

# **Market Surveillance & Compliance Panel Market Watch**

Issue 65

Third Quarter (July to September 2022)

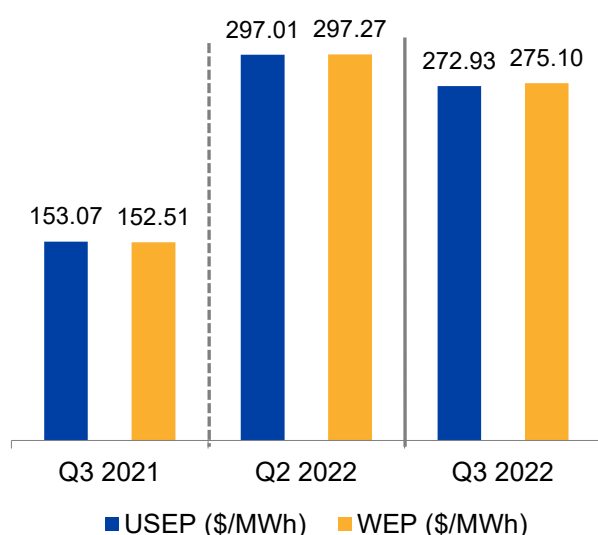
## Executive Summary

The energy prices in the National Electricity Market of Singapore (“NEMS”) fell for a third consecutive quarter in Q3 2022, primarily led by the lower cost of fuel oil. This quarter saw the first decline in the fuel oil price since the Russia-Ukraine conflict started. Despite the fall in energy prices, the quarterly supply cushion was recorded as the lowest since the commencement of NEMS in 2003. This was attributed to a slighter growth in demand coupled with a larger reduction in supply.

Since the commencement of the first cross-border power trading project, the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (“LTMS-PIP”), the flow of electricity has been steady. This confirms the effectiveness of electricity to be traded across a long distance and how the cross-border electricity trading is contributing to alleviating the tight supply market situation in Singapore.<sup>1</sup>

The Government has established a standby LNG facility (“SLF”) for generation companies to draw from in order to generate electricity in the event of disruptions to their natural gas supplies. Given the ongoing volatility in the global energy market and the critical geopolitical situation between Russia and Ukraine, EMA has extended this mechanism until 31 March 2023.<sup>2</sup>

**Chart 1. USEP and WEP by Quarter**



**Table 1. Quarterly Outage Volume and Ancillary Service Prices**

Quarter	Q3 2021	Q2 2022	Q3 2022
<b>Total Outage Volume (MWh Cumulative)</b>			
<b>Planned Outage</b>	2,086,571	4,883,446	4,594,616
<b>Forced Outage</b>	180,742	72,465	168,281
<b>Ancillary Services (\$/MWh)</b>			
<b>Primary Reserve</b>	1.38	0.24	1.97
<b>Contingency Reserve</b>	15.53	41.17	40.43
<b>Regulation</b>	16.56	49.99	51.76

The Uniform Singapore Energy Price (“USEP”) and the Wholesale Electricity Price (“WEP”) decreased by 8.11% to \$272.93/MWh and 7.46% to \$275.10/MWh respectively for a QoQ comparison. This is mainly attributed to the reduction of the fuel oil price and a shift in energy offers to lower price tranches. In particular, the quantity of energy offers made at or below \$100/MWh increased 5.75 percentage points from 66.75% in Q2 2022 to 72.50% in Q3 2022.

The prices of ancillary services were mixed across the board. The price of the contingency reserve decreased by 1.78% from \$41.17/MWh to \$40.43/MWh coinciding with the reduction in the contingency reserve requirements in Q3 2022. The Risk Adjustment Factor (“RAF”) for Contingency Reserve Requirement reduced from 1.5 to 1.0 since 8 July 2022 as we see an increase in the Tenaga Nasional Berhad - Singapore Power PowerAssets Ltd (“TNB-SPPA”) interconnection capacity. The prices of the primary reserve and the regulation rose 713.97% and 3.53% respectively and this could be attributed to the high USEP in the month of July due to the tighter supply cushion that was caused by the gas curtailments observed as compared to August and September. It is relevant to note that the periods of high

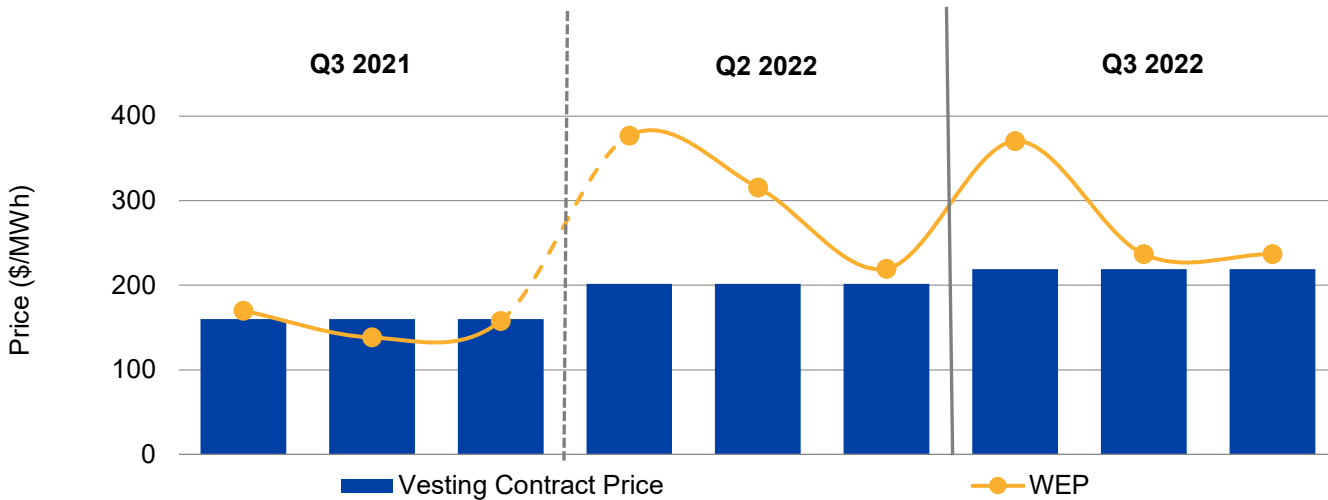
<sup>1</sup> <https://www.mti.gov.sg/Newsroom/Parliamentary-Replies/2022/08/Written-reply-to-PQ-on-renewable-energy-import-from-Laos>

<sup>2</sup> <https://www.mti.gov.sg/Newsroom/Parliamentary-Replies/2022/07/Written-reply-to-PQ-on-Singapores-energy-security>

reserve and regulation prices coincided with periods of high USEP observed during July as ancillary services, such as reserve and regulation, are usually used to supplement tight supply conditions.

