



# Power

☆RIM POWER INTELLIGENCE DAILY

★No.1523 Nov 1 2019

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--TOKYO, 16:30 JST Nov 1 2019<Assessment Closing Time>

## ©Notice

### ○Renewal of Rim's Website

Rim Intelligence has renewed our website on Oct 7, Monday. Before the renewal, we will transfer the server of our website on Oct 6, Sunday. Although we do not change the URL(<https://eng.rim-intelligence.co.jp/index/top>) of the top page, some URLs for our reports or market news pages will be changed. Therefore, in case you have bookmarked some URLs in our website, please bookmark again after the website is renewed on Oct 7.

Moreover, the URL of Rim Trading Board will be changed, but you can jump to the new page automatically when you access the current page. Please bookmark the new URL.

If you have any questions, please feel free to contact us.

Rim Intelligence Tech Team

813-3552-2411

[info@rim-intelligence.co.jp](mailto:info@rim-intelligence.co.jp)

## ©RECX-22 index

RECX-22 index for Friday was 92.61, down 0.08 points from the previous day

### -----Introduction of Rim reports-----

Please access the URL below for a lineup of Rim reports. You can view sample reports as well as detailed explanations on the contents:

<https://eng.rim-intelligence.co.jp/first/report>

Lineup:

Bunker Oil	Crude/Condensate	Products	
LPG	Petrochemicals	Polyolefins	
LNG	Power	Daily Data	Rim Data File

For inquiries on the above, please contact:

Tel: +81-3-3552-2411

◎POWER MARKET

○Rim Index Day-Ahead Prices

Nov 1 2019	East Japan			DOD	West Japan			DOD
24 Hours	6.69	~	7.69	-0.33	4.94	~	5.94	-0.82
Day Time	6.88	~	7.88	-0.36	4.23	~	5.23	-1.46
Peak Time	6.00	~	6.96	-1.10	3.33	~	4.33	-2.59
Night Time	6.61	~	7.21	-0.31	5.92	~	6.92	+0.06

Yen/kWh

\*Day Time 08:00-22:00, Peak Time 13:00-16:00, Night Time 0:00-08:00 & 22:00-24:00

○Rim Index Forward Prices

Month	24 Hours	DOD	Month	24 Hours	DOD
Dec-19	9.40	-0.04	Aug-20	9.14	-0.03
Jan-20	9.38	-0.02	Sep-20	8.59	-0.04
Feb-20	9.36	-0.03	Oct-20	8.13	-0.03
Mar-20	8.37	-0.03	Nov-20	8.11	-0.02
Apr-20	8.34	-0.05	Dec-20	9.07	-0.01
May-20	8.28	-0.05	Jan-21	9.06	-0.01
Jun-20	8.21	-0.05	Feb-21	9.07	0.00
Jul-20	9.17	-0.04			

Yen/kWh

\*Nationwide prices based on power generation costs reflecting Rim's estimated spot prices of fuel including Coal, LNG, Crude Oil and C-Fuel and JCC. Marginal costs (fuel costs) are calculated by multiplying the ratio of each fuel used at thermal units of nine leading power utilities by the above power generation costs. Marginal costs are adjusted by the alpha factor calculated based on the historical patterns of marginal costs and spot prices.

○Estimated Monthly Prices-24 Hours Average (Nationwide)

Unit: Yen/kWh

	Dec-19	DOD	Jan-20	DOD	Feb-20	DOD	Mar-20	DOD	Apr-20	DOD
A	9.53	+0.03	9.73	+0.02	9.40	+0.02	8.44	+0.02	8.41	+0.04
C	11.19	+0.14	11.47	0.00	11.22	-0.02	9.69	-0.02	9.51	-0.02
D	9.45	0.00	9.78	0.00	9.81	0.00	9.12	0.00	8.15	0.00
E	9.12	0.00	9.21	-0.26	8.87	-0.42	8.17	-0.46	7.84	-0.36
F	9.40	0.00	9.75	0.00	9.79	0.00	8.85	0.00	8.72	0.00
Ave.	9.46	+0.01	9.75	0.00	9.67	+0.01	8.80	-0.07	8.43	+0.00
	May-20	DOD	Jun-20	DOD	Jul-20	DOD	Aug-20	DOD	Sep-20	DOD
A	8.19	+0.03	8.26	+0.02	9.28	+0.01	9.03	+0.01	8.68	+0.02
C	9.82	-0.02	10.06	-0.10	11.69	-0.07	11.32	-0.07	9.03	-0.07
D	8.01	0.00	8.55	0.00	9.85	0.00	9.88	0.00	9.50	0.00
E	7.66	-0.83	8.39	-0.33	8.42	-0.32	8.43	-0.30	8.33	-0.27
F	8.49	0.00	9.06	0.00	10.81	0.00	10.92	0.00	9.46	0.00
Ave.	8.23	-0.15	8.67	-0.11	9.98	0.00	9.94	0.00	9.06	-0.01
	Oct-20	DOD	Nov-20	DOD	Jul-20	DOD	Aug-20	DOD	Sep-20	DOD
A	8.17	+0.01	8.10	+0.01	8.98	+0.01	9.07	+0.01	9.04	+0.01
C	9.45	-0.08	9.38	-0.39	10.72	+0.19	10.85	-0.07	10.82	-0.20
D	8.92	0.00	8.81	0.00	9.66	0.00	9.90	0.00	9.95	0.00
E	8.34	-0.25	8.45	-0.24	8.72	-0.23	8.85	-0.30	8.51	-0.29
F	9.13	0.00	9.30	0.00	9.66	0.00	9.92	0.00	9.97	0.00
Ave.	8.80	-0.08	8.85	-0.08	9.43	0.00	9.63	-0.03	9.65	0.00

