Utilization of Cross-regional Interconnection Lines for Regional Service Areas(FY 2011 to FY 2020)

[GWh]

		FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Hokkaido-Honshu	→Tohoku (Forward)	3,925	214	182	143	146	237	340	130	279	947
	→Hokkaido (Counter)	7	673	505	617	804	1,033	1,270	1,005	2,117	1,154
Tohoku-Tokyo	→Tokyo (Forward)	9,454	16,084	22,450	21,273	22,587	23,097	28,238	27,298	27,575	31,396
	→Tohoku (Counter)	5,674	4,520	3,891	4,029	3,714	4,660	7,071	3,139	252	541
Tokyo-Chubu	→Chubu (Forward)	1,151	1,579	2,829	2,702	693	2,729	3,954	1,711	354	1,497
	→Tokyo (Counter)	2,426	1,288	536	2,755	4,513	5,144	5,328	5,116	4,147	3,016
Chubu-Kansai	→Kansai (Forward)	3,734	7,487	7,049	7,131	3,412	5,538	8,106	3,675	980	4,413
	→Chubu (Counter)	8,403	5,726	4,928	6,342	7,577	6,544	9,889	9,980	7,175	13,285
Chubu-Hokuriku	→Hokuriku (Forward)	169	452	170	231	108	241	353	134	7	91
	→Chubu (Counter)	130	183	310	296	172	59	108	76	40	458
Hokuriku-Kanasai	→Kansai (Forward)	1,127	1,590	1,406	2,265	2,047	2,033	2,949	2,033	2,918	3,223
	→Hokuriku (Counter)	730	464	587	491	502	640	1,260	2,540	547	620
Kansai-Chugoku	→Chugoku (Forward)	1,483	2,836	2,326	2,252	948	716	4,493	4,734	578	584
	→Kansai (Counter)	10,520	6,788	5,468	5,994	9,138	13,179	16,727	13,388	9,793	12,416
Kansai-Shikoku	→Shikoku (Forward)	0	208	0	1	2	2	1	82	31	10
	→Kansai (Counter)	9,810	8,938	9,073	9,362	9,611	8,856	9,510	8,840	9,956	8,623
Chugoku-Shikoku	→Shikoku (Forward)	3,475	3,575	3,583	2,677	3,423	3,294	4,061	2,579	131	245
	→Chugoku (Counter)	6,727	3,564	3,694	3,912	4,631	7,638	7,540	4,023	4,143	1,445
Chugoku-Kyushu	→Kyushu (Forward)	2,582	4,210	3,838	3,596	2,174	1,935	3,014	1,998	138	177
	→Chugoku (Counter)	13,905	13,596	13,847	11,218	14,947	15,476	18,183	18,280	16,311	15,864

* Based on the scheduled power flows of cross-regional interconnection lines

* The values in red and blue represent the annual maximum and the minimum capabilities in each line and direction between FY 2011 and FY 2020, respectively.

Figure 2-4: Annual Utilization of Cross-regional Interconnection Lines for Regional Service Areas (FY 2011 to FY 2020)

(3) Monthly Utilization of Cross-regional Interconnection Lines by Transaction in FY 2020

Table 2-4 shows the monthly and annual utilization of cross-regional interconnection lines by transaction in FY 2020.

Table 2-4: Monthly and Annual Utilization of Cross-regional Interconnection Lines by Transaction

[GWh]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
Bilateral	40	79	18	19	7	20	11	2	112	757	27	9	1,103
Day-ahead	6,798	8,017	7,301	9,389	9,921	8,695	7,812	6,977	7,116	6,820	5,858	6,525	91,229
1 Hour-ahead	318	571	975	850	707	982	416	397	767	744	464	483	7,675

* The values in red and blue represent the annual maximum and minimum capability, respectively.
* The implicit auction scheme was introduced in October 2018.

(4) Annual Utilization of Cross-regional Interconnection Lines by Transaction from FY 2011 to FY 2020

Table 2-5 and Figures 2-5, 2-6, and 2-7 show the annual utilization of cross-regional interconnection lines by transaction for FY 2011 to FY 2020.

Table 2-5: Annual Utilization of Cross-regional Interconnection Lines by Transaction (FY 2011 to FY 2020)

[GWh]

	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Bilateral	79,693	76,328	73,289	71,558	75,947	84,843	109,842	56,710	255	1,103
Day-ahead	5,718	7,155	11,632	14,174	13,152	14,817	18,350	51,120	83,216	91,229
1 Hour-ahead	22	493	1,750	1,554	2,050	3,392	4,203	2,932	4,000	7,675

* "Hour-ahead" refers to a transaction that is four hours ahead of the gate closure in FY 2015. From FY 2016, it refers to a transaction that is one hour ahead of the gate closure.

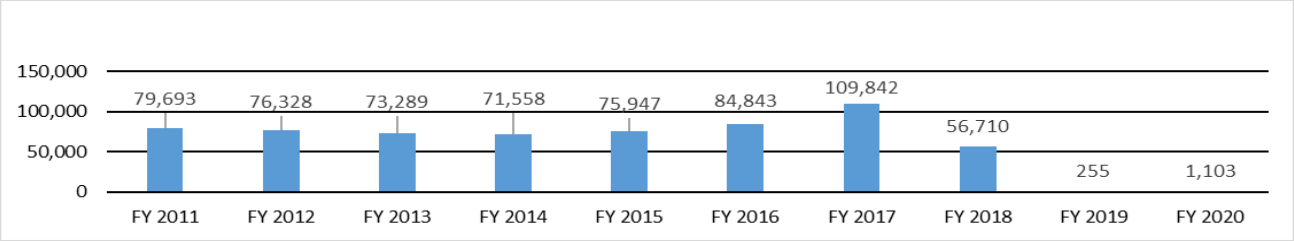

Figure 2-5: Annual Utilization of Cross-regional Interconnection Lines by Bilateral Transaction (FY 2011 to FY 2020)

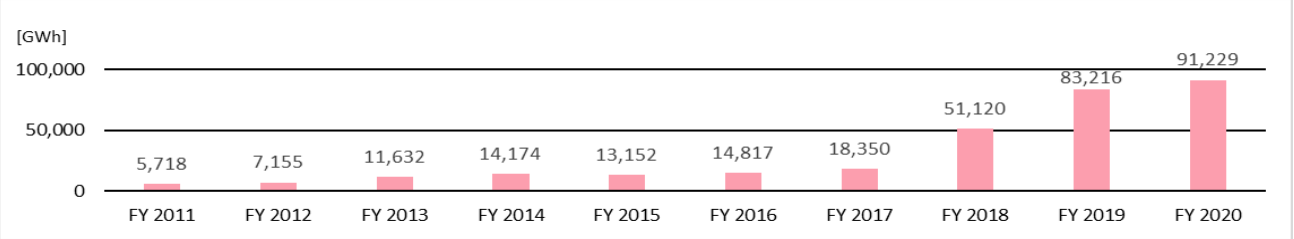

Figure 2-6: Annual Utilization of Cross-regional Interconnection Lines by Day-ahead Transaction (FY 2011 to FY 2020)

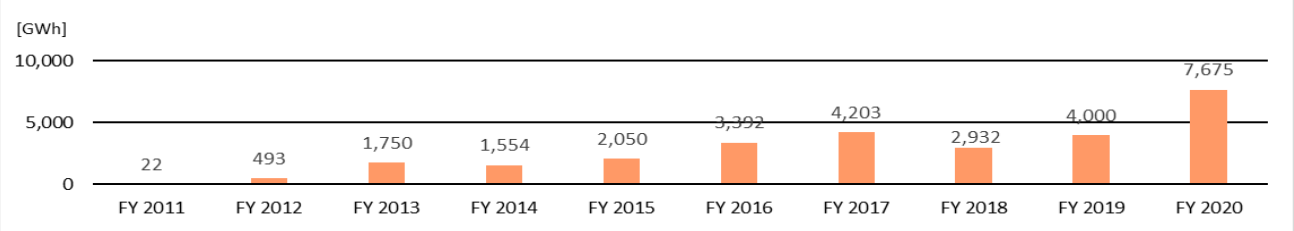

Figure 2-7: Annual Utilization of Cross-regional Interconnection Lines by Hour-ahead Transaction (FY 2011 to FY 2020)

3. Status of Maintenance Work on Cross-regional Interconnection Lines

The following describes details of the actual maintenance work on cross-regional interconnection lines, as reported by the GT&D companies in accordance with the provisions of Article 167 of the Operational Rules.

(1) Actual Monthly Maintenance Work on Cross-regional Interconnection Lines in FY 2020

Table 2-6 shows the monthly and annual maintenance works on cross-regional interconnection lines in FY 2020, and Figure 2-8 shows the nationwide monthly planned outage rate for FY 2020.

Table 2-6: Monthly and Annual Maintenance Works on Cross-regional Interconnection Lines

Interconnection	Corresponding Facilities	Apr.		May		Jun.		Jul.		Aug.		Sep.		Oct.		Nov.		Dec.		Jan.		Feb.		Mar.		Annual	
		Nos.	Days	Nos.	Days	Nos.	Days	Nos.	Days	Nos.	Days	Nos.	Days	Nos.	Days	Nos.	Days	Nos.	Days	Nos.	Days	Nos.	Days	Nos.	Days	**Nos.**	**Days**
Hokkaido-Honshu	Hokkaido and Honshu HVDC Link, New Hokkaido and Honshu HVDC Link	12	30	7	31	32	30	0	0	14	18	12	11	3	1	0	0	0	0	0	0	0	0	0	0	80	121
Tohoku-Tokyo	Soma-Futaba bulk line, Iwaki bulk line	0	0	0	0	0	0	0	0	0	0	0	0	7	4	0	0	0	0	0	0	0	0	0	0	7	4
Tokyo-Chubu	Sakuma FC C.S.	5	2	0	0	0	0	0	0	0	0	1	7	0	0	0	0	1	1	0	0	1	1	0	0	8	11
	Shin Shinano FC C.S.	0	0	8	4	11	15	0	0	0	0	4	4	11	9	22	21	13	12	8	8	13	10	9	6	99	89
	Higashi Shimizu FC C.S.	1	1	0	0	0	0	2	2	0	0	2	5	4	8	0	0	0	0	0	0	0	0	1	1	10	17
Chubu-Kansai	Mie-Higashi Omi line	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	8	3
Chubu-Hokuriku	Minami Fukumitsu HVDC BTB C.S., Minami Fukumitsu Substation	0	0	0	0	2	23	0	0	0	0	9	14	15	28	14	14	12	12	0	0	10	9	6	4	68	104
Hokuriku-Kansai	Echizen-Reinan line	0	0	0	0	4	22	0	0	0	0	5	8	6	9	2	1	0	0	0	0	0	0	2	2	19	42
Kansai-Chugoku	Seiban-Higashi Okayama line, Yamazaki-Chizu line	14	7	5	7	1	1	0	0	0	0	5	8	0	0	0	0	0	0	0	0	0	0	1	31	26	54
Kansai-Shikoku	Kihoku and Anan AC/DC C.S.	2	7	5	4	8	5	0	0	0	0	0	0	2	2	0	0	0	0	0	0	7	10	0	0	24	28
Chugoku-Shikoku	Honshi interconnection line	2	1	12	26	2	6	0	0	0	0	0	0	1	1	0	0	0	0	1	2	0	0	0	0	18	36
Chugoku-Kyushu	Kanmon interconnection line	8	12	9	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	18	25
Nationwide (Cumulative works for the same facilities deducted)		44	60	46	84	64	103	2	2	14	18	38	57	49	62	38	36	26	25	9	10	32	31	23	46	385	534

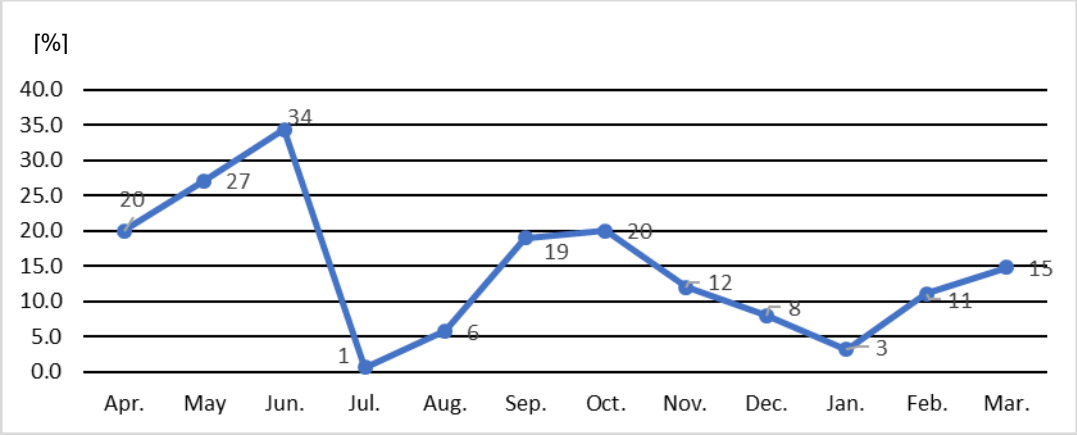

Figure 2-8: Nationwide Monthly Planned Outage Rate

$$\text{* Monthly Planned Outage Rate (\%)} = \frac{\text{Total days of planned outage in the month}}{\text{10 interconnection lines} \times \text{calendar days}}$$

(2) Annual Maintenance Works on Cross-regional Interconnection Lines from FY 2011 to FY 2020

Table 2-7 shows the annual maintenance works on cross-regional interconnection lines for FY 2011 to FY 2020.

The annual maintenance work on cross-regional interconnection lines for FY 2020 occurred on 385 occasions, the highest annual total for the past ten years. This significant increase was attributable to increases at the facilities of Shin Shinano FC, Minami Fukumitsu BTB Converter Station, and Minami Fukumitsu Substation.

Table 2-7: Annual Maintenance Work on Cross-regional Interconnection Lines (FY 2011 to FY 2020)

	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	Total	10-years Average
Number	56	58	38	63	91	218	267	205	353	385	1,734	173

* The significant increase from FY 2015 to FY 2016 is attributable to the introduction of the Cross-regional Operation System, which made detailed data management available.

4. Forced Outage of Cross-regional Interconnection Lines

(1) Forced Outage of Cross-regional Interconnection Lines in FY 2020

Table 2-8 shows the forced outage of cross-regional interconnection lines in FY 2020.

Table 2-8: Forced Outage of Cross-regional Interconnection Lines

Date	Facility	Background
April 7	Kihoku and Anan AC/DC C.S.	Trip by Water leakage of cooling system for Group 1 valves at Anan Converter Station
July 26	Higashi Shimizu FC	Secondary accident of network
July 28	Shin Shinano FC units No.1 & No.2	Secondary accident of network
August 22	Shin Shinano FC unit No.2	Secondary accident of network
September 3	Sakuma FC	Secondary accident of network
September 3	Higashi Shimizu FC	Secondary accident of network
September 19	Shin Shinano FC unit No.2	Secondary accident of network
March 2	Shin Shinano FC unit No.1	Unknown

* The forced outage affecting the TTC is described.

Two additional accidents which affected the transfer capability also occurred.[2]

(2) Annual Forced Outage of Cross-regional Interconnection Lines for FY 2011 to FY 2020

Table 2-9 shows the annual forced outage of cross-regional interconnection lines for FY 2011 to FY 2020.

Table 2-9: Annual Forced Outage of Cross-regional Interconnection Lines (FY 2011 to FY 2020)

	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	Total	10-years Average
Number	5	6	9	1	3	3	3	6	9	8	53	5

[2] They were both generator shutdowns at the Soma–Futaba trunk line attributable to an earthquake on February 13, and another on March 20.

5. Actual Employment of the Transmission Margin

"Employment of the transmission margin" refers to the supply of electricity by GT&D companies utilizing their transmission margin to interconnection lines where the supply–demand balance is restricted or insufficient to reduce power supply, among other such possibilities. Table 2-10 shows the actual employment of the transmission margin for FY 2020 according to the provisions of Article 152 of the Operational Rules.

Actual employment of the transmission margin for FY 2020 was 16 days, and was the highest since the Organization was established in FY 2015, which is attributable to measures taken for the supply–demand tightness during the winter of 2020/2021.

Table 2-10: Actual Employment of the Transmission Margin

Date	Facility	Background
December 15 & 16, 2020	Interconnection facilities between Tokyo and Chubu (Flow from Tokyo to Chubu)	〔Countermeasures to tight supply-demand during the winter 2020/21〕 Insufficient ATC of the corresponding facilities which is necessary for the instruction of power exchanges because of continuous shortage of supply capacity nationwide due to extremely cold weather.
January 3, 4, 6 & 7, 2021	Interconnection facilities between Tokyo and Chubu (Flow from Chubu to Tokyo)	〔Countermeasures to tight supply-demand during the winter 2020/21〕 Insufficient ATC of the corresponding facilities which is necessary for the instruction of power exchanges because of continuous shortage of supply capacity nationwide due to extremely cold weather.
January 8, 9, 10, 11, 12, 13, 15 & 16, 2021	Interconnection facilities between Tokyo and Chubu (Flow from Tokyo to Chubu)	〔Countermeasures to tight supply-demand during the winter 2020/21〕 Insufficient ATC of the corresponding facilities which is necessary for the instruction of power exchanges because of continuous shortage of supply capacity nationwide due to extremely cold weather.
January 13, 2021	Interconnection facilities between Chugoku and Shikoku (Flow from Chugoku to Shikoku)	〔Countermeasures to tight supply-demand during the winter 2020/21〕 Insufficient ATC of the corresponding facilities which is necessary for the instruction of power exchanges because of continuous shortage of supply capacity nationwide due to extremely cold weather.
February 14, 2021	Interconnection facilities between Tokyo and Chubu (Flow from Chubu to Tokyo)	Insufficient ATC of the corresponding facilities in the regional service area of Tohoku NW which is subject to the instruction of power exchanges because of decreased supply capacity due to earthquake of maximum seismic intensity of 6 occurred in Fukushima offshore.

Table 2-11: Actual Employment of Transmission Margin (FY 2016 to FY 2020)

[days]

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Nationwide	0	3	15	1	16

6. Actual Available Transfer Capabilities of Each Cross-regional Interconnection Line

The actual ATC values calculated and published are shown in Figures 2-10 to 2-19. (Figures 2-9 and Table 2-12 explain how to interpret the ATC graphs.)

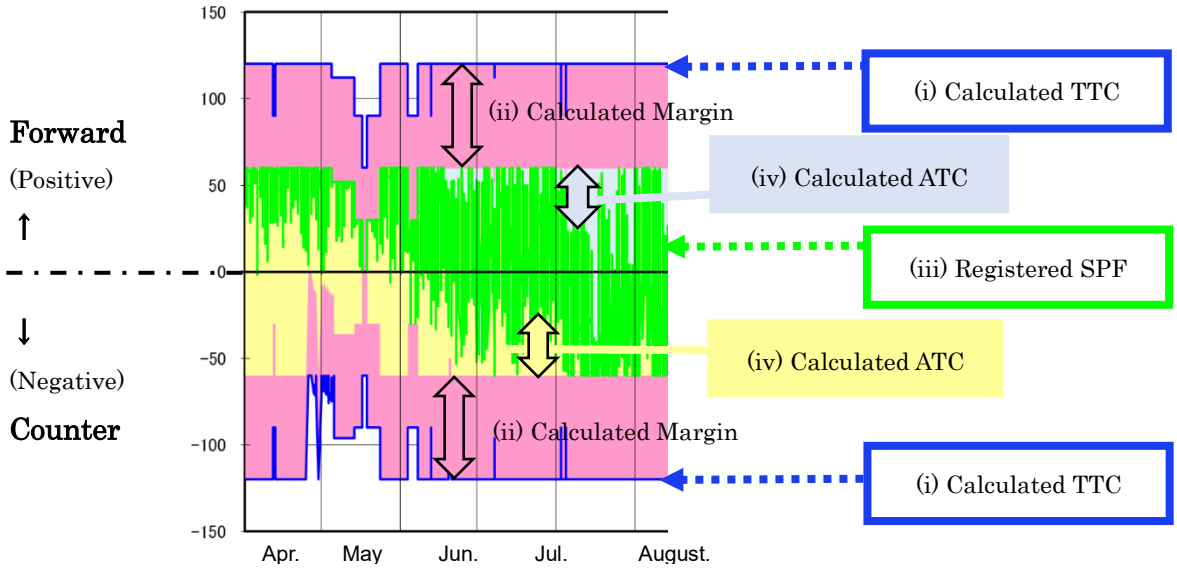

Figure 2-9: How to Interpret an ATC graph

Table 2-12: Explanation of ATC graph components

	By the end of September, 2018	After October, 2018 (introduction of implicit auction scheme)
(i) Calculated TTC	The maximum electricity that can be sent to the distribution facilities while securing supply reliability without damaging the transmission and distribution facilities	The same as the left
(ii) Calculated Transmission Margin	The amount of electricity managed by the Organization as a part of total TTC by the directions of scheduled power flows of the interconnection lines to receive electricity from other regional service areas through interconnection lines under abnormal situations of electric network, supply shortage or other emergent situations, to keep stabilizing the electric network, or to develop an environment of market trading of electricity, or to procure balancing capacity from other regional service areas. Power flows of allocation plans utilizing transmission margin and those employing transmission margin shall be deducted.	The amount of electricity managed by the Organization as a part of total transfer capability of the interconnection lines to receive electricity from other regional service areas through interconnection lines under abnormal situations of electric network, supply shortage or other emergent situations, to keep stabilizing the electric network, or to procure balancing capacity from other regional service areas. Scheduled power flows employing transmission margin shall be deducted.
(iii) Registered SPF	Sum of the registered power flows stated below: 1) allocation plans in "first come, first seerved" principle 2) trade in day-ahead spot market 3) trade in 1 hour-ahead market	Sum of the registered power flows stated below: 1) trade in day-ahead spot market 2) trade in 1 hour-ahead market
(iv) Calculated ATC	(iv) = (i) - (ii) - (iii) The necessary capability for long-cycle cross-regional frequency control shall be immediately deducted from ATC at the decision of its implementation.	The same as the left

The actual flows on the transmission lines are offset in each direction. Therefore, the scheduled power flow is the offset value between the forward and counter flows, not the simple sum of both directions. In addition, offset values on the graphs are observed as SPF, rather than observing the capacity of each forward flow and counter flow.

(Reference) Publishing actual ATC
Detailed network system information including actual ATC is available at the URL below.
URL http://occtonet.occto.or.jp/public/dfw/RP11/OCCTO/SD/LOGIN_login#

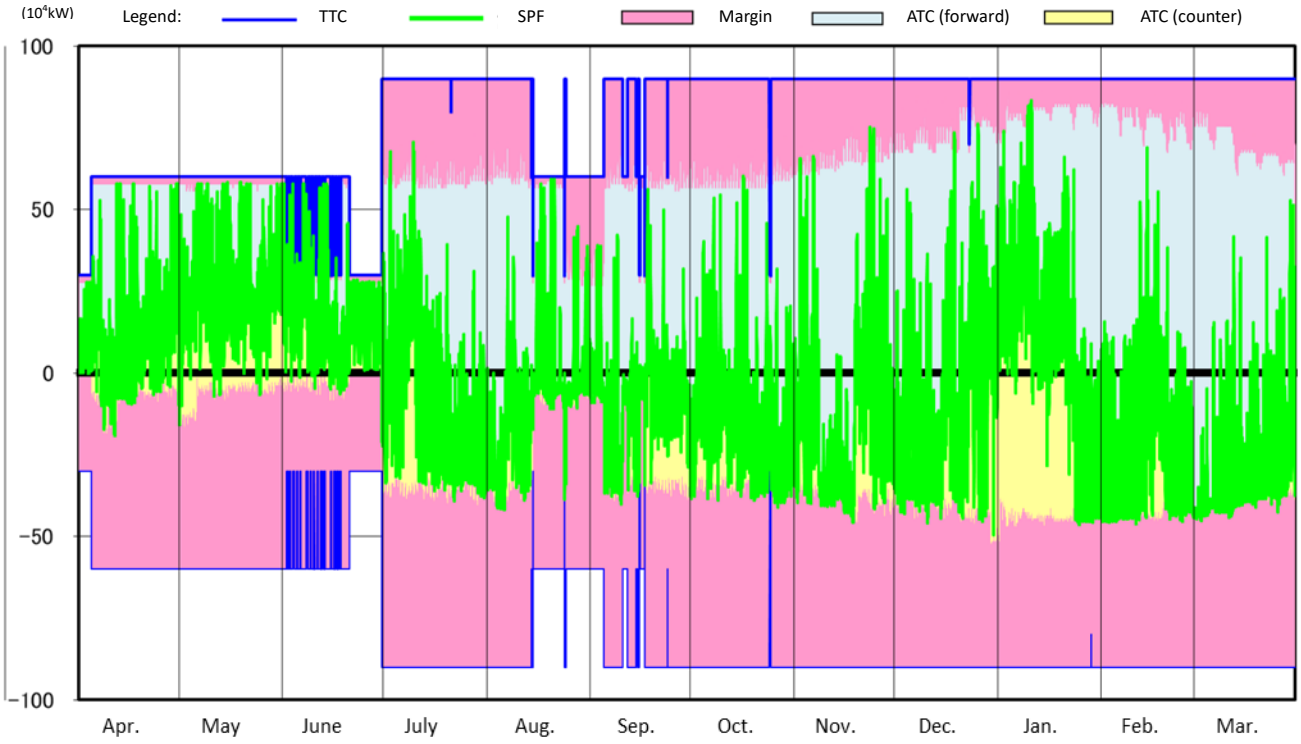

Figure 2-10: Actual ATC for Interconnection Facilities between Hokkaido and Honshu
(Hokkaido–Honshu HVDC Link, and New Hokkaido–Honshu HVDC Link)

Note: Hokkaido to Tohoku is considered a forward (positive) flow, with Tohoku to Hokkaido being a counter (negative) flow.

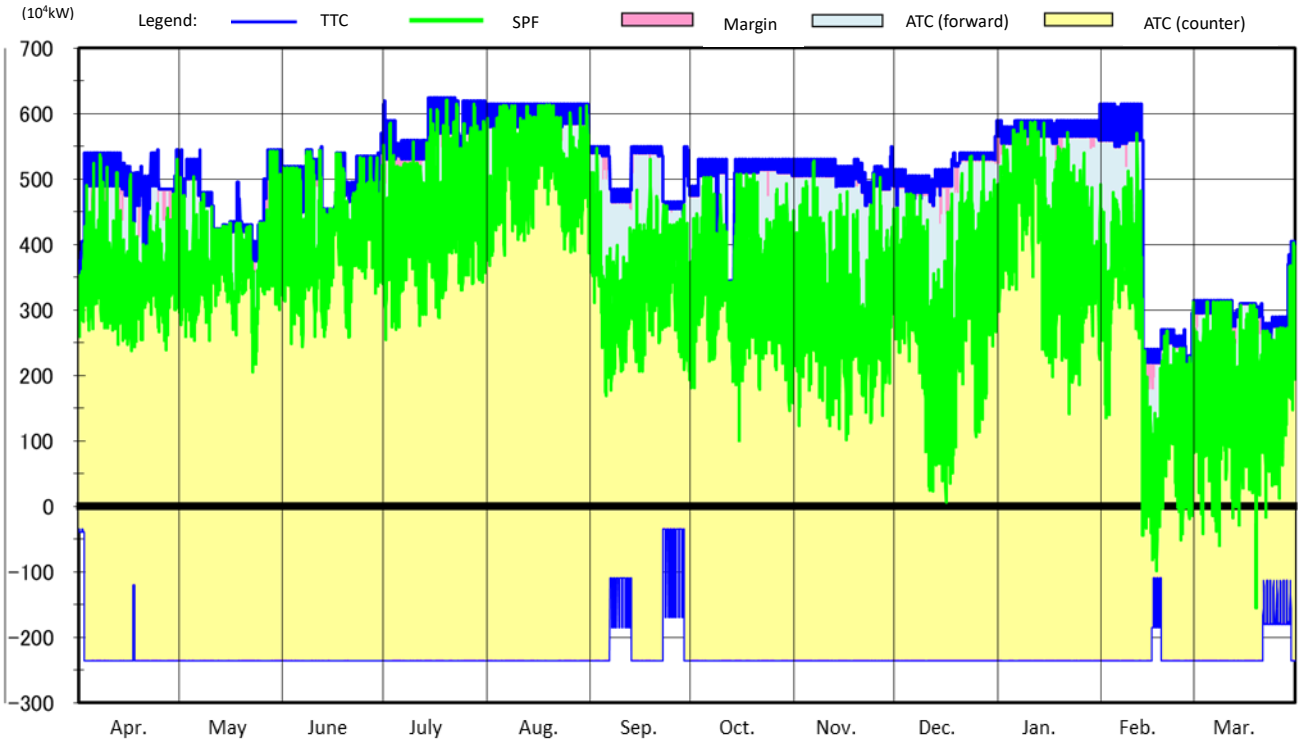

Figure 2-11: Actual ATC for Interconnection Lines between Tohoku and Tokyo
(Soma–Futaba Bulk Line and Iwaki Bulk Line)

Note: Tohoku to Tokyo is considered a forward (positive) flow, with Tokyo to Tohoku being a counter (negative) flow.

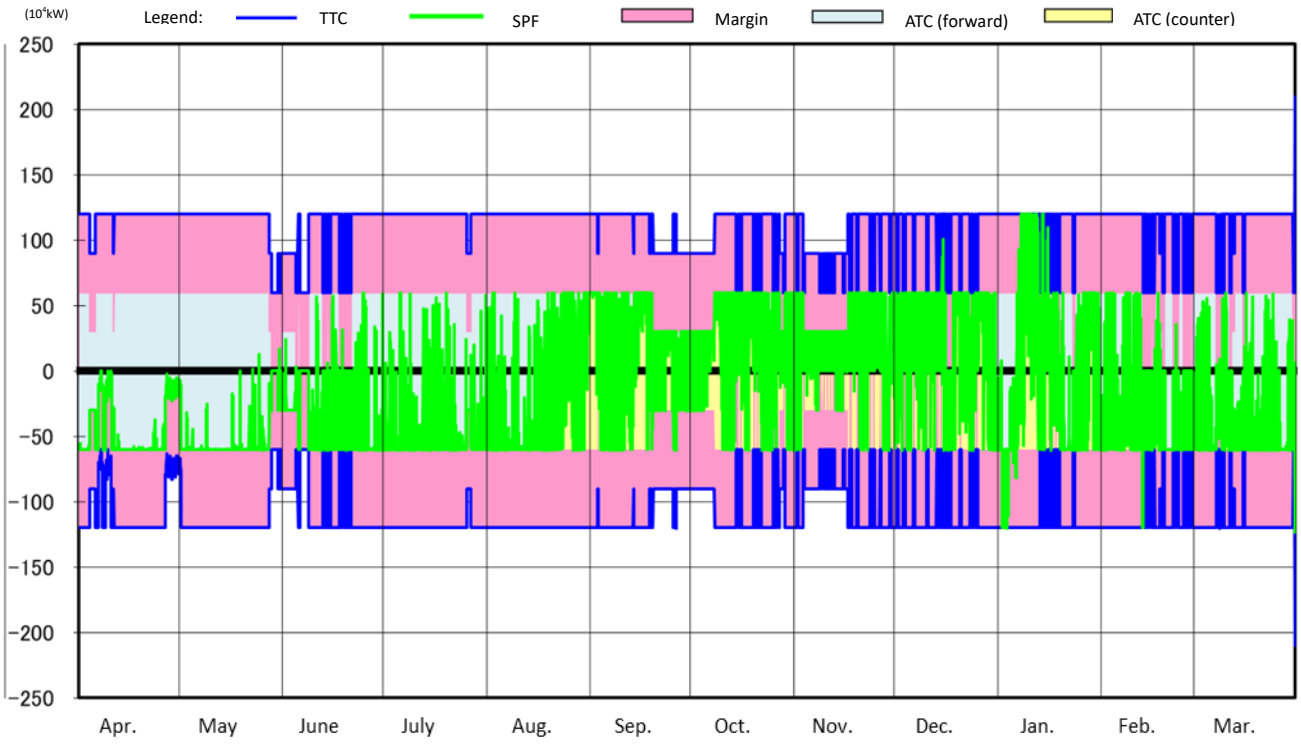

Figure 2-12: Actual ATC for Interconnection Facilities between Tokyo and Chubu
(Sakuma, Shin Shinano and Higashi Shimizu and Hida–Shinano F.C.)

Note: Tokyo to Chubu is considered a forward (positive) flow, with Chubu to Tokyo being a counter (negative) flow.

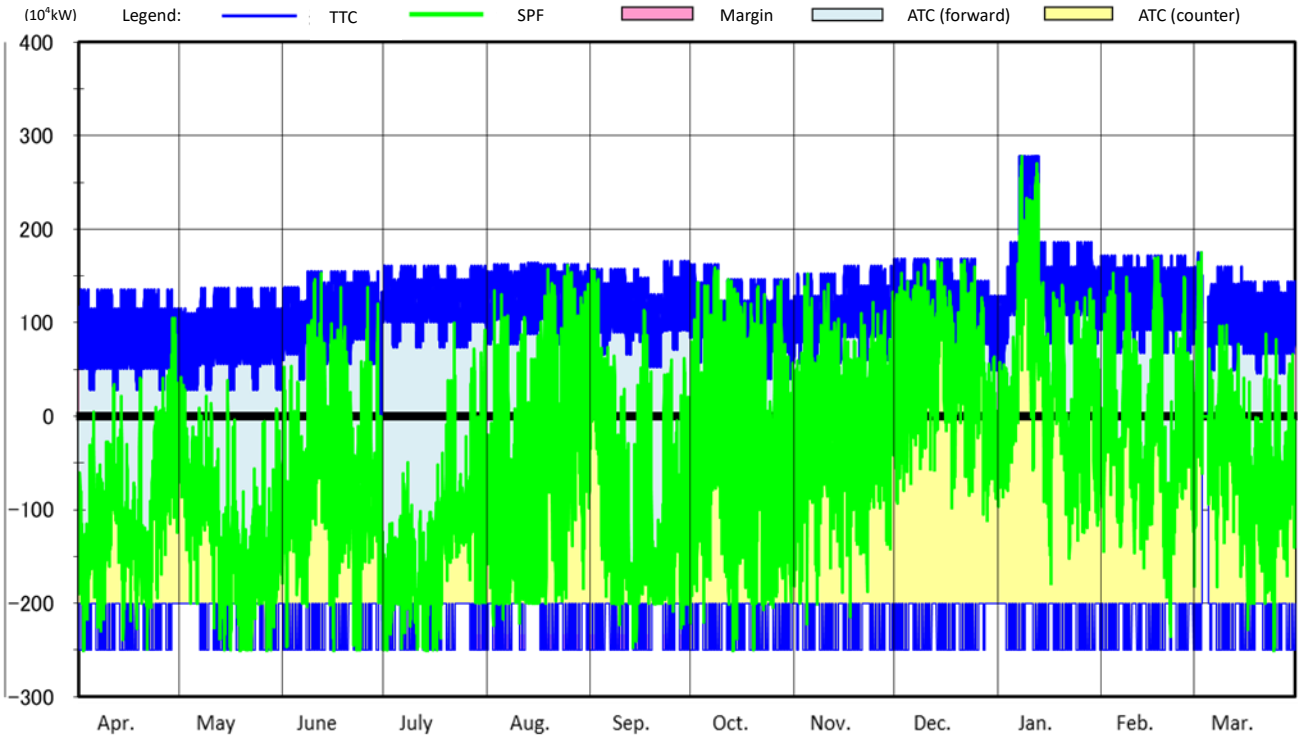

Figure 2-13: Actual ATC for the Interconnection Line between Chubu and Kansai (Mie–Higashi Omi Line)

Note: Chubu to Kansai is considered a forward (positive) flow, with Kansai to Chubu being a counter (negative) flow.