## Prices in Q3 2022

Chart 2. Vesting Contract Price Versus WEP by Quarter



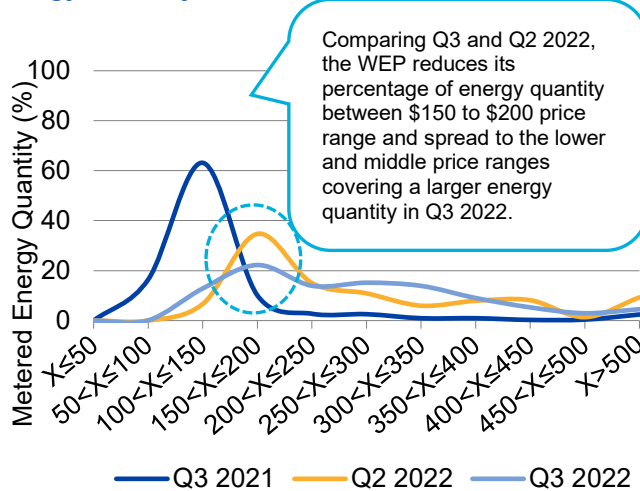
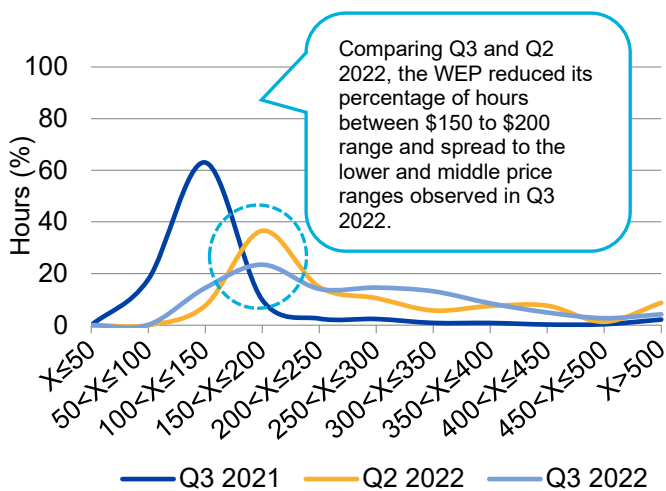
This quarter, the WEP decreased 7.46% from \$297.27/MWh in Q2 2022 to \$275.10/MWh in Q3 2022 and marked the fourth consecutive quarter with WEP levels above the vesting contract price. On the monthly level, the average WEP dropped from \$361.79/MWh in July to \$231.37/MWh in August 2022 due to a tighter supply market accompanied by the higher gas curtailment rate for the month of July. The difference between the vesting contract price and the WEP narrowed this quarter with the WEP clearing at \$275.10/MWh, 25.49% higher than Q3 2022 vesting contract price as compared to 47.46% in Q2 2022.

The vesting contract price increased 8.75% from \$201.60/MWh in Q2 2022 to \$219.23/MWh in Q3 2022, which marked the sixth consecutive rise in the vesting contract price since Q2 2021 and the highest level recorded since Q4 2012 at \$205.48/MWh. This represents a 37.06% increment when compared to Q3 2021, indicating that the components used in the calculation of the vesting contract price increased which could be attributed to the geopolitical tensions between Russia and Ukraine.

The narrowing difference between the vesting contract price and the WEP is in line with EMA’s decision to curb the market power of the generation companies and provide a cushion to the consumers in the event of higher prices.

Chart 3. Distribution of WEP Over Time

Chart 4. Distribution of WEP Over Total Metered Energy Quantity



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 2022, compared to the previous quarter and the previous year respectively.

The distribution of the WEP over time moved to the lower and middle price ranges in Q3 2022 when compared to Q2 2022 (Chart 3). The frequencies of WEP in the price range of \$150/MWh to \$200/MWh decreased to 23.44 percentage points as compared to 36.56 percentage points in Q2 2022. The WEP was equal to or lower than \$150/MWh for 14.52% of the time, as opposed to 7.53% in Q2 2022, attributed to the lower fuel price observed in Q3 2022.

It is noteworthy that 4.21% of the time, the WEP was higher than \$500/MWh in Q3 2022, which is a reduction from 8.68% in Q2 2022, but an increase from 2.17% in Q3 2021. This was due to more energy offers moved to lower price tranches observed in July, August, and September but it did not reduce to as low as what was observed in Q3 2021.

The distribution of the WEP in terms of percentage metered energy quantity in the market was similar to its distribution based on the percentage number of hours. The WEP was in the middle price range for most of the metered energy quantity in Q3 and Q2 2022, as well as when compared to Q3 2021 (Chart 4).

**Chart 5. Correlation Between WEP and Metered Energy Quantity**      **Chart 6. WEP Versus Fuel Oil Price**

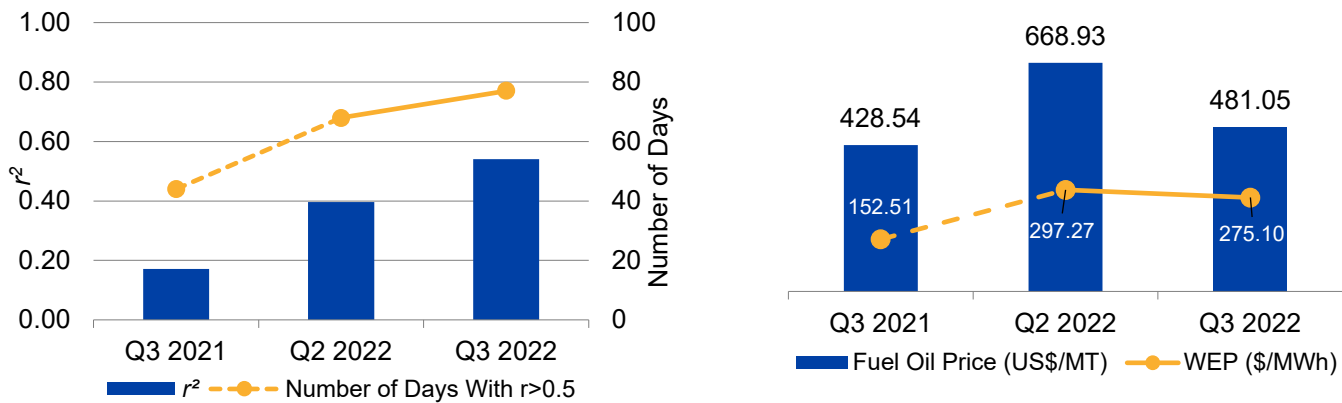


Chart 5 shows the proportion of variance in the WEP which could be explained by changes in the metered energy quantity measured by  $r^2$ . It was observed that the correlation between the metered energy quantity and the WEP strengthened with a higher  $r^2$  at 0.54 obtained in Q3 2022 compared to 0.40 in Q2 2022, indicating that the metered energy quantity had a greater influence on the WEP.

