

# Market Surveillance & Compliance Panel Market Watch

Issue 61
Third Quarter (July to September 2021)



## **Executive Summary**

The energy prices in the National Electricity Market of Singapore ("NEMS") have been increasing continuously with the gradual recovery from the Covid-19 pandemic. This quarter marked the fifth consecutive quarter seeing increased prices since Q2 2020 when all the restrictions and measures started, resulting in a low level of the energy prices last seen in 2016.

This quarter's prices registered the highest levels in the past five years, with an increment of more than 50% compared to Q2 2021. The Energy Market Authority ("EMA") issued an investigation update<sup>1</sup> for the high prices in July 2021 and explained that the root cause was due to an unplanned curtailment of piped natural gas supply from Indonesia.

Chart 1. USEP and WEP by Quarter

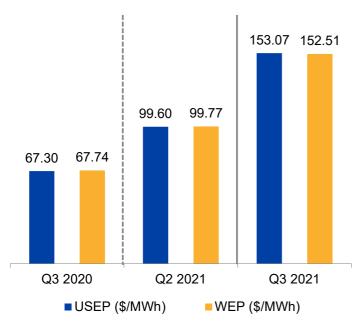


Table 1. Quarterly Outage Volume and Ancillary Service Prices

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Quarter	Q3 2020	Q2 2021	Q3 2021				
Total Outage Volume (MWh Cumulative)							
Planned Outage	1,279,755	2,275,914	2,086,571				
Forced Outage	654,337	208,587	180,742				
Ancillary Services (\$/MWh)							
Primary Reserve	1.81	0.47	1.42				
Contingency 8.00		8.53	15.47				
Regulation	8.93	8.10	16.59				

The Uniform Singapore Energy Price ("USEP") and the Wholesale Electricity Price ("WEP") increased 53.69% to \$153.07/MWh and 52.87% to \$152.51/MWh respectively for a Q-o-Q comparison, which more than doubled if compared with Q3 2020 (Chart 1). Other than July, the high prices were also observed on some days during August and September. It was attributed to an increase in fuel oil price, more expensive energy offers, and a higher capacity ratio of open cycle gas turbine ("OCGT") units.

The rise in energy prices during Q3 2021 could be brought about by a combination of the following movements when compared to Q2 2021:

- a 10.90% increment in the fuel oil price<sup>2</sup> to US\$428.54/MT;
- a 3.78 percentage points decrease in offers made at or below \$100/MWh to 76.62%; and
- a 0.29 percentage point rise in the capacity ratio of OCGT units to 0.31%.

The prices of ancillary services increased across the board. The primary reserve price went up by two folds from \$0.47/MWh in Q2 2021 to \$1.42/MWh in Q3 2021 (Table 1). This was a result of the primary reserve price in September 2021 at \$2.68/MWh, the highest since August 2020, mainly caused by an increase in primary reserve requirement.

<sup>&</sup>lt;sup>1</sup> https://www.ema.gov.sg/Electricity-Regulatory-Updates.aspx

<sup>&</sup>lt;sup>2</sup> Daily average of IFO180 settlement price published by SGX Exchange Limited ("SGX") – <u>SGX Platts Singapore Fuel Oil 180cst Index Futures</u>.



The contingency reserve price this quarter was 81.25% higher than that of Q2 2021. The monthly contingency reserve prices were all at the high side in July, August, and September. It is relevant to note that the periods of high contingency reserve price coincided with the periods of high USEP in the three months when ancillary services, such as contingency reserve and regulation, are usually used to supplement the supply to meet tight supply conditions.

The high contingency reserve prices of these periods pushed up the average quarterly contingency reserve price. Noteworthy, the contingency reserve price in July cleared at \$19.47/MWh, the highest monthly average price observed since November 2019.

The regulation price doubled in Q3 2021 compared to the previous quarter, due to the similar reason explained for contingency reserve and the contracted regulation offers.