The Organization has enlarged the TTC of interconnection line between Chubu and Kansai (Mie–Higashi Omi Line) as an emergency transaction according to the provisions of Article 153 of the Operational Rules. During the supply–demand tightness nationwide in the winter of 2020/2021, the ATC of the corresponding line was insufficient to issue instructions of power exchange to GT&D companies, and the electricity supply–demand would have degraded without a power exchange. The Organization has considered the possible risk of blackout caused by accidents to transmission lines on rare occasions, and has enlarged the TTC of the corresponding line. The periods and average capabilities in the enlargement are as below.

Interconnection Line between Chubu and Kansai (Mie–Higashi Omi Line) [Flow to Kansai area]

1) From 4:30 to 24:00 on Januaryuary 8 (1330 MW at most)
2) From 3:00 to 24:00 on Januaryuary 9 (1070 MW on average)
3) From 0:00 to 24:00 on Januaryuary 10 (1060 MW on average)
4) From 0:00 to 24:00 on Januaryuary 11 (1060 MW on average)
5) From 0:00 to 24:00 on Januaryuary 12 (1110 MW on average)
6) From 0:00 to 24:00 on Januaryuary 13 (1150 MW on average)

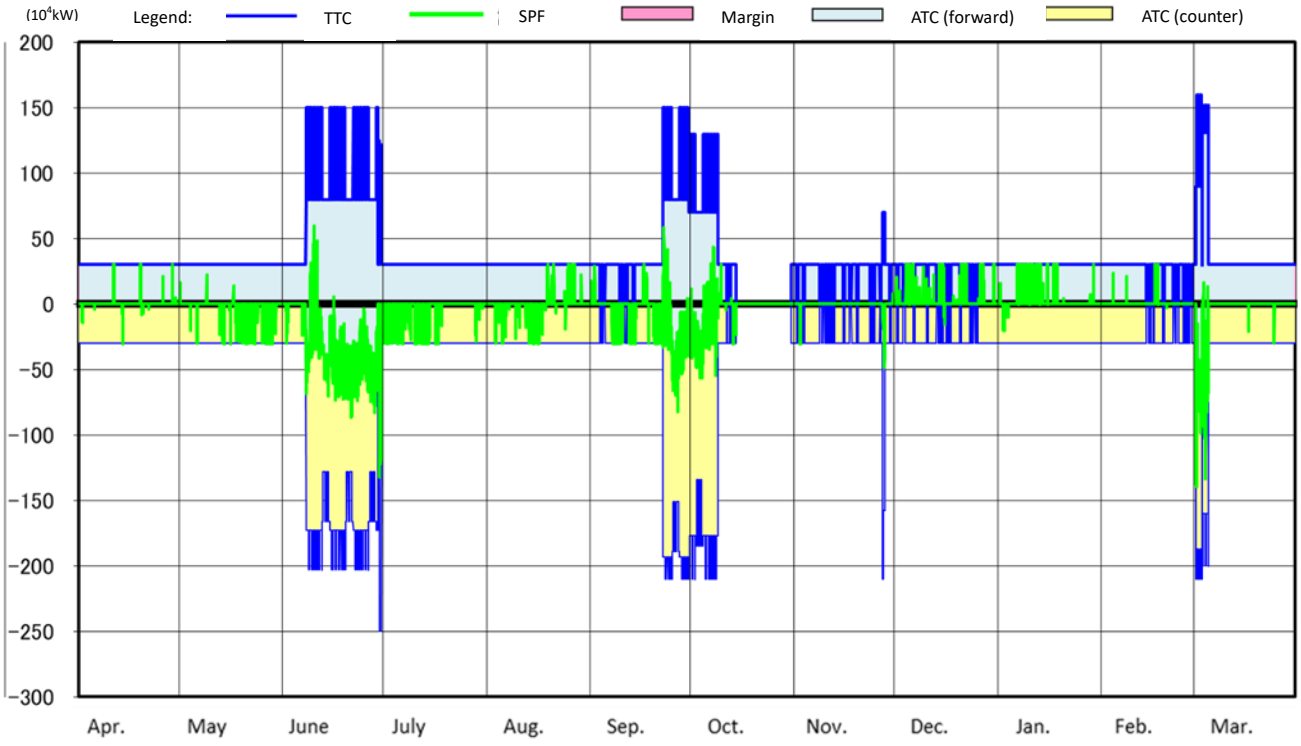

Figure 2-14: Actual ATC for Interconnection Facilities between Chubu and Hokuriku
(Minami Fukumitsu HVDC BTB Converter Station and Minami Fukumitsu Substation)

Note: Chubu to Hokuriku is considered a forward (positive) flow, with Hokuriku to Chubu being a counter (negative) flow.

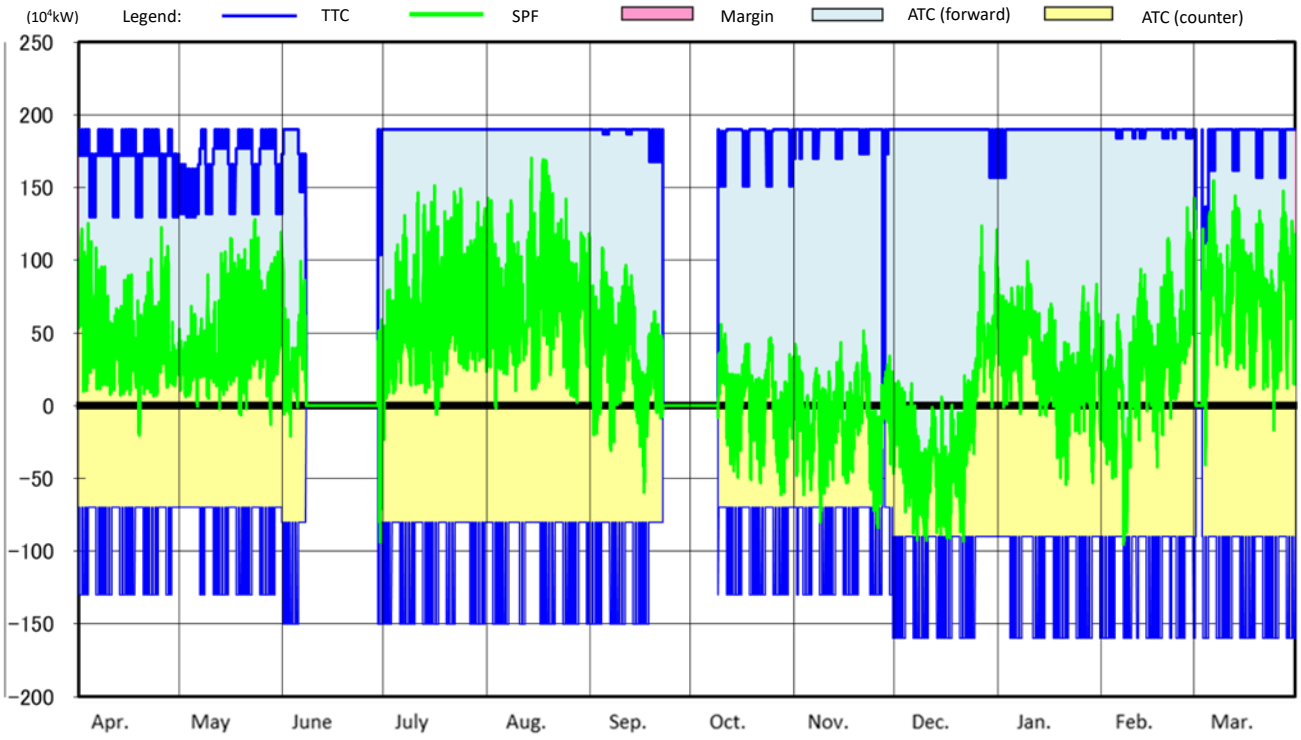

Figure 2-15: Actual ATC for the Interconnection Line between Hokuriku and Kansai (Echizen–Reinan Line)

Note: Hokuriku to Kansai is considered a forward (positive) flow, with Kansai to Hokuriku being a counter (negative) flow.

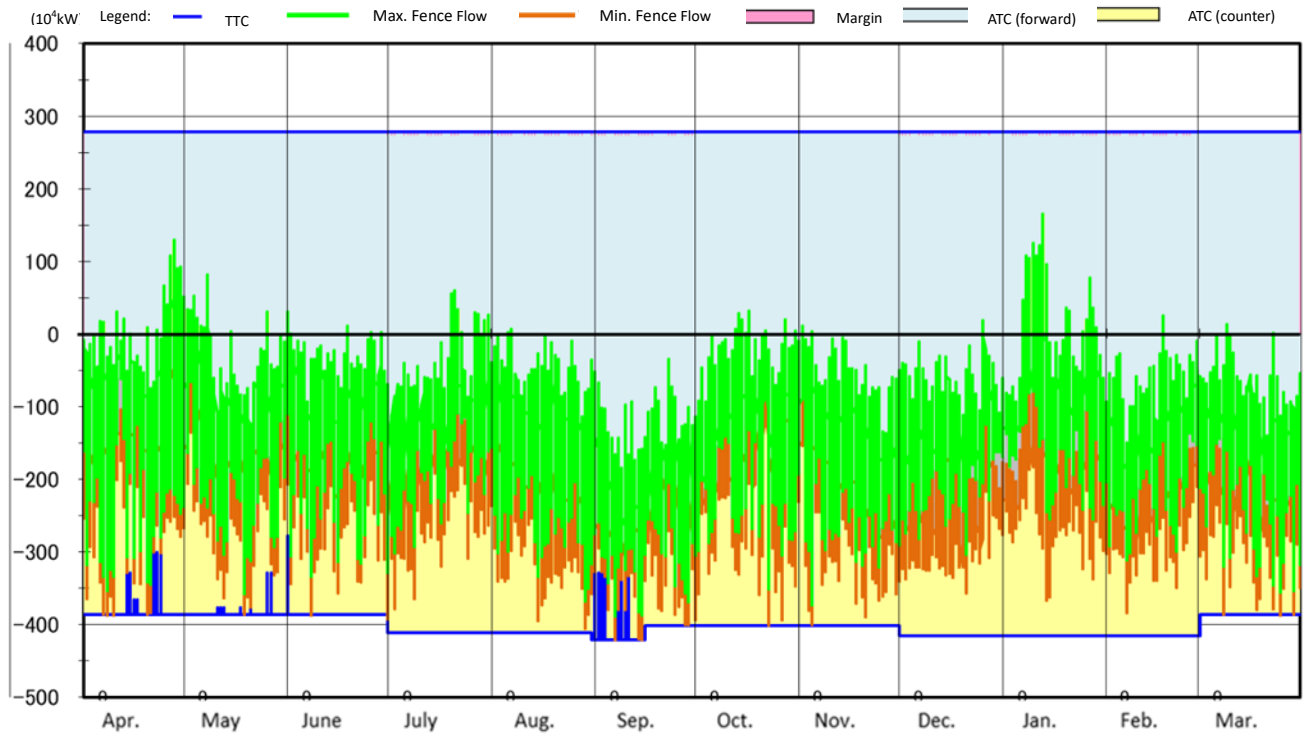

Figure 2-16: Actual ATC for Interconnection Lines between Kansai and Chugoku
(Seiban–Higashi Okayama Line and Yamazaki–Chizu Line)

Note: Kansai to Chugoku is considered a forward (positive) flow, with Chugoku to Kansai being a counter (negative) flow.

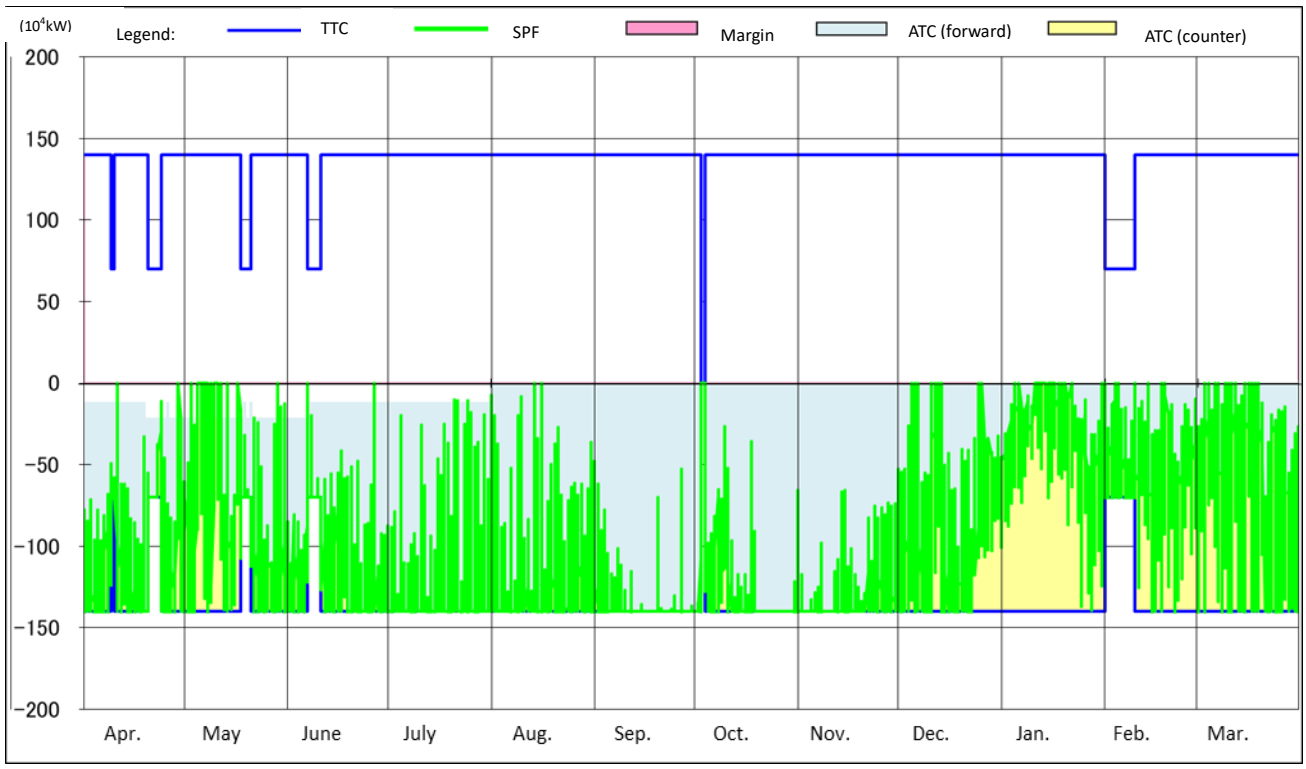

Figure 2-17: Actual ATC for Interconnection Facilities between Kansai and Shikoku
(Interconnection facilities between Kihoku and Anan AC/DC Converter Station)

Note: Kansai to Shikoku is considered a forward (positive) flow, with Shikoku to Kansai being a counter (negative) flow.
*The ATC for the forward flow is calculated and chosen as the smaller from the following.
・TTC−transfer margin−SPF.
・TTC of Minami Awa Bulk Line− (Supply Capacity of Tachibanawan Thermal Power Station−SPF of Anan−Kihoku DC Bulk Line).

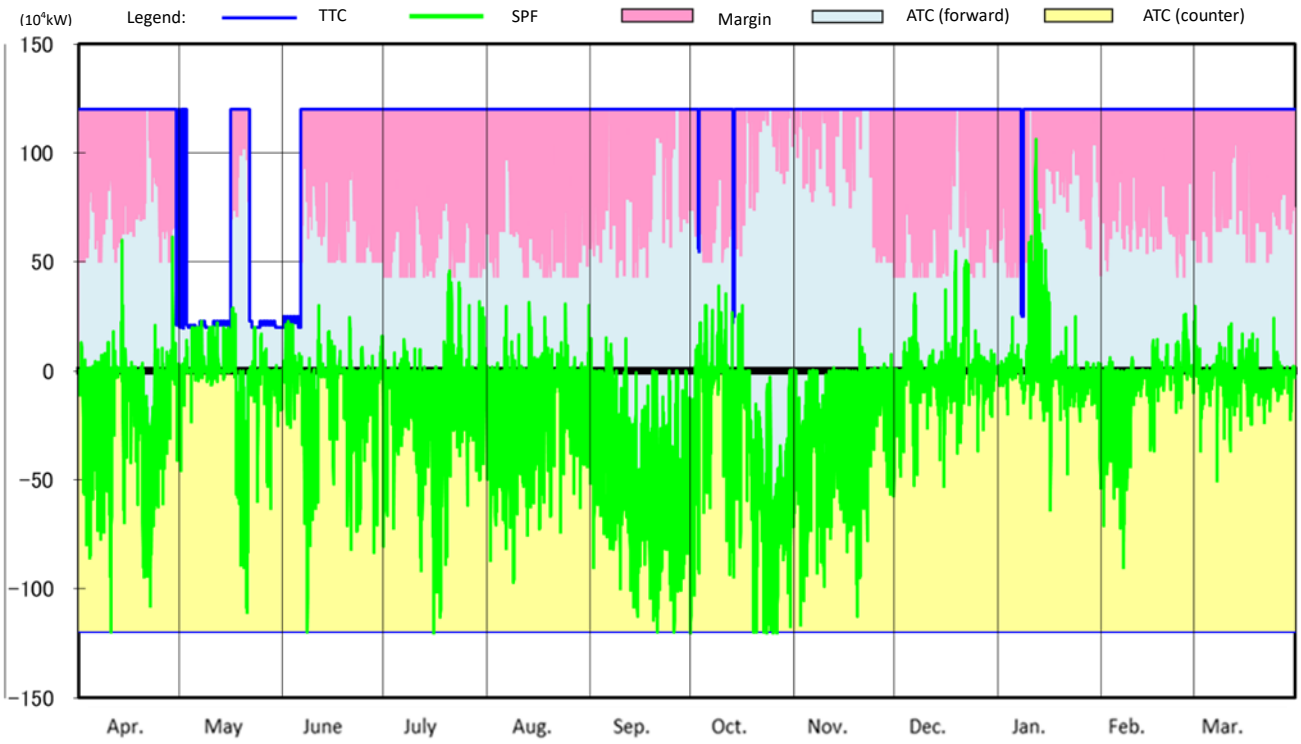

Figure 2-18: Actual ATC for the Interconnection Line between Chugoku and Shikoku (Honshi Interconnection Line)
Note: Chugoku to Shikoku is considered a forward (positive) flow, with Shikoku to Chugoku being a counter (negative) flow.

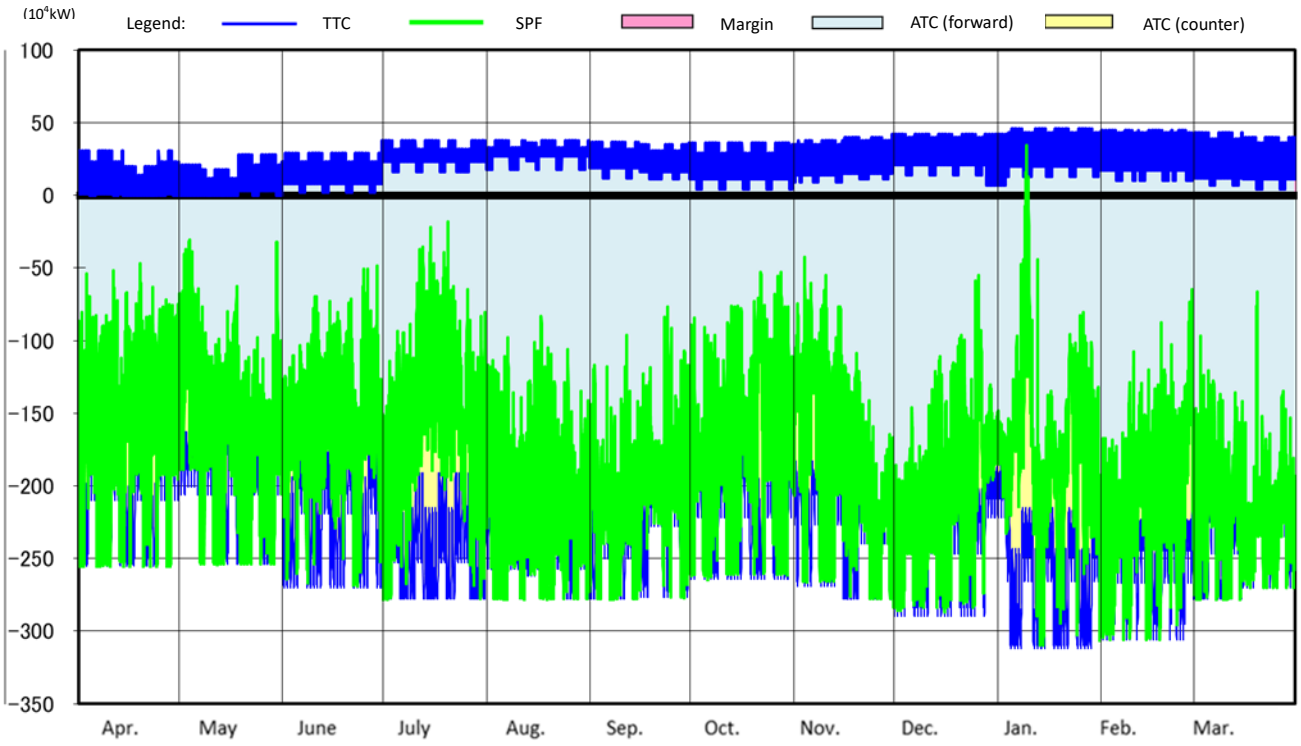

Figure 2-19: Actual ATC for the Interconnection Line between Chugoku and Kyushu
(Kanmon Interconnection Line)

Note: Chugoku to Kyushu is considered a forward (positive) flow, with Kyushu to Chugoku being a counter (negative) flow.

7. Actual Constraints on Cross-regional Interconnection Lines Nationwide

For the constraints on each regional service area of the 10 GT&Ds, please see the links below.

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* Constraints maps are published on the websites below (in Japanese only).

Hokkaido Electric Power Network, Inc.:
http://www.hepco.co.jp/network/con_service/public_document/bid_info.html
Tohoku Electric Power Network Co., Inc.:
https://nw.tohoku-epco.co.jp/consignment/system/announcement/
TEPCO Power Grid, Incorporated:
http://www.tepco.co.jp/pg/consignment/system/index-j.html
Chubu Electric Power Grid Co., Inc.:
https://powergrid.chuden.co.jp/takuso_service/hatsuden_kouri/takuso_kyokyu/rule/map/
Hokuriku Electric Power Transmission & Distribution Company:
http://www.rikuden.co.jp/nw_notification/U_154seiyaku.html#akiyouryu
Kansai Transmission and Distribution, Inc.:
https://www.kansai-td.co.jp/consignment/disclosure/distribution-equipment/index.html
Chugoku Electric Power Transmission & Distribution Company, Incorporated:
https://www.energia.co.jp/nw/service/retailer/keitou/access/
Shikoku Electric Power Transmission & Distribution Company, Incorporated:
https://www.yonden.co.jp/nw/line_access/index.html
Kyushu Electric Power Transmission & Distribution Co., Inc.:
https://www.kyuden.co.jp/td_service_wheeling_rule-document_disclosure
The Okinawa Electric Power Company Incorporated:
http://www.okiden.co.jp/business-support/service/rule/plan/index.html

CONCLUSION

Actual Utilization of Cross-regional Interconnection Lines

For the actual utilization of cross-regional interconnection lines, data on the utilization, the maintenance work, the forced outages, the employment of transmission margin, and the ATC have been collected.

III. Actual Network Access Business

Actual Data of Preliminary Consultation, System Impact Study, and Contract Applications in FY 2020

[only in Japanese]

https://www.occto.or.jp/houkokusho/2021/files/hatsudensetsubi_kouhyou.pdf

June 2021

Organization for Cross-regional Coordination of Transmission Operators, Japan

IV. Projection and Challenges regarding Electricity Supply–Demand and Network based on the Aggregation of Electricity Supply Plan

Aggregation of Electricity Supply Plans
Fiscal Year 2021

https://www.occto.or.jp/en/information_disclosure/supply_plan/files/supplyplan_2021.pdf

September 2021

Organization for Cross-regional Coordination of Transmission Operators, Japan

Aggregation of Electricity Supply Plans
Fiscal Year 2021

September 2021

Organization for Cross-regional Coordination of Transmission Operators, Japan

INTRODUCTION

The Organization for Cross-regional Coordination of Transmission Operators, Japan (hereafter, the Organization) has aggregated the electricity supply plans for fiscal year (FY) 2021 according to the provisions of Article 28 of the Operational Rules of the Organization and Article 29 of the Electricity Business Act(hereafter, the Act), which require the plans to be submitted by electric power companies (EPCOs), and their results be published.

The electricity supply plans are submitted by the EPCOs according to the Network Code of the Organization, are aggregated by the Organization, and sent to the Ministry of Economy, Trade and Industry (METI) annually by the end of March.
In total, 1,642 electricity supply plans for FY 2021 were aggregated, including 1,636 plans submitted by companies that became EPCOs by the end of November 2020 and six plans submitted by companies that became EPCOs by March 1, 2021.

Number of Electric Power Companies Subject to the Aggregation in FY 2021

Business License	Number
Generation Companies	935
Retail Companies	660
Specified Transmission, Distribution and Retail Companies	31
Specified Transmission and Distribution Companies	3
Transmission Companies	3
General Transmission and Distribution Companies	10
Total	1,642

[Reference] Electricity supply plan

The EPCOs shall develop a comprehensive plan for electricity supply, and development of a generation or transmission facility for a 10-year period according to the provisions of Article 29 of the Act.

The METI shall recommend to EPCOs any alterations to the supply plan if the plan is recognized as being inadequate for the security of a stable supply by cross-regional operation or for other development of electricity business in a comprehensive and rational manner

Due Date of Submission of Supply Plans	
(1)Electric Power Company (EPCO) except General Transmission and Distribution Company submission to the Organization	March 1 (draft: Feb. 10)
(2)General Transmission and Distribution Company submission to the Organization	March 25 (draft: Mar. 10)
(3)The Organization submission to the METI	the End of March

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

Items to be aggregated in the electricity supply plan are described in the covering letter of the aggregation of electricity supply plans according to the provisions of the Ordinance of the METI. The Organization has 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 2020, and Forecast for FY 2021 and 2022 (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 2020, and Projection for FY 2021 and 2022 (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 2020 and Forecast for FY 2021 and 2022 (Short Term)

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

Table 1-1 shows the actual data for the aggregated peak demand for each regional service area[2] submitted by the 10 general transmission and distribution (GT&D) companies for FY 2020 and the forecast[3] value for FY 2021 and 2022.

The peak demand (average value of the three highest daily loads) for FY 2021 was forecast at 159,030 MW, which represents a 0.1% decrease over 159,160 MW; i.e. the temperature-adjusted[4] value for FY 2020.

Peak demand for FY 2022 was forecast at 159,530 MW, which represents a 0.2% increase over the temperature-adjusted[4] value for FY 2020.

Table 1-1 Peak Demand (average value of the three highest daily loads) in August
(nationwide, 10^4 kW at the sending end)

FY 2020 Actual (temperature adjusted)	FY 2021 Forecast	FY 2022 Forecast
15,916	15,903 (-0.1%*)	15,953 (+0.2%*)

*% change compared with actual data for FY 2020 (temperature adjusted)

b. Forecast for FY 2021 and 2022

Tables 1-2 and 1-3 show the monthly peak demand in FY 2021 and 2022, respectively, from the aggregated peak demand for each regional service area submitted by the 10 GT&D companies. The monthly peak demand in summer (August) is greater than that in winter (January) by about 10 GW; therefore, nationwide peak demand occurs in summer.

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[1] Peak demand (average value of the three highest daily loads) corresponds to the average value of the three highest daily loads (hourly average) in each month.

[2] 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 transmission and distribution network of the GT&D companies. The Organization publishes these average values according to the provisions of paragraph 5, Article 23 of the Operational Rules.

[3] Demand forecast beyond FY 2021 is based on normal weather. Thus, weather conditions for forecast assumption may vary in contrast to the actual data or estimated value in FY 2020.

[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 2021
(nationwide, 10^4 kW at the sending end)

	Apr.	May	Jun.	Jul.	Aug.	Sep.
Peak Demand	11,541	11,334	12,543	15,860	15,903	13,917
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Peak Demand	11,798	12,387	14,085	14,855	14,835	13,337

Table 1-3 Monthly Peak Demand (average value of the three highest daily loads) in FY 2022
(nationwide, 10^4 kW at the sending end)

	Apr.	May	Jun.	Jul.	Aug.	Sep.
Peak Demand	11,593	11,381	12,596	15,909	15,953	13,960
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Peak Demand	11,833	12,415	14,115	14,883	14,863	13,362

c. Annual Electric Energy Requirements

Table 1-4 shows the preliminary data[5] for FY 2020 and the forecast value for FY 2021 from the aggregated electric energy requirements of each regional service area submitted by the 10 GT&D companies.

The electric energy requirements for FY 2021 are forecast at 866.7 TWh, a 1.9% increase over the 850.8 TWh in the preliminary data for FY 2020.

Table 1-4 Annual Electric Energy Requirements
(nationwide, TWh at the sending end)

FY 2020 Preliminary (temperature- and leap-year-adjusted)	FY 2021 Forecast
850.8	866.7(+1.9%*)

* % changes over the preliminary value for the previous year.

[5] Preliminary data for annual electric energy requirements are an aggregation of the actual data from April to November 2020 with the preliminary data from December 2020 to March 2021.

2. 10-Year Demand Forecast (Long Term)

Table 1-5 shows the major economic indicators developed and published on November 25, 2020 by the Organization, which are assumptions to be used by the GT&D companies to forecast the peak demand in their regional service areas.

The real gross domestic product (GDP)[6] is estimated at ¥502.3 trillion in FY 2020 and ¥555.2 trillion in FY 2030 with an annual average growth rate (AAGR) of 1.0%. The index of industrial production (IIP)[7] is projected at 88.2 in FY 2020 and 104.5 in FY 2030 with an AAGR of 1.7%. By contrast, the population is estimated at 125.72 M. in FY 2020 and 119.50 M. in FY 2030 with an AAGR of -0.5%.

Table 1-5 Major Economic Indicators Assumed for Demand Forecast

	FY 2020	FY 2030
Gross Domestic Product(GDP)	¥502.3 trillion	¥555.2 trillion [+1.0%]*
Index of Industrial Product(IIP)	88.2	104.5 [+1.7%]*
Population	125.72 M	119.50 M [-0.5%]*

* Average annual growth rate for the forecast value of FY 2020.

a. Peak Demand (average value of the three highest daily loads) in August

Table 1-6 shows the peak demand forecast for FY 2021, FY 2025, and FY 2030 as the aggregation of peak demand for each regional service area submitted by the 10 GT&D companies. In addition, Figure 1-1 shows the actual data and the forecast of peak demand from FY 2009 to 2030.
The peak demand nationwide is forecast at 158,720 MW in FY 2025 and 156,950 MW in FY 2030, with an AAGR of -0.1% from FY 2020 to FY 2030.

The peak demand forecast over 10 years shows a slightly decreasing trend, which is largely due to negative factors, such as efforts to reduce electricity use, wider use of energy-saving electric appliances, a shrinking population, and load-leveling measures, and despite positive factors such as the expansion of the economic scale and greater dissemination of electric appliances.

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 2021 [aforementioned]	FY 2025	FY 2030
15,903	15,872 [-0.1%]*	15,695 [-0.1%]*

* Average Annual Growth Rate for the forecast value of FY 2020.

[6] GDP expressed as the chained price for calendar year (CY) 2011.
[7] Index value in CY 2015 = 100.

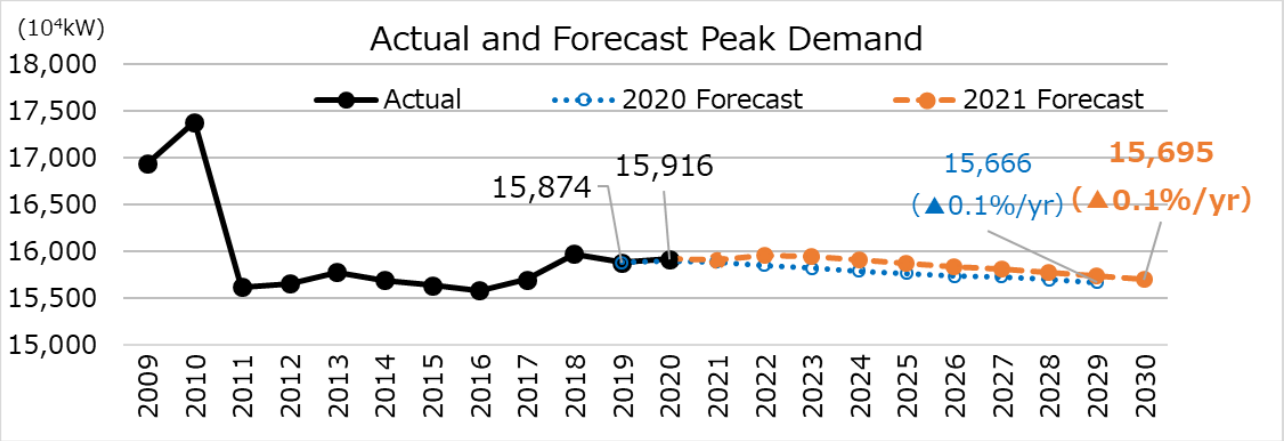

Figure 1-1 Actual and Forecast Peak Demand (August for Nationwide, 10^4 kW at the sending end)

b. Annual Electric Energy Requirement

Table 1-7 shows the forecast for annual electric energy requirements in FY 2021, FY 2025, and FY 2030 as the aggregation of the electric energy requirements for each regional service area submitted by the 10 GT&D companies.

The nationwide annual electric energy requirement is forecast at 866.3 TWh in FY 2025 and 857.9 TWh in FY 2030, with an AAGR of +0.1% increase from FY 2020 to FY 2030.