\*Prices are estimated by five retail electricity suppliers shown as A, C, D, E and F. Prices are not Rim's assessments. Ave. is the simple average of estimated prices by five suppliers.





OTOCOM Power Futures West Japan DT Load Power Day Time (8:45~15:15) Unit: Yen/kWh								
Month	Pv Close	Open	High	Low	Settle	DOD	Volume	Close
Nov-2019	9.10	-	-	-	-	-0.29	-	8.81
Dec-2019	9.95	-	-	-	-	-0.34	-	9.61
Jan-2020	10.89	-	-	-	-	-0.20	-	10.69
Feb-2020	10.66	-	-	-	-	-0.14	-	10.52
Mar-2020	8.50	-	-	-	-	-0.08	-	8.42
Apr-2020	9.05	-	-	-	-	-0.32	-	8.73
May-2020	9.15	-	-	-	-	-0.34	-	8.81
Jun-2020	9.19	-	-	-	-	-0.19	-	9.00
Jul-2020	12.19	-	-	-	-	-0.30	-	11.89
Aug-2020	11.39	-	-	-	-	-0.11	-	11.28
Sep-2020	9.45	-	-	-	-	-0.05	-	9.40
Oct-2020	9.35	-	-	-	-	-0.43	-	8.92
Nov-2020	9.93	-	-	-	-	-0.36	-	9.57
Dec-2020	10.79	-	-	-	-	-0.42	-	10.37
Jan-2021	11.40	-	-	-	-	-0.12	-	11.28
Total							-	

JEPX Benchmark Prices				
Delivery Date	2019/Nov/1		DOD	WOW
24 Hours Average	Yen/kWh	6.74	+0.07	-1.31
Day Time Average	Yen/kWh	6.70	+0.13	-1.82
Peak Time Average	Yen/kWh	6.63	+0.90	-1.74
Total Traded Volumes	kWh	824,839,900	+46,697,800	+20,682,950
*Data are obtained from the JEPX website. Prices are for reference only and not Rim's assessments. Day Time= 8:00-20:00, Peak Time=13:00-16:00, Average=Simple Average				

## Market Summary

### Summary

#### <Day-ahead delivery Nov 2>

##### East, West Japan tumble on ample solar power

Rim Index for Day-ahead delivery weakened both in East and West Japan. The 24 hours average fell by Yen 0.33 from the previous day to Yen 7.19 in East Japan and by Yen 0.82 to Yen 5.44 in West Japan. The East-West spread was Yen 1.75 in favor of the East, widening Yen 0.49 from Yen 1.26 for Nov 1 delivery.

Spot prices for Nov 2 delivery came under pressure from the looming outlook for slack supply-demand fundamentals. Solar power generation was expected to be sufficient amid slack demand from the industrial sector on Saturday. The day time average price eased by Yen 0.36 to Yen 7.38 in East Japan and by Yen 1.46 to Yen 4.73 in West Japan. The peak time average dropped by Yen 1.10 to Yen 6.48 in East Japan and by Yen 2.59 to Yen 3.83 in West Japan. The night time average edged down by Yen 0.31 to Yen 6.91 in East Japan but gained Yen 0.06 to Yen 6.42 in West Japan. In

West Japan, prices during the night time were sustained by a decline in spare generation capacity as some power utilities were expected to lower their power output besides ongoing planned shutdowns at some thermal units.

Volumes of power offered through sell tenders were 866.83 mil kWh, down 11.6% from the previous day. The sharp day-to-day fall came in line with ongoing shutdowns of thermal units and lower operating rates. Meanwhile, volumes of power bid through buy tenders were 746.40 mil kWh, down 20.0% from the previous day. The decline of bid volumes was steeper than that of offered volumes, with offers outpacing bids in 32 windows at 8:00 pm and later hours. Demand waned fast on prospects for loosening supply-demand fundamentals. Traded volumes also dwindled by a whopping 23.9% on day to 628.10 mil kWh, marking the lowest volume since 636.09

mil kWh on Jun 9 delivery. Especially, traded volumes during day time posted a sharp decrease by nearly 30%, amid growing concerns over slack supply-demand fundamentals during day time.

