

Market Surveillance & Compliance Panel Market Watch

Issue 64

Second Quarter (April to June 2022)

Executive Summary

The energy prices in the National Electricity Market of Singapore (“NEMS”) fell for a second consecutive quarter in Q2 2022. The fall was primarily led by lower offer prices submitted in the NEMS, which could be attributed to the measures that the Government has put in place to secure Singapore’s electricity supply, help stabilise the electricity prices, and maintain the orderly functioning of the wider energy sector¹.

The Government has established a standby LNG facility (“SLF”), which generation companies can draw from to generate electricity in the event of disruptions to their natural gas supplies. The Government also required the generation companies to bolster their own stockpile of fuel and empowered the Energy Market Authority (“EMA”) to direct the generation companies to generate electricity using gas from the SLF, if there are potential shortages.

Despite the fall, Q2 2022 recorded the third-highest quarterly energy prices since the commencement of NEMS in 2003 against the backdrop of the rising global gas and oil prices exacerbated by the conflict between Russia and Ukraine.

Chart 1. USEP and WEP by Quarter

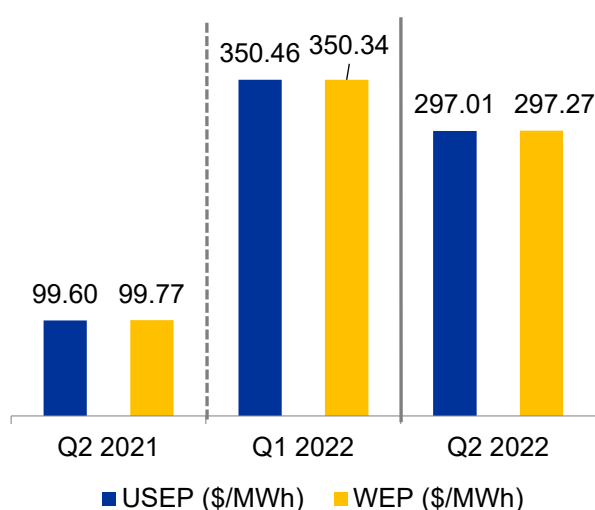


Table 1. Quarterly Outage Volume and Ancillary Service Prices

Quarter	Q2 2021	Q1 2022	Q2 2022
Total Outage Volume (MWh Cumulative)			
Planned Outage	2,275,914	4,743,129	4,883,446
Forced Outage	208,587	77,742	72,465
Ancillary Services (\$/MWh)			
Primary Reserve	0.47	0.45	0.24
Contingency Reserve	8.53	42.85	41.17
Regulation	8.10	56.33	49.99

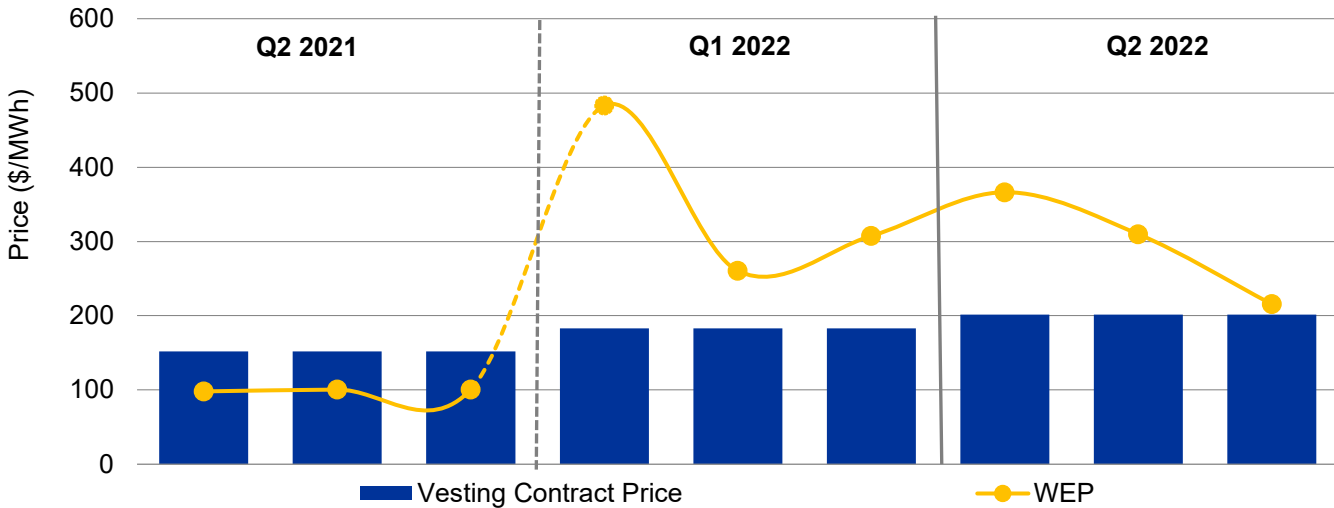
The Uniform Singapore Energy Price (“USEP”) and the Wholesale Electricity Price (“WEP”) decreased 15.25% to \$297.01/MWh and 15.15% to \$297.27/MWh respectively for a QoQ comparison. This is mainly attributed to the shift in energy offers to lower price tranches, despite the rise in fuel oil price and tighter supply cushion. In particular, the quantity of energy offers made at or below \$300/MWh increased 2.70 percentage points from 83.69% in Q1 2022 to 85.39% in Q2 2022.