The annual electric energy requirement forecast over 10 years shows a slightly increasing trend, which is considered to be attributed to positive factors such as the expansion of economic scale and greater dissemination of electric appliances, offseting the negative factors, such as efforts to reduce electricity use, and a shrinking population under the circumstances that stagnant economic activity triggered by the global outbreak of COVID-19 is shortly remained to economic activity in the projected period.

Table 1-7 Annual Electric Energy Requirement Forecast
(nationwide, TWh at the sending end)

FY 2021 [aforementioned]	FY 2025	FY 2030
866.7	866.3 [+0.1%]*	857.9 [+0.1%]*

* AAGR for the forecast value of FY 2020.

II. Electricity Supply and Demand

1. Supply Reliability Criteria

The Organization has prepared to apply expected unserved energy (EUE) as a new reliablility criterion to the electricity supply plan based on the review of reliability criteria. Based on the discussions of the 58th meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation (March 3, 2021), the Organization has applied EUE as a reliability criterion. Annual EUE values of 0.048kWh/kW-year and 0.498kWh/kW-year for nationwide and for the Okinawa area, respectively, are the newly applied reliability criteria for the electricity supply plan. Figure 2-1 shows the summary of supply reliability evaluation (kW evaluation) based on annual EUE (available only in Japanese).

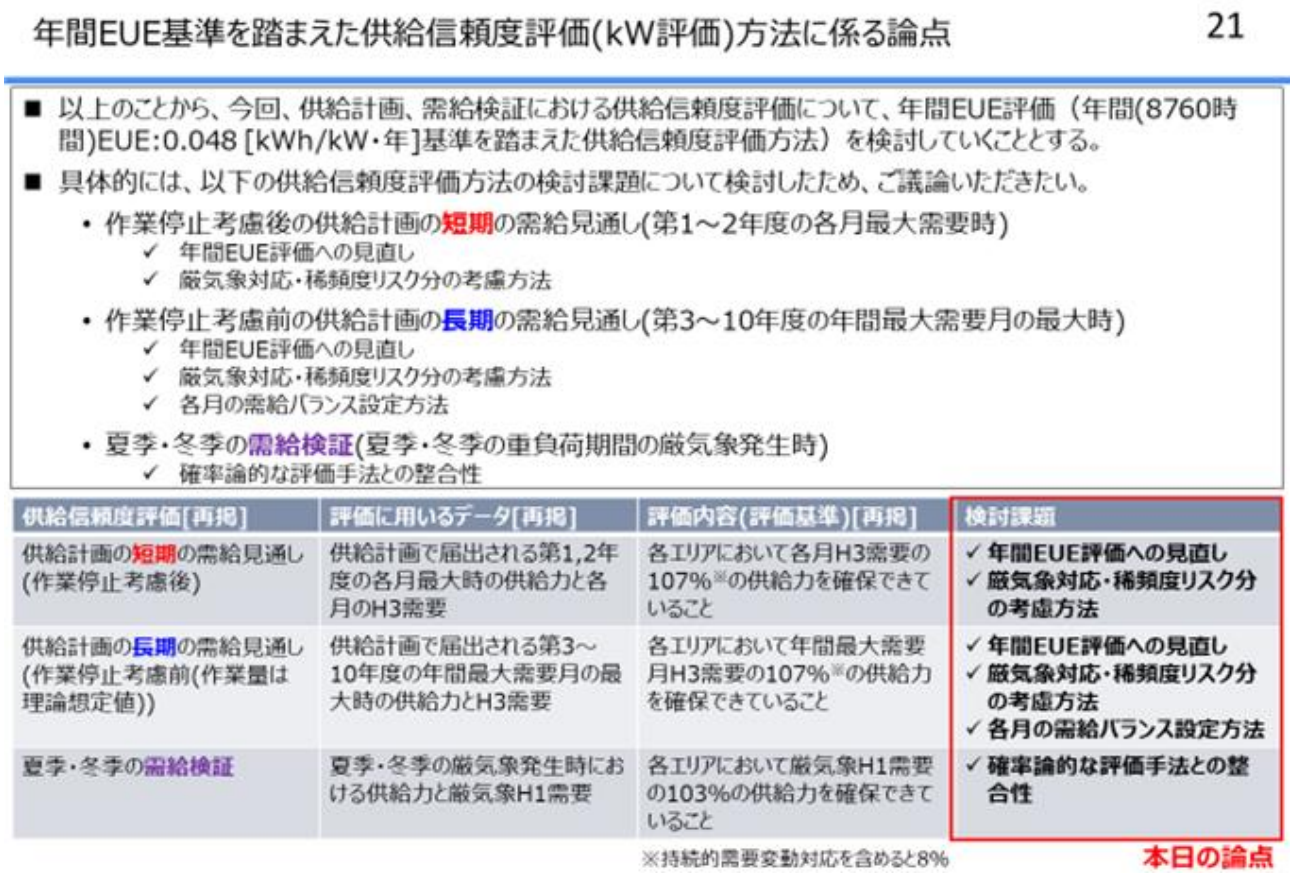

Figure 2-1 Summary of Supply Reliability Evaluation (in kW) based on Annual EUE

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

Figure 2-2 shows the evaluation of supply capacity by the conventional approach, which is supplementally implemented as well as EUE approach (available only in Japanese).

The supply reliability criteria for the electricity supply plan now applies annual EUE criteria to confirm supply reliability; however, it is crucial that supply capacity be balanced for each month according to the consideration of area characteristics, such as winter in the Hokkaido area and severe weather. Therefore, the Organization evaluates whether the supply capacity in th short

term(the first and second year of the projected period) is satisfied by the annual EUE criteria, and in the same time, confirms the reserve margin of each area and month.

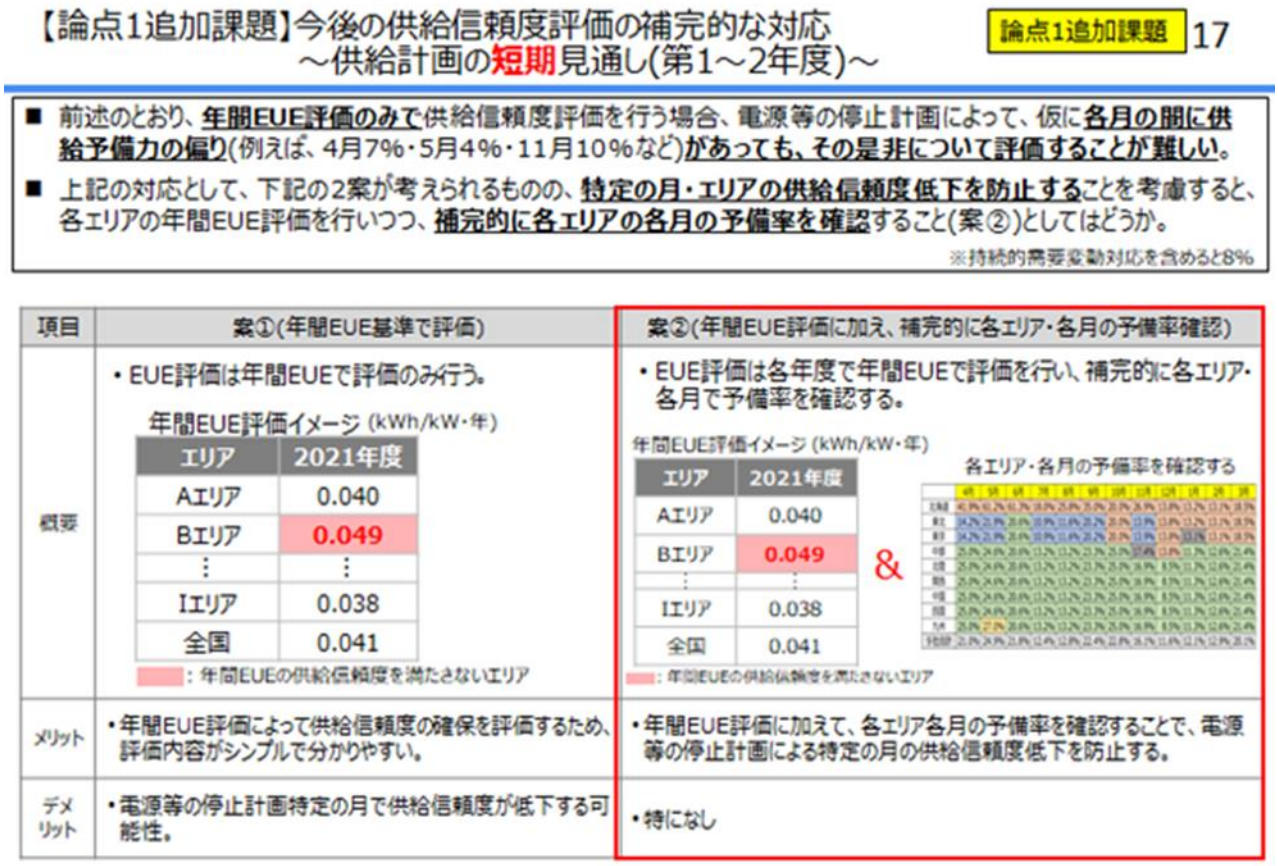

Figure 2-2 Summary of Evaluation of Supply Capacity by Conventional Approach

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

(Reference) Characteristics of Annual EUE

Figure 2-3 shows characteristics of annual EUE. For evaluation by annual EUE criteria, the stable supply is secured through the year at the usual level if annual EUE value is less than 0.048 kWh/kW-year.

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

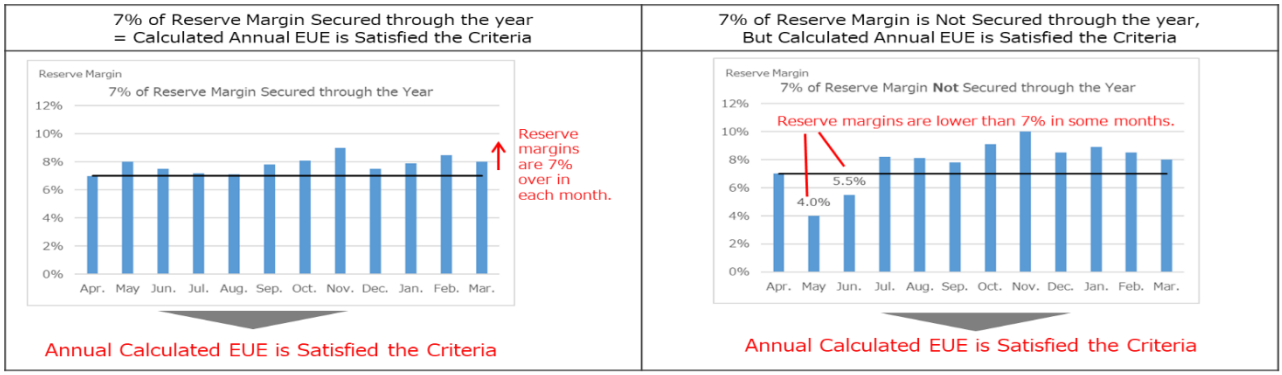

Figure 2-3 Characteristics of Annual EUE

2. Evaluation of Supply Capacity by EUE Approach in the Projected Period (FY 2021 through 2030)

Table 2-1 shows the calculated result of supply capacity by annual EUE. In the short term (the first and second year of the projected period), the entire area and year fall within the criteria of secure supply (0.048kWh/kW-year in nationwide, 0.498kWh/kW-year in Okinawa). The maximum value in the projected period is 0.046kWh/kW-year for the Tokyo area in FY 2022, which means that there is rather high probability of supply interruption in the projected period.

In the long term, the calculated result for the Kyushu area after FY 2026 exceeds the criteria, which is because of uncertainty in the commercial operation of some large generating facilities in the area at the moment.

Currently, there are some areas and years that do not satisfy the criteria of reliability; the Organization continues evaluation work for future supply plans keeping watch for development plans of generating facilities in the mid-to-long term.

Table 2-1 Calculated Result of Supply Capacity by Annual EUE

(kWh/kW- year)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hokkaido	0.000	0.000	0.004	0.008	0.005	0.012	0.008	0.007	0.008	0.000
Tohoku	0.003	0.002	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Tokyo	0.028	0.046	0.026	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Chubu	0.004	0.003	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hokuriku	0.005	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Kansai	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chugoku	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Shikoku	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Kyushu	0.008	0.001	0.013	0.022	0.041	0.594	0.508	0.581	0.493	0.184
Interconnected	0.013	0.016	0.012	0.003	0.004	0.057	0.049	0.056	0.047	0.018
Okinawa	0.035	0.031	0.034	0.023	0.292	0.058	0.061	0.069	0.080	0.087

3. Evaluation of Supply Capacity by Conventional Approach in the Short Term

The Organization will evaluate the supply–demand balance for each regional service area as well as nationwide using the supply capacity[8] and peak demand data for the regional service areas.

The Organization will implement its evaluation using the criterion of whether or not the reserve margin (%)[9] for each regional service area is secured over 8%. In the Okinawa EPCO regional service area, the criterion is to secure the power supply capacity over peak demand against an interruption of its largest generating unit and balancing capacity with frequency control function in its regional service area and the evaluation will be implemented at the time of the least reserve margin.

Figure 2-4 summarizes the supply–demand balance evaluation. The supply capacity includes the generating capacity requirements secured by retail and GT&D companies for their regional service areas and the production of surplus power[10] of generation companies. The supply capacity currently secured by retail companies includes power procured[11] from other regional service areas through cross-regional interconnection lines. Thus, the surplus power of generation companies or the reserve capacity of retail companies might provide the supply capacity for other regional service areas in the future.

Under the circumstances in which the operation of a nuclear power plant becomes uncertain, the supply capacity of the corresponding unit or plant is recorded as zero where the corresponding supply capacity is reported as “uncertain” according to Procedures for Electricity Supply Plans of FY 2021, published in December 2020 by the Agency for Natural Resources and Energy. In the electricity supply plans for FY 2020, the supply capacity was reported as “uncertain” for all nuclear power plants except those that had resumed operation by the time of the submission of the electricity supply plans (March 1, 2021).

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

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

[10] Surplus power is the surplus power generation capacity of generation companies in a regional service area without a sales destination.

[11] In case of congestion in cross-regional interconnection lines, the rebated figure for each area calculated by the Organization is added.

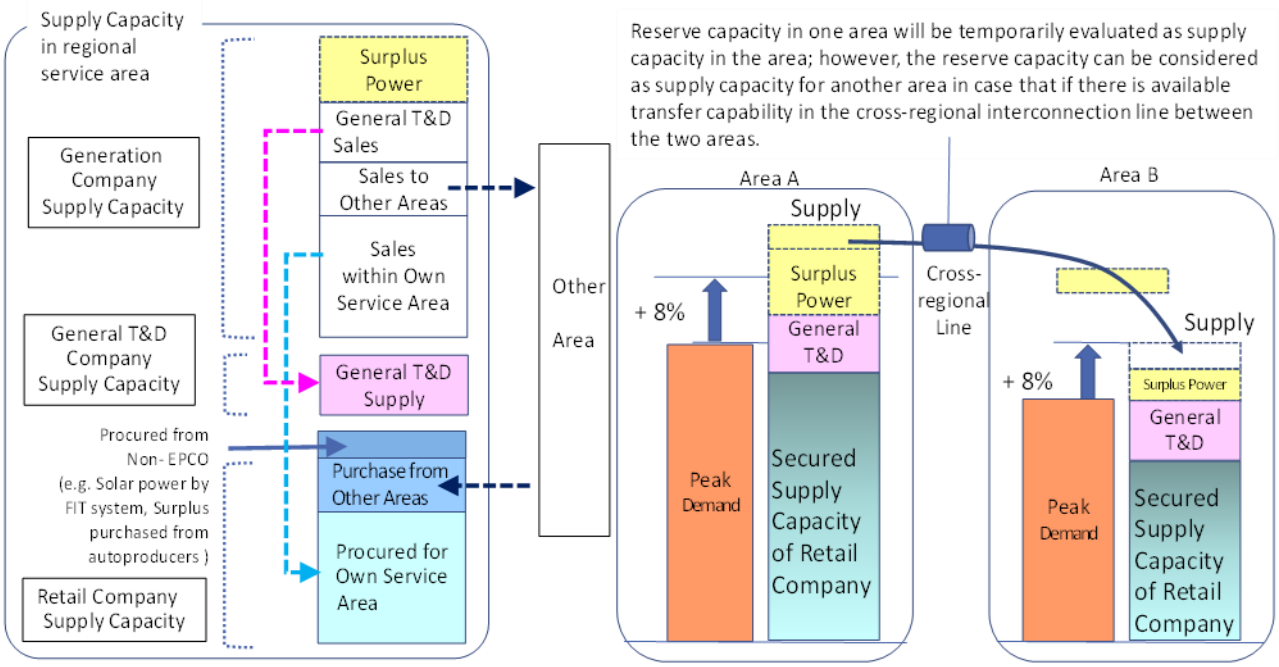

Figure 2-4 Summary of Supply–Demand Balance Evaluation

[Reference] Calculation Method of Supply Capacity

The calculation method for supply capacity or surplus power is based on the description in the "Guideline for the Calculation of Demand and Supply Capacity"[12](Agency for Natural Resources and Energy: December 2020) and "Procedures for Electricity Supply Plans of FY 2021"[13](Agency for Natural Resources and Energy: December 2019).

[12] Guideline for the Calculation of Demand and Supply Capacity (only in Japanese)
https://www.enecho.meti.go.jp/category/electricity_and_gas/electricity_measures/001/pdf/guideline.pdf

[13] Procedures for Electricity Supply Plans of FY 2021 (only in Japanese)
https://www.enecho.meti.go.jp/category/electricity_and_gas/electricity_measures/001/pdf/kisai-youryo.pdf

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

The calculation method of available transfer capability of cross-regional interconnection lines is stated below.

ATC = Transfer Capability (1) - Transfer Margin (2) - Schedule Power Flow of cross-regional interconnection line at 15:00 h in August (3).

Short term

(1): Based on "Transfer Capability of Cross-regional Interconnection Lines FY 2021-2030" [annual and long-term plans] (February 12, 2021: The Organization)[14]

(2): Based on "Transfer Margin of Cross-regional Interconnection Lines FY 2021 and 2022" [annual plan] (February 12, 2021: The Organization)[15][16]

(3): Based on monthly scheduled power flows reported in the "Plan for Transaction of Electricity (Table 36)" of the electricity supply plan for FY 2021

Mid-to-Long term

(1): For FY 2021 and 2022, the August value calculated from (1) in short term above; for FY 2023-2030, based on "Transfer Capability of Cross-regional Interconnection Lines FY 2021-2030" [annual and long-term plans] (February 21, 2021: The Organization)[14]

(2): For FY 2021 and 2022, the August value calculated from (2) in short term above; for FY 2023-2030, based on "Transfer Margin of Cross-regional Interconnection Lines FY 2021-2030" [long-term plans] (Febrary 21, 2021: The Organization) [15]

(3): Based on 15:00 h in August scheduled power flows of the period reported in "Plan for Transaction of Electricity (Table 32-8)" of the electricity supply plan for FY 2021

[14] Reference: material from the "4th Meeting of the Working Group on Cross-regional Transfer Capability" (only in Japanese)
http://www.occto.or.jp/iinkai/unyouyouryou/2020/unyouyouryou_2020_4_haifu.html

[15] Reference: material from the "3rd Meeting of the Working Group on Transmission Margin" (only in Japanese)
http://www.occto.or.jp/iinkai/margin/2020/margin_kentoukai_2020_3.html

[16] The value of the transfer margin for FY 2022 is calculated based on the "Transfer Margin of Cross-regional Interconnection Lines FY 2021 and 2022" [annual plan] (Mar. 1, 2021: The Organization)

a. Projection of Supply–Demand Balance in FY 2021 and 2022

(i) Projection for FY 2021

Table 2-2 shows the monthly projection of the least reserve margin for each regional service area recalculated to levelize using power exchanges to areas below the 8% reserve margin from areas of over the 8% reserve margin based on the ATC.[17]

Further, information on environmental assessment of thermal power plants[18] probably includes some generating facilities, in which EPCOs confirm their business judgment and proceed to their construction. Therefore, the Organization has investigated generating facilities that are not included in the electricity supply plans, although they have already applied for generator connection to GT&D companies and submitted construction plans according to the provisions of Article 48 of the Act in cooperation with the Government. Table 2-2 includes the result of the investigation, which shows that the reserve margins are below the criteria of 8% in the Tokyo area for July 2021 and January 2022. In addition, reserve margins for February 2022 are below 8% in the regional service areas of Tohoku, Tokyo, Chubu, Hokuriku, Kansai, Chugoku, Shikoku, and Kyushu.

Table 2-2 Monthly Projection of the Least Reserve Margins Nationwide and for Each Regional Service Area
(with power exchanges through cross-regional interconnection lines and generating facilities not included in the electricity supply plans, at the sending end)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	29.5%	55.6%	54.0%	32.9%	37.7%	47.9%	43.6%	25.7%	13.1%	13.4%	12.3%	14.9%
Tohoku	17.7%	26.5%	21.0%	17.5%	16.1%	16.6%	19.2%	10.5%	13.1%	13.4%	12.3%	13.3%
Tokyo	17.7%	22.7%	21.0%	**7.5%**	8.9%	16.6%	19.2%	10.5%	11.5%	**7.7%**	**5.8%**	13.3%
Chubu	23.6%	24.6%	25.2%	9.2%	10.3%	16.6%	27.2%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Hokuriku	23.6%	24.6%	25.2%	9.2%	10.3%	16.6%	27.2%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Kansai	23.6%	24.6%	25.2%	9.2%	10.3%	16.6%	28.1%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Chugoku	23.6%	24.6%	25.9%	9.2%	10.3%	16.6%	28.1%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Shikoku	23.6%	24.6%	25.9%	9.2%	10.3%	16.6%	28.1%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Kyushu	28.9%	27.1%	27.6%	10.6%	15.5%	27.2%	28.1%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Interconnected	21.7%	25.4%	24.6%	10.0%	11.5%	18.5%	24.5%	16.2%	11.7%	9.0%	**6.6%**	14.2%
Okinawa	55.8%	54.4%	30.9%	30.3%	32.3%	38.7%	48.9%	56.2%	74.2%	66.4%	64.7%	86.0%
Nationwide	22.1%	25.7%	24.7%	10.2%	11.7%	18.7%	24.7%	16.6%	12.2%	9.4%	**7.0%**	14.7%

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

In the Okinawa EPCO regional service area,[19] which is a small and isolated island system unable to receive power through interconnection lines, the criterion of stable supply is to secure supply capacity over peak demand by deducting the capacity of the largest generating unit and the balancing capacity with frequency control ('Generator I', 301 MW in total), without applying the criteria of other interconnected areas.[20]

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[17] This evaluation is implemented based on the following. The evaluation of the timing of utilization of interconnection lines varies in the regional service areas; power exchange availability is calculated based on the least reserve margin, and the calculated results are lower than those based on the reserve margin at a given time. Therefore, this evaluation covers a more severe condition, which is better for a stable supply.

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

[19] In the Okinawa EPCO regional service area, the evaluation excludes the reserve margins of several isolated islands.

[20] The evaluation is implemented at the time of the least reserve margin instead of the peak demand occurrence.

Table 2-3 shows the monthly reserve margin against the deduction of the capacity of Generator I, which indicates that the stable supply was secured in each month.

Table 2-3 Monthly Reserve Margin against the Deduction of the Capacity of Generator I (at the sending end)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Okinawa	26.7%	29.1%	10.0%	9.4%	11.6%	18.0%	25.7%	29.3%	43.1%	36.6%	34.5%	53.7%

(ii) Projection for FY 2022

Table 2-4 shows the result of the similar calculation for FY 2022, which shows reserve margins are below the criteria of 8% in the Tokyo area for July, November 2022, and January through March 2023. In addition, reserve margins for July 2022 are below 8% in each regional service area of Chugoku, and Shikoku.

Table 2-4 Monthly Projection of the Least Reserve Margins Nationwide and for Each Regional Service Area
(with power exchanges through cross-regional interconnection lines and generating facilities not included in the electricity supply plans, at the sending end)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	23.8%	36.4%	45.2%	32.2%	35.0%	42.8%	31.8%	22.4%	23.8%	20.8%	23.7%	27.9%
Tohoku	23.8%	29.6%	20.9%	17.6%	17.9%	28.6%	31.8%	22.4%	22.8%	20.8%	23.7%	27.9%
Tokyo	15.9%	26.6%	20.9%	**6.8%**	8.0%	13.2%	20.2%	**7.6%**	12.0%	**6.3%**	**6.1%**	**7.5%**
Chubu	19.2%	26.6%	22.3%	**7.1%**	8.9%	13.2%	20.2%	10.7%	12.4%	10.8%	10.0%	17.8%
Hokuriku	19.2%	26.6%	22.3%	**7.1%**	8.9%	16.4%	20.2%	10.7%	12.4%	10.8%	10.0%	18.9%
Kansai	19.2%	26.6%	22.3%	**7.1%**	8.9%	16.4%	22.0%	18.2%	12.4%	10.8%	10.0%	18.9%
Chugoku	19.2%	26.6%	22.3%	**7.1%**	8.9%	16.4%	22.0%	18.2%	12.4%	10.8%	10.0%	18.9%
Shikoku	19.2%	26.6%	22.3%	**7.1%**	8.9%	16.4%	23.5%	18.2%	12.4%	10.8%	10.0%	18.9%
Kyushu	29.7%	34.2%	28.7%	9.7%	11.7%	32.2%	35.5%	26.8%	12.4%	13.4%	10.0%	18.9%
Interconnected	19.6%	27.9%	23.0%	8.7%	10.3%	18.1%	23.6%	14.6%	13.6%	10.8%	10.4%	16.1%
Okinawa	62.8%	51.4%	39.7%	40.3%	43.6%	45.0%	49.8%	53.0%	58.3%	58.3%	84.4%	92.6%
Nationwide	20.0%	28.1%	23.2%	9.0%	10.6%	18.4%	23.9%	15.0%	14.0%	11.2%	10.9%	16.7%

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

In the Okinawa EPCO regional service area,[21] which is a small and isolated island system unable to receive power through interconnection lines, the criterion of stable supply is to secure the supply capacity over peak demand by deducting the capacity of the largest generating unit and the balancing capacity with frequency control ('Generator I', 301 MW in total), without applying the criteria of other interconnected areas.[22]

Table 2-5 shows the monthly reserve margin against the deduction of the capacity of Generator I, which indicates that the stable supply was secured in each month.

Table 2-5 Monthly Reserve Margin against the Deduction of the Capacity of Generator I (at the sending end)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Okinawa	34.0%	26.5%	19.1%	19.7%	23.2%	24.6%	26.9%	26.4%	27.5%	28.8%	54.5%	60.6%

[21] See footnote 19.
[22] See footnote 20.

b. Difference Between Projected Supply Capacity and Target Reserve Capacity (As the Criterion of 8% Reserve Margin)

(i) Projection for FY 2021

Table 2-6 shows the difference between projected supply capacity and target reserve capacity, calculated with a 8% reserve margin for FY 2021. It shows some shortage in the Tokyo area for 270 MW in July, 120 in January, and 2,840 in February for the Tokyo through Kyushu areas in total.

Table 2-6 Difference between Projected Supply Capacity and Target Reserve Capacity in FY 2021

[10^4 kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido												
Tohoku												
Tokyo				27						12	284	
Chubu												
Hokuriku												
Kansai												
Chugoku												
Shikoku												
Kyushu												
Okinawa												
Nationwide				27						12	284	

(ii) Projection for FY 2022

Table 2-7 shows the difference between projected supply capacity and target reserve capacity, calculated with a 8% reserve margin for FY 2022. It shows some shortage in the Tokyo area of 630 MW in July, 170 in November, 80 in January, 910 in February, 200 in March, and 660 in July for the Chugoku and Shikoku areas.

Table 2-7 Difference between Projected Supply Capacity and Target Reserve Capacity in FY 2022

[10^4 kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido												
Tohoku												
Tokyo				63				17		80	91	20
Chubu				66								
Hokuriku												
Kansai												
Chugoku												
Shikoku												
Kyushu												
Okinawa												
Nationwide				129				17		80	91	20

c. Difference Between Forecasted Peak Demand for FY 2021 Evaluated by the Conventional Approach

Table 2-8 shows a comparison of the peak demand forecast for FY 2021 between the supply plans of FY 2021 (the 1st year) and supply plans of FY 2020 (the 2nd year), for July 2021, January and February 2022, which has a lower reserve margin against the 8% criterion.

For the peak demand forecast, a slight increase is shown in July, but a decrease of 1,000 MW is expected in January and February 2022.

Table 2-8 Comparison of Peak Demand Forecast for FY 2021 between the FY 2021 Supply Plan (the 1st year) and FY 2020 Supply Plan(the 2nd year)

【Peak Demand Forecast】 [10^4 kW]

	FY 2021(2nd year of 2020 Plan)			FY 2021(1st year of 2021 Plan)			Balance		
Area	Jul.	Jan.	Feb.	Jul.	Jan.	2月	Jul.	Jan.	Feb.
Hokkaido	409	498	491	404	497	493	-5	-1	2
Tohoku	1,265	1,366	1,351	1,265	1,350	1,335	0	-16	-16
Tokyo	5,307	4,762	4,762	5,329	4,773	4,773	**22**	**11**	**11**
Chubu	2,473	2,305	2,305	2,453	2,285	2,285	-20	-20	**-20**
Hokuriku	495	490	490	492	489	489	-3	-1	**-1**
Kansai	2,663	2,449	2,449	2,726	2,431	2,431	63	-18	**-18**
Chugoku	1,046	1,036	1,036	1,032	1,025	1,025	-14	-11	**-11**
Shikoku	496	457	457	492	453	453	-4	-4	**-4**
Kyushu	1,538	1,492	1,492	1,521	1,451	1,451	-17	-41	**-41**
Total	15,692	14,855	14,833	15,714	14,754	14,735	**22**	**-101**	**-98**

d. Difference Between Projected Supply Capacity for FY 2021 Evaluated by the Conventional Approach

Table 2-9 shows a comparison of the supply capacity projection for FY 2021 between the supply plan of FY 2021 (the 1st year) and supply plan of FY 2020 (the 2nd year), for July 2021, January and February 2022, which has a lower reserve margin against the 8% criterion.

For the supply capacity projection, a significant decrease is shown, for 3,000 MW in July, 4,000 in January, and 5,500 in February.

Table 2-9 Comparison of Supply Capacity Projection for FY 2021 between FY 2020 Supply Plan (the 2nd year) and FY 2021 Supply Plan (the 1st year)

【Supply Capacity Projection】 [10^4 kW]

	FY 2021(2nd year of 2020 Plan)			FY 2021(1st year of 2021 Plan)			Balance		
Area	Jul.	Jan.	Feb.	Jul.	Jan.	2月	Jul.	Jan.	Feb.
Hokkaido	541	639	636	576	578	578	35	-61	-58
Tohoku	1,586	1,657	1,643	1,534	1,568	1,562	-52	-89	-81
Tokyo	5,545	5,082	4,989	5,636	5,091	5,014	**91**	**9**	**24**
Chubu	2,632	2,453	2,397	2,571	2,503	2,446	-61	51	**49**
Hokuriku	568	534	536	564	506	505	-4	-28	**-31**
Kansai	2,889	2,652	2,693	2,777	2,559	2,426	-112	-93	**-267**
Chugoku	1,320	1,165	1,179	1,283	1,128	1,123	-37	-37	**-56**
Shikoku	617	545	536	612	530	527	-5	-16	**-9**
Kyushu	1,869	1,758	1,648	1,736	1,627	1,528	-134	-132	**-119**
Total	17,568	16,485	16,257	17,290	16,089	15,708	**-277**	**-396**	**-549**

e. Difference Between Scheduled Maintenance of Generating Facility for FY 2021 Evaluated by the Conventional Approach

Figure 2-5 shows the monthly scheduled maintenance planned for FY 2021 in the 2021 Supply Plan. Figure 2-6 shows the difference in scheduled maintenance for FY 2021 between the supply plans of FY 2021(the 1st year) and supply plans of FY 2020 (the 2nd year).

The Organization has requested that all EPCOs avoid the peak period in the summer and winter for their scheduled maintenance of generating facilities as " Request for Systematically Securing Supply Capacity"; however, the schedule maintenance in February 2022 is particularly increasied compared with the 2020 Supply Plan.

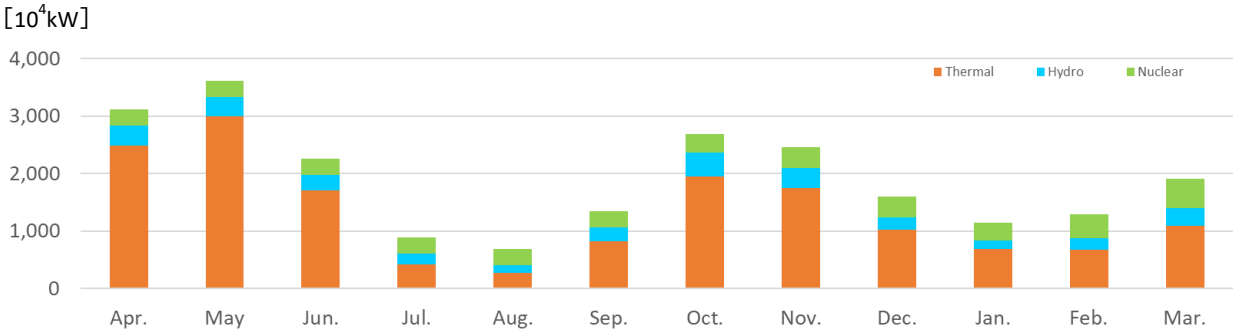


Figure 2-5 Monthly Scheduled Maintenance Planned for FY 2021 in 2021 Supply Plan

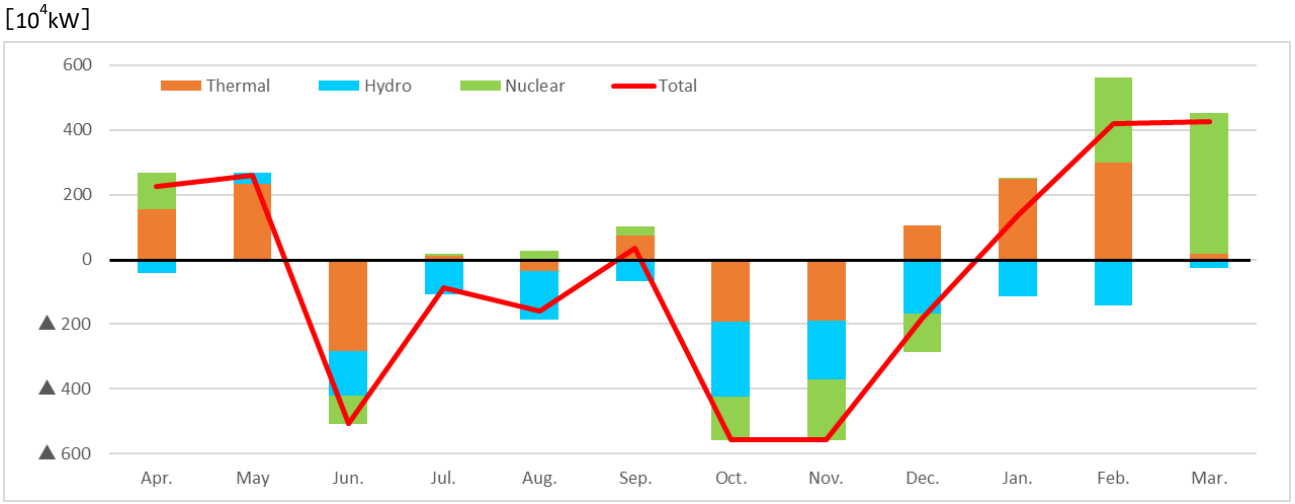


Figure 2-6 Difference in Scheduled Maintenance for FY 2021 between FY 2020 (the 2nd year) and FY 2021 (the 1st year) Supply Plan

f. Suspension and Decommissioning of Generating Facilities in 2021 Supply Plan

Table 2-10 shows suspension and decommissioning of generating facilities in the 2021 Supply Plan. In the plan, additional capacity of 660 MW is newly included in the suspension and decommissioning plan.