In Kyushu, output of renewable energy generation would be curbed on Saturday. According to an output restriction report released by Kyushu Electric Power as of 16:00 hours on Friday, it planned to control power output by 1.15 mil kW, equivalent to 19% of connected renewable energy generation. It was the largest power control since the beginning of October. Under such supply-demand situations in Kyushu, price divergence from other regions was witnessed only in one window during night time. In day time, low power prices in Kyushu spilled over the whole West Japan. From 8:00 hours, transactions chronologically materialized at Yen 5.16, 4.53 and 4.18, followed by a dive to Yen 2.31 at 9:30 hours.

The market further plunged to Yen 0.10 at 10:00 hours, and stuck to the bottom price of Yen 0.01 during 10:30-13:30 hours. After that, the market gradually rebounded to above Yen 3 and then above Yen 4, finally recovering to above Yen 7 at 16:00 hours on the back of lower solar power output later in the day. "West Japan will face further loosening supply-demand fundamentals, leaving power prices at Yen 0.01 in more windows as clear weather was forecast across the region," a trader at a power producer and supplier (PPS) said. A fundamental analyst at another PPS said, "Solar power gave such a negative impact on prices as Kyushu EPC planned to curb renewable energy generation by more than 1.00 mil kW on Nov 2," adding the "Saturday" factor further accelerated a slackening of already slack supply-demand fundamentals. From next week onwards as well, the fluctuation of solar power output would be a major key to determine the price trend.

## Forward prices (Fuel Price Trends)

### Forward prices tumble on softer JCC forecast, LNG

Rim Index for forward prices softened on Friday. The decline came in line with a downturn in Rim's JCC (Japan Crude Cocktail) forecast coupled with softer LNG prices on a DES Northeast Asia basis. Thermal coal prices on an FOB Newcastle Australia basis and C-Fuel oil prices in Asia were mixed from month to month.

The estimated monthly average of Dubai paper swaps, a criterion used to forecast the JCC, eased \$0.57-1.04 from the previous day, with forward contracts suffering steeper losses. Dubai paper swaps stood in the high \$57 level for December 2019, high \$56 level for January 2020 and high \$51 level for February 2021. In the international crude oil market as of the evening on Nov 1, the NYMEX WTI contract for December 2019 traded at \$54.16 while the ICE Brent contract hovered at \$59.45. The DES Northeast Asia market for LNG lost ground amid looming oversupply sentiment as spot cargoes were well offered from several projects. Prices for December 2019 arrival softened to the high \$5 level per mmBtu, falling below the \$6 mark. In the coal market, FOB New Castle prices on the ICE futures were mixed on Oct 31. The prompt seven contracts dropped by \$0.20-0.45 from Oct 30 while the February contract jumped more than \$1.

Contracts for other months were almost stable. The December 2019 contract ended at \$67.10, down \$0.40 from Oct 30 while the January 2020 contract settled down \$0.30 at \$68.30. The February 2021 contract was up \$1.30 at \$74.80.

Crude prices (JCC + petroleum and coal tax) dropped to Yen 47,480 for the front-month of December 2019, down Yen 330 from the previous day. Compared to the front month, prices for June 2020 were Yen 3,080 lower and prices for February 2021 were Yen 5,060 lower. For C-Fuel (import price + import tax + petroleum and coal tax), prices for November 2018 gained Yen 340 to Yen 50,000. Compared to the front month, prices for June 2020 were Yen 1,100 lower while prices for February 2021 were Yen 220 higher. For LNG (mixture of JCC and DES Northeast Asia spot price + petroleum and coal tax), prices for December 2019 retreated Yen 340 to Yen 51,820. Compared to the front month, prices for June 2020 were Yen 1,350 lower and prices for February 2020 were Yen 3,180 lower. For coal (FOB Newcastle price + freight cost + petroleum and coal tax), prices for December 2019 shed Yen 50 to Yen 9,840. Compared to the front month, prices for June 2020 were Yen 490 higher and prices for February 2020 were Yen 850 higher.

**OTOCOM Power Futures Summary**
**Closing prices up in East, down in West**

On the Tokyo Commodity Exchange (TOCOM) on Friday, no deals were reported during day time (8:45-15:15 hours). The closing prices generally rose in two regions in East Japan, but fell in two regions in West Japan, pushing the East-West price differential wider. The December contract of day time load power edged up by Yen 0.24 to Yen 11.64 in East Japan but softened by 0.34 to Yen 9.61 in West Japan. The East-West price gap grew to Yen 2.03. Meanwhile, some power producers and suppliers showed readiness to participate in trading after the long weekend.

As of 15:00 hours on Friday, the lowest sell indications and highest buy indications for each contract month were shown below. The narrowest gap between sell and buy ideas was Yen 0.40 in two contracts. The December 2019 contract for base load power in West Japan attracted offers at Yen 8.78, countered by bids at Yen 8.38. The December 2019 contract for day time load power in East Japan was asked at Yen 11.80 and bid at Yen 11.40.