The prices of ancillary services for contingency reserve and regulation decreased across the board this quarter due to fewer periods of contingency reserve and regulation shortfalls. There was a total of 151 periods of contingency reserve shortfall and one period of regulation shortfall as compared to 306 periods of contingency reserve shortfall and 10 periods of regulation shortfall in Q1 2022. In addition, primary and contingency reserve requirements in Q2 2022 decreased by 1.93% and 0.13% respectively.

¹ <https://www.mti.gov.sg/Newsroom/Parliamentary-Replies/2022/07/Written-reply-to-PQ-on-Singapores-energy-security>

Prices in Q2 2022

Chart 2. Vesting Contract Price Versus WEP by Quarter



This marked the third consecutive quarter with WEP levels above the vesting contract price. The last time the WEP exceeded the vesting contract price was in Q3 2013. However, the difference between the vesting contract price and the WEP narrowed this quarter with the WEP clearing at \$297.27/MWh, 47.46% higher than Q2 2022 vesting contract price, as shown in Chart 2. On the monthly level, the average WEP decreased from \$366.29/MWh in April to \$215.66/MWh in June 2022.

At the same time, the vesting contract price increased 10.25% from \$182.85/MWh in Q1 2022 to \$201.60/MWh in Q2 2022, which marked the fifth consecutive rise in the vesting contract price since Q2 2021 and the highest level recorded since Q4 2012 at \$205.48/MWh. Comparing the components used in the calculation of the vesting contract price in Q1 2022 and Q2 2022, the rise in the vesting contract price in Q2 2022 was mainly driven by a 22.71% increase in the Brent Oil price. On a YoY comparison, the Q2 2022 vesting contract price increased 32.81% when compared to Q2 2021, which could be attributed to the rising global gas and oil prices exacerbated by the conflict between Russia and Ukraine.

The vesting contract regime was meant to discourage generation companies to withhold their generation capacity and exert upward pressure on the WEP, via vesting contracts which mandate a certain electricity volume (vesting contract level) to be hedged at a certain price (vesting contract price). The observation of the WEP staying above the vesting contract price highlighted the importance of the vesting contract regime in stabilising the electricity prices.

Chart 3. Distribution of WEP Over Time

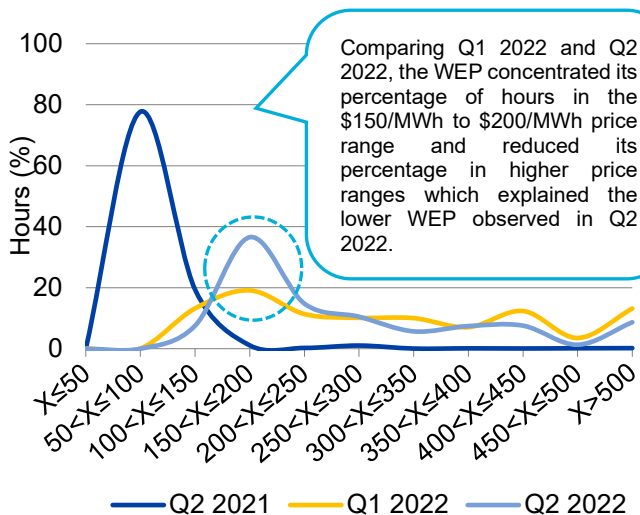
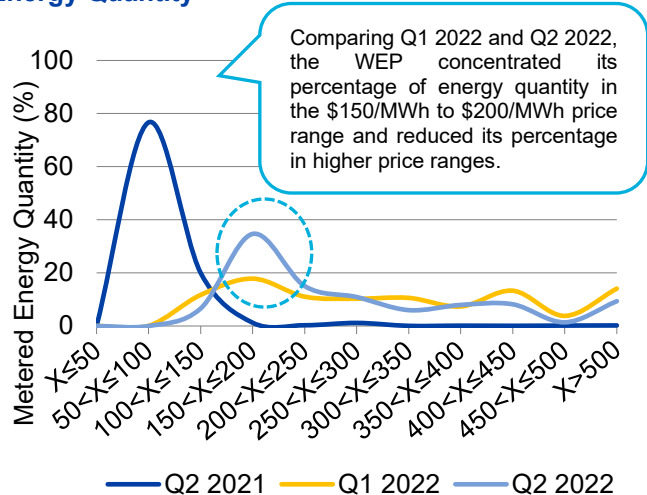