Correspondingly, there were 77 out of 92 days in Q3 2022 where  $r$  was greater than 0.5 compared to 68 out of 91 days in Q2 2022. This implies that the metered energy quantity and the WEP had a strong positive correlation over a longer time in Q3 2022 than in Q2 2022.

With the stronger correlation results in Q3 2022, the metered energy quantity remained the main contributing factor to the movements in the WEP. The  $r$  value of 0.74 in Q2 2022 meant that changes in the metered energy quantity could account for 73.53% of the changes in the WEP during the quarter.

As shown in Chart 6, the fuel oil price reduced by 28.09% from US\$668.93/MT in Q2 2022 to US\$481.05/MT in Q3 2022. However, when compared to the same quarter the previous year, the fuel oil price in Q3 2022 increased 12.25% from US\$428.54/MT in Q3 2021. This is the first quarterly decline in the fuel oil price since the global energy crunch and the Russia-Ukraine conflict and was largely due to weaker oil demand in other countries<sup>3</sup>. Since the fuel oil price is an input to the cost of electricity generation, the decrease in the fuel oil price led to similar changes in the WEP in Q3 2022. The WEP of \$275.10/MWh showed a decrease of 7.46% from \$297.27/MWh in Q2 2022.

<sup>3</sup> <https://www.reuters.com/business/energy/oil-slides-us-crude-gasoline-stocks-surge-2022-10-14/>

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

Month/Quarter	Variation Between RTS and STS (\$/MWh)	Maximum Periodic Variation (\$/MWh)
Jul-21	10.39	837.32
Aug-21	-9.84	753.01
Sep-21	7.77	2692.17
Apr-22	28.47	2965.39
May-22	2.26	347.12
Jun-22	-3.25	969.79
Jul-22	1.20	3638.24
Aug-22	4.79	4005.47
Sep-22	-2.43	360.89
<b>Q3 2021</b>	9.33	2,692.17
<b>Q2 2022</b>	11.33	2,965.39
<b>Q3 2022</b>	2.81	4,005.47

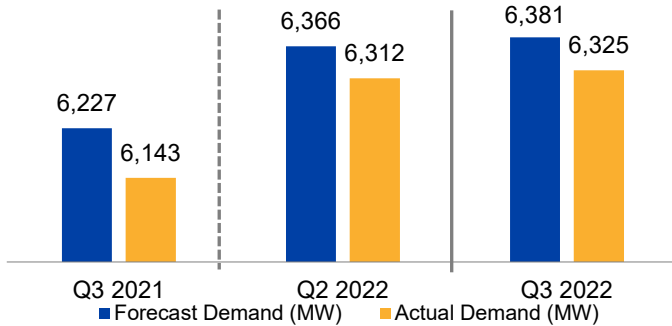
Table 2 shows the monthly and quarterly average variation in the USEP produced in the real-time dispatch schedule (“RTS”) and the short-term schedule (“STS”), together with the largest variation observed in a single dispatch period during each month and quarter. A positive variation means the RTS produced 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 decreased to \$2.81/MWh in Q3 2022, which is \$8.52/MWh lower than the price variation observed in Q2 2022 at \$11.33/MWh and \$6.52/MWh lower than that in Q3 2022. This lower average price variation in Q3 2022 reflects a more accurate price forecast as compared to Q2 2022.

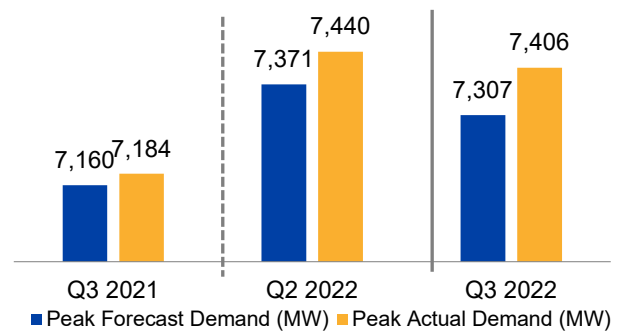
Additionally, the lower average price variation was attributed to a reduced number of periods of real-time USEP spikes, 520 periods ( $\geq$  \$400/MWh) in Q3 2022 (786 periods in Q2 2022), and the maximum periodic price variation was as high as \$4,005.47/MWh in Q3 2022, versus \$2,965.39/MWh in Q2 2022, and \$2,692.17/MWh in Q3 2021.

## Demand and Supply in Q3 2022

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



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



Q3 2022 recorded the highest average forecast and actual demand levels since the commencement of NEMS in 2003. The average forecast demand increased by 0.24% from 6,366 MW in Q2 2022 to 6,381 MW in Q3 2022 (Chart 7). Similarly, the average actual demand increased by 0.21%, from 6,312 MW in Q2 2022 to 6,325 MW in Q3 2022. Both the peak forecast and peak actual demand decreased in Q3 2022 by 0.87% and 0.45% respectively when compared to Q2 2022 (Chart 8).

The stronger demand in Q3 2022 was likely due to:

- Lesser public holidays during Q3 2022 as compared to the previous quarter in Q2 2022.
- Higher reading of Singapore Gross Domestic Product (“GDP”). The reading of GDP, the standard measure of the value added created through the production of goods and services in a country, registered a higher figure this quarter.