Month	Base East		Base West		DT East		DT West	
	Offer	Bid	Offer	Bid	Offer	Bid	Offer	Bid
2019/11	-	8.00	-	6.24	10.65	10.50	-	-
2019/12	10.00	9.92	8.88	8.38	12.13	10.94	9.95	9.10
2020/1	10.89	10.03	10.09	8.78	12.03	11.00	10.95	9.75
2020/2	11.44	10.03	10.03	8.52	12.00	11.30	10.95	9.65
2020/3	9.70	8.78	8.79	7.88	11.50	10.67	8.96	8.00
2020/4	11.30	-	-	-	11.30	-	-	-
2020/5	11.15	-	-	-	10.80	-	-	-
2020/6	11.25	-	-	-	10.80	-	-	-
2020/7	13.50	-	-	-	14.50	-	-	-
2020/8	13.20	-	-	-	14.50	-	-	-
2020/9	12.00	-	-	-	14.00	-	-	-
2020/10	11.00	-	-	-	11.00	-	-	-
2020/11	11.00	-	-	-	11.00	-	-	-
2020/12	12.00	-	-	-	14.00	-	-	-
2021/1	-	-	-	-	14.25	-	-	-

Unit: Yen/kWh

## ©JEPX Day-Ahead Spot Price Charts

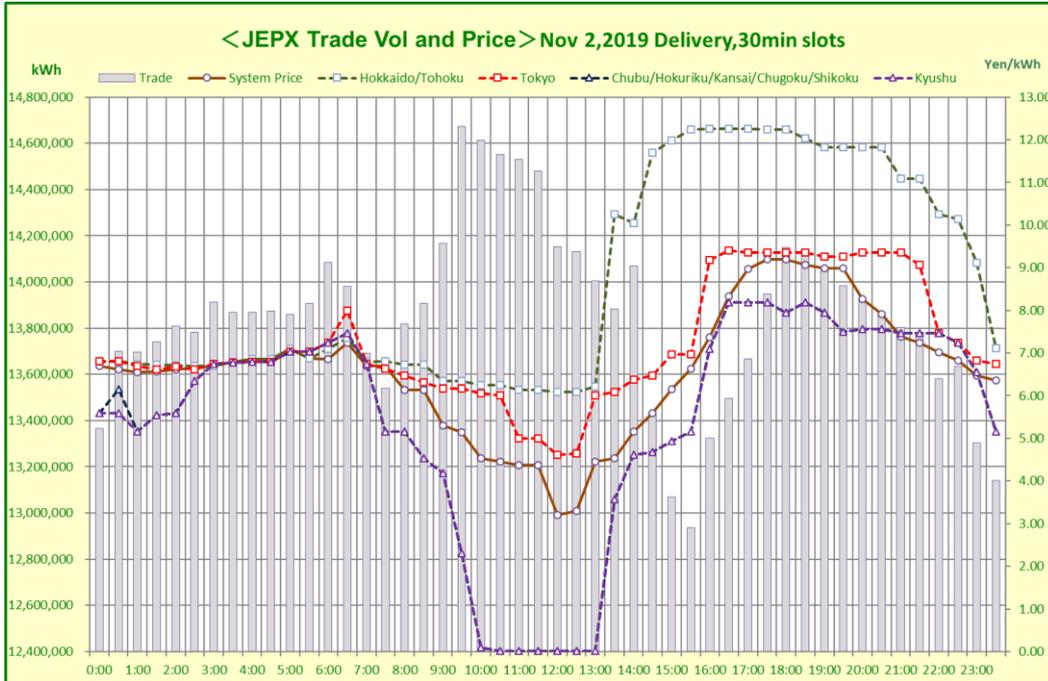
## ○Traded Volumes and Prices (Nov 2 delivery)

Price divergence for 30 minutes (1 window) between Tohoku and Tokyo (Soma-Futaba Main Line)

Price divergence for 19 hours (38 windows) between Tokyo and Chubu (Frequency Converter)

Price divergence for 30 minutes (1 window) between Chugoku and Kyushu (Kanmon Interconnection Line)