Besides, there is 5,490 MW of generating facilities which has already been included in the suspension

and decommissioning plan after FY 2021. In total, there is 6,150 MW capacity planned for the suspension and decommissioning in the projected period.

Table 2-10 Suspension and Decommissioning of Generating Facilities in 2021 Supply Plan (10^4 kW)

Fuel	Newly Added	Already Included	Total Capacity to be Decommissioned
LNG	10	549	559
Oil	20	—	20
Coal	36	—	36
Total	**66**	**549**	**615**

g. Capacity Secured and Surplus Power Evaluatied by the Conventional Approach

Figure 2-7 shows a comparison between the supply capacity to be procured* by a retail company for their forecasted peak demand and the surplus power of generation companies. The supply capacity to be procured exceeds the surplus power in January and Februrary 2022.

*Supply capacity to be procured: Σ(forecasted peak demand of retail companies – procured supply capacity of retail companies).

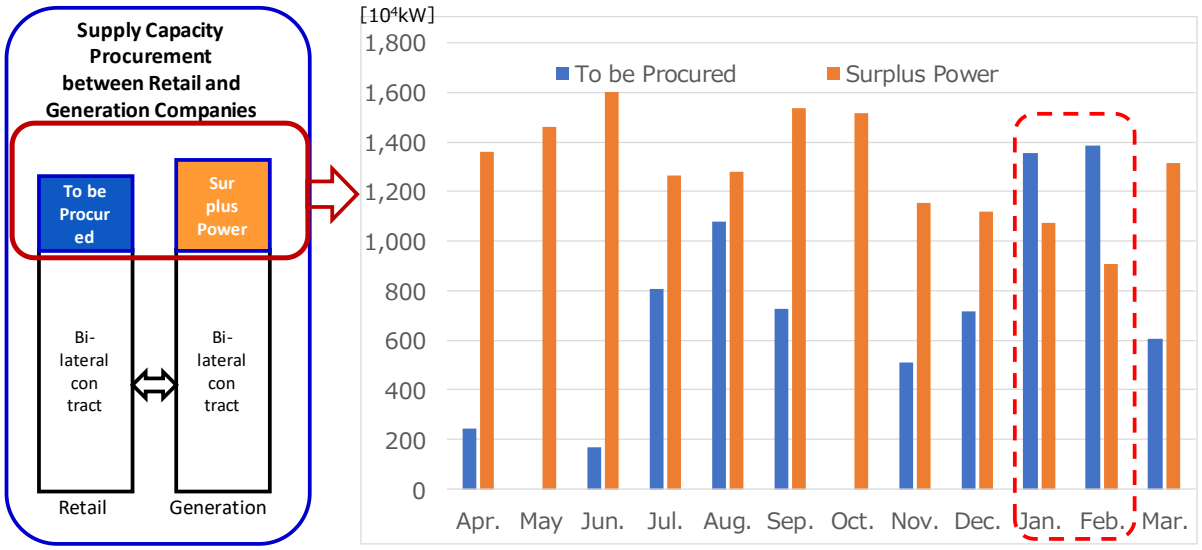


Figure 2-7 Comparison between Supply Capacity to be Procured by a Retail Company for their Forecasted Peak Demand and Surplus Power of Generation Companies

h. Summary of Supply Capacity Evaluated by the Conventional Approach

As mentioned, the Organization has confirmed that the reserve margin of 8% will not be achieved for multiple regions in particular in February 2022, due to the tendency of th reserve capacity in

each month caused by scheduled maintenance of the generating facility, even if annual EUE is achieved for the short term. The Organization has been concerned with the probability of a tight supply-demnd balance by a major shutdown of the generating facility during the peak demand period in winter unless proper countermeasure are implemented.

Therefore, the Organization has confirmed with the EPCOs that if their scheduled maintenance plans and long-term suspension plans are capable of changing their schedules, and are coordinated so that the subject generating facility can be counted as additional supply capacity.

The Organization has continued the above measures to achieve further improvement of the reserve margin. Thus, the Organization decided not to implement a review of safeguard measures of capacity procurement at this point.

4. Evaluation of Energy Supply

For evaluation of the energy supply (kWh), the Organization plans to implement an annual evaluation, known as an Electricity Supply-Demand Verification," in autumn, when information for winter demand forecast, such as weather forecast is obtained, and additional generation fuel can be available. In addition to the evaluation in autumn, the Organization plans to monitor energy supply twice a month and publish the results.

The Organization does not implement the evaluation of energy supply balance; however, it confirms the annual energy supply balance at this point and publishes information which will lead to a response of the EPCOs.

a. Projection of Energy Supply

Figure 2-8 shows the monthly energy supply balance for a total of interconnected nine areas in FY 2021(the 1st year of projected period of FY 2021 plans). Table 2-11 shows the forecasted energy requirement of the FY 2021 plan, and volumes and rates of shortage from the forecast. It seems that the energy supply* will be less than the forecasted energy requirement by 0.1 to 3.2 TWh/month of volume (equivalent to 0.1 to 4.3% against the forecast energy requirement) throughout the year.

* Projected energy supply is an addition of energy supply with bilateral contract to retail companies which includes generation of nonelectric power companies, and generation surplus.

The Organization expects that retail companies shall premeditatedly accomplish procurement of supply capacity, and generation companies shall additionally procure generation fuel to increase energy generation for actual demand and supply timing based on the projection.

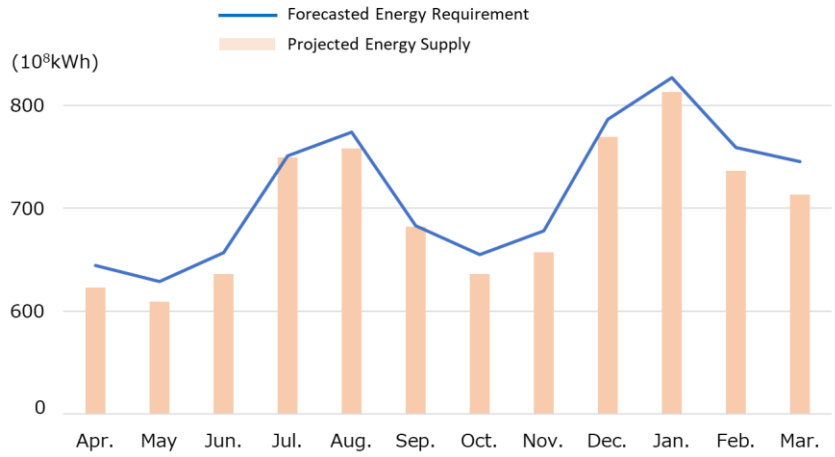


Figure 2-8 Monthly Energy Supply Balance for a Total of Interconnected Nine Areas in FY 2021

Table 2-11 Forecasted Energy Requirement of FY 2021 Plan, Volumes and Rates of Shortage from the Forecast

(10⁸kWh)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
Forecasted Energy Requirement	644	629	657	751	774	683	655	678	786	827	759	745	8,588
Projected Shortage from Energy Requirement	-21	-20	-21	-2	-16	-1	-19	-21	-17	-14	-23	-32	-207
Shortage Rate for Energy Requirement	-3.4%	-3.2%	-3.2%	-0.4%	-2.0%	-0.1%	-2.8%	-3.1%	-2.0%	-1.8%	-3.0%	-4.3%	-2.4%

For increase in energy supply, it is seen that some EPCOs will add supply capacity for actual supply-demand timing. Actual increases in energy supply by about 7% compared with the projected figure (mainly from thermal power generation) were experienced at the past supply plan, and generation companies intend to procure additional generation fuel, which became clear at the hearing opportunity in the aggregation of supply plans. In particular, as a tighter supply-demand balance is projected in the winter peaking period, the Organization implements an evaluation of the electricity supply-demand verification, monitors the balance twice a month afterward, and publishes its result.

[Reference] Actual Supply-Demand Balance of Energy Supply in FY 2020 Supply Plans

Figure 2-9 shows the actual supply-demand balance of energy supply in the FY 2020 supply plans. Table 2-12 indicates the actual energy supply and requirement, and the balance and rates against the projected supply. There were times when the projected energy supplies were below the forecasted energy requirement by 0.7 to 2.8% in FY 2020. However, when the actual timing of supply-demand became nearer, according to procurement of supply capacity by retail companies, increased energy generation was added by the generation companies. (Basically, fluctuation of the energy requirement is absorbed by thermal power generation.)

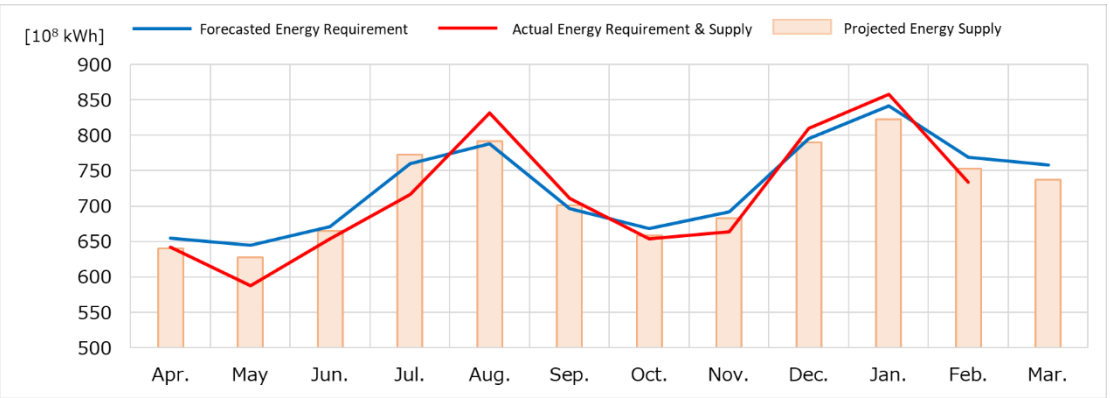


Figure 2-9 Actual Supply-Demand Balance of Energy Supply in FY 2020 Supply Plans

Table 2-12 Actual Energy Supply and Requirement, Balance and Rates against the Projected Supply

(10⁸ kWh)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
a. Forecasted Energy Requirement	655	645	671	760	788	696	668	692	795	841	769	758	8,738
b. Projected Energy Supply	640	627	665	772	792	701	658	683	790	823	752	737	8,640
c. Balance between Projected Energy Supply and Forecasted Energy Requirement (b-a)	-14	-17	-7	12	4	5	-10	-8	-5	-19	-17	-21	-97
d.Variance from Forecasted Energy Requirement (c/a)	-2.2%	-2.7%	-1.0%	1.6%	0.5%	0.7%	-1.6%	-1.2%	-0.7%	-2.2%	-2.2%	-2.8%	-1.1%
e. Actual Energy Requirement & Supply	642	587	653	716	831	711	654	664	810	858	734		
f. Balance between Actual Energy Supply and Projected Energy Supply (e-b)	1	-40	-11	-56	39	10	-4	-19	20	36	-19		
g. Excess Rate of Actual Supply from Projected Supply (f/b)	0.2%	-6.3%	-1.7%	-7.2%	5.0%	1.4%	-0.6%	-2.8%	2.5%	4.3%	-2.5%		

b. Evaluation of Energy Supply (Energy to Be Procured and Surplus Generation)

Figure 2-10 shows the comparison of energy supply, which retail companies plans to procure at energy market and surplus energy that the generation companies are expected to provide to the market. Retail companies plan more energy procurement in the energy market in April, June, August, Februrary and March. However, it is expected that surplus energy provided will be less than what the retail companies expect in those months.

The Organization expects that retail companies shall premeditatedly achieve enregy procurement, and generation companies shall increase their energy generation based on this information.

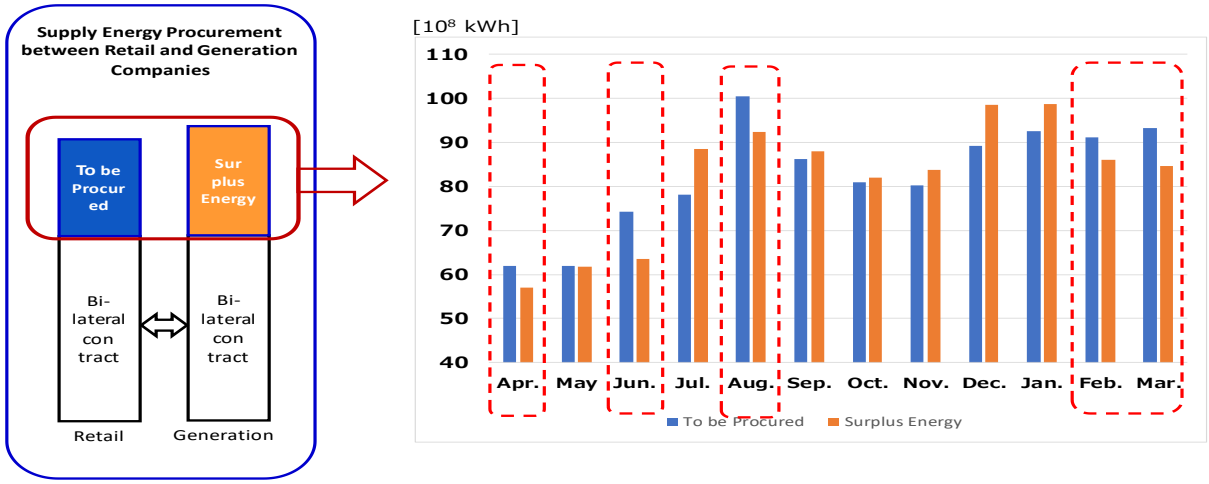


Figure 2-10 Comparison of Energy Supply Procurment of Retail Companies and Surplus Energy Provision

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

・ Evaluation of Supply Capacity by the EUE Approach

For short term of the projected period (FY 2021 and 2022), indices of EUE is satisfied in all areas and years. By contrast, for the mid-to-long term, the indices of EUE exceed the criteria for the Kyushu area after FY 2026.

・ Evaluation of Supply Capacity by the Conventional Approach

It is confirmed that the 8% resereve margin is not secured in FY 2021 and 2022 in several areas and for several months.

・ Evaluation of Energy Supply

It is expected that the energy supply in FY 2021 will be less than the forecasted energy requirement by 0.1 to 3.2 TWh/month of volume (equivalent to 0.1 to 4.3% against the forecast energy requirement) throughout the year.

Based on these evaluation, The Organization will implement the measures stated below. Figure 2-11 indicates the implementation schedules afterward (in Japanese only).

The Organization has confirmed that there are some areas and months that cannot secure an 8% reserve margin even if the annual EUE has satisfied its criteria in FY 2021 and 2022, and is concerened with the probability of a tight supply-demnd balance by a major shutdown of the generating facility during peak demand period in winter, unless proper countermeasure are implemented.

However, for immediate implementation of safeguard measures of generator procurement at this point, it shall lead to excessive supply capacity and procurement cost that may be procured in market trading at the proper cost; thus, the Organization considers that implementation of safeguard measures of generator procurement is not rational.

On this account, the Organization confirmed with EPCOs whether any rescheduling of scheduled maintenance work is available, or suspension of aged generators will be postponed. It has coordinated that the confirmation above leads to additional supply capacity to be used. Hereafter, publishing the result of the confirmation and the coordination above, the Organization will reconfirm with retail and generation companies sufficient preparedness for supply-demand tightness. If they do not have sufficient countermeasures, the Organization recommends to them proper measures for supply capacity procurement.

Further, in the event of not achieving improvement of the supply-demand balance with proper countermeasures of retail and generation companies, the Organization will determine again the implementation of safeguard measures of generator procurement in the short term period at the April meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation.

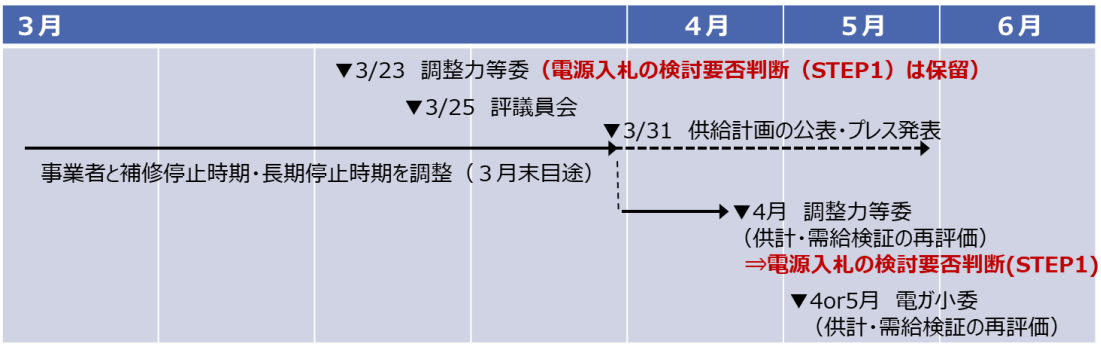


Figure 2-11 Review and Implementation Schedules of Supply-demand Evaluation and Supply Capacity Procurement

[Reference] Safeguard Measures of Generator Procurement

Figure 2-12 indicates the operational flow of safeguard measures for generator procurement (in Japanese only).

Safeguard measures for generator procurement is a scheme that procures supply capacity to secure the supply-demand balance. This scheme is composed of two steps: at STEP 1, the Organization determines the necessity for review of the procurement after the aggregation of electricity supply plans and the result of verification of demand and supply, and at STEP 2, the Organization launches a “Bidding Committee” (provisional name) to determine implementation of the procurement based on the determination of STEP 1.

電源入札等の業務フロー（現状） 3

➢ 電源入札等の検討開始判断時期（STEP1)について、第1年度は前年度3月末～4月上旬、第2年度～第10年度は6月末としている。

第25回 調整力及び需給バランス評価等に関する委員会 （2018.3.5）資料5 抜粋

	STEP 0	STEP 1	STEP 2
	供給計画とりまとめ・大臣送付	電源入札等の検討開始の判断	電源入札等の実施の判断
決議	評議員会※1⇒理事会	理事会	評議員会⇒理事会
諮問委員会	－	本委員会	「入札委員会（仮称）」
実施時期	前年度3月末	（第1年度）：前年度3月末～4月上旬 （第2～10年度）6月末	（第1年度）：4月まで （第2～10年度）：12月まで （判断を翌年度に繰り延べることもあり得る）
評価内容	・受領した供給計画（需要想定及び供給力算定）の適切性、広域系統長期方針・広域系統整備計画との整合性を確認 〔需給バランス評価〕 ・適正な供給力の確保状況※2を確認	〔需給バランス評価〕 ・供給計画に準じた需要及び供給力による評価 〔需給変動リスク分析〕 ・社会情勢や電源構成等を鑑み、個別に注視すべきリスク要因を抽出し、必要に応じ考慮	・電源入札等以外の対策の有無について詳細検討（追加的な供給力及びネガワットの確保等） ⇒需給バランスの再評価、需給変動リスクの再分析
判断基準	・需要想定要領、供給計画に関する国のガイドライン、広域系統長期方針、広域系統整備計画 〔需給バランス評価〕 ・平年H3需要※3に対する基準	〔需給バランス評価〕 ・STEP0と同じ 〔需給変動リスク分析〕 ・厳気象H1需要※4に対する基準（第1年度のみ※5）	・平年H3需要※3に対して、電源入札等以外の需給対策を考慮したうえで、STEP1と同じ基準を用いる ・厳気象H1需要※4に対して、電源入札等以外の需給対策を考慮したうえで、STEP1と同じ基準を用いる（第1年度のみ） 上記を基本としつつ入札委員会で議論

※1：経済産業大臣への意見送付に関する事項 ※2：火力発電所の燃料計画の確認を含む ※3：平年並みの気象条件における最大3日平均需要 ※4：厳しい気象条件（猛暑、厳寒）における最大電力需要 ※5：第1年度は、期待可能な運用上の対策を考慮

Figure 2-12 Operational Flow of Safeguard Measures of Generator Procurement

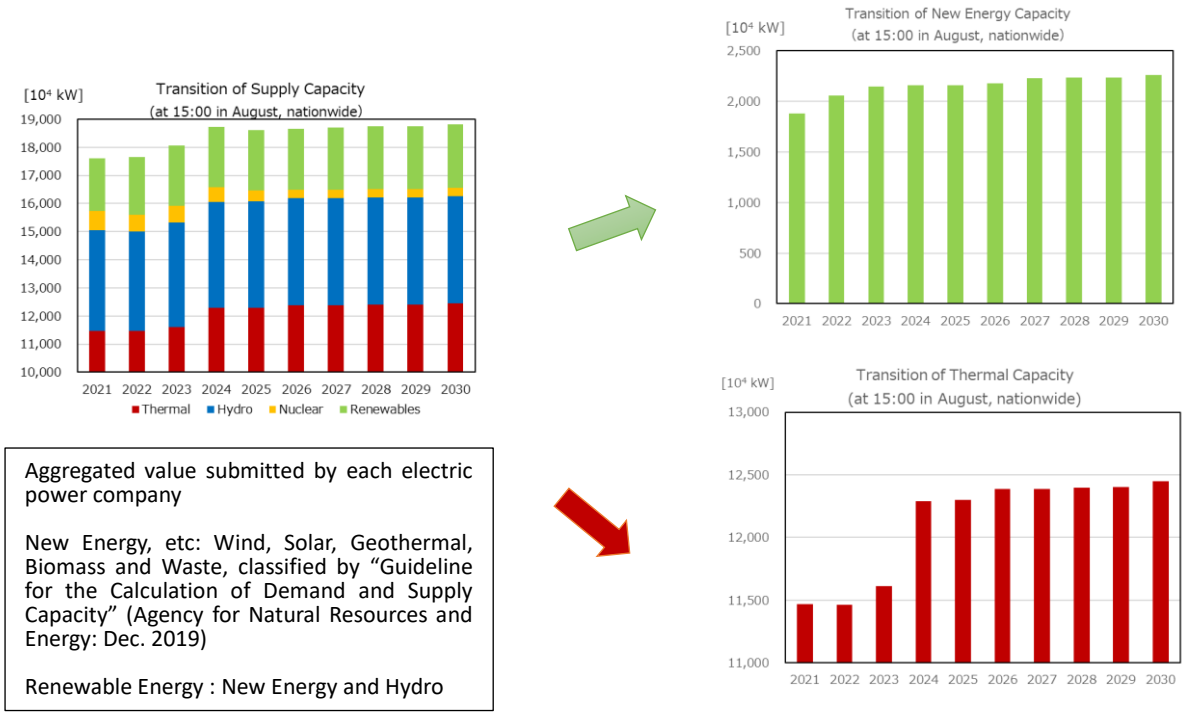
[Source]Marerial 3, 36th meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation (February 19, 2019)
https://www.occto.or.jp/iinkai/chouseiryoku/2018/files/chousei_jukyu_36_03.pdf

[Reference] Detailed Analysis of the Aggregation

a. Transition of Supply Capacity by Generation Sources

Figure 2-13 shows the supply capacity (nationwide in August, at 15:00 h) by power generation source in the projected period.

Supply capacity of new energy, etc. is projected to increase. Thermal power is projected to temporarily decrease through replacement according to future power development and reach its bottom in FY 2022 and 2023, after which it increases due to replacement or new installations.
As a whole, supply capacity is projected to decrease slightly in the coming years, but thereafter increases.



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. 2019)

Renewable Energy : New Energy and Hydro

Figure 2-13 Transition of Supply Capacity by Generation Sources

b. Transition of Suspended Thermal Power Plants

Figure 2-14 shows mid-to-long-term projections of suspended thermal power plants (18-22 GW), which are not counted as part of the supply capacity due to long-term planned outage. The Organization has conducted hearings from EPCOs regarding whether the suspended plants can postpone their decomission or they can return power generation around one year with judgment and preparation in the proper timing. As a result, it is possible that suspended thermal 6-11 GW power plants will be counted on as an additional supply capacity.

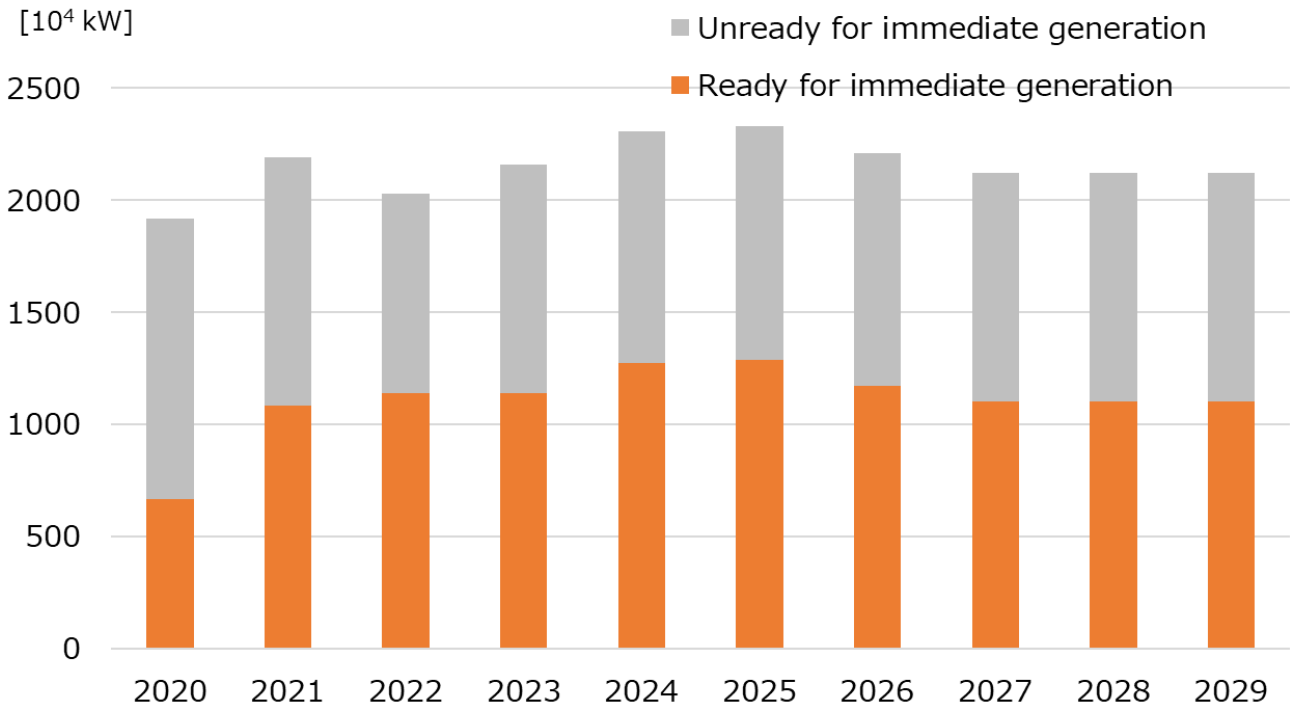


Figure 2-14 Projections of Suspended Thermal Power Plants

III. Analysis of the Transition of Power Generation Sources

The analysis in this chapter is based on the automatic aggregation of values submitted by EPCOs. It is noted that these values will not necessarily be realized in the future due to operating conditions of the 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 electric power plants owned by EPCOs and feed-in-tariff (FIT) generators owned by companies other than EPCOs that are registered as procurers of supply capacity of retail and GT&D companies in the projected period. For the development plans of EPCOs, only generating facilities that have a given probability of development are included in the calculation; however, not all development plans will necessarily be realized, and inefficient facilities will proceed toward decomission resulting from actions due to political measures in the future.

The installed generation capacity by a power generation source submitted from the EPCOs is calculated from the concepts below.

*1 Hydro and Thermal

For existing facilities, the generation company aggregates the generating facility that it owns. For a newly installed facility, a generating facility such as in the course of proceeding with its environmental assessment or publishing its commercial operation, is included in the aggregation. The same concept is applied to geothermal, biomass and wastes power generation sources.

*2 Nuclear

The generation company aggregates its generating facilities that have actual operation experience, in addition to 33 units for which the date for resuming operation is uncertain, and excluding any facility that terminated operation.

*3 Solar and Wind

The GT&D company aggregates the projected value of the generation facility integration according to 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 show the transition of installed power generation capacity by a power generation source, which are automatically aggregated values of the EPCOs submission based on the concepts above.

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

Power Generation Sources		2020	2021	2025	2030
Thermal[*1]		15,990	15,809	16,524	16,437
	Coal	4,593	4,815	5,284	5,281
	LNG	8,430	8,113	8,453	8,367
	Oil and others[23]	2,967	2,882	2,787	2,789
Nuclear[*2]		3,308	3,308	3,308	3,308
Renewables		11,958	12,519	14,044	15,136
	Conventional Hydro	2,167	2,171	2,188	2,195
	Pumped Storage	2,747	2,747	2,747	2,747
	Wind[*3]	444	540	978	1,505
	Solar[*3]	6,123	6,569	7,490	8,051
	Geothermal[*1]	53	53	55	55
	Biomass[*1]	339	366	517	513
	Waste[*1]	84	74	69	69
Miscellaneous		27	24	27	27
Total		31,283	31,661	33,903	34,909

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

*1 The Organization automatically aggregates the value of the genererating facility that the generation company owns; however, not all development plans will necessarily be realized, and inefficient facilities will proceed to be retired resulting from actions due to political measures in the future. For newly installing facility, generating facility such as in the course of proceeding its environmental assessment or publishing its commercial operation, is included in the aggregation.

*2 Included are the facilities which has actual operation experience, in addition to 33 units for which the date for resuming operation is uncertain; operation-terminated facilities are excluded.

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

[23] The category 'Oil and others' includes the total installed capacities from oil, LPG, and other gas and bituminous mixture fired capacities.

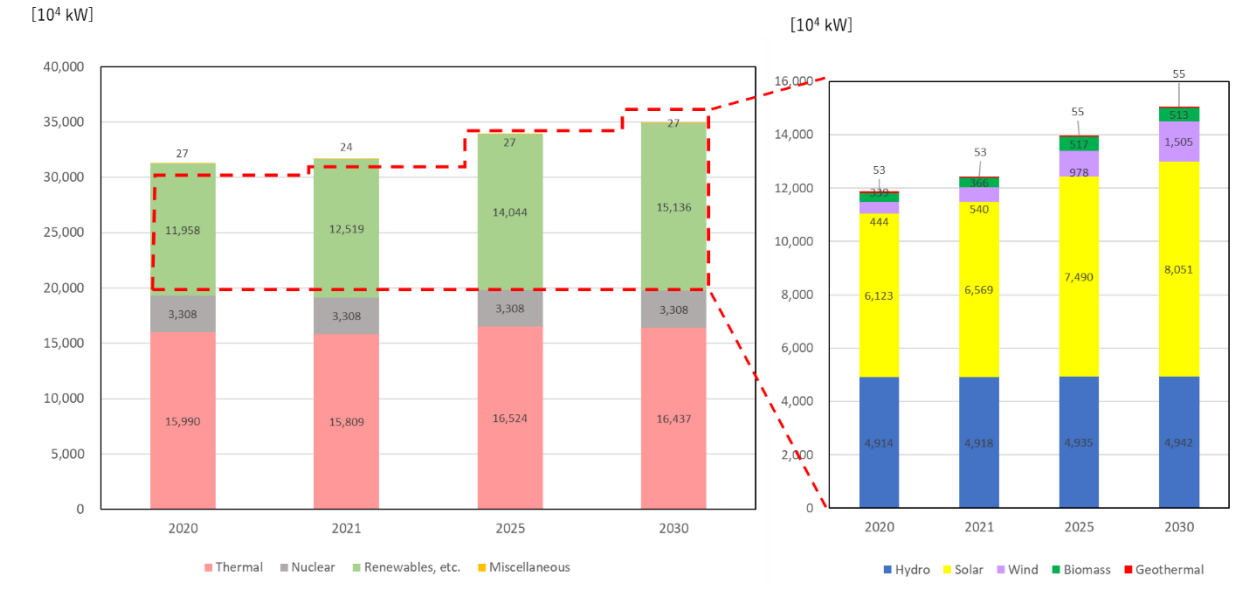


Figure 3-1 Transition of Installed Power Generation Capacities by Power Generation Sources (Nationwide)

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

2. Installed Power Generation Capacity for Each Regional Service Area

Figure 3-2 shows the installed power generation capacity for each regional service area at the end of FY 2020.

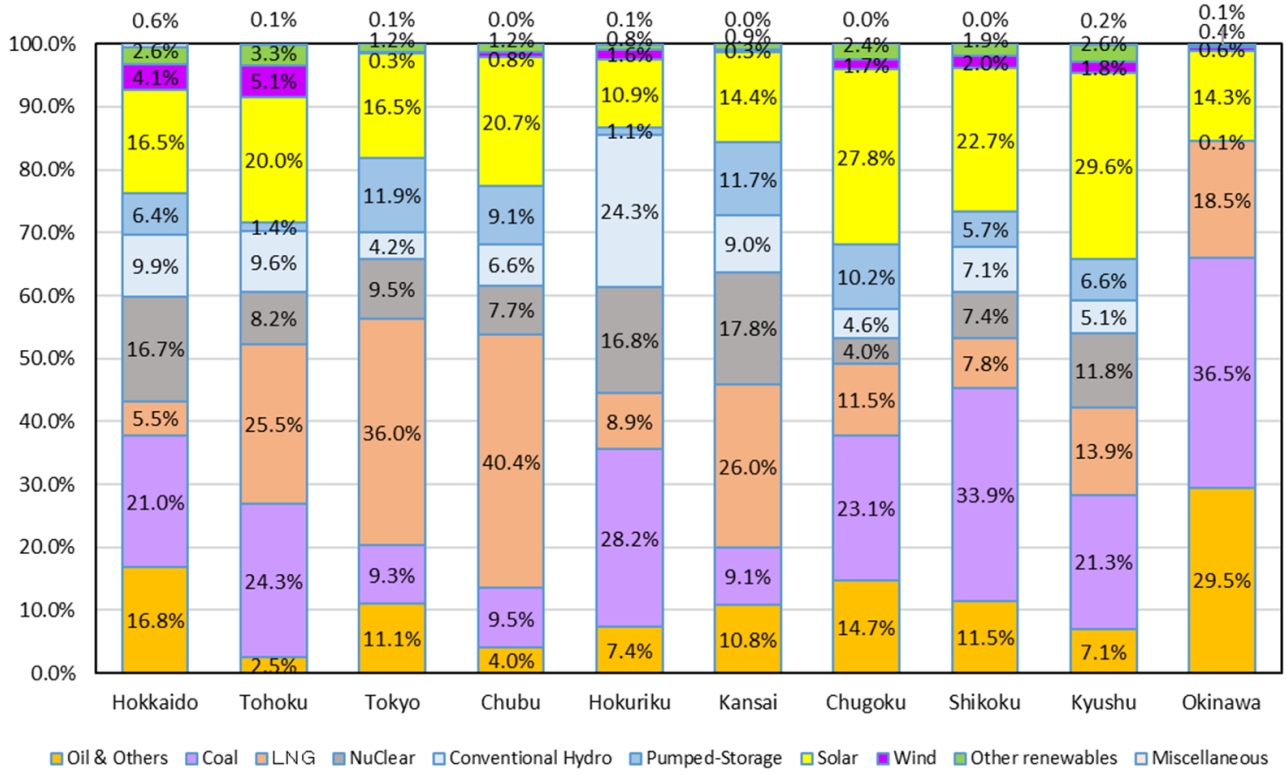


Figure 3-2 Composition of Installed Power Generation Capacity (kW) for Each Regional Service Area

* The ratio of the installed power generation capacity by each power generation source is calculated from automatic aggregation of the values.