## Prices in Q3 2021

**Chart 2. Vesting Contract Price Versus WEP by Quarter** 



The vesting contract price in Q3 2021 increased 5.37% to \$159.95/MWh, from \$151.80/MWh in Q2 2021, the highest recorded since Q4 2019 at \$154.53/MWh (Chart 2). This represents a 44.49% increment when compared to Q3 2020, indicating that the components of the vesting contract price were returning to the pre-pandemic<sup>3</sup> levels with the reopening of the economic activities and the relaxation of the safe management measures.

The WEP was moving upward cross the quarters and was noticeably volatile in Q3 2021. The WEP in July cleared at \$166.52/MWh, exceeding the Q3 2021 vesting contract price by 4.11%. However, the quarterly average WEP of \$152.51/MWh remained below the vesting contract price.

**Chart 3. Distribution of WEP Over Time** 

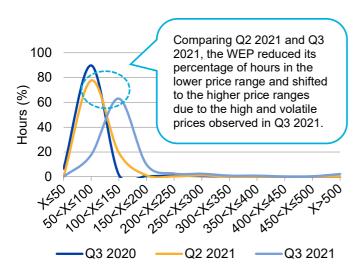
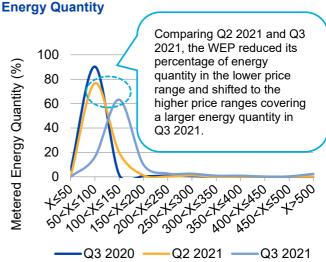


Chart 4. Distribution of WEP Over Total Metered



Charts 3 and 4 show the frequency of the WEP in various price ranges, measured as a percentage of the total number of hours and a percentage of the total metered energy quantity for Q3 2021, compared to the previous quarter and the previous year respectively.

The distribution of the WEP over time moved to higher price ranges in Q3 2021 than in Q3 2020 and Q2 2021 (Chart 3). The WEP concentrated in the price band of \$100/MWh - \$150/MWh for 63.02% of the entire quarter in Q3 2021, while there was only 1.59% of the time in Q3 2020 when Singapore was severely affected by the Covid-19 pandemic and 19.37% of the time in Q2 2021 when the safe management measures were gradually eased.

<sup>&</sup>lt;sup>3</sup> Pre-pandemic in this report refers to the period up to Q1 2020. Q2 2020 would be considered the Covid-19 pandemic period.



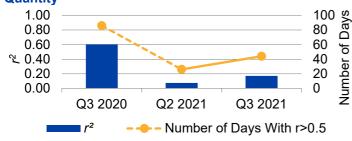
The peak of the distribution this quarter became lower because the frequency difference was redistributed across the various price ranges above \$150/MWh. The WEP in Q3 2021 was greater than \$150/MWh for 19.32% of the time opposed to 2.15% in Q3 2020 and 2.93% in Q2 2021. Noteworthy that out of the 19.32%, 2.17% of the time the WEP was higher than \$500/MWh in Q3 2021 opposed to 0.11% in Q3 2020 and 0.18% in Q2 2021.

The distribution of the WEP in terms of total metered energy quantity in the market was similar to that based on total number of hours for the three quarters in comparison (Chart 4). In Q3 2021, the peak of the distribution slipped to 63.27% of the metered energy quantity but with a higher WEP in the price band of \$100/MWh - \$150/MWh. It was merely 1.74% and 20.03% of that observed in Q3 2020 and Q2 2021 respectively.

Similarly, the WEP was in the higher price ranges above \$150/MWh for 20.43% of the metered energy quantity in Q3 2021, versus 2.44% in Q3 2020 and 3.29% in Q2 2021, as a result of the redistribution of the frequency difference. In particular, 2.43% out of 20.43% of the time was with the WEP clearing above \$500/MWh in Q3 2021 against 0.13% in Q3 2020 and 0.21% in Q2 2021.