Chart 4. Distribution of WEP Over Total Metered Energy Quantity



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 Q2 2022, compared to the previous quarter and the previous year respectively.

In Q2 2022, the distribution of the WEP is more concentrated in the price range of \$150/MWh to \$200/MWh than the distribution observed in Q1 2022, as shown in Chart 3. Given that higher frequency of the WEP concentrated in the price range of \$150/MWh to \$200/MWh, the frequencies of the WEP lesser than \$150/MWh and greater than \$200/MWh were reduced by 5.75 percentage points and 11.69 percentage points respectively from Q1 2022 to Q2 2022. In particular, there was a subtle shift in the WEP distribution from higher price ranges of above \$300/MWh in Q1 2022 to lower price ranges of below \$300/MWh in Q2 2022.

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 higher price ranges for most of the metered energy quantity in Q2 2022 and Q1 2022 when compared to Q2 2022 (Chart 4).

Given the concentration and peaking of the distribution curves in the price range of \$150/MWh to \$200/MWh observed in Charts 3 and 4, the WEP was observed to be in the lower price tranches over a longer duration and across a greater metered energy quantity in Q2 2022 compared to Q1 2022, which explained the lower WEP recorded for the quarter. The changes in the distribution curves in Q2 2022 could be attributed to the lower energy offer prices submitted by the generation companies in response to the measures implemented by the Government to stabilise the electricity prices.

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

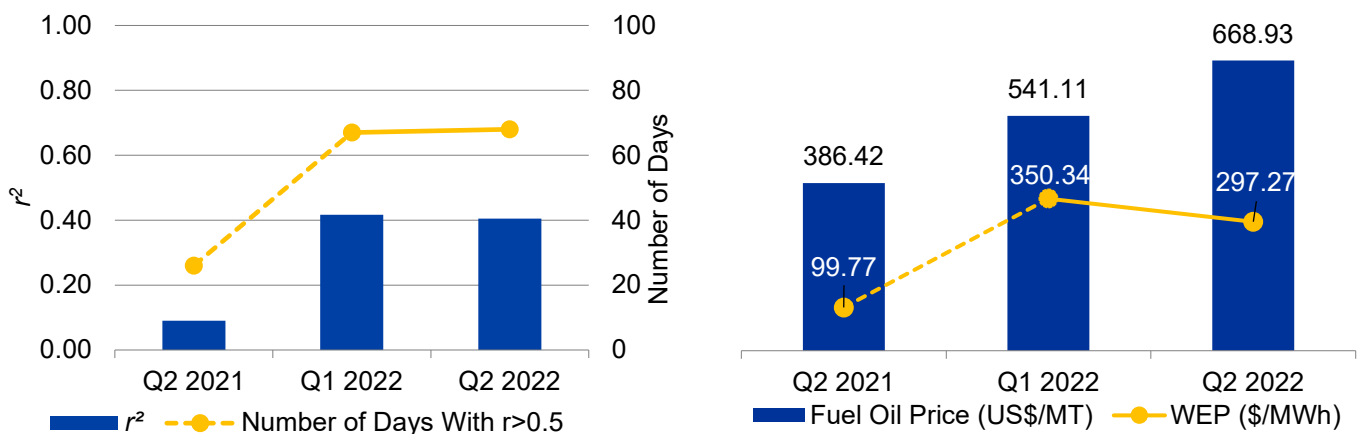


Chart 5 shows the proportion of variance in the WEP which could be explained by changes in the metered energy quantity measured by r^2 . It was observed that the correlation between the metered energy quantity and the WEP was slightly weakened given the lower r^2 at 0.40 obtained in Q2 2022 compared to 0.42 in Q1 2022. Nevertheless, the metered energy quantity was the key contributor to the WEP movements in Q1 and Q2 2022. The r value of 0.63 in Q2 2022 showed that changes in the metered energy quantity could account for 62.74% of the changes in the WEP during the quarter. Meanwhile, the metered energy quantity in Q2 2022 had a greater influence on the WEP compared to Q2 2021. There were 42 more days in Q2 2022 with r greater than 0.5 compared with Q2 2021.