3. Transition of Solar and Wind Generation Capacities

Figure 3-3 shows the projection of integrated solar and wind-generation capacities by each regional service area (at the end of the indicated fiscal year).[24]

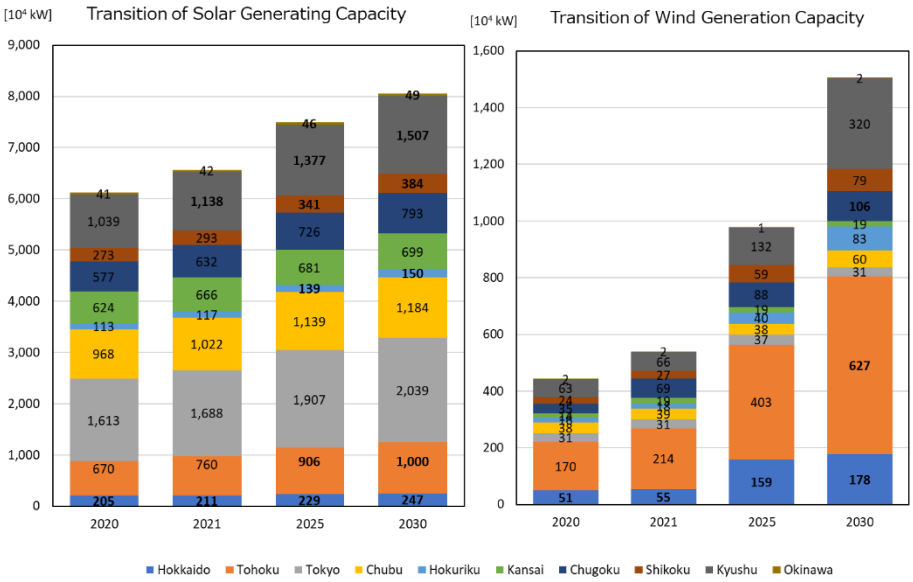


Figure 3-3 Transition of Solar and Wind Generating Capacity for Each Regional Service Area

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

4. Development Plans by the Power Generation Source

Table 3-2 shows the development plans[25] up to FY 2030 submitted by generation companies, according to their new developments, uprated or derated installed facilities, and planned decommission of facilities in the projected period.

Table 3-2 Generation Development Plans up to FY 2030 by Stages[25] (Nationwide, 10^4 kW)

Power Generation Sources		New Installation		Uprating/Derating		Decommissioning	
		Capacity	Sites	Capacity	Sites	Capacity	Sites
Hydro		**39.1**	**61**	**6.0**	**36**	**△18.3**	**33**
	Conventional	39.1	61	6.0	36	△18.3	33
	Pumped Storage	—	—	—	—	—	—
Thermal		**1,163.8**	**30**	**0.0**	**0**	**△660.3**	**35**
	Coal	441.3	6	—	—	△51.8	3
	LNG	717.4	15	—	—	△432.6	12
	Oil	5.1	9	—	—	△175.9	20
	LPG	—	—	—	—	—	—
	Bituminous	—	—	—	—	—	—
	Other Gas	—	—	—	—	—	—
Nuclear		**1,018.0**	**7**	**15.2**	**1**	**0.0**	**0**
Renewables		**595.3**	**250**	**0.2**	**1**	**△64.7**	**66**
	Wind	156.6	54	—	—	△47.4	52
	Solar	332.3	168	—	—	△0.2	1
	Geothermal	4.4	3	—	—	△2.4	1
	Biomass	96.8	20	—	—	△7.5	5
	Waste	5.2	5	0.2	1	△7.5	7
Total		2,816.2	348	21.4	38	△743.2	134

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

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

[Reference] Net Electric Energy Generation (at the sending end)

The net electric energy generation (at the sending end) is an estimation* comprised of calculated values by the power generation source in a given premise by each generation or GT&D company for the projected period. This is not necessarily the same as the actual net electric energy generation.

Each generation company has submitted the value of electric energy generation, which is the sum of the energy generation of available generation facilities in the projected period. This is automatically summed in merit order of operational cost. In addition, the value is based on future energy sales led by actual sales and future sales contracts, without considering the effect of regulating measures.

This estimation of net electric energy generation may change according to the operating conditions of nuclear power plants, change in generation sources—specified as "miscellaneous" in future trends—and energy output shedding of inefficient coal-fired thermal power generation according to the regulating measures of generation efficiency under the Energy Conservation Act. Thus, the estimation is not necessarily the same as the electric energy generation in the future, and is likely to approximate the target value of the energy mix of the country.

The calculation method and the result of net electric energy generation by power generation source are stated below.

* This estimation includes the electric energy generated from generation facilities owned by generation companies as well as that of generation facilities such as FIT generators, which retail companies or GT&D companies procure from sources other than generation companies.

(1) Renewables (Table 3-3)

For solar and wind power, the GT&D company calculates their energy generation, based on the aggregation of the projected value of generation facility integration, according to the preliminary consultation and the available connecting capacity of its transmission lines or the actual growth trend of the integration. For geothermal, biomass and waste power generation sources, the generation company calculates their energy generation based on the generation plan that the company develops.

Table 3-3 Composition of the Transition of Electric Energy Generated by Renewable Generation Sources (nationwide, at the sending end; 10^8 kWh)

Generation Source		2020	2021	2025	2030
Renewables		1,023	1,123	1,448	1,574
	Wind	78	93	179	260
	Solar	706	756	870	919
	Geothermal	24	26	30	32
	Biomass	189	223	345	339
	Waste	26	25	24	24

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

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

Table 3-4 Composition of the Transition of Electric Energy Generated by Hydro and Thermal Generation Sources (nationwide, at the sending end; 10^8 kWh)

Generation Source		2020	2021	2025	2030
Hydro		826	846	857	901
	Conventional	770	765	784	804
	Pumped Storage	56	81	74	97
Thermal		6,378	6,206	6,023	5,792
	Coal	2,638	2,899	3,033	3,022
	LNG	3,548	3,090	2,779	2,565
	Oil and others [233]	193	217	211	204

(3) Nuclear (Table 3-5)

The generation company calculates their energy generation based on the generation plan that the company develops for units resuming operation at the end of February 2021. However, units with over 40 years of actual operation require permission from the Nuclear Regulation Authority to resume operation; the energy generation of such units is calculated as zero. In addition, projections concerning resumption of operation are not included in the estimation.

Table 3-5 Composition of the Electric Energy Transition Generated by Nuclear Generation Sources (nationwide, at the sending end; 10^8 kWh)

Generation Source	2020	2021	2025	2030
Nuclear	382	395	377	324

Table 3-6 sums up items (1), (2), and (3) above with the energy generation categorized as "miscellaneous."

Table 3-6 Composition of the Electric Energy Transition Generated by All Generation Sources (nationwide, at the sending end; 10^8 kWh)

	2020	2021	2025	2030
Total	9,107	9,025	9,066	8,970

[Reference] Net Electric Energy Generation for Each Regional Service Area

Figure 3-4 shows the net electric energy generation for each regional service area in FY 2020.

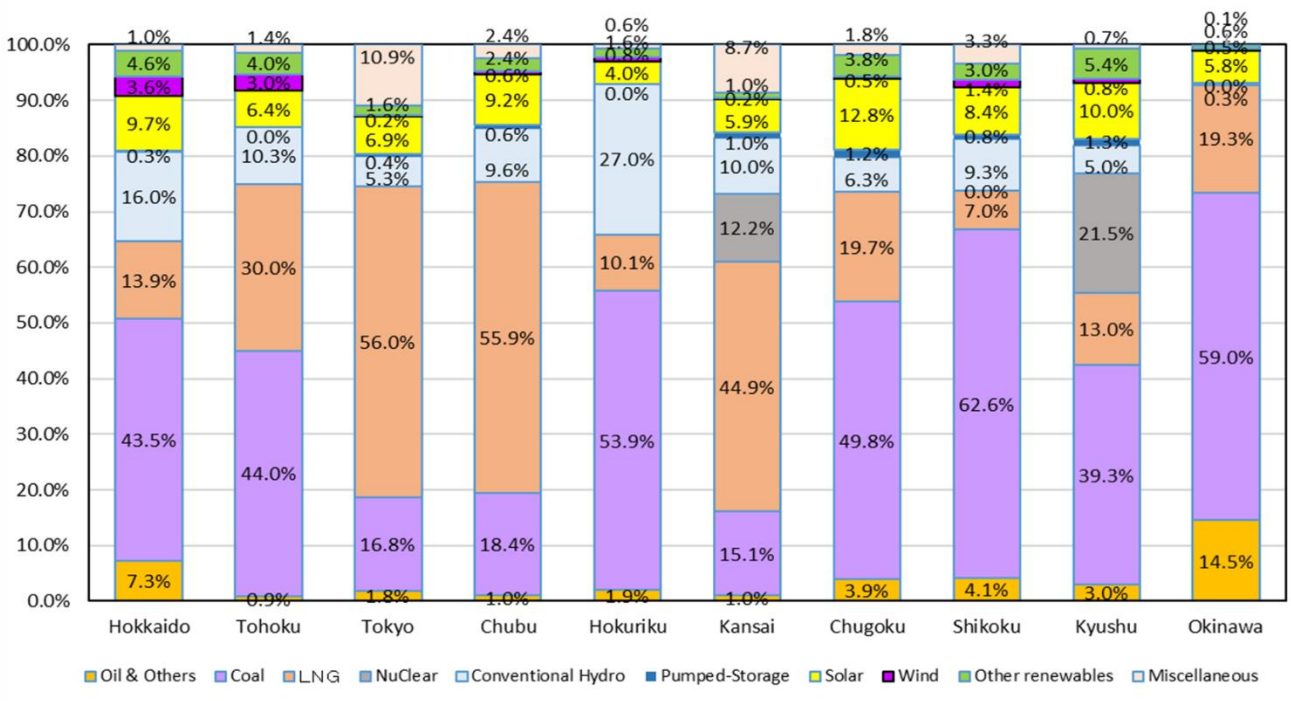


Figure 3-4 Composition of the Net Electric Energy Generation (kWh) for Each Regional Service Area

[Reference] Transition of Capacity Factors by Power Generation Source

Table 3-7 and Figure 3-5 show the capacity factors by the power generation source. Projection of the capacity factors is automatically calculated using the aforementioned power generation sources and the net electric energy generation data provided by the Organization.

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

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

Power Generation Sources	2020	2021	2025	2030
Hydro	19.2%	19.6%	19.8%	20.8%
Conventional	40.5%	40.2%	40.9%	41.8%
Pumped Storage	2.3%	3.4%	3.1%	4.0%
Thermal	45.5%	44.8%	41.6%	40.2%
Coal	65.6%	68.7%	65.5%	65.3%
LNG	48.0%	43.5%	37.5%	35.0%
Oil and others [233]	7.4%	8.6%	8.6%	8.3%
Nuclear	13.2%	13.6%	13.0%	11.2%
Renewables	16.6%	16.9%	18.1%	17.6%
Wind [26]	20.1%	19.6%	20.9%	19.7%
Solar [266]	13.2%	13.1%	13.3%	13.0%
Geothermal	52.2%	56.3%	62.6%	65.3%
Biomass	63.6%	69.6%	76.2%	75.4%
Waste	35.7%	38.3%	39.1%	39.6%

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

[26] There is no consideration for low capacity factors of solar and wind power generation due to output shedding.

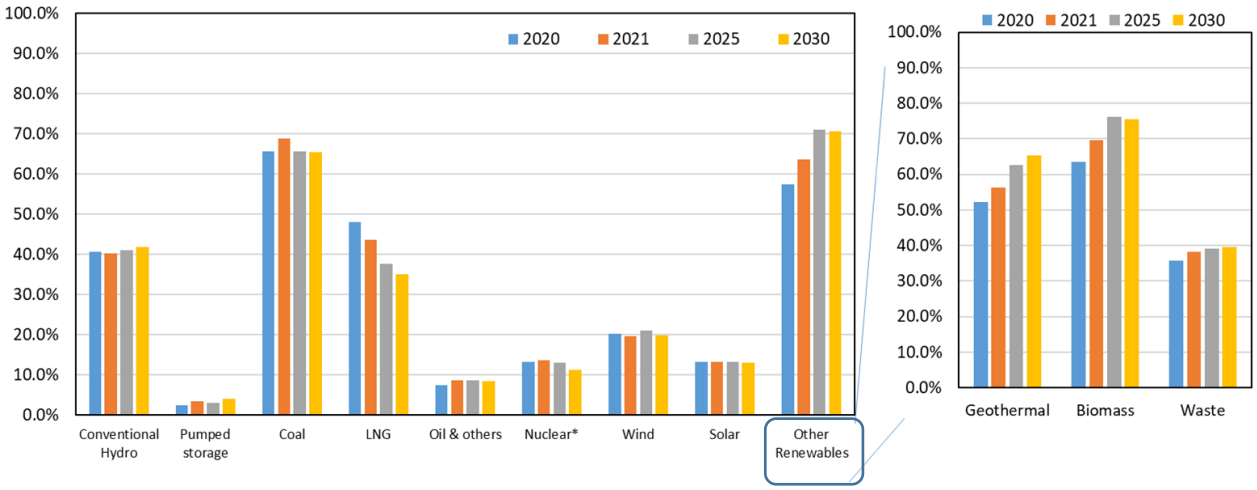


Figure 3-5 Capacity Factors by Power Generation Source (Nationwide)

IV. Development Plans for Transmission and Distribution Facilities

The Organization has aggregated the development plans[27] for cross-regional transmission lines and substations (transformers and AC/DC converters) up to FY 2030, as submitted by GT&D and transmission companies. Table 4-1 shows the development plans for cross-regional transmission lines and substations. Figure 4-1 shows the outlook for electric systems nationwide. 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[28]

Increased Length of Transmission Lines [29]*[30]	635 km (726 km)
Overhead Lines*	597 km (687 km)
Underground Lines	39 km (39 km)
Uprated Capacities of Transformers	29,235 MVA (28,290 MVA)
Uprated Capacities of AC/DC Converters [31]	900 MW (1,800 MW)
Decreased Length of Transmission Lines (Decommissioning)	△61 km (△61 km)
Derated Capacities of Transformers (Decommissioning)	△4,300 MVA (△2,700 MVA)

[27] Development plans for transmission lines and substations are required to 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 more.) The totals are not necessarily equal due to independent rounding.

[28] Figures in parentheses are those from the previous year.

[29] Development plans corresponding to changes in line category or circuit numbers that were not included in measuring the increased length of transmission lines were treated as 'no change in the length of transmission lines'.

[30] Increased length does not include the item with * because of an undetermined in-service date.

[31] Installed capacity for the converter station on one side is included in the DC transmission system.

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

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

500kV Transmission Lines	・(prov.)Cross-regional North Bulk Line: 79 km ・(prov.)Cross-regional South Bulk Line: 64 km ・Soma-Futaba Bulk Line/ Connecting Point Change: 16 km ・(prov.)Shinchi Access Line/ Cross-regional Switching Station lead-in: 1km ・(prov.)Joban Bulk Line/ Cross-regional Switching Station Dπ lead-in: 1 km
Switching Stations	(prov.)Cross-regional Switching Station: 10 circuits

Interconnection Facility Enhancement Plan between Tokyo and Chubu
(210 MW→300 MW; in service: FY 2027)

Frequency Converter Stations	・Shin Sakuma FC station: 300 MW ・Higashi Shimizu FC station: 300 MW→900 MW
275 kV Transmission Lines	・Higashi Shimizu Line: 20 km ・Sakuma Higashi Bulk Line/ Shin Sakuma FC Branch Line: 3 km ・Sakuma Nishi Bulk Line/ Shin Sakuma 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: 750MVA×1 ・Shizuoka Substation: 1,000MVA×1 ・Toei Substation: 800MVA×1 →1,500MVA×2

Interconnection Facility Enhancement Plan between Chubu and Kansai
(in service: undetermined)*under review in the master plan [32]

500 kV Transmission Lines	・Sekigahara Kita Oomi Line: 2 km ・Sangi Bulk Line/ Sekigahara Switching Station π lead-in: 1 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

[32] The master plans is the policy of facility formation targeting the long-term future electricity system.

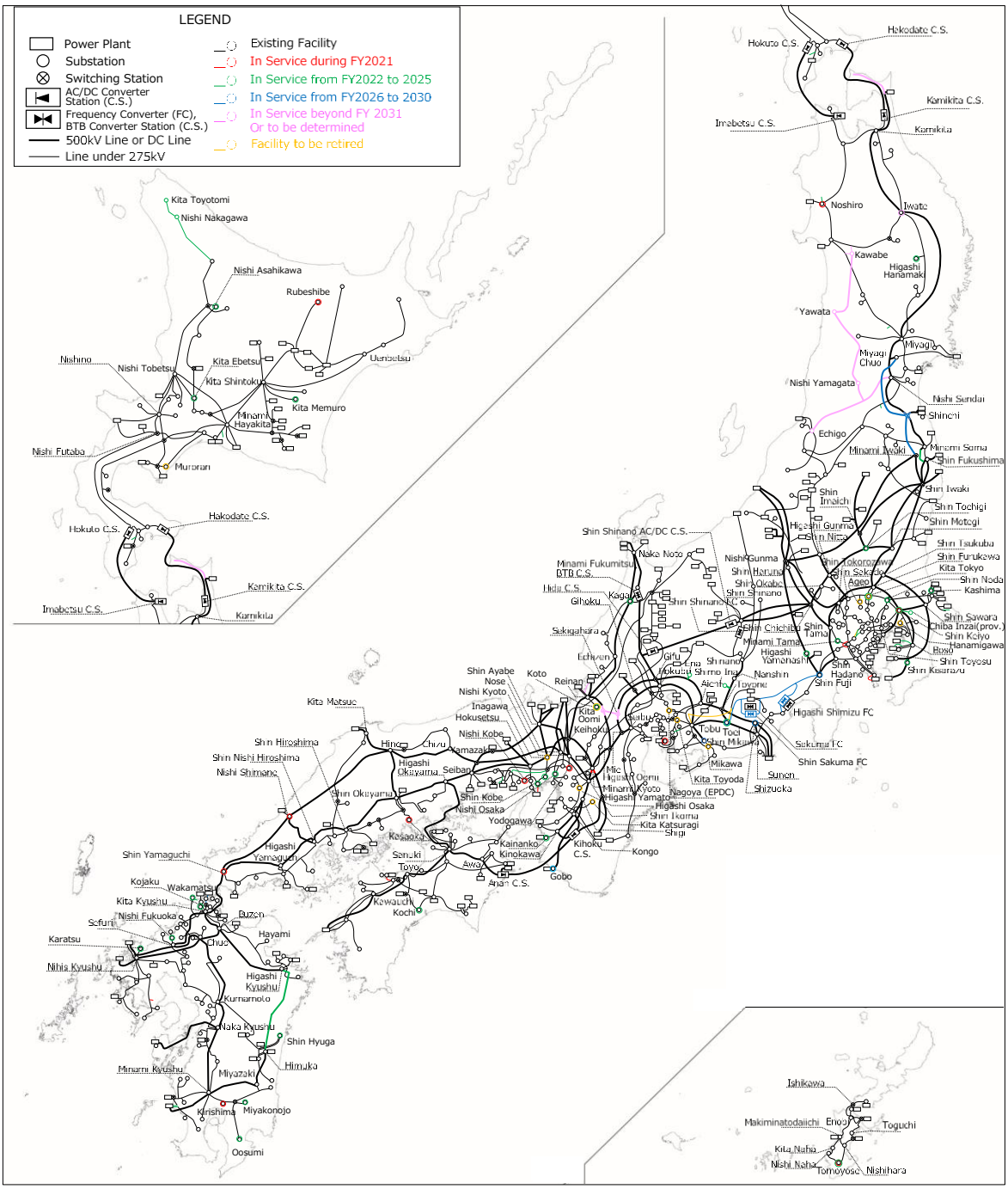


Figure 4-1 Power Grid Configuration in Japan

1. Development Plans for Major Transmission Lines

Table 4-2 Development Plans under Construction

Company	Line[33]	Voltage	Length[34,35]	Circuit	Under construction	In service	Purpose[36]
Hokkaido Electric Power Network, Inc.	Tsuruoka branch Line	187kV	0.1km	1	Sep. 2020	Aug. 2022	Generator connection
TEPCO Power Grid, Inc.	Shinjuku Line replacement	275kV	22.1km→ 21.2km(No.1) *2*3 19.9km→ 21.2km (No.2,3)*2*3	3	Aug. 2019	Aug. 2028(No.1) Nov. 2032(No.2) Nov. 2025(No.3)	Aging management
	Chiba Inzai Substation lead-in	275kV	10.5km	2	Apr. 2020	Apr. 2024	Demand coverage
Chubu Electric Power Grid Co., Inc.	Ena Branch Line	500kV	1km	2	Jun. 2020	Oct. 2024	Demand coverage
	Higashi Nagoya -Tobu Line	275kV	8km*3	2	Apr. 2019	Jun. 2025	Aging management Economic upgrade
Kansai Transmission and Distribution, Inc.	Kobelco Power Kobe daini Access Line*1	275kV	4.4km*2	3	Apr. 2017	Jan. 2021(No.1) Apr. 2021(No.2) Jan. 2022(No.3)	Generator connection
	(prov.) Himeji Access Line*1	275kV	0.9km*2	2	Mar. 2021	Jan. 2025	Generator connection
Shikoku Electric Power Transmission & Distribution Co., Inc.	Saijo Access Line*1	187kV	7km*3	2	Nov. 2019	May 2021	Generator connection
Kyushu Electric Power Transmission & Distribution Co., Inc.	Hyuga Bulk Line	500kV	124km	2	Nov. 2014	Jun. 2022	Aging management Economic upgrade
	JR Shin Isahaya Branch Line	220kV	1km	2	May 2019	Jan. 2022	Demand coverage
	Shin Kagoshima Line/ Sendai Plant π lead-in*1	220kV	2km→ 4km*3	1→2	Aug. 2020	Dec. 2023	Economic upgrade
J-POWER Transmission Network Co.,Ltd.	Ooma Bulk Line	500kV	61.2km	2	May 2006	TBD	Generator connection
Northern Hokkaido Wind Energy Transmission Company (NHWETC)	NHWETC Toyotomi-Nakagawa Bulk Line	187kV	51km	2	Sep. 2018	Sep. 2022	Generator connection
Fukushima souden	Abukumananbu Line	154kV	22km*2	1	Jul. 2020	May 2024	Generator connection

[33] Line with *1 denotes the line renamed not to be identified the fuel of the connecting power plant.
[34] Length with *2 denotes "underground," otherwise "overhead."
[35] Length with *3 denotes that the change in line category or circuit numbers is not included in Table 4-1.
[36] Purpose is stated below: *4 indicates enforcement related to cross-regional interconnection lines.
*5 indicates that the case is under review in the master plan of the cross-regional development.

Demand coverage	Related to increase/decrease demand
Generator connection	Related to generator connection or retirement
Aging management	Related to aging management of facilities (including proper update of facilities 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

Table 4-3 Development Plans in Planning Stages

Company	Line [33]	Voltage	Length [34,35]	Circuit	Under construction	In service	Purpose [36]
Hokkaido Electric Power Network, Inc.	Kita Horonobe Line partly uprating	100kV→187kV	69km	2	May 2021	Jul. 2022	Generator connection
	(prov.) Tomakomai Access Line*1	187kV	0.2km	1	May 2021	Jun. 2022	Generator connection
Tohoku Electric Power Network Co., Inc.	Plant A Access Line*1	275kV	3km	1	Apr. 2021	Dec. 2022	Generator connection
	Plant B Access Line*1	275kV	0.2km	1	Apr. 2023	May 2024	Generator connection
	Northern Akita Prefecture HS Line	275kV	0.3km	2	Jun. 2023	Dec. 2024	Generator connection
	(prov.)Cross-regional North Bulk Line	500kV	79km	2	Jul. 2022	Nov. 2027	Generator connection Reliability upgrade*4
	(prov.)Cross-regional South Bulk Line	500kV	64km	2	Jul. 2024	Nov. 2027	Generator connection Reliability upgrade*4
	Soma-Futaba Bulk Line/connecting point change	500kV	16km	2	Feb. 2022	Nov. 2025	Generator connection Reliability upgrade*4
	(prov.)Shinchi Access Line/ Cross-regional Switching Station lead-in*1	500kV	1km	2	May 2024	Jun. 2026	Generator connection Reliability upgrade*4
	(prov.)Joban Bulk Line/ Cross-regional Switching Station Dπ lead-in	500kV	1km	2	Nov. 2023	Jul. 2026	Generator connection Reliability upgrade*4
	(prov.)Cross-regional Switching Station	500kV	-	10	May 2022	Nov. 2027 (Jun. 2026)	Generator connection Reliability upgrade*4
	Akita Bulk Line/ Kawabe Substation DT lead-in	275kV	5km	2	Beyond FY 2022	Beyond FY 2029	Generator connection
	Akimori Bulk Line/ Kawabe Substation DT lead-in	275kV	0.2km	2	Beyond FY 2025	Beyond FY 2029	Generator connection
	Asahi Bulk Line uprating	275kV→500kV	139km→138km	2	Beyond FY 2026	Beyond FY 2030	Generator connection
	Minami Yamagata Bulk Line uprating	275kV→500kV	23km→23km	2	Beyond FY 2029	Beyond FY 2030	Generator connection
	Dewa Bulk Line	500kV	96km	2	Beyond FY 2021	Beyond FY 2031	Generator connection
	Yamagata Bulk Line uprating/ extension	275kV→500kV	53km→103km	2	Beyond FY 2025	Beyond FY 2031	Generator connection
TEPCO Power Grid, Inc.	Higashi Shinjuku Line replacement	275kV	23.4km→5.0km (No.2)*2*3 23.4km→5.3km (No.3)*2*3	2	Beyond FY 2024	Nov. 2032 (No.2) Nov. 2025 (No.3)	Aging management
	(prov.)G7060005 Access Line	275kV	0.5km*2	1	Apr. 2021	Feb. 2022	Generator connection
	MS18GHZ051500 Access Line (prov.)	275kV	0.1km	2	Jun. 2024	Jun. 2025	Generator connection
	Keihin Line No.1&2 /connecting point change	275kV	0.4km*3	2	Sep. 2021	Mar. 2022	Generator connection
	Higashi Shimizu Line	275kV	13km 7km (diversion)	2	Mar. 2022	Jan. 2027	Reliability upgrade*4
	Nishi Gunma Bulk Line /Higashi Yamanashi Substation T lead-in	500kV	0.1km(No.2)*3 0.1km(No.2)*3	2→3	May 2022	Nov. 2022	Demand coverage

Company	Line [33]	Voltage	Length [34,35]	Circuit	Under construction	In service	Purpose [36]
	Goi Access Line*1	275kV	11.1km	2	Oct. 2021	Oct. 2023	Generator connection
	(prov.) G5150013 Access Line	275kV	0.5km	2	May 2021	May 2022(No.1) Jun. 2022(No.2)	Generator connection
Chubu Electric Power Grid Co., Inc.	Shimo Ina Branch Line	500kV	0.3km	2	Dec. 2021	Oct. 2024	Demand coverage
	Sekigahara-Kita Oomi Line	500kV	2km	2	TBD	TBD	Generator connection *4*5
	Sekigahara Switching Station	500kV	—	6	TBD	TBD	Generator connection *4*5
	Sangi Bulk Line/ Sekigahara Switching Station π lead-in	500kV	1km	2	TBD	TBD	Generator connection *4*5
Kansai Transmission and Distribution, Inc.	Kita Yamato Line/ Minami Kyoto Substation Lead-in change	500kV	0.1km→ 0.2km	2	Jun. 2021	Dec. 2021	Economic upgrade
	Kita Oomi Switching Station	500kV	—	6	TBD	TBD	Generator connection *4*5
	Kita Oomi Line/ Kita Oomi Switching Station πlead-in	500kV	0.5km	2	TBD	TBD	Generator connection *4*5
	Tsuruga Line/ North side improvement	275kV	9.8km→ 9.3km*3	2	TBD	TBD	Aging management
	Shin Kakogawa Line	275kV	25.3km→ 25.3km*3	2	Jul. 2021	Jun. 2025	Generator connection Aging management
	(prov.) Himeji Access West Branch Line*1	275kV	1.2km*3	2	Nov. 2022	Mar. 2023	Aging management
Kyushu Electric Power Transmission & Distribution Co., Inc.	Saibu Gas/ Hibiki Access Line*1	220kV	4km	2	Mar. 2023	Jul. 2025	Generator connection
	Shin Kokura Line	220kV	15km→ 15km*2*3	3→2	Apr. 2021	Oct. 2029	Aging management
J-POWER Transmission Network Co.,Ltd.	Sakuma Higashi Bulk Line/ Shin Sakuma FC Branch Line	275kV	3km	2	FY 2022	FY 2026	Reliability upgrade*4
	Sakuma-Toei Line/ Shin Sakuma FC Branch Line	275kV	1km	2	FY 2022	FY 2026	Reliability upgrade*4
	Shin Toyone-Toei Line	275kV	1km	1	FY 2022	FY 2026	Reliability upgrade*4
	Sakuma-Toei Line	275kV	10.6km→ 11km*3	2	FY 2022	FY 2027	Reliability upgrade*4
	Sakuma-Toei Line	275kV	2km	2	FY 2022	FY 2026	Reliability upgrade*4
	Sakuma Higashi Bulk Line	275kV	123.7km→ 123km*3	2	FY 2022	FY 2027	Reliability upgrade*4

Table 4-4 Decommissioning Plans

Company	Line	Voltage	Length	Circuit	Retirement	Purpose [36]
J-POWER Transmission Network Co.,Ltd.	Shin Toyone-Toei Line	275kV	△2.6km	1	FY 2026	Reliability upgrade*4
	Sakuma Nishi Bulk Line	275kV	△58km	2	FY 2026	Economic upgrade

2. Development Plans for Major Substations

Table 4-5 Development Plans under Construction

Company	Substation [33,37]	Voltage	Capacity	Unit	Under construction	In service	Purpose [36]
Hokkaido Electric Power Network, Inc.	Rubeshibe	187/66kV	60MVA×2→ 100MVA	2→1	Feb. 2021	Oct. 2021	Aging management
	Nishi Nakagawa*6	187/100kV	100MVA×2	2	Apr. 2020	Jul. 2022	Generator connection
Tohoku Electric Power Network Co., Inc.	Noshiro	275/66kV	100MVA	1	Oct. 2019	Jun. 2021	Generator connection
TEPCO Power Grid, Inc.	Shin Keiyo	275/154kV	300MVA×2→ 450MVA×2	2→2	Aug. 2018	Sep. 2019 (5B) Nov. 2021 (6B)	Aging management
	Higashi Yamanashi	500/154kV	750MVA	1	Nov. 2019	Dec. 2022	Demand coverage
	Shin Kisarazu	275/154kV	450MVA×2	2	Aug. 2020	May 2022	Generator connection
Chubu Electric Power Grid Co., Inc.	Chita Plant*1	275/154kV	300MVA×1→ 450MVA×1	1→1	Jul. 2019	Apr. 2021	Aging management
	Chita Plant*1	275/154kV	450MVA×2	2	Jul. 2019	Nov. 2020 (N 1B) Aug. 2021(N 2B)	Generator connection
	Higashi Shimizu	—	300MW→ 900MW	—	Dec. 2020	FY 2027	Reliability upgrade*4
Kansai Transmission and Distribution, Inc.	Nishi Kobe	275/77kV	200MVA×2→ 300MVA	2→1	Nov. 2020	Jun. 2021	Aging management
	Yodogawa	275/77kV	300MVA×2→ 300MVA	2→1	Dec. 2020	Oct. 2021	Aging management
	Nishi Osaka	275/77kV	300MVA	1	Feb. 2021	May 2023	Demand coverage
Chugoku Electric Power Transmission & Distribution Co., Inc.	Shin Yamaguchi	220/110kV	400MVA×2	2	Apr. 2019	Jun. 2021	Economic upgrade
	Kasaoka	220/110kV	250MVA→ 300MVA	1→1	Aug. 2020	May 2021	Aging management
	Nishi Shimane	500/220kV	1,000MVA	1	Apr. 2020	Mar. 2022	Generator connection
Kyushu Electric Power Transmission & Distribution Co., Inc.	Kirishima	220/66kV	300MVA	1	Jan. 2020	Dec. 2021	Generator connection
	Nishi Fukuoka	220/66kV	180MVA×2→ 300MVA	2→1	Sep. 2020	Apr. 2022	Aging management
The Okinawa Electric Power Co., Inc.	Tomoyose	132/66kV	125MVA×2→ 200MVA×2	2→2	Oct. 2017	Apr. 2021 (1B) May 2024 (2B)	Aging management
NHWETC	Kita Toyotomi*6	187/66kV	165MVA×3	3	Apr. 2019	Sep. 2022	Generator connection