The rightward shift of the distribution curves from Q2 2021 to Q3 2021 shown in Charts 3 and 4 reflected the high and volatile WEPs observed during the quarter, attributed to the unplanned curtailment of piped natural gas supply in July, the increased fuel oil price, energy offers moving into more higher price bands, and a higher capacity ratio of OCGT units observed in August and September.

**Chart 5. Correlation Between WEP and Metered Energy Quantity** 



**Chart 6. WEP Versus Fuel Oil Price** 



Chart 5 shows the proportion of variance in the WEP which could be explained by changes in the metered energy quantity measured by  $r^2$ . It was observed that the correlation between the metered energy quantity and the WEP improved with a higher  $r^2$  at 0.17 in Q3 2021 compared to 0.07 in Q2 2021, although this was still at the lower side historically.

Meanwhile, there were 18 more days in Q3 2021 where *r* was greater than 0.5 compared with Q2 2021. This implied that the metered energy quantity and the WEP had a strong positive correlation over a longer period of time in Q3 2021 (44 out of 92 days), versus Q2 2021 (26 out of 91 days).

However, comparing Q3 2021 to Q3 2020, the observations from Chart 5 suggested that the metered energy quantity was not the key contributor to the WEP movements in Q3 2021. The *r* value of 0.41 in Q3 2021 showed that changes in the metered energy quantity could only account for 41.34% of the changes in the WEP during the quarter.

The fuel oil prices were rising across the quarters (Chart 6), recording 10.90% higher levels in Q3 2021 at US\$428.54/MT against US\$386.42/MT in Q2 2021, and an increase of 67.82% from US\$255.36/MT in Q3 2020. The WEP moved in tandem with the increase in the fuel oil price as it is an important cost component of electricity generation. Together with the high and volatile prices observed this quarter, the WEP increased 52.87% from \$99.77/MWh in Q2 2021 to \$152.51/MWh, which more than doubled the WEP of \$67.74/MWh seen in Q3 2020.

The fuel oil prices have been on the upward trend consecutively for five quarters, indicating the resurgent global economy as some countries implemented more flexible lockdown measures with the rise in vaccination rates and the reduction in the Covid-19 infection cases.



Table 2. Variation Between Real-Time Dispatch Price and Forecast Price

Month/Quarter	Variation Between RTS and STS (\$/MWh)	Maximum Periodic Variation (\$/MWh)
July 2020	-0.18	-81.31
August 2020	1.30	432.35
September 2020	-1.06	-582.82
April 2021	1.36	386.27
May 2021	0.15	527.18
June 2021	0.47	-139.39
July 2021	10.39	837.32
August 2021	-9.84	-823.74
September 2021	7.77	2,692.17
Q3 2020	0.85	582.82
Q2 2021	0.66	527.18
Q3 2021	9.33	2,692.17

Table 2 shows the monthly and quarterly average variation in the USEP produced in the real-time dispatch schedule ("RTS") and the short-term schedule ("STS"), together with the largest variation observed in a single dispatch period during each month and quarter. A positive variation means the RTS produced a higher USEP than the STS, while a negative variation means the RTS produced a lower USEP than the STS.

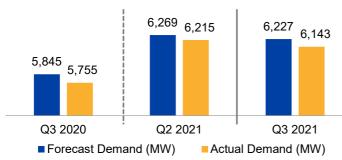
The average variation between the forecast USEP in the STS and the real-time USEP increased to \$9.33/MWh in Q3 2021. The difference is \$8.67/MWh higher than the price variation observed in Q2 2021 at \$0.66/MWh and \$8.48/MWh higher than that in Q3 2020. The greater average price variation in Q3 2021 was because of the volatile prices observed and implied a less accurate price forecast in Q3 2021.