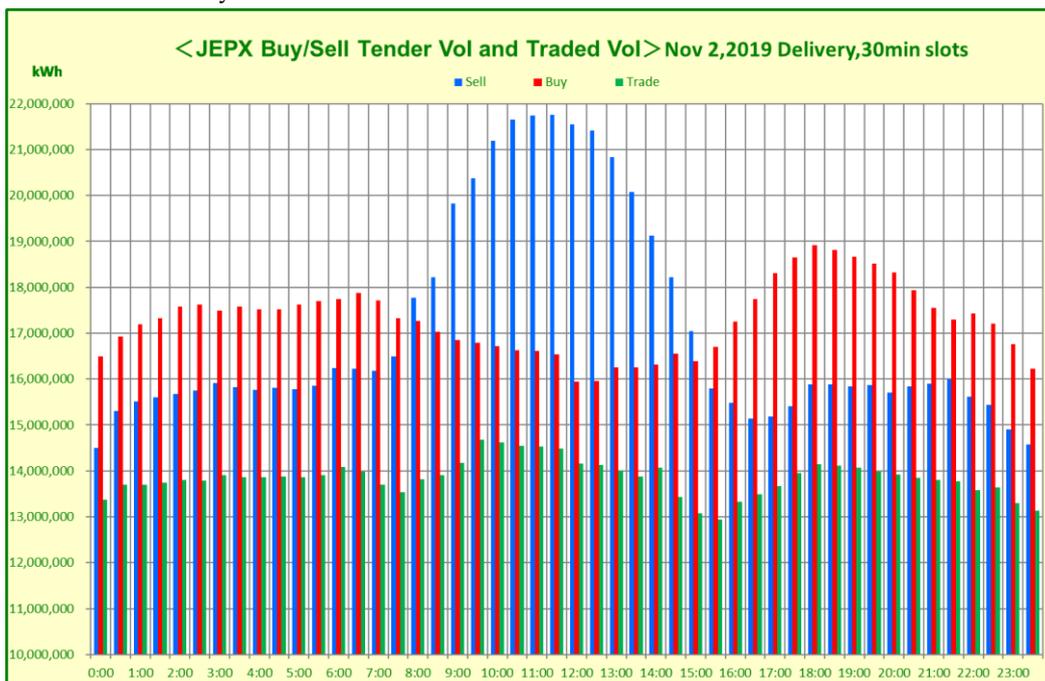
Traded volumes: 628.10 mil kWh, Actual highest price: Yen 9.40 (East Japan), Actual lowest price: Yen 0.01 (West Japan)



## ○Sell/Buy Tenders and Traded Prices (Nov 2 delivery)

Total offered volumes via sell tenders: 866.83 mil kWh

Total bid volumes via buy tenders: 746.40 mil kWh



**©Weekly Temperature Forecast at Main Cities**
**○Nov 2-8 Forecast by Meteorological Agency as of Nov 1 11:00**
**<Temperatures>**

The highest temperature will be above the average year at the beginning and end of the week across Japan. The highest temperature will be similar to or below the average year in the middle of the week. The lowest temperature will be similar to or above the average year across Japan.

**<Weather>**

High atmospheric pressure will cover Japan and bring sunny days in some days of the week. But the weather will be mostly cloudy due to pressure trough, cold air and humid air. In North Japan, some regions may experience rainfalls at the beginning and end of the week. In East and West Japan as well, rainfalls will be witnessed in some regions at the beginning of the week.

City	6-Nov minimum temperature	6-Nov highest temperature	Weather
Sapporo	4.0	7.0	☁
Sendai	9.0	18.0	☁→☀
Niigata	10.0	17.0	☀   ☂
Tokyo	9.0	21.0	☀
Nagoya	8.0	22.0	☀
Toyama	8.0	16.0	☁/☀
Osaka	9.0	20.0	☀
Hiroshima	9.0	21.0	☀
Takamatsu	9.0	20.0	☀
Fukuoka	10.0	21.0	☀
City	7-Nov minimum temperature	7-Nov highest temperature	Weather
Sapporo	2.0	6.0	☁/☂
Sendai	7.0	19.0	☀→☁
Niigata	9.0	19.0	☁→☂
Tokyo	10.0	22.0	☀→☁
Nagoya	9.0	21.0	☁/☀
Toyama	9.0	20.0	☁
Osaka	9.0	21.0	☀/☁
Hiroshima	9.0	21.0	☀→☁
Takamatsu	10.0	21.0	☀→☁
Fukuoka	12.0	20.0	☁/☀
City	8-Nov minimum temperature	8-Nov highest temperature	Weather
Sapporo	1.0	6.0	☁   ☂
Sendai	8.0	16.0	☁/☀
Niigata	10.0	14.0	☁
Tokyo	11.0	18.0	☁
Nagoya	12.0	20.0	☁/☀
Toyama	10.0	16.0	☁
Osaka	13.0	20.0	☁/☀
Hiroshima	12.0	20.0	☁/☀
Takamatsu	13.0	19.0	☁/☀
Fukuoka	13.0	19.0	☁/☀
City	9-Nov minimum temperature	9-Nov highest temperature	Weather
Sapporo	2.0	6.0	☁   ☂
Sendai	6.0	14.0	☀/☁
Niigata	9.0	14.0	☁   ☂
Tokyo	10.0	17.0	☀/☁
Nagoya	10.0	19.0	☀/☁
Toyama	8.0	14.0	☁   ☂
Osaka	11.0	18.0	☀/☁
Hiroshima	11.0	19.0	☀/☁
Takamatsu	11.0	18.0	☀/☁
Fukuoka	12.0	18.0	☁/☀