As shown in Chart 6, the fuel oil price climbed 23.62% from US\$541.11/MT in Q1 2022 to US\$668.93/MT in Q2 2022.² Given the unprecedented global energy crunch and the Russia-Ukraine conflict, this quarter marked the eighth consecutive increase in the fuel oil price, which was also the highest quarterly price since market start. Despite the record high fuel oil price, the WEP reduced 15.15% to \$297.27/MWh this quarter from \$350.34/MWh in Q1 2022 most likely due to energy offer prices submitted at lower price ranges by generation companies.

² Daily average of IFO180 settlement price published by SGX Exchange Limited ("SGX") – [SGX Platts Singapore Fuel Oil 180cst Index Futures](#).

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

Month/Quarter	Variation Between RTS and STS (\$/MWh)	Maximum Periodic Variation (\$/MWh)
April 2021	1.36	386.27
May 2021	0.15	527.18
June 2021	0.47	-139.39
January 2022	5.30	1,852.80
February 2022	-2.21	2,128.83
March 2022	3.48	-2,544.09
April 2022	28.47	2,965.39
May 2022	2.26	347.12
June 2022	-3.25	969.79
Q2 2021	0.66	527.18
Q1 2022	3.66	2,544.09
Q2 2022	11.33	2,965.39

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 forecast USEP produced in the STS in Q2 2021 largely mirrored the real-time USEP, at only \$0.66/MWh above the real-time USEP on average. This reflects the stable USEP in Q2 2021, with only 17 periods of USEP spike (USEP above \$400/MWh) observed, when compared to Q2 2022.

In Q2 2022, the average variation between the forecast USEP in the STS and the real-time USEP increased to \$11.33/MWh, which is \$7.66/MWh higher than the price variation observed in Q1 2022 and \$10.66/MWh higher than that in Q2 2021, implying a further reduced accuracy in the forecast. The price variation in Q2 2022 was due to the relatively high number of periods of USEP spikes (786 periods in Q2 2021 and 1,258 periods in Q1 2022). In addition, larger price variations were usually observed when the market experiences abrupt changes in demand or supply. April 2022 recorded the largest price variation in Q2 2022, which coincided with the month when the ease of COVID-19 safe management measures was announced. This may have led to changes in the electricity consumption behaviour in April 2022. Another possible reason could be the less stable gas supply observed in Q2 2022 – all days in Q2 2022 experienced gas curtailment that ranged from 1% to 15%. On the other hand, there was no gas curtailment in Q2 2021 and there were 70 out of 90 days without gas curtailment in Q1 2022. Generally, gas supply disruptions could result in reduced energy offer quantities submitted by generation companies and thus, lead to contracted supply cushion and unanticipated USEP spikes.

Demand and Supply in Q2 2022

Chart 7. Average Forecast and Actual Demand

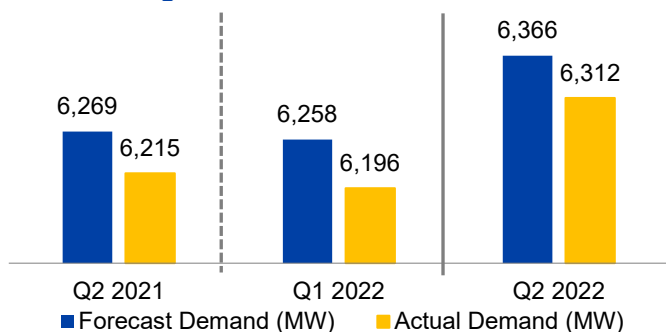
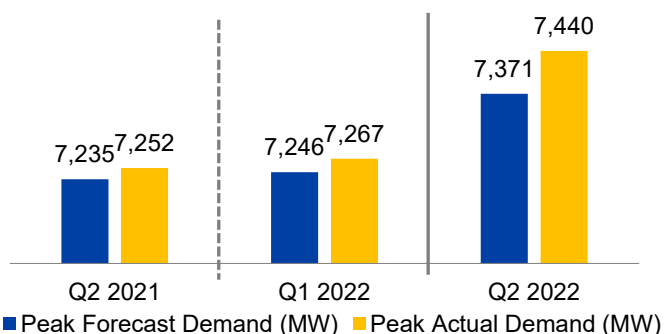


Chart 8. Peak Forecast and Actual Demand



Q2 2022 recorded the highest average forecast and actual demand levels since market start. The average forecast demand increased 1.72% from 6,258 MW in Q1 2022 to 6,366 MW in Q2 2022 (Chart 7). Similarly, the average actual demand increased 1.87%, from 6,196 MW in Q1 2022 to 6,312 MW in Q2 2022. Both the peak forecast and peak actual demand also increased in Q2 2022 by 1.73% and 2.38% respectively when compared to Q1 2022 (Chart 8).