There were 123 periods of real-time USEP spikes (>= \$400/MWh) in Q3 2021 (17 periods in Q2 2021 and 8 periods in Q3 2020) and the largest price variation was as high as \$2,692.17/MWh in Q3 2021, versus \$527.18/MWh in Q2 2021 and \$582.82/MWh in Q3 2020.

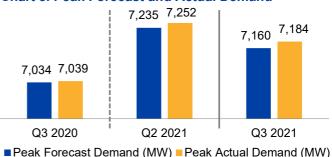


# **Demand and Supply in Q3 2021**

**Chart 7. Average Forecast and Actual Demand** 



**Chart 8. Peak Forecast and Actual Demand** 



The average forecast demand decreased 0.67% from 6,269MW in Q2 2021 to 6,227MW in Q3 2021 (Chart 7). However, the comparison against the same quarter the previous year shows an increment of 6.53% from the 5,845MW mark seen in Q3 2020. The drop observed in the Q-o-Q comparison after a continuous forecast demand growth recorded since Q3 2020, is in response to the tightened safe management measures in the last guarter due to the rise in Covid-19 infection cases. Nonetheless, the average forecast demand in Q3 2021 was still above the pre-pandemic level of 6.010MW in Q1 2020, a signal of Singapore's re-opening impact to the NEMS in the past year.

Both the peak forecast and actual demand decreased observed in Q3 2021 at 1.04% and 0.94% respectively when compared to Q2 2021, reflect the cooler weather in Q3 2021 - the average temperature in Singapore slipped to 28.19°C from 28.71°C in Q2 2021 as the demand for electricity usually correlates to the temperature positively.

Table 3. Quarterly Average Supply and Supply Cushion Chart 9. Offers At or Below \$100/MWh

Quarter	Q3 2020	Q2 2021	Q3 2021
Average Supply (MW)	7,755	8,028	7,983
Supply Cushion (%)	24.61	21.90	21.99



The quarterly average supply in Q3 2021 decreased 0.56% to 7,983MW from 8,028MW in Q2 2021 (Table 3), in line with the lower forecast demand that the generators used as a reference to adjust their energy offers accordingly. In contrast, the supply cushion inched up 0.09 percentage points from 21.90% in Q2 2021 to 21.99% in Q3 2021 as the decrease in forecast demand was greater than that in supply. This was also in response to the lower planned and forced outages recorded in Q3 2021 when compared to Q2 2021 (refer to Table 1).

The energy supply in Q3 2021 was more expensive with the proportion of energy offers priced at or below \$100/MWh shrunk by 3.78 percentage points compared to Q2 2021 and 6.64 percentage points compared to Q3 2020 (Chart 9). This implied that an expanded proportion of energy offer quantities shifted into more pricy price bands, in response to the higher fuel price as another contributing factor to the surged quarterly WEP on top of the earlier mentioned unplanned gas curtailment.



Chart 10. Monthly Average Variation Between Real-Time Dispatch Schedule and Forecast Load

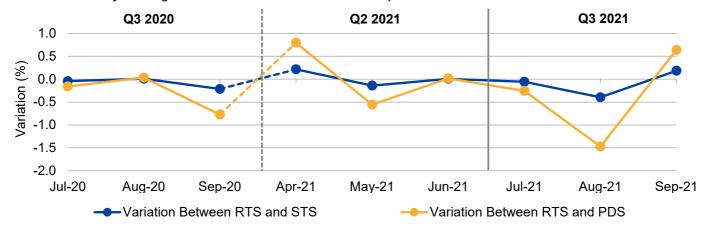
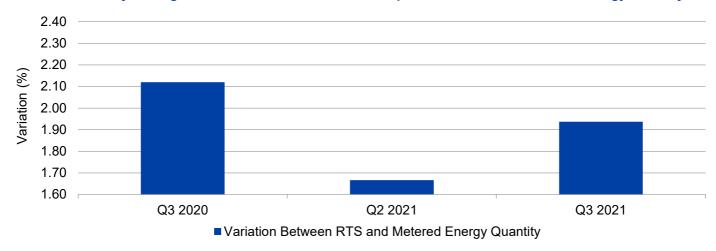


Chart 10 shows the load variations in pre-dispatch schedule ("PDS") and STS compared to RTS. The average load variations in Q3 2021 (0.21 for variation between RTS and STS and 0.79 for variation between RTS and PDS) were greater than those registered in Q2 2021 (0.12 for variation between RTS and STS and 0.45 for variation between RTS and PDS).