City	10-Nov minimum temperature	10-Nov highest temperature	Weather
Sapporo	2.0	8.0	☁
Sendai	5.0	14.0	☀/☁
Niigata	9.0	15.0	☁
Tokyo	9.0	17.0	☀/☁
Nagoya	9.0	18.0	☀/☁
Toyama	7.0	15.0	☁/☀
Osaka	10.0	18.0	☀/☁
Hiroshima	9.0	19.0	☀/☁
Takamatsu	10.0	18.0	☀/☁
Fukuoka	11.0	20.0	☀/☁
City	11-Nov minimum temperature	11-Nov highest temperature	Weather
Sapporo	3.0	11.0	☁   ☂
Sendai	8.0	16.0	☁
Niigata	9.0	18.0	☁   ☂
Tokyo	11.0	18.0	☁
Nagoya	12.0	18.0	☁
Toyama	9.0	17.0	☁   ☂
Osaka	12.0	19.0	☁
Hiroshima	14.0	19.0	☁
Takamatsu	13.0	19.0	☁
Fukuoka	14.0	19.0	☁
City	12-Nov minimum temperature	12-Nov highest temperature	Weather
Sapporo	5.0	13.0	☁   ☂
Sendai	9.0	18.0	☁
Niigata	11.0	17.0	☁
Tokyo	11.0	21.0	☁/☀
Nagoya	12.0	19.0	☁/☀
Toyama	12.0	18.0	☁
Osaka	13.0	19.0	☁/☀
Hiroshima	13.0	20.0	☁/☀
Takamatsu	13.0	20.0	☁/☀
Fukuoka	12.0	20.0	☀/☁

**©Latest Status of Thermal Power Stations**
**○Operation Updates as of Nov 1**

Nine power utilities in Japan are expected to suspend thermal units with a combined capacity of 54.12 mil kW as of Nov 2, Saturday. Nearly 10.17 mil kW will be off line for planned maintenance while unplanned shutdowns account for a loss of the remaining 43.96 mil kW. In the corresponding point a year before, a combined 50.97 mil kW was idled as of Nov 3 2018, Saturday, including nearly 19.41 mil kW for planned maintenance and nearly 31.56 mil kW for unplanned suspensions.

Company	Power Plant	Fuel	Unit	Output (kW)	Outage	Period	Restart	Reason	Update
JERA (Tokyo)	Futtsu	Gas	No.4-1 gas turbine	507,000	Planned	2019/10/31 3:00	2019/11/1		2019/11/1 10:00
Kansai Electric	Sakaiko	Gas	No.3	400,000	Planned	2019/11/2 8:00 (11/2 23:00)	2019/11/3		2019/11/1 14:50 (10/8 13:37)
Chugoku Electric	Shimooseki	Oil	No.2	400,000	Planned	2019/11/2 8:00	2019/11/2		2019/11/1 13:32
	Shimooseki	Oil	No.2	400,000	Planned	2019/11/3 8:00	2019/11/3		2019/11/1 13:32