**Table 3. Quarterly Average Supply and Supply Cushion**

Quarter	Q3 2021	Q2 2022	Q3 2022
<b>Average Supply (MW)</b>	7,987	7,676	7,151
<b>Supply Cushion (%)</b>	22.12	17.09	10.84

The quarterly average supply in Q3 2022 decreased by 6.85% to 7,151MW from 7,676MW in Q2 2022 (Table 3), despite a higher forecast demand. The shrink in supply availability could be attributed to the behaviour of generators as there was a higher gas curtailments rate of 33 days as compared to 20 days in Q2 2022

With a smaller growth in demand and a larger reduction in supply, the corresponding supply cushion contracted 6.25 percentage points from 17.09% in Q2 2022 to 10.84% in Q3 2022. This is the lowest quarterly average supply cushion recorded since market start.

**Chart 9. Trend Of Energy Offer Price Proportion**

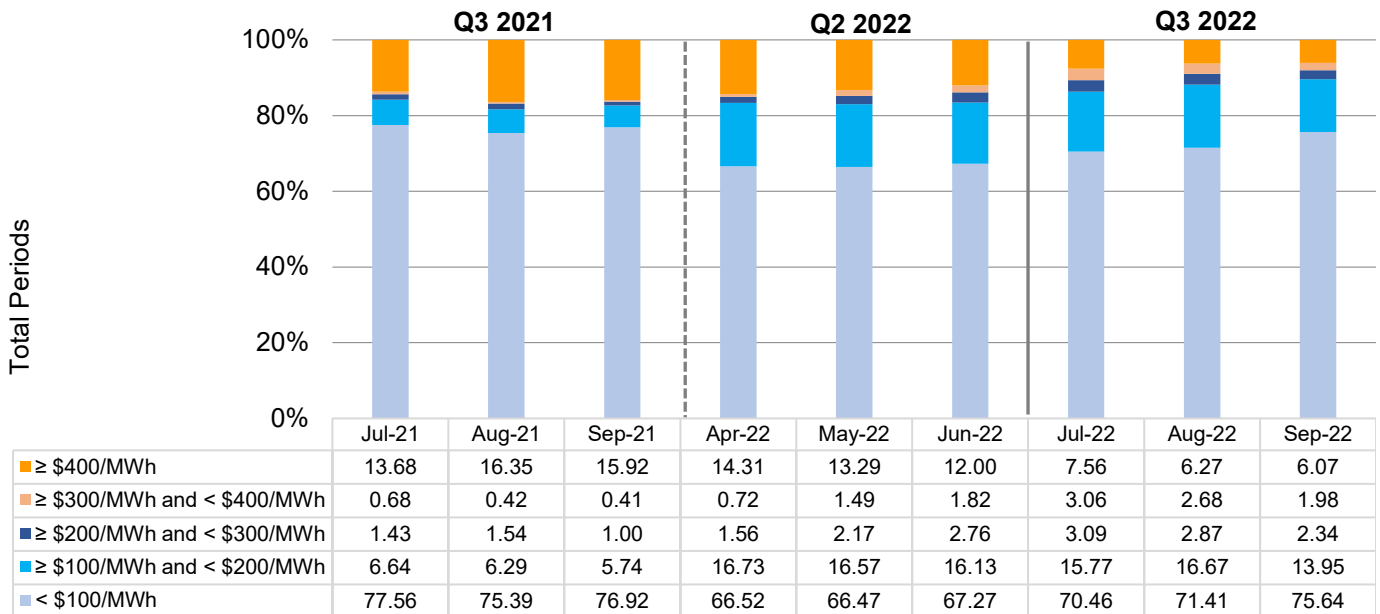


Chart 9 shows a reduction in the proportion of energy offers priced at or above \$400/MWh in Q3 2022 when compared to Q2 2022, as more proportion of energy offers priced at or above \$400/MWh have shifted to price tranches below \$400/MWh. Correspondingly, the proportion of energy offers below \$100/MWh increased significantly in Q3 2022 as compared to Q2 2022.

The proportion of energy offers below \$100/MWh increased from 70.46% in July 2022 to 75.64% in September 2022, as a result, the monthly average WEP decreased from \$361.79/MWh in July to \$232.13/MWh in September 2022.

The shift in energy offers to lower price ranges has likely outweighed the impact of a tighter supply cushion as the resultant WEP was lower this quarter. Higher gas curtailment rates for Q3 2022 causing insufficient supply for generation companies were also observed for Q3 2022.

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

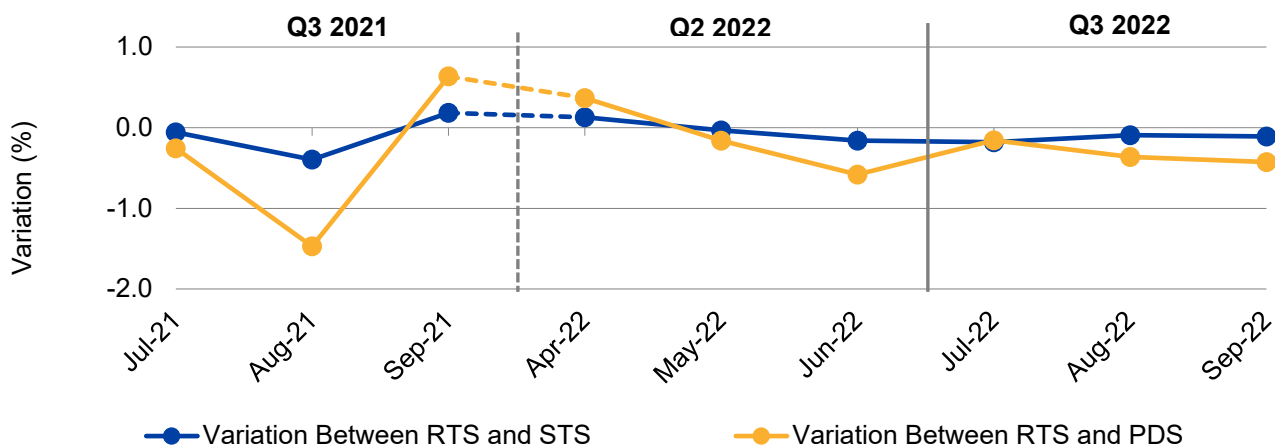
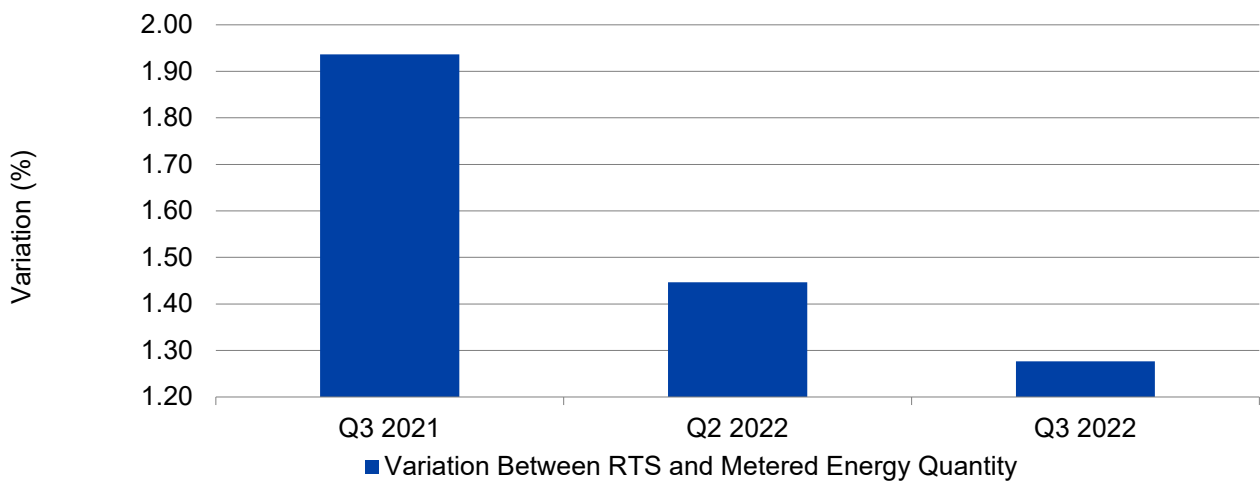