[37] 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 Ebetsu	187/66kV	100MVA→ 150MVA	1→1	May 2021	Jul. 2022	Aging management
	Kita Memuro	187/66kV	60MVA→ 150MVA	1→1	May 2023	Nov. 2024	Aging management
	Nishi Asahikawa	187/66kV	60MVA→ 100MVA	1→1	May 2023	Nov. 2024	Aging management
Tohoku Electric Power Network Co., Inc.	Higashi Hanamaki	275/154kV	300MVA	1	May 2022	Oct. 2024	Demand coverage
	Iwate	500/275kV	1,000MVA	1	Beyond FY 2024	Beyond FY 2028	Generator connection
	Echigo	500/275kV	1500MVA×3	3	Beyond FY 2024	Beyond FY 2030	Generator connection
	Yawata	500/154kV	750MVA	1	Beyond FY 2025	Beyond FY 2031	Generator connection
	Kawabe	500/275kV	1500MVA×3	3	Beyond FY 2024	Beyond FY 2031 (Beyond FY 2029)	Generator connection
	Nishi Yamagata	275/154kV →500/154kV	300MVA×2 →450MVA×2	2→2	Beyond FY 2024	Beyond FY 2031 (Beyond FY 2030)	Generator connection
TEPCO Power Grid, Inc.	Minami Tama	275/66kV	200MVA→ 300MVA	1→1	Jul. 2021	Jun. 2022	Demand coverage
	Shin Tochigi	500/154kV	750MVA	1	Jun. 2021	Nov. 2022	Generator connection
	Shin Fuji	500/154kV	750MVA	1	Oct. 2023	Mar. 2027	Reliability upgrade*4
	Kita Tokyo	275/66kV	300MVA	1	Jun. 2022	Feb. 2024	Economic upgrade
	Shin Keiyo	275/154kV	450MVA	1	Apr. 2022	Mar. 2023	Demand coverage
	(prov.)Chiba Inzai*6	275/66kV	300MVA×2	2	Jun. 2021	Apr. 2024	Demand coverage
	Kashima	275/66kV	300MVA	1	Jun. 2023	Jun. 2024	Generator connection
	Shin Noda	275/154kV	220MVA→ 300MVA	1→1	Dec. 2022	Oct. 2023	Aging management
Chubu Electric Power Grid Co., Inc.	Ena*6	500/154kV	200MVA×2	2	Jun. 2022	Oct. 2024	Demand coverage
	Shimo Ina*6	500/154kV	300MVA×2	2	Jun. 2021	Oct. 2024	Demand coverage
	Toei	500/275kV	800MVA×1→ 1,500MVA×2	1→2	Apr. 2022	FY 2024 (N 2B) FY 2026 (1B)	Reliability upgrade*4
	Shizuoka	500/275kV	1,000MVA	1	FY 2024	FY 2026	Reliability upgrade*4
	Shin Mikawa	500/275kV	1,500MVA	1	Jul. 2027	Aug. 2030	Generator connection
Hokuriku Electric Power Transmission & Distribution Co.	Kaga	275/154kV	400MVA	1	Nov. 2021	Dec. 2023	Reliability upgrade
Kansai Transmission and Distribution, Inc.	Gobo	500/154kV	750MVA×2	2	Aug. 2024	Nov. 2027	Generator connection
	Koto	275/77kV	200MVA→ 300MVA	1→1	Jan. 2022	Oct. 2022	Aging management
	Kainanko	275/77kV	300MVA×1、 200MVA×2→ 300MVA×2	3→2	Sep. 2022	Jun. 2024	Aging management
	Shin Kobe	275/77kV	300MVA×1、 200MVA×1→ 200MVA×1	2→1	Aug. 2022	Jan. 2024	Aging management
	Itami	275/154kV	300MVA	1	Feb. 2023	Jun. 2024	Aging management
Shikoku Electric Power Transmission & Distribution Co., Inc.	Kochi	187/66kV	200MVA→ 300MVA	1→1	Sep. 2021	Apr. 2022	Aging management Demand coverage
	Miyakonojo	220/110kV	150MVA	1	Sep. 2021	Mar. 2024	Generator connection

Company	Substation [33,37]	Voltage	Capacity	Unit	Under construction	In service	Purpose [36]
Kyushu Electric Power Transmission & Distribution Co., Inc.	Shin Hyuga	220/110 /66kV	250/150 /200MVA	1	Jun. 2021	Apr. 2023	Generator connection
	Wakamatsu	220/66kV	250MVA	1	Nov. 2022	Oct. 2024	Generator connection
	Oosumi	110/66kV → 220/110 /66kV	60MVA → 250/100 /200MVA	1→1	Mar. 2022	Feb. 2025	Generator connection
	Kojaku	220/66kV	150MVA→ 200MVA	1→1	May 2021	Apr. 2023	Aging management
	Karatsu	220/66kV	150MVA→ 250 MVA	1→1	Jul. 2022	Nov. 2023	Aging management
J-POWER Transmission Network Co.,Ltd.	(prov.)Shin Satkuma FC*6	—	300MW	—	FY 2024	FY 2027	Reliability upgrade*4
Fukushima souden	Abukumaminami*6	154/66/33kV	170MVA	1	Nov. 2021	May 2024	Generator connection

Table 4-7 Decommissioning Plans

Company	Substation	Voltage	Capacity	Unit	Retirement	Purpose
Hokkaido Electric Power Network, Inc.	Muroran	187/66kV	100MVA	1	Jun. 2023	Aging management
TEPCO Power Grid, Inc.	Hanamigawa	275/66kV	300MVA	1	Mar. 2024	Demand coverage
	Kita Tokyo	275/154kV	300MVA	1	Jan. 2022	Economic upgrade
	Ageo	275/66kV	300MVA	1	Feb. 2025	Economic upgrade
Chubu Electric Power Grid Co., Inc.	Kita Toyoda	275/154kV	450MVA	1	FY 2023	Aging management
	Mikawa	275/154kV	450MVA	1	Apr. 2025	Aging management
Kansai Transmission and Distribution, Inc.	Higashi Osaka	275/154kV	300MVA	1	May 2023	Aging management
	Koto	275/77kV	100MVA×2	2	Oct. 2023	Aging management
	Kita Katsuragi	275/77kV	200MVA×2	2	May 2022 (3B) May 2023 (4B)	Aging management
	Inagawa	500/154kV	750MVA	1	Nov. 2024	Aging management
J-POWER Transmission Network Co.,Ltd.	Nagoya	275/154kV	300MVA×3	3	FY 2024	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 2030 submitted by GT&D and transmission companies.

Table 4-8 Development Plans for Major Transmission Lines

Category	Voltage	Lines	Length [38]	Extended Length [39]	Total Length	Total Extended Length
Newly Installed or Extended	500kV	Overhead	646 km*	1,293 km*	646 km*	1,293 km*
		Underground	0 km	0 km		
	275kV	Overhead	△175 km	△354 km	△158 km	△317 km
		Underground	17 km	37 km		
	220kV	Overhead	5 km	10 km	5 km	10 km
		Underground	0 km	0 km		
	187kV	Overhead	120 km	240 km	120 km	240 km
		Underground	0 km	0 km		
	154kV	Overhead	0 km	0 km	22 km	22 km
		Underground	22 km	22 km		
	Total	Overhead	597 km	1,189 km	635 km	1,248 km
		Underground	39 km	59 km		
To be Decommis-sioned	275kV	Overhead	△61 km	△119 km	△61 km	△119 km
		Underground	0 km	0 km		
	Total	Overhead	△61 km	△119 km	△61 km	△119 km
		Underground	0 km	0 km		

Table 4-9 Revised Plans for Line Category and the Numbers of Circuits [40]

Voltage	Length Extended	Total Extended Length
500kV	0 km	1 km
275kV	227 km	476 km
220kV	19 km	38 km
187kV	7 km	14 km
Total	253 km	528 km

[38] Length denotes both the increased length due to newly installed or extended plans, and the decreased length due to decommissioning. Development plans corresponding to the change of line category or the 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 the length." The total of lengths and the overall total lengths are not necessarily equal due to independent rounding.

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

[40] Table 4-9 aggregates the extended and total extended lengths corresponding to the revised plans for the line category and the number of circuits.

Table 4-10 Development Plans for Major Substations

Category [41]	Voltage [42]	Increased Numbers	Increased Capacity
Newly Installed or Extended	500kV	25 [4]	23,000 MVA [1,000 MVA]
	275kV	6 [2]	3,280 MVA [600 MVA]
	220kV	6 [0]	1,740 MVA [0 MVA]
	187kV	4 [5]	955 MVA [695 MVA]
	154kV	1 [1]	170 MVA [170 MVA]
	132kV	0 [0]	150 MVA [0 MVA]
	110kV	△1 [0]	△60 MVA [0 MVA]
	Total	41 [12]	29,235 MVA [2,465 MVA]
To be Decommis-sioned	500kV	△1	△750 MVA
	275kV	△13	△3,450 MVA
	187kV	△1	△100 MVA
	Total	△15	△4,300 MVA

The figures in [ ] indicate the increase in the number of transformers resulted from new substation installations.

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

Category	Company and Number of Sites	Capacity
Newly Installed or Extended	Chubu Electric Power Grid Co.,Inc. 1	600 MW
	J-POWER Transmission Network Co., Ltd. 1	300 MW

4. Aging Management of Existing Transmission and Distribution Facility

Existing transmission and distribution facilities that were installed after the period of economic expansion period (from the 1960s to the 1970s) will reach their replacement time. Facilities to be replaced are in an increasing trend, and significant facilities will remained unreplaced in place of the recent replacement work. To secure a stable electricity supply in the future, a proper decisions for the replacement schedule are evitable. Figures 4-2 to 4-5 show the actual installation years of existing transmission and distribution facilities.

[41] Decommission plans with transformer installations are included in “Newly Installed” or “Extended,” and negative values are included in the increased numbers or the increased capacity.
[42] Voltage class by upstream voltage.

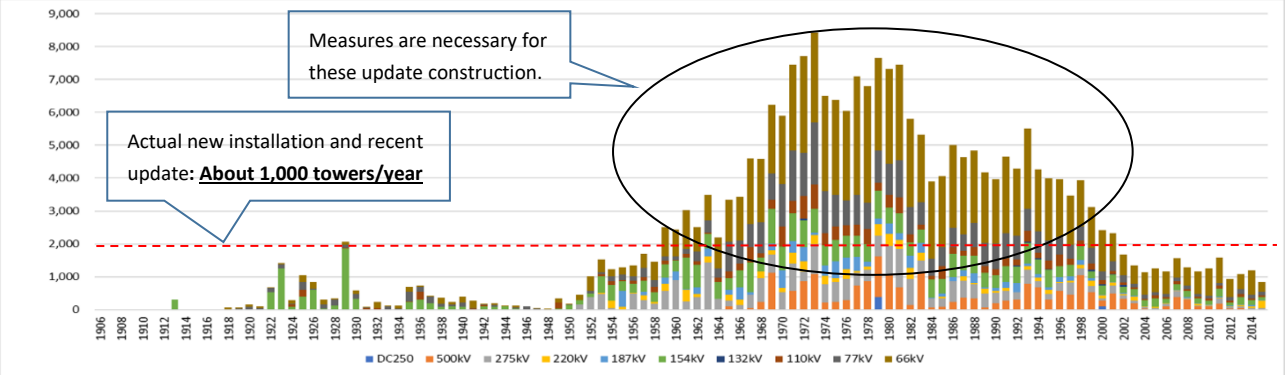


Figure 4-2 Actual Installation Year of Existing Transmission Towers (66kV-500kV)

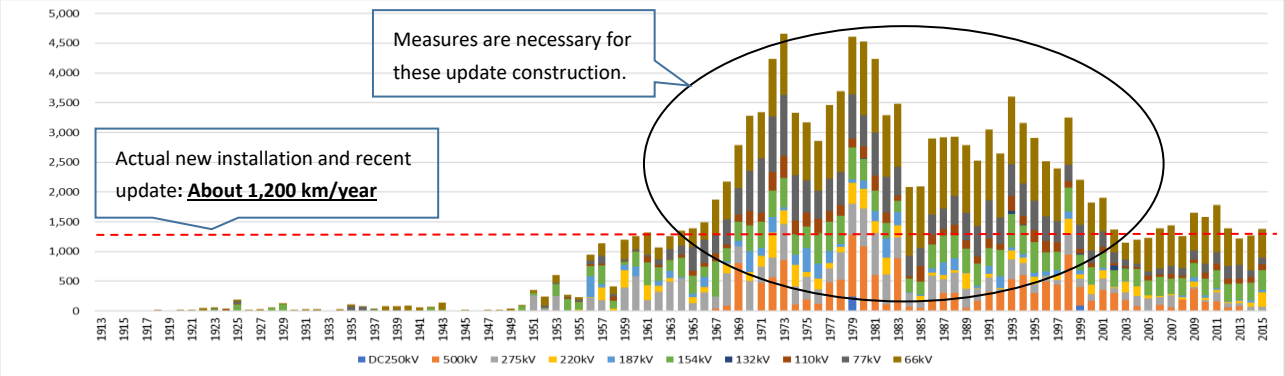


Figure 4-3 Actual Installation Year of Existing Overhead Lines (66kV-500kV)

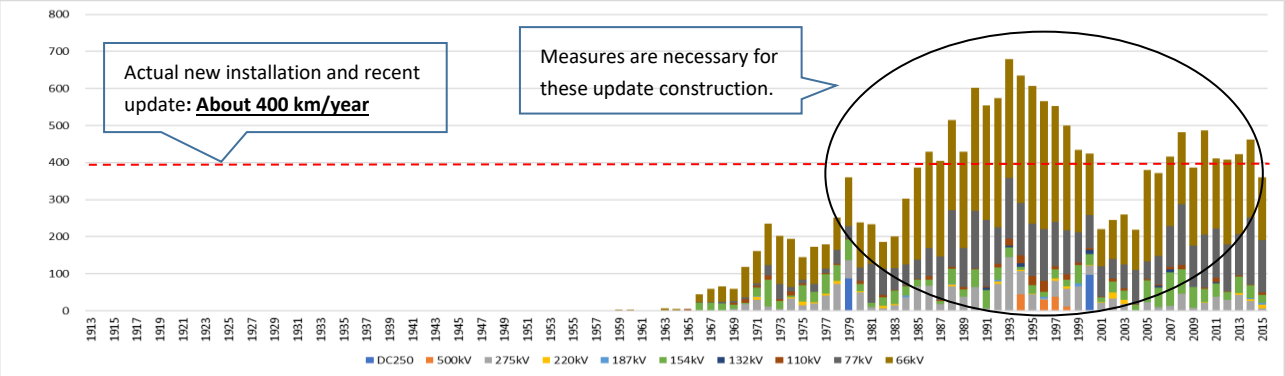


Figure 4-4 Actual Installation Year of Existing Underground Cables (66kV-500kV)

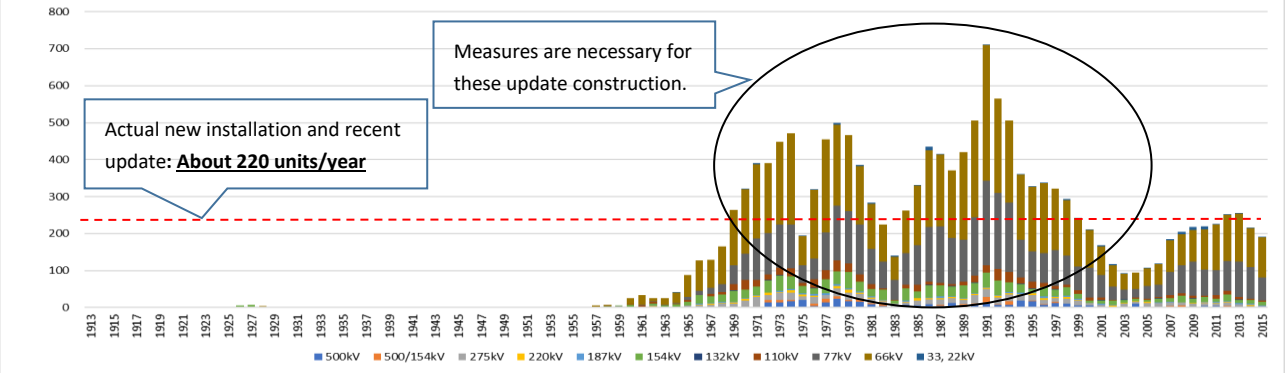


Figure 4-5 Actual Installation Year of Existing Transformers (66kV-500kV; one those of 22kV is partly included)

Furthermore, in recent years the number of working linesmen tends to decrease, and workforce with skills and ability in short supply. Figure 4-6 shows the transition of numbers of tower-climbing linesmen working at the transmission construction.[43]

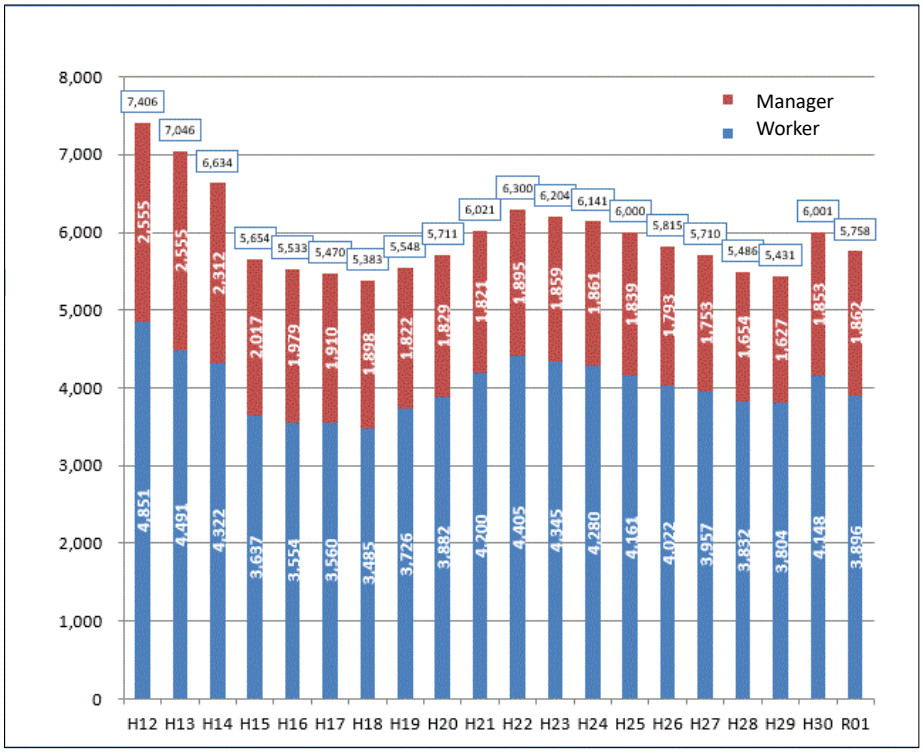


Figure 4-6 Transition of the Number of Tower-climbing Linesmen[43]

[43] Source: Transmission Line Construction Engineering Society of Japan. http://www.sou-ken.or.jp/01souken/souken_toukei.php (only in Japanese)

V. Cross-regional Operation

Retail companies will procure the supply capacity for their customers in their regional service areas. The scheduled procurement from external service areas at 15:00 h during August 2021 is illustrated in four figures. Figures 5-1 and 5-2 show the supply capacity and the ratio of the supply capacity, respectively, at 15:00 h during August. Figures 5-3 and 5-4 show the energy supply and the ratio of the energy supply, respectively, in FY 2021.

Higher ratios for procurement from external regional service areas are observed in the Tokyo, Kansai, and Chugoku EPCO areas; on the contrast, higher transmission to external regional service areas are observed in the Tohoku, Shikoku, and Kyushu EPCO areas.

The analysis result shows the same tendency as in the past years because there were no changes in major bilateral contracts of transmission line use.

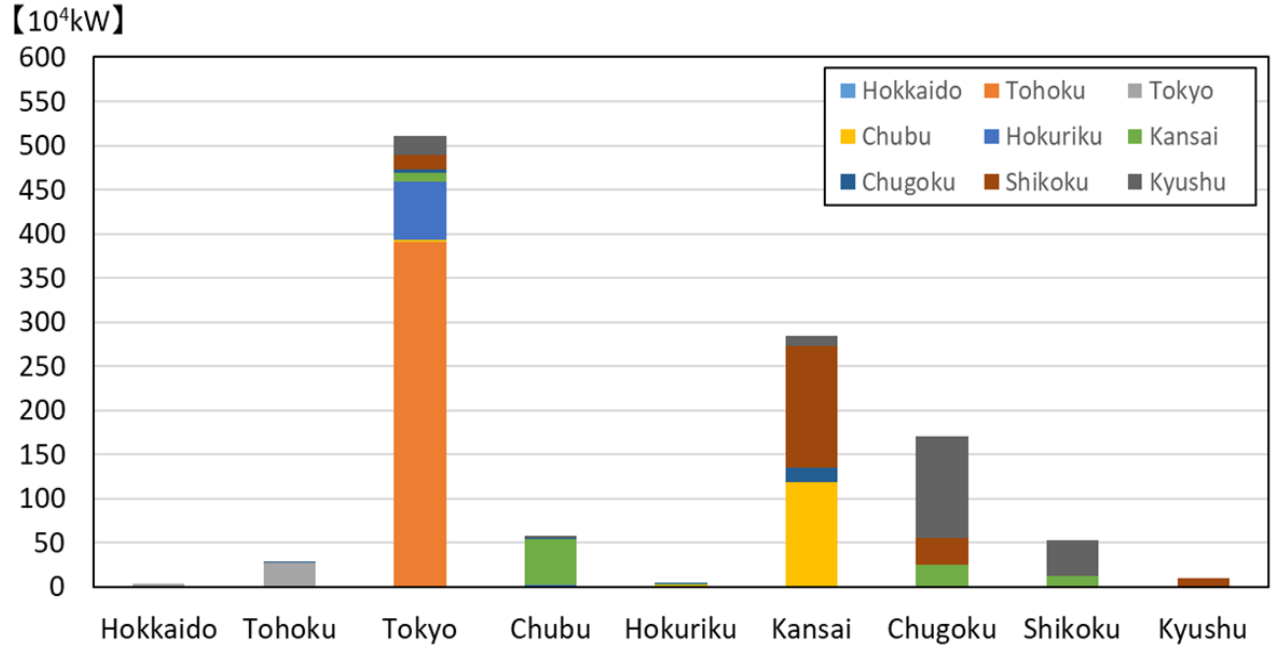


Figure 5-1 Scheduled Procurement of Supply Capacity from External Regional Service Areas

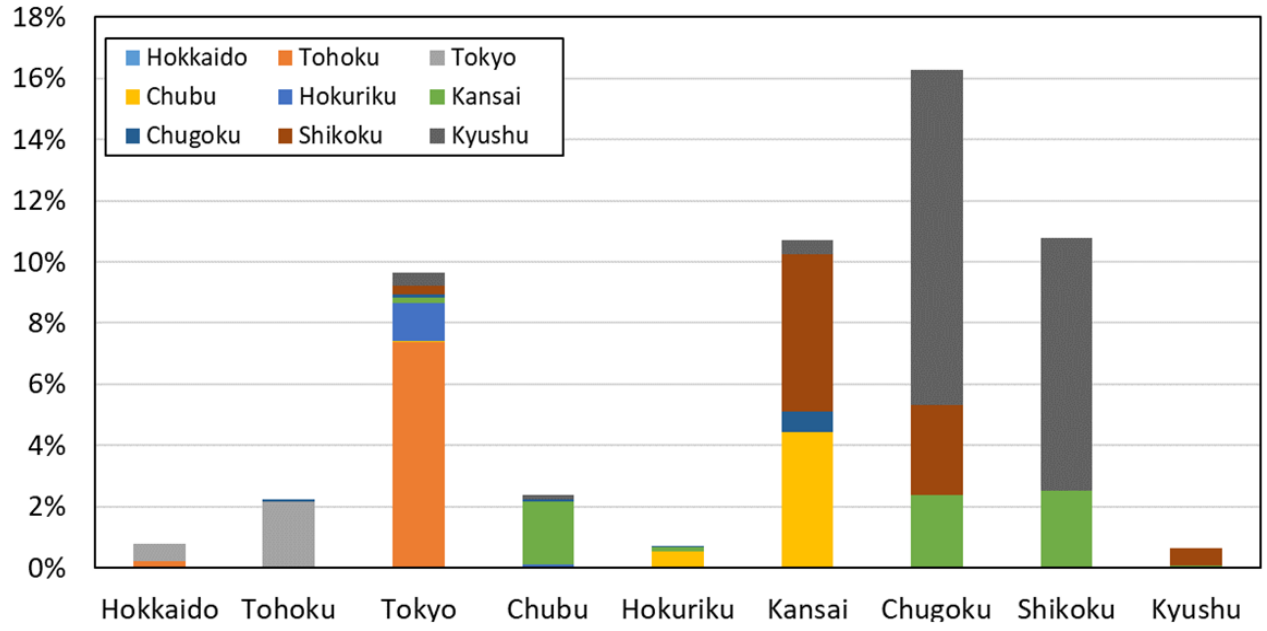


Figure 5-2 Ratio of Scheduled Procurement of Supply Capacity from External Regional Service Areas

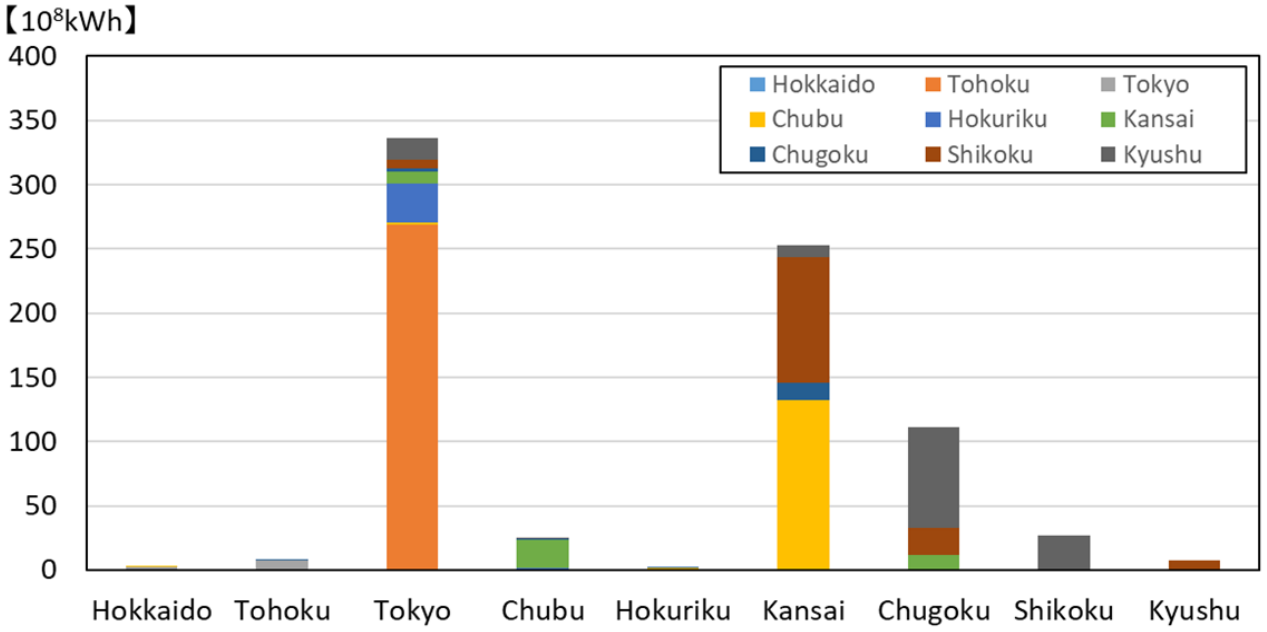


Figure 5-3 Scheduled Procurement of Energy Supply from External Regional Service Areas

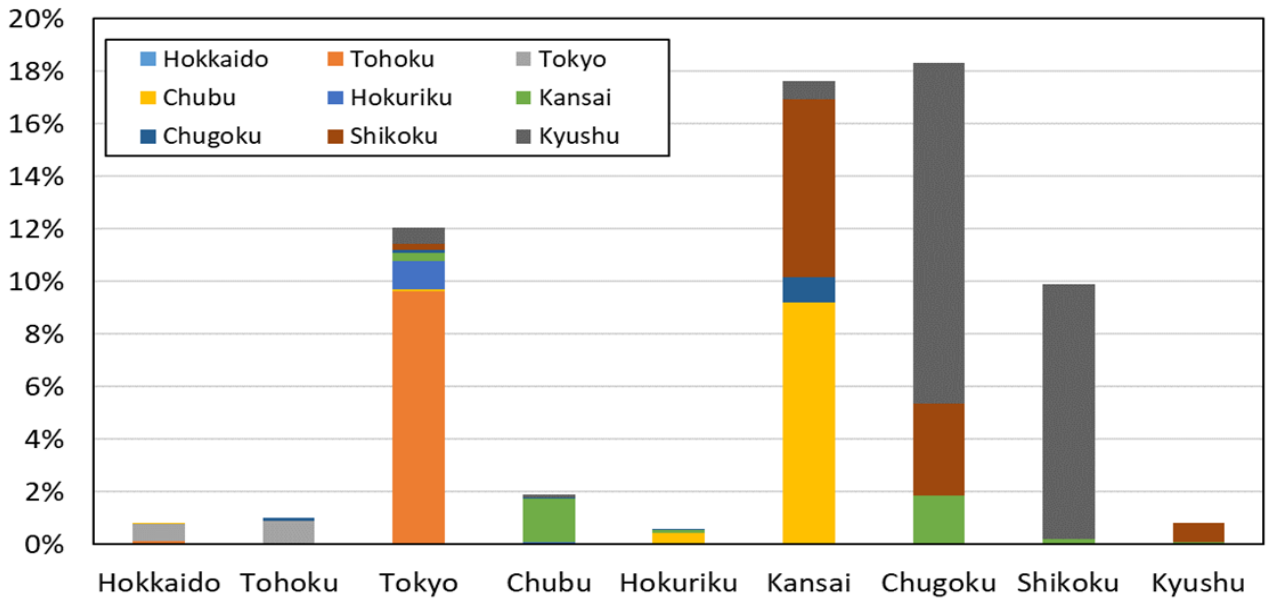


Figure 5-4 Ratio of Scheduled Procurement of Energy Supply from External Regional Service Areas

VI. Analysis of Characteristics of EPCOs

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

In total, 660 retail companies submitted their electricity supply plans, and these are classified by the business scale of the retail demand forecast by the corresponding companies. Figures 6-1 and 6-2 show the distributions of the business scale of retail demand and the accumulated retail demand forecast by the corresponding companies, respectively. Notably, small and medium-sized retail companies (business scale of under 1 GW) plan to expand business.

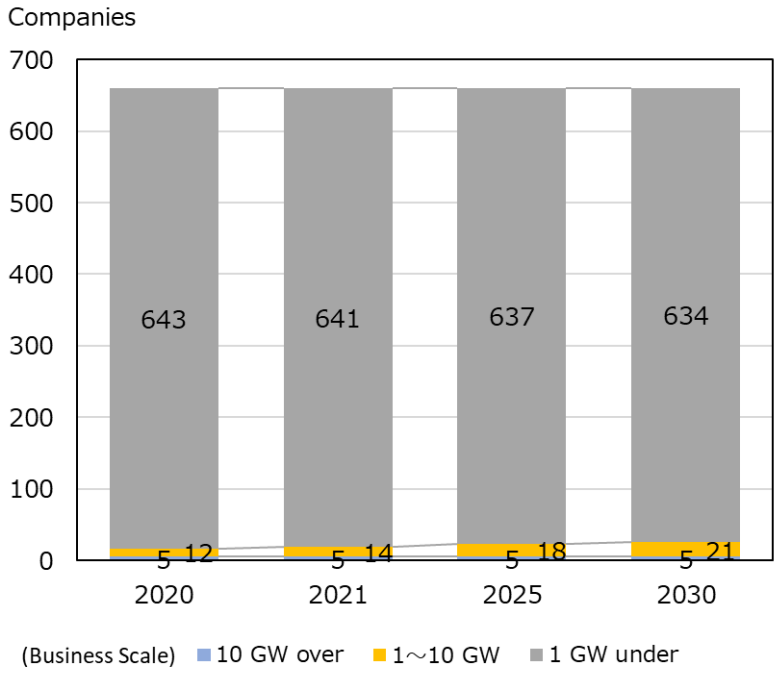


Figure 6-1 Distribution of the Retail Demand by Retail Companies by Business Scale

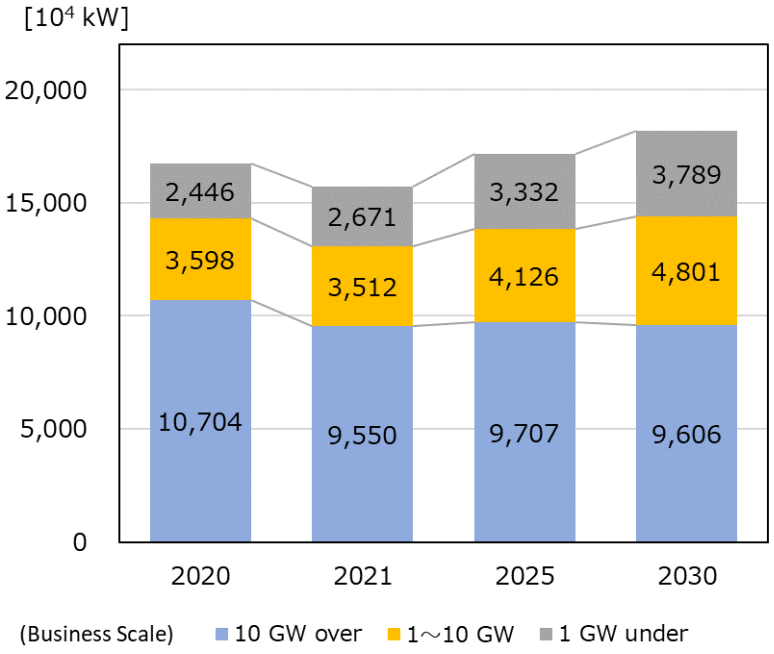


Figure 6-2 Distribution by Accumulated Retail Demand by Retail Companies

Again, retail companies are classified by the business scale of the retail energy sales forecast by the corresponding companies. Figures 6-3 and 6-4 show the distributions of the business scale of retail company energy sales and their accumulated energy sales forecast, respectively. Similarly, small and medium-sized retail companies (business scale of under 1 GW) plan to expand business.