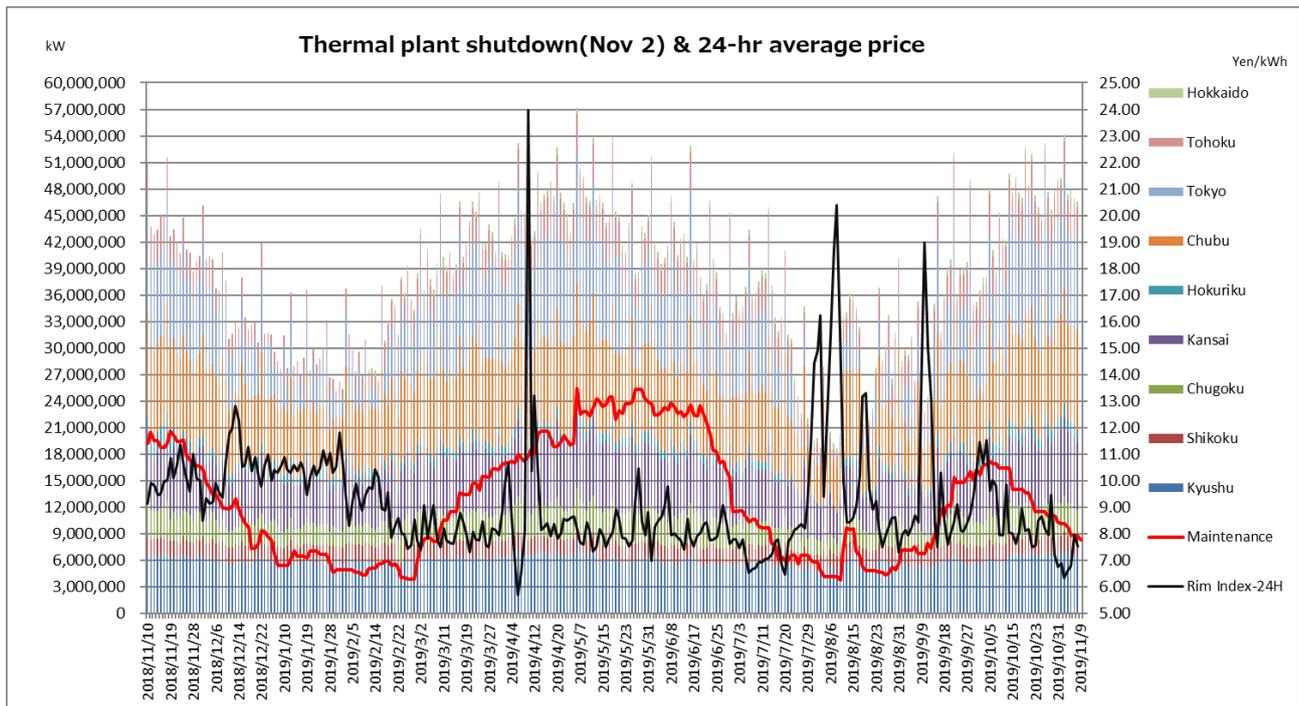
**Facilities of major Power companies**

Kimitsu kyodo	Kimitsu Kyodo (Tokyo)	Gas	No.4	350,000	Unplanned	2019/10/30 17:47	2019/11/1		2019/11/1 9:02
	Kimitsu Kyodo (Tokyo)	Gas	No.5	300,000	Planned	2019/11/1 5:56	2019/11/2		2019/11/1 9:04

**Other companies**

Sendai Power Station	Sendai Power Station (Tohoku)	Coal	No.1	112,000	Planned	2019/11/4 12:00	2019/11/6		2019/11/1 15:26
Kawasaki Natural Gas Power	Kawasaki Natural Gas Power(Tokyo)	Gas	No.1	413,000	Planned	2020/4/29 2:00	2020/6/2		2019/11/1 15:39

2,882,000





## ◎Spark/Dark Spreads and Fuel Cost Netback

## ○Spark/Dark Spreads

Rim Index (yen/kWh Nov.2)			
	DT	Peak	Night
<b>6.32</b>	<b>6.06</b>	<b>5.16</b>	<b>6.67</b>

Fuel	Thermal Efficiency(%)	Fuel Price yen /ton · kl	After Tax yen/ton · kl	Generation Cost yen/kWh	Spread (yen/kWh)			
					24 hr	DT	Peak	Night
L N G	<b>44.10</b>	32,746	34,606	<b>5.17</b>	+1.15	+0.89	-0.01	+1.50
	50.00			4.56	+1.76	+1.50	+0.60	+2.11
	59.00			3.87	+2.45	+2.19	+1.29	+2.80
Coal	<b>40.50</b>	8,515	9,885	<b>3.42</b>	+2.90	+2.64	+1.74	+3.25
	45.00			3.08	+3.24	+2.98	+2.08	+3.59
Imported CFO	<b>38.40</b>	48,927	48,927	<b>11.13</b>	-4.81	-5.07	-5.97	-4.46
Domestic CFO								
0.3% sulfur	<b>38.40</b>	56,000	56,000	<b>12.74</b>	-6.42	-6.68	-7.58	-6.07
3.0% sulfur	<b>38.40</b>	46,000	46,000	<b>10.47</b>	-4.15	-4.41	-5.31	-3.80
Crude	<b>38.40</b>	44,470	47,270	<b>11.25</b>	-4.93	-5.19	-6.09	-4.58

\*1 Rim Index is the average of East Japan prices and West Japan prices.

\*2 Thermal efficiency shown in BOLD is the average thermal efficiency for general electric utilities in the fiscal year 2013.

\*3 In the section of Fuel Price, LNG is a yen-based conversion from DES North East prices for first-half December delivery published in Rim LNG Report. Coal is a yen-based conversion from a sum of FOB Newcastle prices for November loading and freight rates. Imported CFO is a yen-based conversion from CFR Japan FO 0.3%S prices published in Rim Japan Products Report. Domestic CFO is the average of East Japan prices and West Japan prices for October delivery published in Rim Japan Products Report. Crude Oil is a yen-based conversion from the CIF import price for October delivery estimated by Rim. The exchange rate applied for the yen-based conversion is the TTS (Telegraphic Transfer Selling) Rate published by the MUFJ Bank.

\*4 Generation Cost is calculated based on power calorie, fuel calorie, thermal efficiency and fuel prices, and it is so-called marginal cost excluding facility utilization rates.

\*5 Spread is calculated by deducting Generation Cost from Rim Index.

\*6 The latest Petroleum and Coal Tax (Global Warming Tax) is applied. From Apr 1, 2016, the tax was increased by Yen 760/kl to Yen 2,800/kl for Crude/Refined Products. The tax for Gaseous Hydrocarbon was revised upward by Yen 780/ton to Yen 1,860/ton, while the tax for Coal was up Yen 670/ton at Yen 1,370/ton.