Chart 10 shows the variations in the pre-dispatch schedule (“PDS”) and short-term schedule (“STS”) against the real-time schedule (“RTS”). In Q3 2022, the average monthly variations remained relatively small, and it was observed that both the variations in PDS and STS were negatively correlated to RTS. This indicated that the real-time dispatch schedule recorded a lower than forecasted schedule.



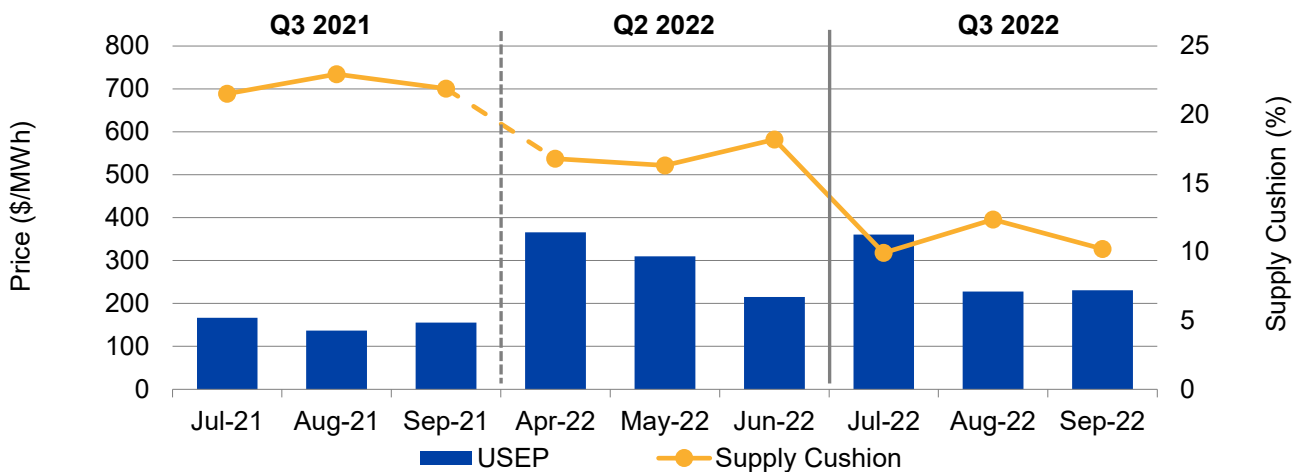
The average load variation in Q3 2022 was 0.13 percentage points for variation between RTS and STS as compared to 0.11 percentage points in Q2 2022. The percentage points for variation between RTS and PDS was 0.31 for Q3 2022 which was lower than those registered in Q2 2022 at 0.37 percentage points. The variations between RTS and STS reduced in comparison to the variations between RTS and PDS, indicating a more accurate load forecasting nearer to real-time as STS is generated more frequently and closer to the RTS.

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



Q3 2022 observed the smallest variation in the quarterly average load variation between the RTS and the metered energy quantity (the actual generation recorded) ever since the NEMS was established (Chart 11). The RTS has shown higher accuracy meter readings than before and is reflective of the households' actual electricity consumption as EMA has been working with SP Group to install advanced meters across Singapore. Therefore, the falling variation across the quarters could be due to the progressive reduction in metering errors.

**Chart 12. USEP and Supply Cushion**



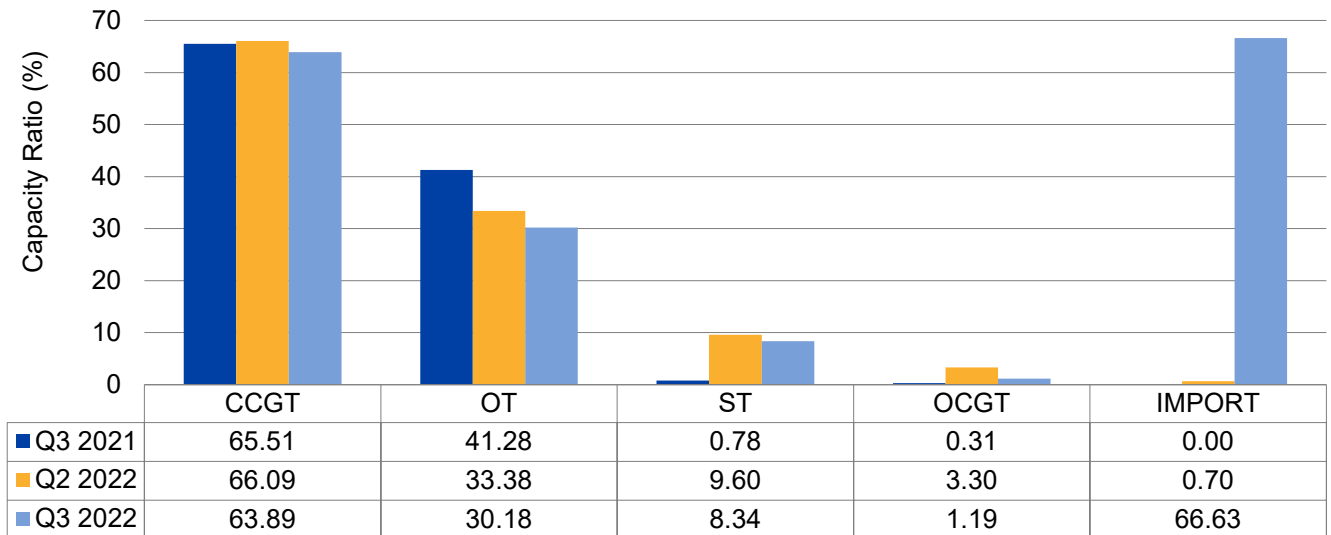
In Q3 2022, the supply cushion averaged 10.84% as compared to 17.09% in Q2 2022. It was observed that the USEP and the supply cushion reduce this quarter, which was counterintuitive.