The bigger variations in Q3 2021 were due to the drastic changes in weather during the past three months – the average temperature in July was 28.52°C which dropped to 27.74°C in August before coming back up to 28.30°C in September. As a result, the system load of RTS was over forecasted in August by 1.47% compared to PDS and 0.40% against STS. The variations between RTS and STS reduced in comparison to the variations between RTS and PDS, indicating a more accurate load forecasting nearer to the real-time.

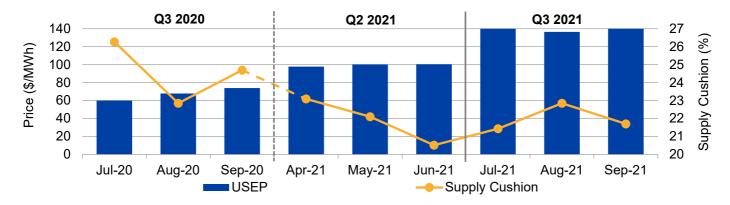
Chart 11. Quarterly Average Variation Between Real-Time Dispatch Schedule and Metered Energy Quantity



The quarterly average load variation between RTS and the metered energy quantity (the actual system generation) increased by 0.27 percentage points to 1.94% in Q3 2021 from 1.67% in Q2 2021 when the smallest variation was recorded since the market started (Chart 11). Nonetheless, the 1.94% of variation was still the third lowest recorded in the history and Q1 2021 registered the second lowest variation at 1.74%, implying a continual improvement of load forecast accuracy in the past three quarters.



**Chart 12. USEP and Supply Cushion** 



The monthly average USEP and supply cushion moved in opposite directions during the three months in Q3 2021, showing the expected changes in the USEP with the changes in electricity demand and supply. When the supply cushion increased to 22.85% in August from 21.43% in July, the USEP decreased 18.24% to \$136.57/MWh in August from \$167.04/MWh in July. This reflected a contracted spare supply available in the market. Similarly, the USEP in September increased with a lower supply cushion compared to that of August.

However, an exception was observed when the USEP in July cleared 66.02% higher than the price of \$100.61/MWh in June despite a 0.92 percentage points higher supply cushion in July. This was due to the high and volatile prices observed in July from an unplanned gas curtailment.

**Chart 13. Capacity Ratio by Generation Type** 

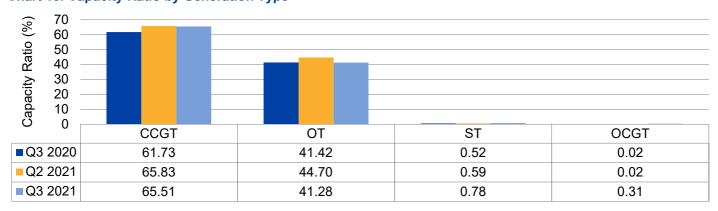


Chart 13 shows the quarterly average capacity ratios of the four generation types in the NEMS. In comparison to Q2 2021, mixed movements were observed in Q3 2021 – the capacity ratios of CCGT and other ("OT") units decreased for 0.33 and 3.42 percentage points, while it increased for ST and OCGT units at 0.19 and 0.29 percentage points respectively. The higher capacity ratio of OCGT units resulted from an increased generation schedule of OCGT units which usually have more expensive energy offers and are only dispatched under tight supply conditions like the ones observed in Q3 2021.