**Fuel Cost Netback**

Rim Index (Yen/kWh)※1	Delivery	24h	Day time	Peak time	Night time	Yen/\$ (Nov.1)※
	Nov.2	6.32	6.06	5.16	6.67	109.94

	RIM Index (Yen/kWh)		Thermal Efficiency※3	Fuel Cost Netback (DES, CIF)				Fuel Prices※4		Margin
				\$/mt	\$/mmBtu	\$/bbl	Yen/kl	Nov.1	Unit	
LNG	24h	6.32	<b>44.10%</b>	367.58	7.11			5.75	\$/mmBtu	1.36
			50.00%	419.02	8.10				\$/mmBtu	2.35
			59.00%	497.48	9.62				\$/mmBtu	3.87
	Day time	6.06	<b>44.10%</b>	351.76	6.80				\$/mmBtu	1.05
			50.00%	401.08	7.76				\$/mmBtu	2.01
			59.00%	476.32	9.21				\$/mmBtu	3.46
	Peak time	5.16	<b>44.10%</b>	297.00	5.74				\$/mmBtu	-0.01
			50.00%	339.00	6.56				\$/mmBtu	0.81
			59.00%	403.07	7.79				\$/mmBtu	2.04
	Night time	6.67	<b>44.10%</b>	388.87	7.52				\$/mmBtu	1.77
			50.00%	443.16	8.57				\$/mmBtu	2.82
			59.00%	525.97	10.17				\$/mmBtu	4.42
Coal	24h	6.32	<b>40.50%</b>	153.74	6.32			\$/mt	76.29	
			45.00%	172.21	7.08			\$/mt	94.76	
	Day time	6.06	<b>40.50%</b>	146.91	6.04			\$/mt	69.46	
			45.00%	164.61	6.76			\$/mt	87.16	
	Peak time	5.16	<b>40.50%</b>	123.24	5.06			\$/mt	45.79	
			45.00%	138.32	5.68			\$/mt	60.87	
	Night time	6.67	<b>40.50%</b>	162.95	6.69			\$/mt	85.50	
			45.00%	182.44	7.50			\$/mt	104.99	
	Imported CFO	24h	6.32	<b>38.40%</b>	231.85	5.76			\$/mt	-196.15
		Day time	6.06	<b>38.40%</b>	221.14	5.50			\$/mt	-206.86
		Peak time	5.16	<b>38.40%</b>	184.05	4.58			\$/mt	-243.95
		Night time	6.67	<b>38.40%</b>	246.28	6.12			\$/mt	-181.72
Crude	24h	6.32	<b>38.40%</b>	222.81	5.79	34.37		\$/bbl	-31.45	
	Day time	6.06	<b>38.40%</b>	212.56	5.53	32.79		\$/bbl	-33.03	
	Peak time	5.16	<b>38.40%</b>	177.10	4.60	27.31		\$/bbl	-38.51	
	Night time	6.67	<b>38.40%</b>	236.60	6.15	36.49		\$/bbl	-29.33	
Domestic CFO 0.3% sulfur	24h	6.32	<b>38.40%</b>				27,774	Yen/kl	-28,226	
	Day time	6.06	<b>38.40%</b>				26,632	Yen/kl	-29,368	
	Peak time	5.16	<b>38.40%</b>				22,676	Yen/kl	-33,324	
	Night time	6.67	<b>38.40%</b>				29,312	Yen/kl	-26,688	
Domestic CFO 3.0% sulfur	24h	6.32	<b>38.40%</b>				27,774	Yen/kl	-18,226	
	Day time	6.06	<b>38.40%</b>				26,632	Yen/kl	-19,368	
	Peak time	5.16	<b>38.40%</b>				22,676	Yen/kl	-23,324	
	Night time	6.67	<b>38.40%</b>				29,312	Yen/kl	-16,688	

\*1 Rim Index is the average of East Japan prices and West Japan prices.

\*2 The exchange rate applied for the yen-based conversion is the TTS (Telegraphic Transfer Selling) Rate published by the MUFJ Bank.

\*3 Thermal efficiency shown in BOLD is the average thermal efficiency for general electric utilities in the fiscal year 2013.

\*4 In the section of Actual Fuel Cost, LNG is a yen-based conversion from DES North East prices for first-half December delivery published in Rim LNG Report. Coal is a yen-based conversion from a sum of FOB Newcastle prices for November loading and freight rates. Imported CFO is a yen-based conversion from CFR Japan FO 0.3%S prices published in Rim Japan Products Report. Crude Oil is a yen-based conversion from the CIF import price for October delivery estimated by Rim. Domestic CFO is the average of East Japan prices and West Japan prices for October delivery published in Rim Japan Products Report.

\*5 The latest Petroleum and Coal Tax (Global Warming Tax) is applied. From Apr 1, 2016, the tax was increased by Yen 760/kl to Yen 2,800/kl for Crude/Refined Products. The tax for Gaseous Hydrocarbon was revised upward by Yen 780/ton to Yen 1,860/ton, while the tax for Coal was up Yen 670/ton at Yen 1,370/ton.