However, on the monthly level, an inverse correlation was observed for July, August, and September 2022 where the higher supply cushion correlates with a lower USEP (August 2022) and the lower supply cushion correlates with a higher USEP (July and September 2022). The highest monthly USEP for the quarter was recorded in July 2022 at \$360.28/MWh, with a monthly average supply cushion level of 9.94% which marks the lowest supply cushion since the market started. In July, we see a higher rate of gas curtailment which reduces the supply for the generation companies.



The USEP reduced 8.11% to \$272.93/MWh in Q3 2022 as compared to Q2 2022 due to an increase in the energy offers at the lower price range. Additionally, a reduction in the fuel oil price from US\$668.93/MT in Q2 2022 to US\$481.05/MT in Q3 2022 could have further driven the reduction in the USEP.

**Chart 13. Capacity Ratio by Generation Type<sup>4</sup>**



Since the commencement of the LTMS-PIP on 23 Jun 2022, the flow of electricity has been steady and there has been active electricity trading. Chart 13 shows the quarterly average capacity ratios of the five generation types in the NEM which includes the new generation type under import.

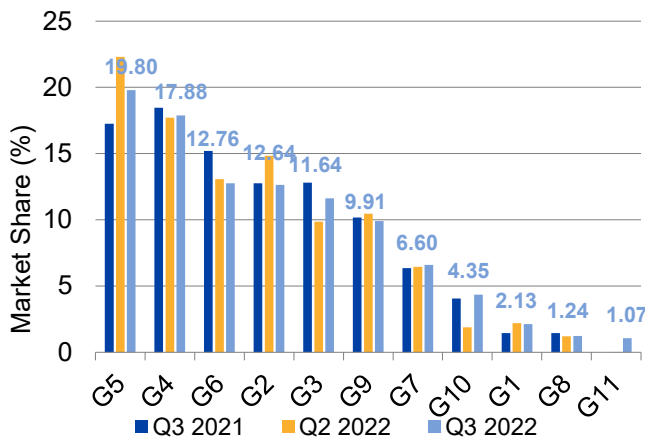
Besides electricity import (“IMPORT”), the movements in the capacity ratios were in line with the lower supply (refer to Table 3) due to the higher gas curtailment rate as observed in Q3 2022. A reduction in the supply of electricity caused lower utilisation from the main generation types due to the limited gas available for consumption.

Compared to Q2 2022, the capacity ratio of combined cycle gas turbine (“CCGT”), other units (“OT”), and steam turbine (“ST”) decreased by 2.20, 3.20, and 2.11 percentage points respectively in Q3 2022. The lower capacity ratio of OCGT units observed was in line with the lower USEP levels in Q3 2022, as OCGT units tend to have energy offers in the higher price tranches, and the lower USEP levels in Q3 2022 could have discouraged OCGT to increase their offer quantities.

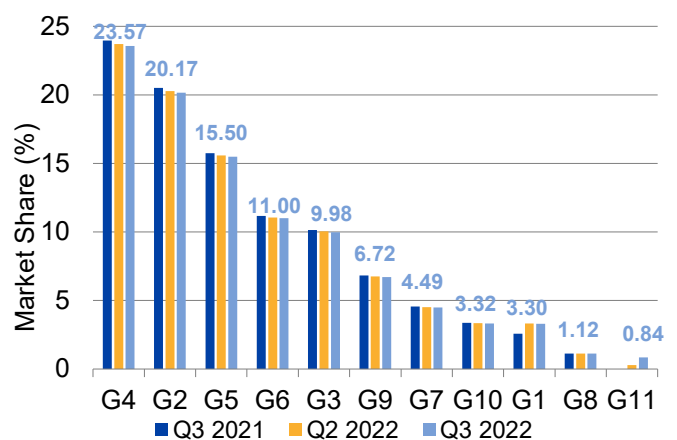
On the other hand, the capacity ratio of IMPORT increased by 65.92 percentage points from 0.70% in Q2 2022 to 66.63% in Q3 2022. As the commencement of the electricity import was on the last week of the previous quarter (7 days out of 91 days), therefore there was a larger increase in the capacity ratio for Q3 2022 as compared to Q2 2022.

<sup>4</sup>Chart 13 has been revised based on an addition of a new generation type.

**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**

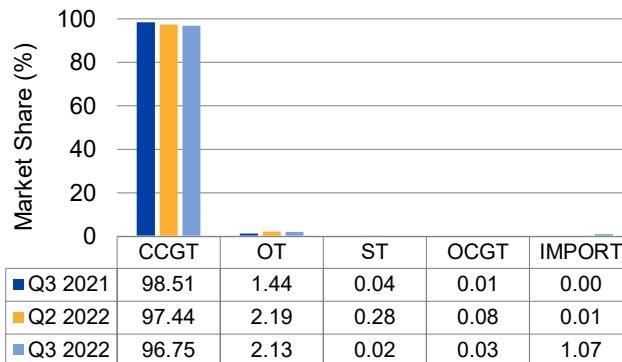


The breakdown of market share in the NEMS based on metered energy quantity and maximum generation capacity by generation company and generation type is shown in Charts 14 and 15 respectively.<sup>5</sup>