Nonetheless, the total capacity ratio was still lower than that in Q2 2021, in line with the lower demand in Q3 2021 (refer to Chart 7) as less energy was required from the generation facilities.

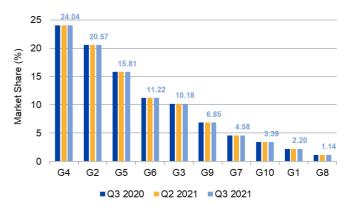
Compared to Q3 2020, the capacity ratio of CCGT units in Q3 2021 was 3.77 percentage points higher with 6.53% increase in system demand.



Chart 14. Market Share in Percentage of Generation Companies Based on Metered Energy Quantity

Chart 15. Market Share in Percentage of Generation Companies Based on Maximum Generation Capacity





Charts 14 and 15 are the market share comparison in the NEMS based on metered energy quantity and maximum generation capacity by generation companies.

G2, G4 and G5 are the largest three generation companies in their capacities. The market share based on the metered energy quantity in Chart 14 shows that the big three generation companies held 48.41% of the total market share in Q3 2021. The market share of G5 dropped by 1.8 percentage points from 19.04% in Q2 2021 to 17.24% in Q3 2021 and was replaced by G4 as the top player. G6 remained at the third place with an improved market share by 0.85 percentage points in Q3 2021. G2's market share increased 0.5 percentage points but still lost out its fourth place to G3 who gained more market share compared to Q2 2021.

The distribution of market share based on generation capacity was more concentrated – the big three generation companies continued to hold 60.43% of the total market share in Q3 2021 (Chart 15), for the fifth consecutive quarter since Q3 2020. This combined market share remained unchanged as there had been no changes in the generation registered facilities.

Chart 16. Market Share in Percentage of Generation Types Based on Metered Energy Quantity

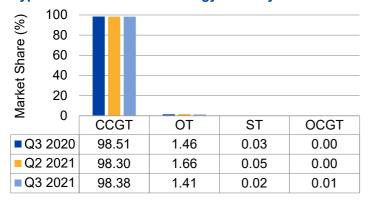
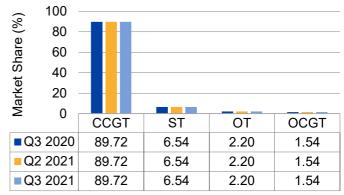


Chart 17. Market Share in Percentage of Generation Types Based on Maximum Generation Capacity



As the NEMS moved towards the most efficient generation technology, the generation of CCGT units has been dominating the market and staying above 98.00% mark since 2016. The CCGT market share had a small uptick of 0.08 percentage points from 98.30% based on the metered energy quantity in Q2 2021 to 98.38% in Q3 2021 (Chart 16). This could be attributed to the lower planned outage rate of CCGT units with less capacity being placed on maintenance.

The market share distribution based on maximum generation capacity remained the same since Q3 2020 (Chart 17) as there was neither entry nor exit of any generation registered facility in the NEMS. The last change was the ST unit exited the market in Q2 2020.



Chart 18. Frequency of Generation Companies as Single Pivotal Supplier

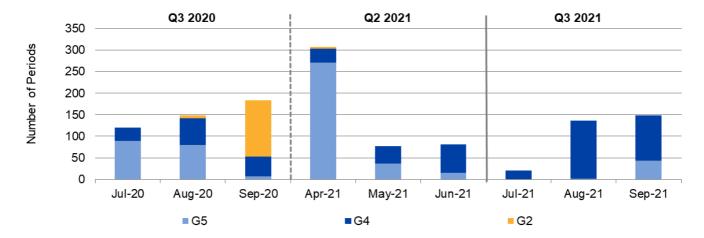


Chart 18 shows the number of trading periods with a single pivotal supplier in the NEMS for each month in the three quarters under review. A single pivotal supplier was present in 6.91% of the total number of periods in Q3 2021, 3.76% lower than 10.67% in Q2 2021 and 3.35% lower than 10.26% in Q3 2020. The main single pivotal supplier switched from G5 in Q3 2020 and Q2 2021 to G4 in Q3 2021, where G4 recorded 259 out of 305 periods as a single pivotal supplier. G2 was not identified as a single pivotal supplier during the quarter with a total of 4,416 trading periods.