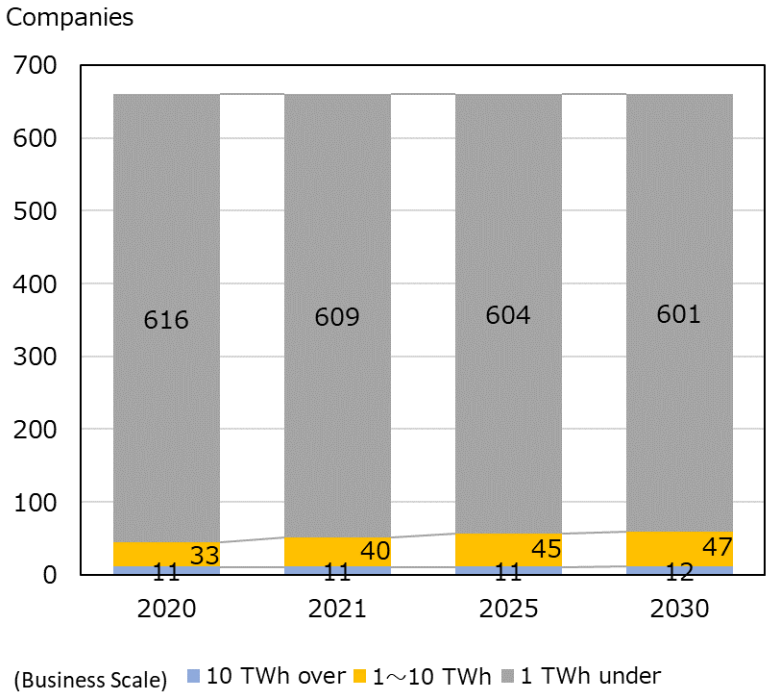


Figure 6-3 Distribution of Retail Company Energy Sales by Business Scale

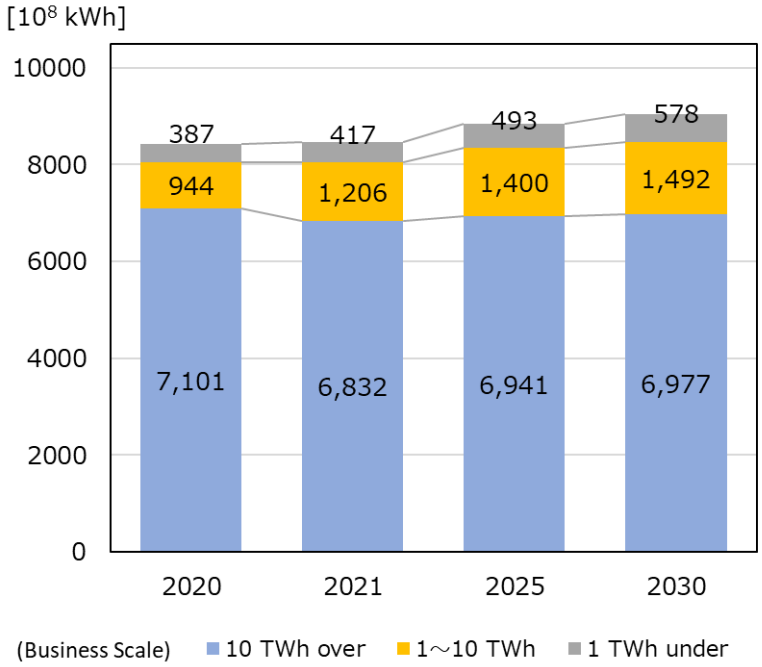


Figure 6-4 Distribution by Retail Company of Accumulated Energy Sales

2. Retail Company Business Areas

Figure 6-5 shows the ratio of retail companies by the number of areas where they plan to conduct their business. Figure 6-6 shows the number of retail companies by their business planning areas in FY 2021. The figures exclude 86 retail companies that had not yet developed their retail business plans. Half of the retail companies plan their business in a single area.

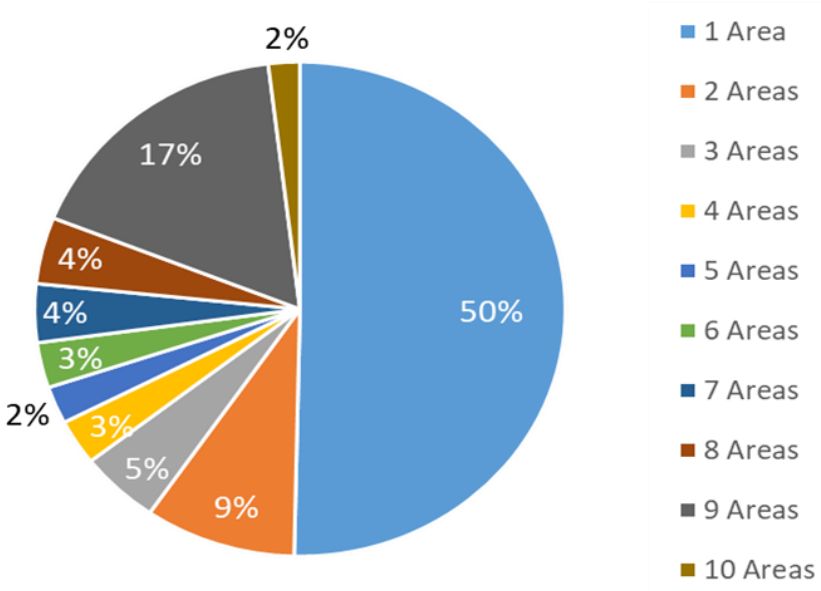


Figure 6-5 Ratio of Retail Companies by the Number of Planned Business Areas in FY 2021

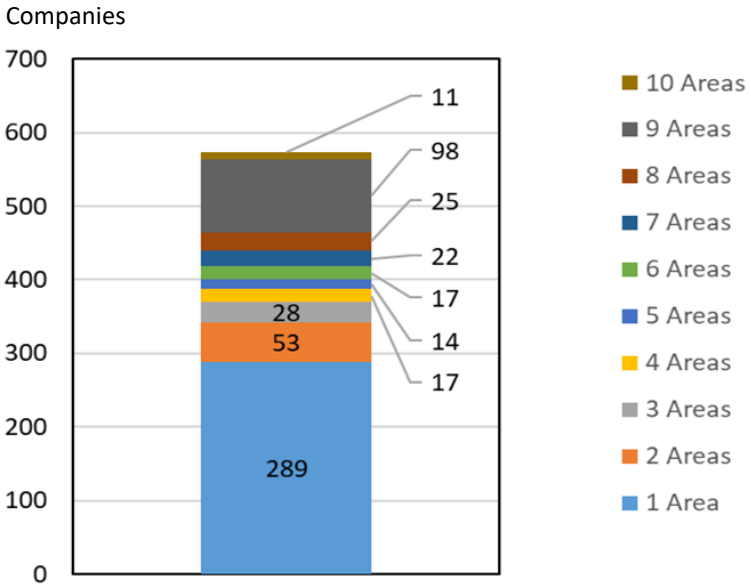
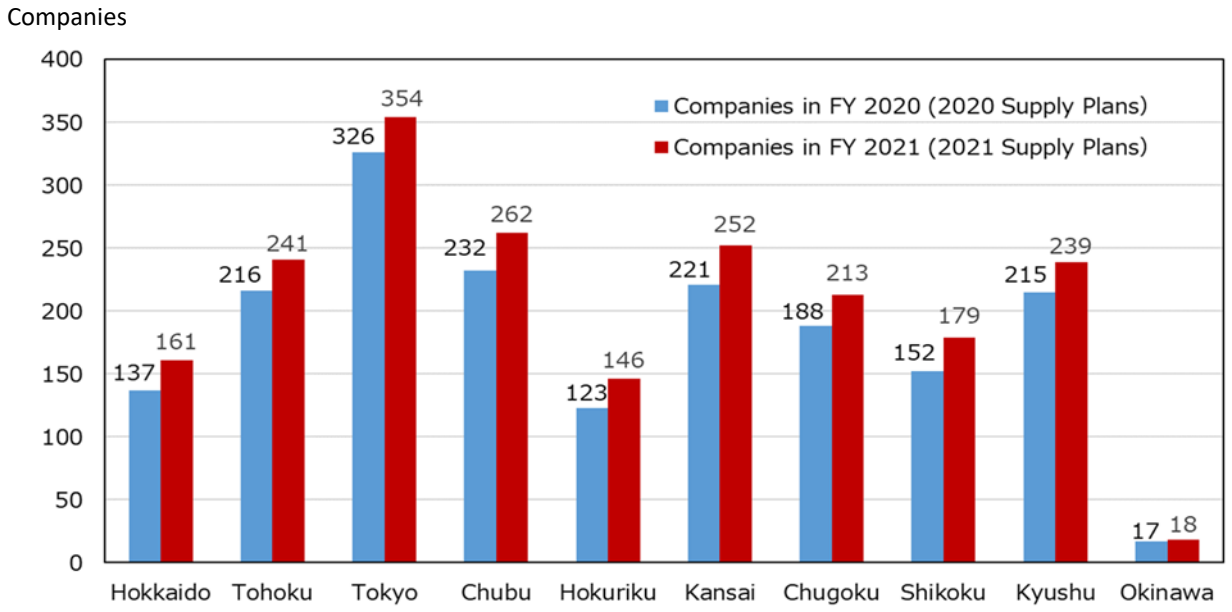


Figure 6-6 Number of Retail Companies by their Business Planning Areas in FY 2021

Figure 6-7 shows the number and the retail demand of retail companies in each regional service areas for GT&D companies in FY 2021. As retail companies increase their numbers in every regional service area, the choice of retail company for electricity customers is expanding.



Projected Peak Demand in FY 2021 (10^4 kW)

Hokkaido	Tohoku	Tokyo	Chubu	Hokuriku	Kansai	Chugoku	Shikoku	Kyushu	Okinawa
415	1,293	5,329	2,453	492	2,726	1,032	492	1,521	150

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 shows the transition of retail demand forecast in the regional service area by the retail department of the former general electric utilities, and their procured supply capacity for the demand. The retail and generation departments of the former general electric utilities secure a sufficient supply capacity procured toward the retail demand of their own area.

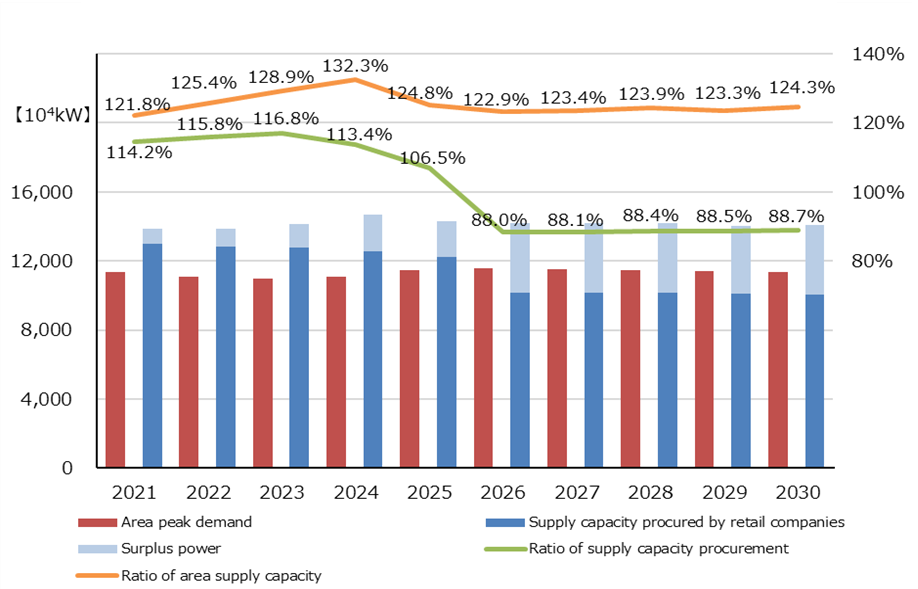


Figure 6-8 Ratio of Secured Supply Capacity to Forecast Retail Demand of Their Own Area for Former General Electric Utilities[44] (at 15:00 in August, at the sending end)

The competition among retail departments of former general electric utilities becomes fierce; the supply capacity procured for the retail demand of external areas that such companies forecast, and the retail demand that power producers and suppliers (PPSs) forecast as their retail demand, shows a declining trend(Figure 6-9).

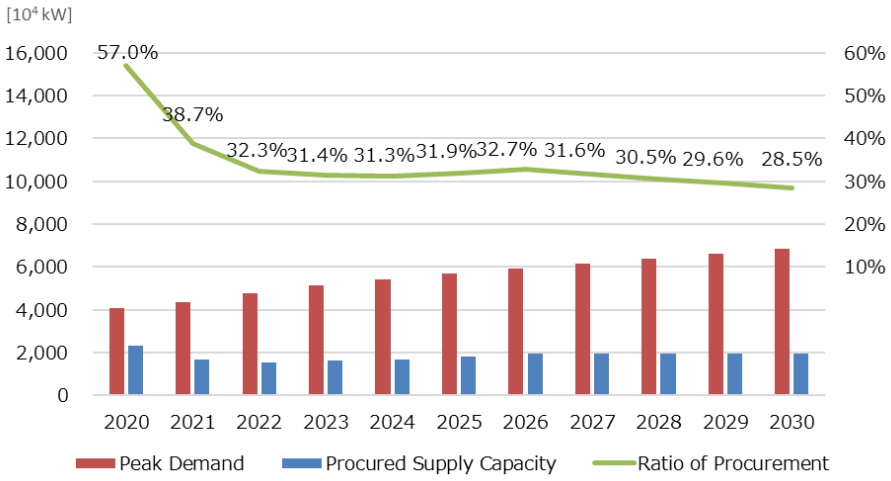


Figure 6-9 Ratio of Procured Supply Capacity to Forecast Retail Demand by Retail Companies [Former General Electric Utilities in External Areas and by PPSs] (at 15:00 in August, at the sending end)

[44] Includes surplus power of a group of companies deducting the balancing capacity to the secured supply capacity by retail companies.

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

In total, 935 generation companies submitted their electricity supply plans, and these are classified by the business scale of the installed capacity operated by the corresponding companies. Figure 6-10 shows the distribution by business scale and Figure 6-11 shows the installed capacity operated by the corresponding companies.

Generation companies with an installed capacity of under 10 GW are planning to enlarge the scale of their business.

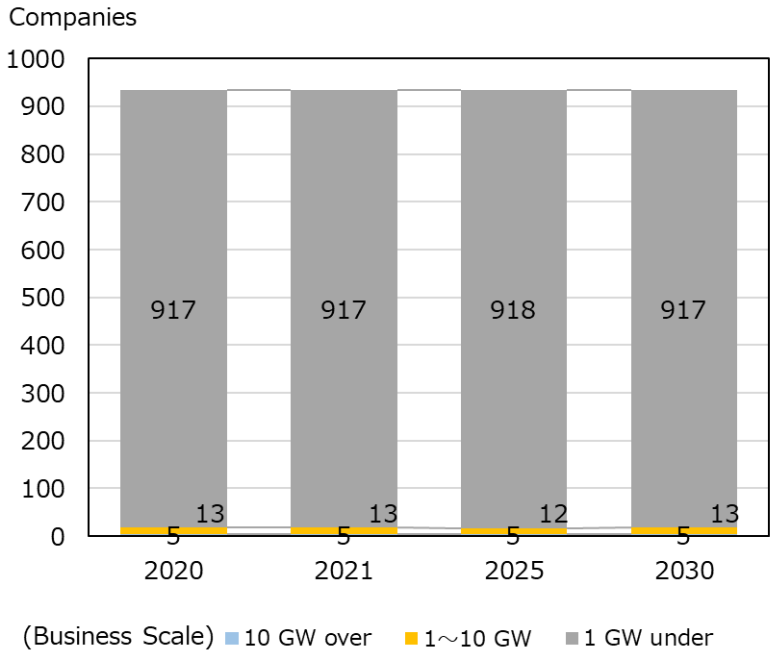


Figure 6-10 Distribution by Business Scale of Generation Company Installed Capacity

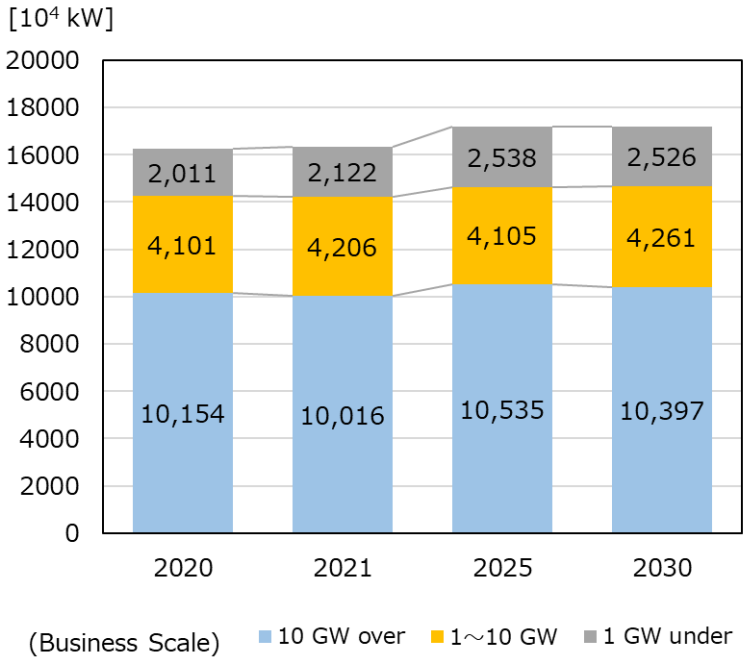


Figure 6-11 Distribution by Generation Company Accumulated Installed Capacity

Similarly, generation companies are classified by the business scale of the corresponding company energy-supply forecast. Figure 6-12 shows the distribution by the business scale of the energy supply and Figure 6-13 shows the distribution by the corresponding company accumulated energy supply forecast.

Generation companies with an energy supply of under 10 TWh are planning to decrease their energy generation.

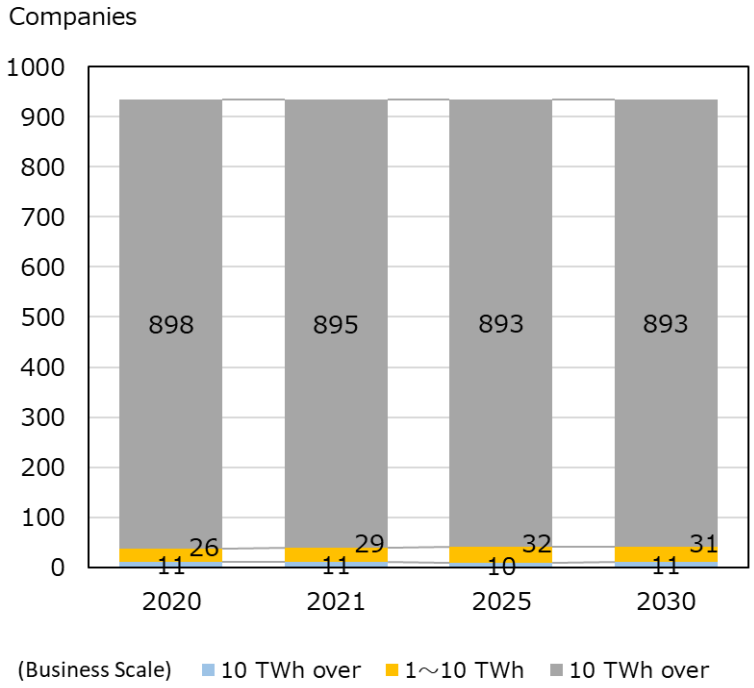


Figure 6-12 Distribution of Generation Company Energy Supply by Business Scale

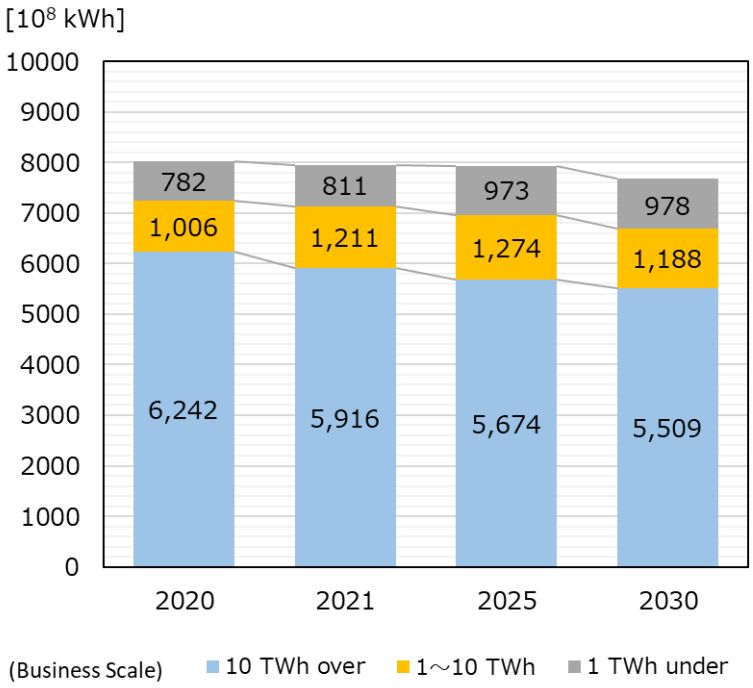


Figure 6-13 Distribution of Generation Company by Accumulated Energy Supply

Figure 6-14 shows the number of generation companies at the end of FY 2020 by the power generation sources of their own generators. The figures exclude 117 generation companies that do not own their generation plants. Approximately half of all generation companies solely own renewable energy generation facilities.

It is prominent that the generation company with renewable energy generation, solar power in particular, is increasing, and a stronger introduction of renewable energy is led by new generation companies.

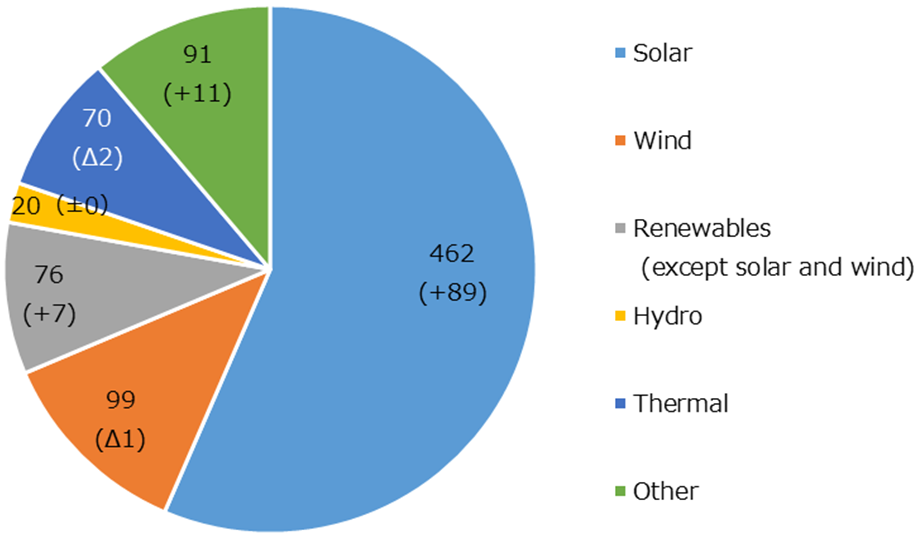


Figure 6-14 Number of Generation Companies by Power Generation Sources

5. Generation Company Business Areas

Figure 6-15 shows the ratio of generation companies to the number of areas where they plan to conduct their business. Figure 6-16 shows the number of generation companies by their business planning areas in FY 2021. The figures exclude 168 generation companies that do not own their generation plants.

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

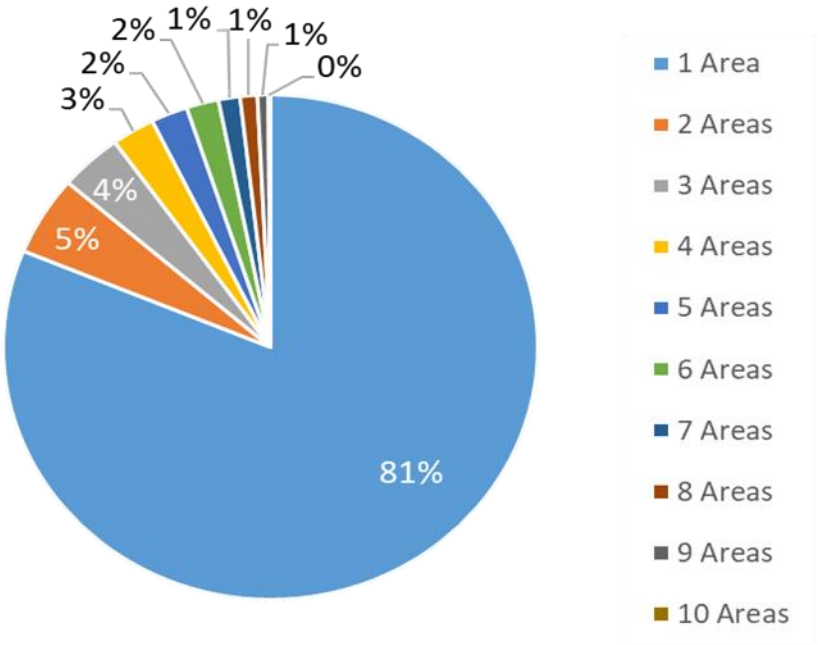


Figure 6-15 Ratio of Generation Companies by the Number of Planned Business Areas in FY 2021

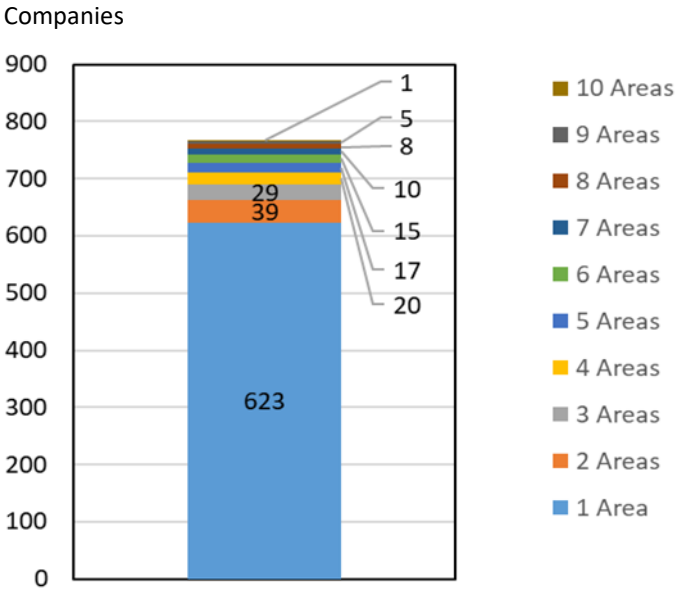
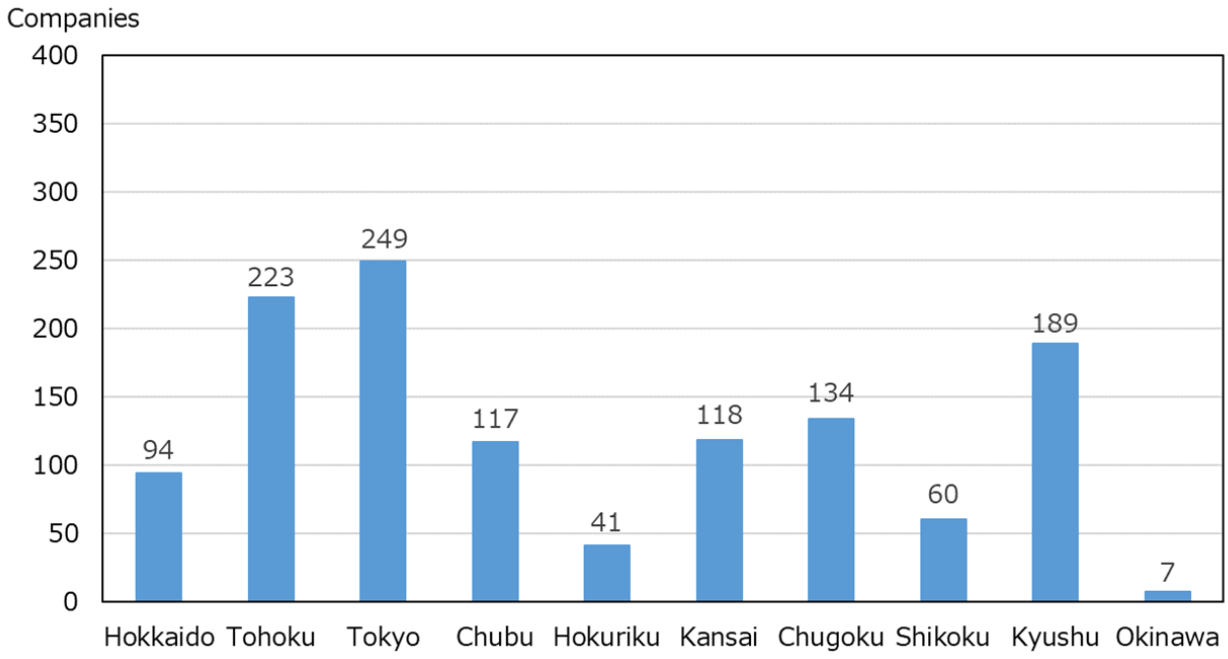


Figure 6-16 Number of Generation Companies by Their Business Planning Areas in FY 2021

Figure 6-17 shows the number and the installed capacity of generation companies in each regional service area for GT&D companies in August 2021. In the Hokkaido, Tohoku, Chugoku, and Kyushu regional service areas, the scale of generation companies is rather small and their supply capacity is comparatively small despite the number of generation companies in these regional service areas.



Projected Supply Capacity in FY 2021 (10^4 kW)

Hokkaido	Tohoku	Tokyo	Chubu	Hokuriku	Kansai	Chugoku	Shikoku	Kyushu	Okinawa
566	1,859	4,835	2,388	579	2,436	1,029	676	1,872	196

Figure 6-17 Number and Installed Capacity of Generation Companies in Each Regional Service Area

VII. Findings and Current Challenges

The current challenges relating to the aggregation of electricity supply plans are as follows.

1. Concerns about shortage of supply capacity (kW)

The Organization has introduced a new reliability criterion, i.e. the EUE, which is based on estimated supply interruption in a year. For FY 2021 and 2022, the evaluated result from the aggregated supply plans satisfies the new reliability criterion. However, evaluation implemented by the conventional approach shows that the reserve margins is 5.8% and below the criterion of 8% for February 2022 in each of the areas of Tohoku, Tokyo, Chubu, Hokuriku, Kansai, Chugoku, Shikoku, and Kyushu. In addition, fluctuation risk analysis of supply-demand during the winter peaking period of 2021/2022 implemented by the Organization, shows that the reserve margin against the H1 peak demand (estimated maximum peak demand) will be lower than 3% for most ares; particularly the Tokyo area; the reserve margin will also be lower than 3% in January 2022, and that will be a very severe situation.

This is mainly attributable to a decrease in supply capacity in the winter peaking period due to significant planned maintenance work of generators for 1,300 MW in February 2022. In considering that a supply shortage occurred in the recent winter, the Organization believes that generation companies that have large generating unit should carefully plan their maintenance work schedule based on supply - demand balance instead of bilateral contract of supply capacity with retail companies.

The Organization broadly addresses preparedness for a tight supply-demand situation publishing a severe result of supply-demand balance evaluation, and in areas of severe supply-demand situation, the Organization deales with improving this balance by scheduling coordination of maintenance work of generation companies and premeditated procurement of supply capacity by retail companies. In case of difficulty in securing a stable supply capacity, even if these countermeasures are implemented, the Organization further proceeds to ensuring a secure and stable supply by utilizing safeguard measures of generation procurement.

Furthermore, the reserve margin in July 2021 is nationally estimated at 3.4%; that is slightly over the smallest reserve margin of 3%, and the supply-demand situation is not safely secured. The Organization expects the Government to review preparedness of the tightened supply-demand situation, such as appealing to electricity customers to save power.

2. Countermeasures against tight supply-demand balance based on energy supply balance (kWh) and recent tight supply-demand conditions during winter 2020/2021

It is assumed that the increasing factor of scheduled maintenance work stated above comes from an increase in undetermined procurement of supply capacity by retail companies. As a result, the energy supply balance worsens by 1.3% annually in FY 2021 compared with FY 2020. It is

confirmed that procurement of the energy supply is lower than in the previous year.

The Organization will evaluate the energy supply balance, including fuel procurement, by verification of the electricity supply-demand after autumn in 2021 in addition to the conventional supply capacity evaluation. To prevent a tight supply-demand situation, the Organization will continuously monitor supply-demand situation before the winter peaking period begins, and will publish the information on the supply-demand situation. On this account, the Organization expects premeditated procurement of the supply capacity by the retail companies preparing for the tight supply-demand situation, security of sufficient energy supply from generation companies, as well as restraining the suspension or decommission of generators that are used as supply capacity under the circumstances of increasing procurement by bilateral or forward contract.

The Organization expects the Government to specifically review the measures for the tight supply-demand using the monitoring implemented by the Organization.

3. Countermeasures for achieving the energy mix toward FY 2030

The Japanese Government shall decdicate all its energy toward the realization of the energy mix toward FY 2030 at the 5th Energy Basic Plan determined in July 2018.

By contrast, it is revealed that the composition of the energy supply (kWh) projected in FY 2030 shows 36% for coal-fired thermal and 4% for nuclear generation, and a gap exists between the projected energy supply and the energy mix. The aggregation of the electricity supply plans sums the generation plans that each EPCO counts as securing a stable supply based on certain given premises. It is probable that this trend of energy supply will continue. Unless EPCOs change their generation plans, based on further political initiative or transformation of business environment, the achievement of the energy mix in FY 2030 will be difficult.

For the achievement of the energy mix, it is necessary to accumulate initiatives that fit the circumstances of each generation source faces, such as proper implementation of regulatory measures or inducive measures. The Organization expects the Government to properly implement initiatives toward a steady achievement of the energy mix.

VIII. Conclusions

1. Electricity Demand Forecast

The AAGR of peak demand nationwide in the mid-to-long term is forecast to decrease by 0.1%. AAGR is forecasted to be negative, and is attributable to a number of major decreasing factors, such as a shrinking population, and efforts to reduce electricity use, notwithstanding increasing factors such as growth of economic activity and wider use of electric appliances.

2. Electricity Supply and Demand

The Organization is prepared to apply EUE as a new reliablility criterion to the electric supply plan based on the review of reliability criteria. In the short term (the first and second year of the projected period), all the areas and all the years fall within the criteria of secure supply (0.048 kWh/kW-year nationwide, 0.498 kWh/kW-year in Okinawa). In the long term, the calculated result for the Kyushu area after FY 2026 exceeds the criteria. By contrast, the supply–demand balance evaluation by the conventional approach (the criterion of a stable supply, that is, a reserve margin of 8% in interconnected areas, and supply capacity over the peak demand by deducting the capacity of the largest generating unit and balancing capacity with frequency control [Generator I] in Okinawa) shows that the 8% reserve margin will not be achieved in particular months and particular areas in the short term as FY 2021 and 2022.

For energy–supply requirement evaluation, it seems that energy supply will be below the forecasted energy requirement by 0.1 to 3.2 TWh/month of volume (equivalent to 0.1 to 4.3% against the forecast energy requirement) throughout FY 2021.

On this account, the Organization has verified with the EPCOs whether any deferral of scheduled maintenance work is possible, or suspension of aged generators can be postponed, and the confirmation above leads to additional supply capacity to be used. Hereafter, publishing the result of the confirmation and the coordination above, the Organization will reconfirm with the retail and generation companies that there is sufficient preparedness for supply-demand tightness. If they do not have sufficient countermeasures, the Organization recommends that they take proper measures for supply capacity procurement.