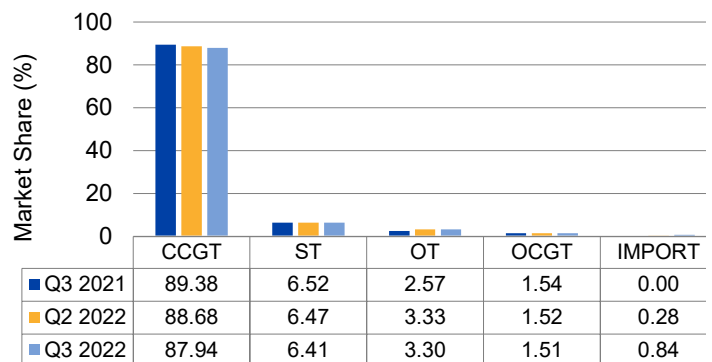
Chart 14 shows that G5, G4, and G6 are the three largest generation companies based on the metered energy quantity. The top three generation companies held 50.43% of the total market share in Q3 2022, a decrease from 54.87% in Q2 2022 and 50.85% in Q3 2021. While the top six generation companies with the largest market shares reduced from 88.25% in Q2 2022 to 84.62% in Q3 2022, G3 recorded the greatest increase of 1.77 percentage points, and G5's market share shrunk the most with a reduction of 2.51 percentage points.

As shown in Chart 15, the distribution of market share based on generation capacity was still above 50% – the big three generation companies held 59.23% of the total market share in Q3 2022, a slight reduction from 59.57% in Q2 2022. The market share of G11 had increased by 0.56 percentage points from 0.28% in Q2 2022 to 0.84% in Q3 2022. The reason for the dropped in the market share of the big three generation companies was mainly due to a new generation company has successfully registered one generation registered facility in the Singapore Wholesale Electricity Market.

**Chart 16. Market Share in Percentage of Generation Types Based on Metered Energy Quantity<sup>6</sup>**



**Chart 17. Market Share in Percentage of Generation Types Based on Maximum Generation Capacity<sup>7</sup>**



Most of the generation in the NEMS is produced by CCGT units (96.75% of the metered energy quantity in Q3 2022 as shown in Chart 16), as the market moves towards the most efficient generation technology (87.94% of the total maximum generation capacity in Q3 2022 as shown in Chart 17).

As seen in Chart 16, the CCGT market share reduced by 0.69 percentage points from 97.44% in Q2 2022 to 96.75% in Q3 2022, based on the metered energy quantity. This could be attributed to an increase in the proportion of the market share of generation type like IMPORT.

<sup>5</sup> Registered maximum capacity and metered energy quantity exclude battery and intermittent generation.

<sup>6</sup> Chart 16 figures have been revised based on an addition of a new generation type.

<sup>7</sup> Chart 17 figures have been revised based on an addition of a new generation type.

The market share distribution based on maximum generation capacity has seen slight changes in Q3 2022 (Chart 17) as there was an entry of a new generation registered facility in the NEMS in Q2 2022.

**Chart 18. Frequency of Generation Companies as Single Pivotal Suppliers**

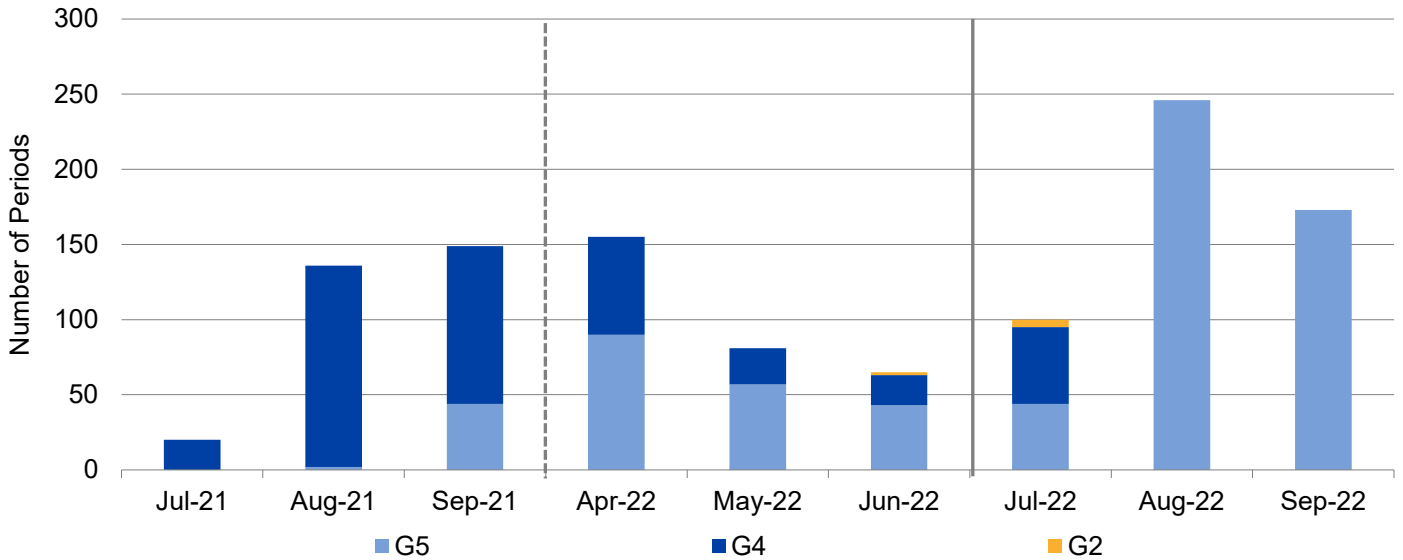


Chart 18 shows the number of trading periods with a single pivotal supplier in the NEMS for each month in the three quarters under review. A single pivotal supplier was present in 10.48% of the total number of periods in Q3 2022, 6.13% and 9.44% higher than in Q2 2022 and Q3 2022 respectively. G5 remained the main single pivotal supplier in the market in Q2 2022 where it occupied 463 out of 519 single pivotal supplier periods in Q3 2022. There was a total of 4,416 dispatch periods in Q3 2022.