**Chart 19. Trend of Price Setting Generation Companies** 

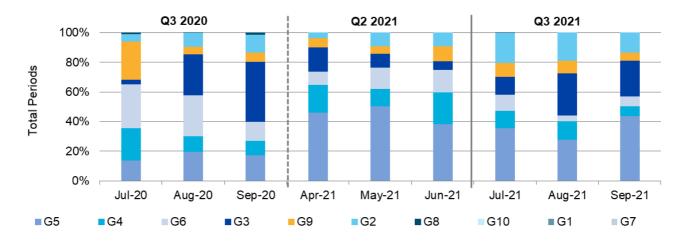


Chart 19 shows the monthly breakdown of price setting generation companies in Q3 2020, Q2 2021 and Q3 2021. G5 remained as the main price setting generation company in the market in Q3 2021 compared to Q2 2021. G5 set prices for 35.45% of the total number of price setting periods in Q3 2021, down from 45.13% in Q2 2021. G3 replaced G4 with the second highest price setting frequency at 20.49% in Q3 2021 from 11.10% in Q2 2021.



**Table 4. Demand Response Activations** 

Quarter	Date	Period	USEP (\$/MWh)	CUSEP (\$/MWh)
	27 July 2020	28	250.03	253.85
	27 July 2020	29	247.77	254.36
	14 September 2020	20	233.53	237.54
	14 September 2020	22	232.24	245.5
	21 September 2020	22	163.69	254.3
Q3 2020	25 September 2020	29	228.69	252.84
	28 September 2020	18	332.54	455.47
	28 September 2020	19	303.35	454.51
	28 September 2020	20	467.21	718.13
	28 September 2020	22	451.19	508.27
	28 September 2020	23	248.96	350.96
02 2024	7 May 2021	29	237.36	238.34
Q2 2021	11 May 2021	23	399.65	401.91
	2 July 2021	22	271.4	272.81
	26 July 2021	20	1,009.95	1,090.65
	26 July 2021	21	1,283.72	1,312.80
	26 July 2021	22	1,312.88	1,514.86
	26 July 2021	23	1,300.12	1,514.94
	26 July 2021	24	1,283.78	1,312.85
	26 July 2021	25	1,009.89	1,312.86
	26 July 2021	26	1,009.86	1,312.81
	26 July 2021	27	1,313.01	1,514.92
	26 July 2021	28	1,355.56	1,514.87
	26 July 2021	29	1,355.57	1,514.88
	26 July 2021	30	1,463.27	1,514.84
	26 July 2021	31	996.39	1,008.88
	26 July 2021	32	569.37	982.72
	26 July 2021	33	569.35	842.29
	26 July 2021	34	555.13	789.14
	2 August 2021	23	388.25	393.4
Q3 2021	2 August 2021	28	393.43	575.84
	2 August 2021	30	575.84	627.04
	2 August 2021	32	1,907.55	1,907.53
	17 August 2021	23	251.85	251.99
	17 August 2021	24	229.73	251.9
	2 September 2021	23	268.03	268.28
	3 September 2021	25	735.67	1,907.21
	3 September 2021	26	364.65	420.98
	3 September 2021	27	422.62	737.99
	3 September 2021	28	303.59	351.54
	3 September 2021	29	280.46	290.99
	23 September 2021	21	1,433.44	1,433.43
	23 September 2021	22	1,441.25	1,441.25
	23 September 2021	23	1,435.84	1,439.77
	23 September 2021	24	1,433.47	1,433.47
	23 September 2021	25	849.21	857.48
	23 September 2021	27	975.9	977.79
	23 September 2021	31	1,555.89	979.08
_	23 September 2021	34	1,253.62	1,253.61



Table 4 lists the Demand Response ("DR") activations in the three quarters under review, and the associated USEP and counterfactual USEP ("CUSEP") during those periods with DR activations.