Further, in case of not achieving improvement of the supply‐demand balance with proper countermeasures of retail and generation companies, the Organization will determine again the implementation of safeguard measures of generator procurement in the short term period at the April meeting of the Study Committee on Regulating and Marginal Supply Capability and Long-Term Supply–Demand Balance Evaluation.

3. Analysis of the Transition of Power Generation Sources Nationwide

Regarding the transition of installed power generation capacity and net electricity generation, renewable energy such as solar power and wind power is projected to increase. For nuclear power plants, energy generation is calculated as zero given that their capacity is reported as “uncertain.”

4. Development Plans for Transmission and Distribution Facilities

Regarding the development plans for major transmission lines and substations, generator access

lines are significantly planned anew, and development plans for cross-regional interconnection lines include facilities necessary for cross-regional operation.

5. Cross-regional Operation

The aggregated results for procuring supply capacity or energy from external service areas, are almost the same as in the previous year in both areas, with higher procurement from external service and in with higher transmission to external areas.

6. Analysis of Characteristics of EPCOs

Distributions are calculated for retail and generation companies according to business scale and business areas, and are aggregated to the projection for the 10-year period. In addition, the ratios of the secured supply capacity are reviewed. In particular, small and medium-sized retail companies have planned their supply capacity as "unspecified procurement," as in the previous year's plan. As a result, the ratios of the secured supply capacity indicate a declining tendency.

7. Findings and Challenges

The Organization has communicated to METI its opinions concerning three major challenges in relation to the aggregation of electricity supply plans for FY 2021.

Attached are the Appendices on the aggregation of the electricity supply plans.

APPENDIX 1 Supply–Demand Balance for FY 2021 and 2022 (Short-term)

i) Projection for FY 2020

Tables A1-1 to A1-4 show the monthly supply–demand balance, such as peak demand, monthly supply capacity, monthly reserve capacity, and reserve margin for each regional service area in FY 2021, respectively. Table A1-5 shows the monthly projection of the reserve margin for each regional service area recalculated with power exchanges to areas below the 8% reserve margin from areas with over 8% reserve margin with additional supply capacity according to provision of Article 48 of the Act. Further, Table A1-6 shows the monthly peak demand, monthly supply capacity, monthly reserve capacity, and reserve margin at the designated time.

Table A1-1 Monthly Peak Demand Forecast for Each Regional Service Area in FY 2021 (10^4kW at the sending end)

[10^4 kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	393	356	355	404	415	388	396	454	481	497	493	454
Tohoku	1,056	984	1,059	1,265	1,293	1,164	1,052	1,164	1,291	1,350	1,335	1,241
Tokyo	3,819	3,671	4,077	5,329	5,329	4,516	3,758	4,042	4,427	4,773	4,773	4,366
50 Hz areas Total	5,268	5,011	5,491	6,998	7,037	6,068	5,206	5,660	6,199	6,620	6,601	6,061
Chubu	1,829	1,868	2,017	2,453	2,453	2,316	1,958	1,935	2,108	2,285	2,285	2,082
Hokuriku	387	354	397	492	492	436	369	404	456	489	489	446
Kansai	1,833	1,857	2,105	2,726	2,726	2,284	1,890	1,935	2,326	2,431	2,431	2,129
Chugoku	748	739	811	1,032	1,032	922	772	835	1,014	1,025	1,025	901
Shikoku	344	342	390	492	492	432	356	365	453	453	453	397
Kyushu	1,028	1,044	1,188	1,521	1,521	1,312	1,118	1,141	1,433	1,451	1,451	1,228
60 Hz areas Total	6,169	6,204	6,908	8,716	8,716	7,702	6,463	6,615	7,790	8,134	8,134	7,183
Interconnected	11,437	11,215	12,399	15,714	15,753	13,770	11,669	12,275	13,989	14,754	14,735	13,244
Okinawa	104	119	144	144	146	145	130	112	97	101	100	93
Nationwide	11,541	11,334	12,543	15,858	15,899	13,915	11,798	12,387	14,085	14,855	14,835	13,337

Table A1-2 Monthly Projection of Supply Capacity for Each Regional Service Area in FY 2021 (10^4kW at the sending end)

[10^4 kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	574	605	573	576	608	584	602	633	585	578	578	588
Tohoku	1,260	1,304	1,305	1,534	1,566	1,434	1,240	1,290	1,472	1,568	1,562	1,413
Tokyo	4,380	4,346	4,854	5,636	5,699	5,273	4,448	4,386	5,022	5,091	5,014	4,872
50 Hz areas Total	6,214	6,255	6,732	7,746	7,874	7,291	6,291	6,310	7,080	7,237	7,154	6,874
Chubu	2,281	2,285	2,469	2,571	2,618	2,528	2,370	2,339	2,421	2,503	2,446	2,401
Hokuriku	488	474	485	564	546	543	491	472	509	506	505	494
Kansai	2,105	2,135	2,475	2,777	2,773	2,510	2,380	2,350	2,511	2,559	2,426	2,326
Chugoku	955	980	1,169	1,283	1,333	1,156	1,073	1,005	1,028	1,128	1,123	1,115
Shikoku	473	510	556	612	616	584	495	489	525	530	527	505
Kyushu	1,408	1,420	1,559	1,736	1,811	1,710	1,423	1,301	1,556	1,627	1,528	1,411
60 Hz areas Total	7,710	7,804	8,714	9,544	9,698	9,031	8,231	7,956	8,549	8,852	8,554	8,252
Interconnected	13,924	14,059	15,447	17,290	17,572	16,322	14,522	14,266	15,629	16,089	15,708	15,126
Okinawa	161	184	189	188	193	202	193	175	168	168	164	173
Nationwide	14,086	14,243	15,635	17,478	17,764	16,524	14,715	14,440	15,797	16,257	15,872	15,300

Table A1-3 Monthly Projection of Reserve Capacity for Each Regional Service Area in FY 2020 (10^4kW at the sending end)

[10^4 kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	181	249	218	172	193	196	206	179	104	81	85	134
Tohoku	204	320	246	269	273	270	188	126	181	218	227	172
Tokyo	561	675	777	307	370	757	690	344	595	318	241	506
50 Hz areas Total	946	1,244	1,241	748	837	1,223	1,085	650	881	617	553	813
Chubu	452	417	452	118	165	212	412	403	313	218	161	319
Hokuriku	101	121	88	72	54	107	122	69	54	17	16	49
Kansai	272	278	370	51	47	226	490	415	185	128	-5	197
Chugoku	207	241	358	251	301	234	301	170	14	103	98	214
Shikoku	129	168	166	120	124	152	139	124	72	77	74	108
Kyushu	380	376	371	215	290	398	305	160	123	176	77	183
60 Hz areas Total	1,541	1,600	1,806	828	982	1,329	1,769	1,342	760	718	420	1,070
Interconnected	2,487	2,844	3,048	1,576	1,819	2,552	2,854	1,991	1,640	1,335	973	1,883
Okinawa	58	65	45	44	47	56	63	63	72	67	64	80
Nationwide	2,545	2,909	3,092	1,620	1,866	2,608	2,917	2,054	1,712	1,402	1,038	1,963

Table A1-4 Monthly Projection of Reserve Margin for Each Regional Service Area in FY 2021

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	46.0%	69.9%	61.4%	42.6%	46.6%	50.4%	52.1%	39.5%	21.7%	16.3%	17.2%	29.6%
Tohoku	19.4%	32.5%	23.3%	21.3%	21.1%	23.2%	17.9%	10.8%	14.0%	16.1%	17.0%	13.9%
Tokyo	14.7%	18.4%	19.1%	**5.8%**	**6.9%**	16.8%	18.4%	8.5%	13.4%	**6.7%**	**5.0%**	11.6%
50 Hz areas Total	18.0%	24.8%	22.6%	10.7%	11.9%	20.1%	20.8%	11.5%	14.2%	9.3%	8.4%	13.4%
Chubu	24.7%	22.3%	22.4%	**4.8%**	**6.7%**	9.1%	21.0%	20.9%	14.8%	9.6%	**7.0%**	15.3%
Hokuriku	26.1%	34.2%	22.3%	14.6%	10.9%	24.4%	33.2%	17.0%	11.7%	**3.4%**	**3.3%**	11.0%
Kansai	14.8%	15.0%	17.6%	**1.9%**	**1.7%**	9.9%	25.9%	21.5%	**7.9%**	**5.3%**	**-0.2%**	9.2%
Chugoku	27.7%	32.6%	44.2%	24.4%	29.2%	25.4%	39.0%	20.4%	**1.4%**	10.0%	9.5%	23.7%
Shikoku	37.6%	49.0%	42.7%	24.5%	25.3%	35.3%	38.9%	34.0%	15.8%	16.9%	16.3%	27.1%
Kyushu	36.9%	36.0%	31.2%	14.1%	19.1%	30.3%	27.3%	14.0%	8.6%	12.1%	**5.3%**	14.9%
60 Hz areas Total	25.0%	25.8%	26.1%	9.5%	11.3%	17.3%	27.4%	20.3%	9.8%	8.8%	**5.2%**	14.9%
Interconnected	21.7%	25.4%	24.6%	10.0%	11.5%	18.5%	24.5%	16.2%	11.7%	9.0%	**6.6%**	14.2%
Okinawa	55.8%	54.4%	30.9%	30.3%	32.3%	38.7%	48.9%	56.2%	74.2%	66.4%	64.7%	86.0%
Nationwide	22.1%	25.7%	24.7%	10.2%	11.7%	18.7%	24.7%	16.6%	12.2%	9.4%	**7.0%**	14.7%

Below 8 % criteria

Table A1-5 Monthly Projection of Reserve Margin for Each Regional Service Area in FY 2021

(with power exchanges through cross-regional interconnection lines and generating facilities not included in the electricity supply plans, at the sending end)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	29.5%	55.6%	54.0%	32.9%	37.7%	47.9%	43.6%	25.7%	13.1%	13.4%	12.3%	14.9%
Tohoku	17.7%	26.5%	21.0%	17.5%	16.1%	16.6%	19.2%	10.5%	13.1%	13.4%	12.3%	13.3%
Tokyo	17.7%	22.7%	21.0%	**7.5%**	8.9%	16.6%	19.2%	10.5%	11.5%	**7.7%**	**5.8%**	13.3%
Chubu	23.6%	24.6%	25.2%	9.2%	10.3%	16.6%	27.2%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Hokuriku	23.6%	24.6%	25.2%	9.2%	10.3%	16.6%	27.2%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Kansai	23.6%	24.6%	25.2%	9.2%	10.3%	16.6%	28.1%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Chugoku	23.6%	24.6%	25.9%	9.2%	10.3%	16.6%	28.1%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Shikoku	23.6%	24.6%	25.9%	9.2%	10.3%	16.6%	28.1%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Kyushu	28.9%	27.1%	27.6%	10.6%	15.5%	27.2%	28.1%	20.1%	11.5%	8.8%	**5.8%**	14.8%
Interconnected	21.7%	25.4%	24.6%	10.0%	11.5%	18.5%	24.5%	16.2%	11.7%	9.0%	**6.6%**	14.2%
Okinawa	55.8%	54.4%	30.9%	30.3%	32.3%	38.7%	48.9%	56.2%	74.2%	66.4%	64.7%	86.0%
Nationwide	22.1%	25.7%	24.7%	10.2%	11.7%	18.7%	24.7%	16.6%	12.2%	9.4%	**7.0%**	14.7%

Improve to over 8%

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

Table A1-6 Monthly Projection of Supply Demand Balance in Okinawa in FY 2020 (10^4kW at the sending end)

[10^4 kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Peak Demand	104	119	144	146	150	147	130	112	97	101	100	93
Supply Capacity	161	187	189	197	206	206	193	175	168	168	164	173
Reserve Capacity	58	67	45	51	56	59	63	63	72	67	64	80
Resreve Margin	55.8%	56.5%	30.9%	35.3%	37.5%	39.7%	48.9%	56.2%	74.2%	66.4%	64.7%	86.0%

ii) Projection for FY 2022

Tables A1-7 to A1-10 show the monthly supply–demand balance, such as peak demand, monthly supply capacity, monthly reserve capacity, and reserve margin for each regional service area in FY 2022, respectively. Table A1-11 shows the monthly projection of the reserve margin for each regional service area recalculated with power exchanges to areas below the 8% reserve margin from areas with over 8% reserve margin with additional supply capacity according to provision of Article 48 of the Act. Further, Table A1-12 shows the monthly peak demand, monthly supply capacity, monthly reserve capacity, and reserve margin at the designated time.

Table A1-7 Monthly Peak Demand Forecast for Each Regional Service Area in FY 2022 (10^4kW at the sending end)

[10^4 kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	394	357	356	405	416	389	397	455	482	498	494	455
Tohoku	1,053	981	1,056	1,261	1,289	1,160	1,051	1,163	1,290	1,349	1,334	1,240
Tokyo	3,842	3,690	4,096	5,337	5,337	4,522	3,759	4,037	4,419	4,761	4,761	4,353
50 Hz areas Total	5,289	5,028	5,508	7,003	7,042	6,071	5,207	5,655	6,191	6,608	6,589	6,048
Chubu	1,843	1,882	2,033	2,472	2,472	2,334	1,974	1,950	2,124	2,302	2,302	2,098
Hokuriku	389	355	399	494	494	438	370	406	458	491	491	448
Kansai	1,840	1,863	2,113	2,736	2,736	2,293	1,897	1,942	2,335	2,440	2,440	2,137
Chugoku	750	741	814	1,035	1,035	924	774	837	1,017	1,028	1,028	904
Shikoku	344	342	390	493	493	433	356	365	453	453	453	398
Kyushu	1,033	1,049	1,194	1,529	1,529	1,318	1,124	1,147	1,440	1,459	1,459	1,235
60 Hz areas Total	6,199	6,232	6,943	8,759	8,759	7,740	6,495	6,647	7,827	8,173	8,173	7,220
Interconnected	11,488	11,260	12,451	15,762	15,801	13,811	11,702	12,302	14,018	14,781	14,762	13,268
Okinawa	105	121	146	146	147	147	131	113	98	102	101	94
Nationwide	11,593	11,381	12,596	15,908	15,948	13,958	11,833	12,415	14,115	14,883	14,863	13,362

Table A1-8 Monthly Projection of Supply Capacity for Each Regional Service Area in FY 2022 (10^4kW at the sending end)

[10^4 kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	519	544	538	579	587	583	582	622	671	666	665	592
Tohoku	1,283	1,352	1,410	1,612	1,672	1,494	1,403	1,453	1,624	1,664	1,680	1,576
Tokyo	4,444	4,559	4,788	5,529	5,586	5,219	4,463	4,244	4,836	4,963	4,968	4,681
50 Hz areas Total	6,245	6,455	6,736	7,719	7,845	7,295	6,448	6,319	7,131	7,293	7,313	6,849
Chubu	2,105	2,254	2,503	2,612	2,674	2,434	2,182	2,030	2,318	2,446	2,415	2,339
Hokuriku	494	478	457	486	511	482	504	464	509	505	502	514
Kansai	2,224	2,327	2,394	2,697	2,754	2,563	2,195	2,262	2,637	2,669	2,734	2,533
Chugoku	854	908	1,059	1,274	1,261	1,154	1,046	1,017	1,186	1,224	1,198	1,131
Shikoku	461	496	544	589	622	589	546	489	505	516	509	525
Kyushu	1,361	1,480	1,622	1,762	1,760	1,794	1,548	1,523	1,645	1,731	1,629	1,518
60 Hz areas Total	7,499	7,943	8,579	9,419	9,581	9,016	8,020	7,784	8,799	9,091	8,987	8,559
Interconnected	13,745	14,398	15,314	17,139	17,426	16,311	14,468	14,103	15,930	16,383	16,300	15,409
Okinawa	170	183	204	205	212	213	197	173	155	161	186	181
Nationwide	13,915	14,581	15,518	17,344	17,638	16,524	14,665	14,277	16,085	16,545	16,486	15,590

Table A1-9 Monthly Projection of Reserve Capacity for Each Regional Service Area in FY 2021 (10^4kW at the sending end)

[10^4 kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	125	187	182	174	171	194	185	167	189	168	171	137
Tohoku	230	371	354	351	383	334	352	290	334	315	346	336
Tokyo	602	869	692	192	249	697	704	207	417	202	207	328
50 Hz areas Total	956	1,427	1,228	716	803	1,224	1,241	664	940	685	724	801
Chubu	262	372	470	140	202	100	208	80	194	144	113	241
Hokuriku	105	123	58	-8	17	44	134	58	51	14	11	66
Kansai	384	464	281	-39	18	270	298	320	302	229	294	396
Chugoku	104	167	245	239	226	230	272	180	169	196	170	227
Shikoku	117	154	154	96	129	156	190	124	52	63	56	127
Kyushu	328	431	428	233	231	476	424	376	205	272	170	283
60 Hz areas Total	1,300	1,711	1,636	660	822	1,276	1,526	1,138	973	918	814	1,340
Interconnected	2,257	3,138	2,864	1,377	1,625	2,500	2,766	1,802	1,913	1,602	1,538	2,141
Okinawa	66	62	58	59	64	66	65	60	57	59	85	87
Nationwide	2,322	3,200	2,922	1,436	1,689	2,566	2,832	1,862	1,970	1,662	1,623	2,228

Table A1-10 Monthly Projection of Reserve Margin for Each Regional Service Area in FY 2022

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	31.8%	52.5%	51.0%	42.8%	41.2%	49.8%	46.5%	36.7%	39.3%	33.7%	34.6%	30.2%
Tohoku	21.8%	37.8%	33.5%	27.8%	29.7%	28.8%	33.5%	24.9%	25.9%	23.3%	25.9%	27.1%
Tokyo	15.7%	23.5%	16.9%	**3.6%**	**4.7%**	15.4%	18.7%	**5.1%**	9.4%	**4.2%**	**4.4%**	**7.5%**
50 Hz areas Total	18.1%	28.4%	22.3%	10.2%	11.4%	20.2%	23.8%	11.7%	15.2%	10.4%	11.0%	13.2%
Chubu	14.2%	19.8%	23.1%	**5.7%**	8.2%	**4.3%**	10.5%	**4.1%**	9.1%	**6.3%**	**4.9%**	11.5%
Hokuriku	27.1%	34.6%	14.7%	**-1.7%**	**3.4%**	10.0%	36.3%	14.4%	11.2%	**2.8%**	**2.2%**	14.8%
Kansai	20.9%	24.9%	13.3%	**-1.4%**	**0.7%**	11.8%	15.7%	16.5%	12.9%	9.4%	12.1%	18.5%
Chugoku	13.8%	22.5%	30.1%	23.1%	21.9%	24.9%	35.1%	21.5%	16.6%	19.1%	16.5%	25.1%
Shikoku	33.9%	45.2%	39.4%	19.4%	26.1%	36.1%	53.5%	34.0%	11.4%	13.9%	12.3%	31.8%
Kyushu	31.8%	41.1%	35.8%	15.2%	15.1%	36.1%	37.7%	32.8%	14.2%	18.6%	11.7%	22.9%
60 Hz areas Total	21.0%	27.5%	23.6%	**7.5%**	9.4%	16.5%	23.5%	17.1%	12.4%	11.2%	10.0%	18.6%
Interconnected	19.6%	27.9%	23.0%	8.7%	10.3%	18.1%	23.6%	14.6%	13.6%	10.8%	10.4%	16.1%
Okinawa	62.8%	51.4%	39.7%	40.3%	43.6%	45.0%	49.8%	53.0%	58.3%	58.3%	84.4%	92.6%
Nationwide	20.0%	28.1%	23.2%	9.0%	10.6%	18.4%	23.9%	15.0%	14.0%	11.2%	10.9%	16.7%

Below 8 % criteria

Table A1-11 Monthly Projection of Reserve Margin for Each Regional Service Area in FY 2022

(with power exchanges through cross-regional interconnection lines and generating facilities not included in the electricity supply plans, at the sending end)

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Hokkaido	23.8%	36.4%	45.2%	32.2%	35.0%	42.8%	31.8%	22.4%	23.8%	20.8%	23.7%	27.9%
Tohoku	23.8%	29.6%	20.9%	17.6%	17.9%	28.6%	31.8%	22.4%	22.8%	20.8%	23.7%	27.9%
Tokyo	15.9%	26.6%	20.9%	**6.8%**	8.0%	13.2%	20.2%	**7.6%**	12.0%	**6.3%**	**6.1%**	**7.5%**
Chubu	19.2%	26.6%	22.3%	**7.1%**	8.9%	13.2%	20.2%	10.7%	12.4%	10.8%	10.0%	17.8%
Hokuriku	19.2%	26.6%	22.3%	**7.1%**	8.9%	16.4%	20.2%	10.7%	12.4%	10.8%	10.0%	18.9%
Kansai	19.2%	26.6%	22.3%	**7.1%**	8.9%	16.4%	22.0%	18.2%	12.4%	10.8%	10.0%	18.9%
Chugoku	19.2%	26.6%	22.3%	**7.1%**	8.9%	16.4%	22.0%	18.2%	12.4%	10.8%	10.0%	18.9%
Shikoku	19.2%	26.6%	22.3%	**7.1%**	8.9%	16.4%	23.5%	18.2%	12.4%	10.8%	10.0%	18.9%
Kyushu	29.7%	34.2%	28.7%	9.7%	11.7%	32.2%	35.5%	26.8%	12.4%	13.4%	10.0%	18.9%
Interconnected	19.6%	27.9%	23.0%	8.7%	10.3%	18.1%	23.6%	14.6%	13.6%	10.8%	10.4%	16.1%
Okinawa	62.8%	51.4%	39.7%	40.3%	43.6%	45.0%	49.8%	53.0%	58.3%	58.3%	84.4%	92.6%
Nationwide	20.0%	28.1%	23.2%	9.0%	10.6%	18.4%	23.9%	15.0%	14.0%	11.2%	10.9%	16.7%

Improve to over 8%

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

Table A1-12 Monthly Projection of Supply Demand Balance in Okinawa in FY 2022 (10^4kW at the sending end)

[10^4 kW]

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Peak Demand	105	121	146	147	152	149	131	113	98	102	101	94
Supply Capacity	170	185	204	214	226	217	197	173	155	161	186	181
Reserve Capacity	66	65	58	67	74	69	65	60	57	59	85	87
Resreve Margin	62.8%	53.6%	39.7%	45.3%	48.6%	46.0%	49.8%	53.0%	58.3%	58.3%	84.4%	92.6%

APPENDIX 2 Long-Term Supply–Demand Balance for the 10-year Period FY 2021–2030

Tables A2-1 to A2-4 show a 10-year projection of the annual peak demand, annual supply capacity, annual reserve capacity, and reserve margin for each regional service area from FY 2021 to 2030, respectively. Table A2-5 shows the annual projection of the reserve margin for each regional service area recalculated with power exchanges from areas with over 8% reserve margin to areas below the 8% reserve margin with additional supply capacity according to provision of Article 48 of the Act. Tables A2-6 to A2-9 show a 10-year projection of the annual peak demand, annual supply capacity, annual reserve capacity, and reserve margin for winter peak areas of Hokkaido and Tohoku, respectively. Table A2-10 shows the 10-year projection of the reserve margin for each regional service area recalculated with power exchanges to areas below the 8% reserve margin from areas with over 8% reserve margin with additional supply capacity according to provision of Article 48 of the Act. Further, Table A2-11 shows the annual peak demand, monthly supply capacity, monthly reserve capacity, and reserve margin for the projected period at the designated time.

Table A2-1 Annual Peak Demand Forecast for Each Regional Service Area
(at 15:00 in August, 10^4kW at the sending end)

[10^4 kW]

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hokkaido	415	416	416	416	415	415	415	415	414	414
Tohoku	1,293	1,289	1,284	1,278	1,271	1,264	1,257	1,250	1,243	1,236
Tokyo	5,329	5,337	5,333	5,328	5,323	5,316	5,309	5,302	5,294	5,286
50 Hz areas Total	7,037	7,042	7,033	7,022	7,009	6,995	6,981	6,967	6,951	6,936
Chubu	2,453	2,472	2,464	2,456	2,448	2,440	2,432	2,425	2,418	2,411
Hokuriku	492	494	496	497	496	494	493	491	490	488
Kansai	2,726	2,736	2,728	2,719	2,711	2,703	2,694	2,686	2,677	2,669
Chugoku	1,032	1,035	1,036	1,036	1,035	1,035	1,035	1,035	1,034	1,034
Shikoku	492	493	491	490	488	487	486	484	483	481
Kyushu	1,521	1,529	1,534	1,532	1,529	1,526	1,524	1,521	1,519	1,516
60 Hz areas Total	8,716	8,759	8,749	8,730	8,707	8,685	8,664	8,642	8,621	8,599
Interconnected	15,753	15,801	15,782	15,752	15,716	15,680	15,645	15,609	15,572	15,535
Okinawa	146	147	149	150	151	152	153	153	154	155
Nationwide	15,899	15,948	15,931	15,902	15,868	15,832	15,798	15,762	15,726	15,690

Table A2-2 Annual Projection of Supply Capacity for Each Regional Service Area
(at 15:00 in August, 10^4kW at the sending end)

[10^4 kW]

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hokkaido	608	587	621	644	644	642	643	643	646	646
Tohoku	1,566	1,672	1,741	1,692	1,642	1,677	1,687	1,705	1,711	1,720
Tokyo	5,699	5,586	5,718	6,048	6,269	6,268	6,275	6,352	6,357	6,364
50 Hz areas Total	7,874	7,845	8,080	8,384	8,556	8,586	8,604	8,700	8,714	8,730
Chubu	2,618	2,674	2,534	2,902	2,818	2,821	2,837	2,834	2,824	2,821
Hokuriku	546	511	515	532	515	510	508	500	498	497
Kansai	2,773	2,754	2,975	2,983	2,859	2,978	2,988	2,967	2,976	2,977
Chugoku	1,333	1,261	1,320	1,296	1,300	1,308	1,307	1,289	1,291	1,293
Shikoku	616	622	645	654	655	655	657	650	651	657
Kyushu	1,811	1,760	1,768	1,739	1,698	1,575	1,580	1,566	1,570	1,620
60 Hz areas Total	9,698	9,581	9,758	10,107	9,844	9,847	9,878	9,805	9,809	9,865
Interconnected	17,572	17,426	17,837	18,491	18,400	18,433	18,481	18,506	18,523	18,594
Okinawa	193	212	215	219	202	214	214	214	214	214
Nationwide	17,764	17,638	18,052	18,710	18,602	18,647	18,695	18,720	18,737	18,808

Table A2-3 Annual Projection of Reserve Capacity for Each Regional Service Area
(at 15:00 in August, 10^4kW at the sending end)

[10^4 kW]

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hokkaido	193	171	205	228	229	227	228	228	232	232
Tohoku	273	383	457	414	371	413	430	455	468	484
Tokyo	370	249	385	720	946	952	966	1,050	1,063	1,078
50 Hz areas Total	837	803	1,047	1,362	1,547	1,591	1,623	1,733	1,763	1,794
Chubu	165	202	70	446	370	381	405	409	406	410
Hokuriku	54	17	19	35	19	16	15	9	8	9
Kansai	47	18	247	264	148	275	294	281	299	308
Chugoku	301	226	284	260	264	273	272	254	256	259
Shikoku	124	129	154	164	167	168	171	166	168	176
Kyushu	290	231	234	207	169	49	56	45	51	104
60 Hz areas Total	982	822	1,009	1,377	1,137	1,162	1,214	1,164	1,188	1,266
Interconnected	1,819	1,625	2,055	2,740	2,683	2,753	2,836	2,897	2,951	3,059
Okinawa	47	64	65	69	51	62	61	60	60	59
Nationwide	1,866	1,689	2,121	2,808	2,734	2,815	2,897	2,958	3,010	3,118

Table A2-4 Annual Projection of Reserve Margin for Each Regional Service Area
(resource within own service area only, at 15:00 in August)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hokkaido	46.6%	41.2%	49.3%	54.9%	55.3%	54.7%	54.8%	55.1%	56.0%	56.0%
Tohoku	21.1%	29.7%	35.6%	32.4%	29.2%	32.7%	34.2%	36.4%	37.7%	39.2%
Tokyo	**6.9%**	**4.7%**	**7.2%**	13.5%	17.8%	17.9%	18.2%	19.8%	20.1%	20.4%
50 Hz areas Total	11.9%	11.4%	14.9%	19.4%	22.1%	22.8%	23.2%	24.9%	25.4%	25.9%
Chubu	**6.7%**	8.2%	**2.9%**	18.2%	15.1%	15.6%	16.7%	16.9%	16.8%	17.0%
Hokuriku	10.9%	**3.4%**	**3.9%**	**7.1%**	**3.8%**	**3.2%**	**3.1%**	**1.8%**	**1.7%**	**1.9%**
Kansai	**1.7%**	**0.7%**	9.0%	9.7%	**5.5%**	10.2%	10.9%	10.5%	11.2%	11.5%
Chugoku	29.2%	21.9%	27.4%	25.1%	25.5%	26.4%	26.3%	24.6%	24.8%	25.0%
Shikoku	25.3%	26.1%	31.3%	33.5%	34.1%	34.4%	35.2%	34.2%	34.8%	36.5%
Kyushu	19.1%	15.1%	15.3%	13.5%	11.0%	**3.2%**	**3.7%**	**2.9%**	**3.3%**	**6.9%**
60 Hz areas Total	11.3%	9.4%	11.5%	15.8%	13.1%	13.4%	14.0%	13.5%	13.8%	14.7%
Interconnected	11.5%	10.3%	13.0%	17.4%	17.1%	17.6%	18.1%	18.6%	18.9%	19.7%
Okinawa	32.3%	43.6%	43.9%	45.6%	33.5%	40.7%	40.0%	39.4%	38.6%	38.0%
Nationwide	11.7%	10.6%	13.3%	17.7%	17.2%	17.8%	18.3%	18.8%	19.1%	19.9%

Below 8 % criteria

Table A2-5 Annual Projection of Reserve Margin for Each Regional Service Area

(with power exchanges through cross-regional interconnection lines and generating facilities not included in the electricity supply plans, at the sending end)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hokkaido	37.7%	35.0%	38.9%	44.5%	44.8%	45.1%	45.2%	45.4%	46.3%	46.4%
Tohoku	16.1%	18.4%	26.6%	23.3%	20.1%	20.8%	22.3%	18.6%	19.0%	19.5%
Tokyo	8.9%	8.0%	9.3%	16.1%	16.0%	16.7%	17.3%	18.6%	19.0%	19.5%
Chubu	10.3%	8.7%	9.3%	16.1%	16.0%	16.7%	17.3%	18.6%	19.0%	19.5%
Hokuriku	10.3%	8.7%	13.3%	16.1%	16.0%	16.7%	17.3%	17.3%	17.8%	18.3%
Kansai	10.3%	8.7%	13.3%	16.1%	16.0%	16.7%	17.3%	17.3%	17.8%	18.3%
Chugoku	10.3%	8.7%	13.3%	16.1%	16.0%	16.7%	17.3%	17.3%	17.8%	18.3%
Shikoku	10.3%	8.7%	13.3%	16.1%	16.0%	16.7%	17.3%	17.3%	17.8%	18.3%
Kyushu	15.5%	11.7%	13.3%	16.1%	16.0%	14.7%	15.0%	14.8%	15.2%	18.3%
Interconnected	11.5%	10.3%	13.1%	17.4%	17.1%	17.6%	18.2%	18.6%	19.0%	19.7%
Okinawa	32.3%	43.6%	43.9%	45.6%	33.5%	40.7%	40.0%	39.4%	38.6%	38.0%
Nationwide	11.7%	10.6%	13.4%	17.7%	17.3%	17.8%	18.4%	18.8%	19.2%	19.9%

Improve to over 8%

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

Table A2-6 Annual Peak Demand Forecast for Winter Peak Areas of Hokkaido and Tohoku
(at 18:00 in January, 10^4kW at the sending end)

[10^4 kW]

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hokkaido	497	498	498	498	498	497	497	497	497	496
Tohoku	1,350	1,349	1,347	1,342	1,337	1,332	1,327	1,322	1,317	1,311

Table A2-7 Annual Projection of Supply Capacity for Winter Peak Areas of Hokkaido and Tohoku
(at 18:00 in January, 10^4kW at the sending end)

[10^4 kW]

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hokkaido	578	666	673	656	661	659	660	663	663	714
Tohoku	1,568	1,664	1,685	1,698	1,666	1,716	1,736	1,765	1,795	1,818

Table A2-8 Annual Projection of Reserve Capacity for Winter Peak areas of Hokkaido and Tohoku
(at 18:00 in January, 10^4kW at the sending end)

[10^4 kW]

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hokkaido	81	168	175	158	163	162	163	166	166	218
Tohoku	218	315	338	356	329	384	409	443	478	507

Table A2-9 Annual Projection of Reserve Margin for Winter Peak Areas of Hokkaido and Tohoku
(at 18:00 in January)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Hokkaido	16.3%	33.7%	35.0%	31.7%	32.7%	32.6%	32.8%	33.4%	33.4%	44.0%
Tohoku	16.1%	23.3%	25.1%	26.5%	24.6%	28.9%	30.8%	33.5%	36.3%	38.7%

Table A2-10 Annual Projection of Reserve Margin for Winter Peak Areas of Hokkaido and Tohoku
(at 18:00 in Januar, with power exchanges through cross-regional interconnection lines and generating facilities not included in the electricity supply plans, at the sending end)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hokkaido	16.2%	28.1%	28.2%	28.3%	27.2%	30.3%	31.7%	33.9%	35.9%	40.5%
Tohoku	16.2%	25.4%	28.2%	28.3%	27.2%	30.3%	31.7%	33.9%	35.9%	40.5%

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

Table A2-11 Annual Projection of Supply Demand Balance in Okinawa (10^4kW at the sending end)

[10^4 kW]

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Peak Demand	150	152	154	155	156	157	157	158	159	160
Supply Capacity	206	226	229	234	217	229	229	229	230	230
Reserve Capacity	56	74	75	79	61	72	72	71	71	70
Resreve Margin	37.5%	48.6%	49.0%	50.8%	39.2%	46.2%	45.7%	45.2%	44.6%	44.0%

V. Review of the Adequate Level of Balancing Capacity in Each Regional Service Area

Evaluation of Proper Standard of Soliciting Balancing Capacity for FY 2022

[only in Japanese]

https://www.occto.or.jp/houkokusho/2021/files/20210630_chousei_hitsuyoryo_kentoukekka.pdf

June 2021

Organization for Cross-regional Coordination of Transmission Operators, Japan

VI. Research and Study

"Research on Grid Codes in European Countries and USA" *[only in Japanese]*

Europe: https://www.occto.or.jp/iinkai/gridcode/2021/files/gridcode_06_11.pdf
USA: https://www.occto.or.jp/iinkai/gridcode/2021/files/gridcode_06_12.pdf

Organization for Cross-regional Coordination of
Transmission Operators, Japan (OCCTO)
http://www.occto.or.jp/en/index.html