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

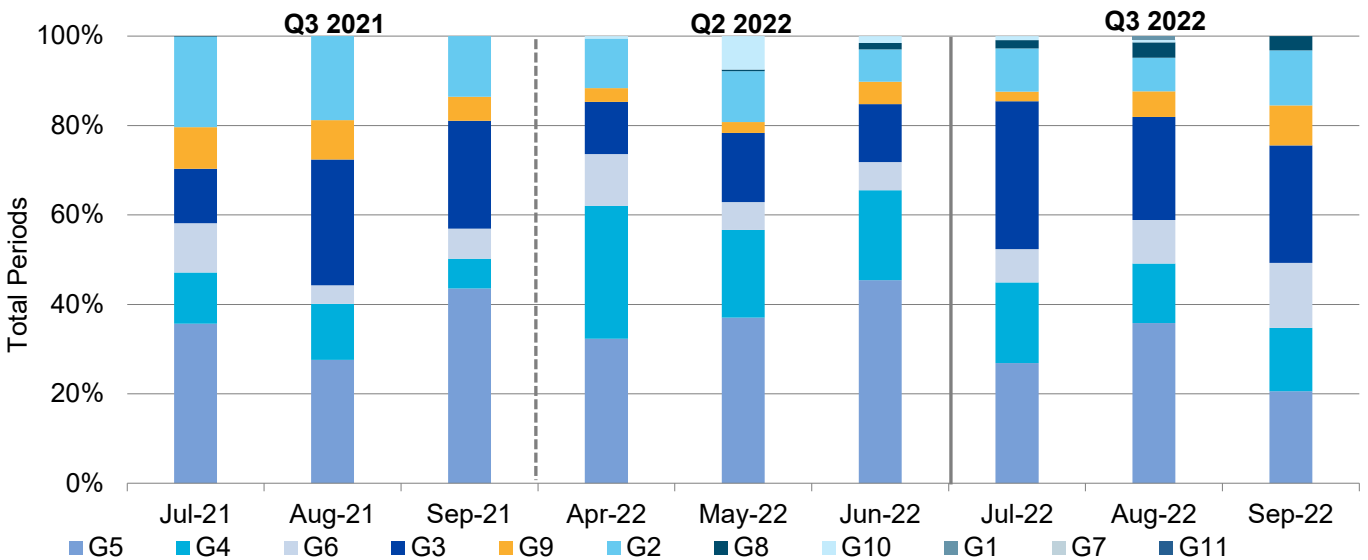


Chart 19 shows the monthly breakdown of price-setting generation companies in Q3 2022, Q2 2022, and Q3 2021. G3 exchanged position with G5 and set prices for 27.83% of the total number of price-setting periods in Q3 2022, while G5 still maintained as the main price-setting generation company in the market in Q2 2022 and Q3 2021. G5 exchanged position with G4 and was the second-highest price-setting frequency at 27.62% in Q3 2022.

**Chart 20. Demand Response Activations**

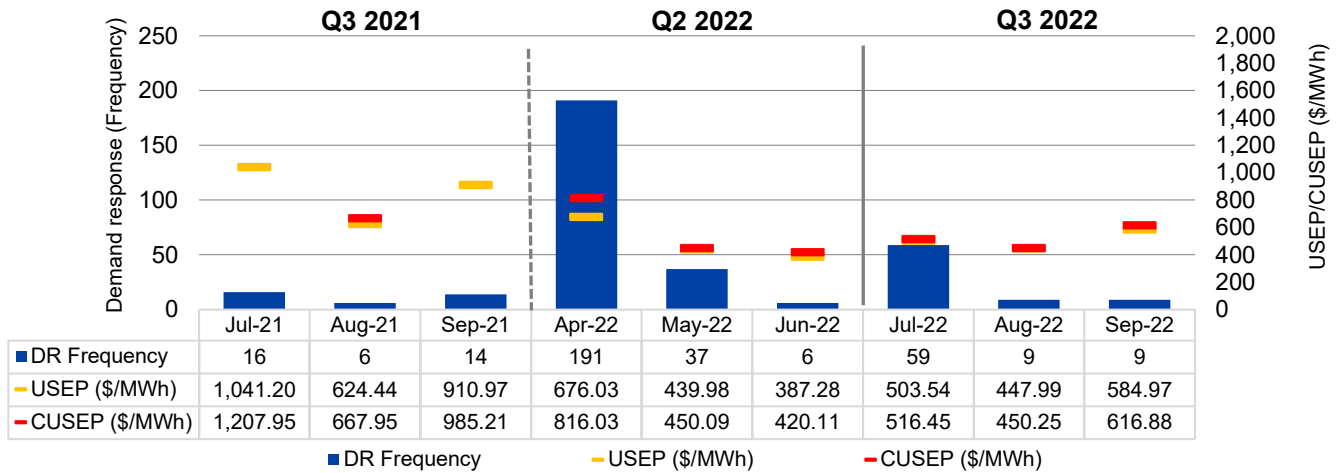


Chart 20 lists the Demand Response (“DR”) activations in the three quarters under review, and the associated USEP and counterfactual USEP (“CUSEP”) during those periods with DR activations.

There were 77 DR activations in Q3 2022, which was lower than the cumulative total of 234 occurrences recorded from the DR activation in Q2 2022. The daily average USEP for periods with DR activation in Q3 2022 was \$506.57/MWh, while the average CUSEP was \$520.45/MWh without DR curtailment.

The number of DR activation is usually reflective of the number of USEP spikes and the reduction in the number of DR activations coincided with the lower WEPS observed in Q3 2022 due to the drop in fuel oil price and generators shifting their energy offers to lower price tranches in Q3 2022.

## Compliance Statistics for Q3 2022



**Potential Breaches of the Market Rules**



**Determinations\***



**Enforcement**

**210 cases in total**

2 self-reports  
**208** referrals/complaints  
 0 MSCP initiative

**207 determinations in total**

4 cases determined to be in breach  
 0 cases determined to take no further action  
**203** cases determined not to be in breach  
 0 cases determined to be event of default

**4 cases in total**

2 financial penalty  
**2** non-compliance letters  
 0 suspension order  
 0 termination order  
 0 other MSCP order  
**\$7,000** of financial penalty imposed  
**\$6,000** of costs awarded

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

The MSCP issued three rule breach determinations in Q3 2022 to:

- i. 2 cases from YTL PowerSeraya Pte. Limited regarding failure to comply with gate closure rules on 17 April 2022 (Financial penalty \$7,000, \$2,000 costs)
- ii. 1 case from Senoko Waste-To-Energy Pte. Ltd. regarding failure to comply with gate closure rules on 26 April 2022 (\$2,000 costs)
- iii. 1 case from Energy Market Company Pte Ltd regarding late validation of offer on 15 July 2022 (\$2,000 costs)

## 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, 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 [User Guide to MSCP Market Watch](#) 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 with 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:

- Professor Walter Woon, Chairman
- T P B Menon
- Lee Keh Sai
- Philip Chua
- Professor Euston Quah
- Dr Stanley Lai

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