There were 36 DR activations in Q3 2021, a higher number than a total of 29 occurrences recorded historically since the first DR activation on 17 April 2018. July reported 16 DR activations and 15 occurred on 26 July 2021 consecutively from Period 20 to Period 34, the highest number of DR curtailment in a day. This coincided with the high and volatile prices caused by the unplanned gas curtailment mentioned earlier. The daily average USEP on 26 July 2021 was \$533.11/MWh, while the average CUSEP was \$588.66/MWh without DR curtailment.

DR was activated for 6 periods in August over two different days and 14 periods in September over three different days. Price spikes were observed during these days due to higher fuel oil price, more expensive energy offers, and a higher capacity ratio of OCGT units, as explained in sections of executive summary and prices in Q3 2021.



## **Compliance Statistics for Q3 2021**





**Determinations\*** 



**Enforcement** 

#### 91 cases in total

0 self-report91 referrals/complaints0 MSCP initiative

#### 92 determinations in total

17 cases determined to be in breach2 cases determined to take no further action73 cases determined not to be in breach

#### 17 cases in total

10 financial penalty
7 non-compliance letters
0 suspension order
0 termination order
0 other MSCP order
\$38,000 of financial penalty imposed
\$14,000 of costs awarded

The MSCP issued seven rule breach determinations in Q3 2021 to:

- 6 cases from Tuaspring regarding failure to comply with gate closure rules on 6 April 2021 (Letter of non-compliance, \$2,000 costs)
- ii. 4 cases from YTLPS regarding failure to comply with gate closure rules on 20 April 2021 (Financial penalty \$2,500, \$2,000 costs)
- iii. 1 case from TPG regarding failure to comply with gate closure rules on 27 April 2021 (Financial penalty \$3,500, \$2,000 costs)
- iv. 1 case from Sembcorp Cogen regarding failure to comply with gate closure rules on 19 May 2021 (Financial penalty \$12,000, \$2,000 costs)
- v. 1 case from Shell Eastern Petroleum regarding failure to comply with gate closure rules on 4 May 2021 (Letter of non-compliance, \$2,000 costs)
- vi. 2 cases from TPG regarding failure to comply with gate closure rules on 21 May 2021 (Financial penalty \$5,000, \$2,000 costs)
- vii. 2 cases from Sembcorp Cogen regarding failure to comply with gate closure rules on 2 June 2021 (Financial penalty \$15,000, \$2,000 costs)

<sup>\*</sup>This section includes determinations of cases referred to the MSCP in previous quarters.



## **MSCP Market Watch**

The MSCP Market Watch is a quarterly report prepared by the Market Assessment Unit ("MAU") of EMC and submitted to the MSCP. The report summarises the MAU's day-to-day monitoring, cataloguing and evaluation activities and analyses, and compares the market performance for the current quarter with the quarter a year ago and the previous quarter.

All prices and percentages in this report are rounded off to two decimal places.

The <u>User Guide to MSCP Market Watch</u> provides a glossary of the terms used in the MSCP Market Watch among other information to facilitate readers' understanding.

# **Market Surveillance and Compliance Panel**

The MSCP is established by the EMC Board in accordance to section 2.6 of Chapter 3 of the Singapore Electricity Market Rules.

The MSCP, with the assistance of the MAU, monitors and investigates the conduct of market participants, the market support services licensee, EMC and the Power System Operator and the structure and performance of the wholesale electricity markets.

The MSCP comprises the following members:

- T P B Menon, Chair
- Lee Keh Sai
- Philip Chua
- Professor Euston Quah
- · Professor Walter Woon

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