The stronger demand in Q2 2022 was likely due to:

- resumption in social and economic activities following Singapore's transition from the Transition Phase to COVID-19 Resilience since 26 April 2022;³ and
- warmer weather conditions experienced in Q2 2022 – the average temperature in Singapore rose to 28.64°C from 28.36 °C in Q1 2022 as electricity consumption usually correlates positively to the temperature.

Table 3. Quarterly Average Supply and Supply Cushion⁴

Quarter	Q2 2021	Q1 2022	Q2 2022
Average Supply (MW)	8,028	7,666	7,676
Supply Cushion (%)	21.99	18.38	17.09

Table 3 shows the quarterly average supply increased 0.13% to 7,676 MW in Q2 2022 from 7,666 MW in Q1 2022. The increase in supply could be attributed to the behaviour of generation companies. The generation companies might have submitted more offer quantities into the system in response to the higher demand forecasts in Q2 2022, as shown in Chart 7.

Even though the supply grew in Q2 2022, the supply cushion still weakened 1.28 percentage points from 18.38% in Q1 2022 to 17.09% in Q2 2022 as demand growth outpaced the increment in supply. This quarter recorded the lowest average supply cushion since the market start.

³ Singapore entered the COVID-19 Resilience on 26 April where the safe management measures were further eased. <https://www.moh.gov.sg/covid-19-phase-advisory>

⁴ Table 3 has been revised based on current calculation methodology

Chart 9. Trend Of Energy Offer Price Proportion

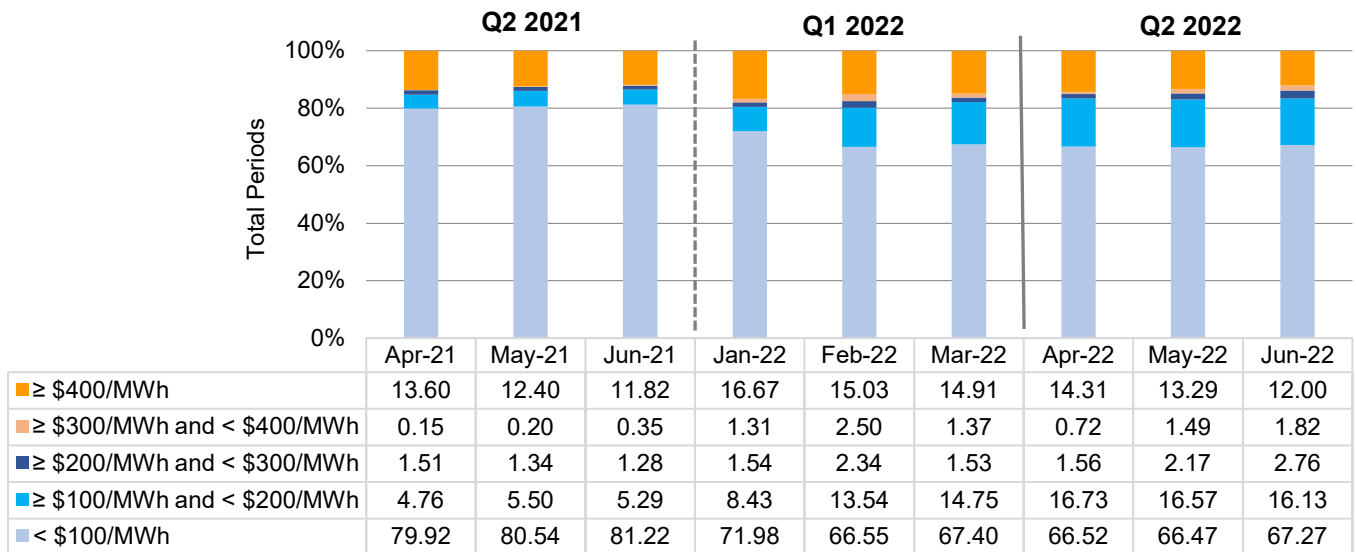


Chart 9 shows a reduction in the proportion of energy offers priced at or above \$400/MWh in Q2 2022 when compared to Q1 2022, as more proportion of energy offers priced at or above \$400/MWh have shifted to price tranches at or below \$400/MWh.⁵ Correspondingly, the proportion of energy offers at or above \$100/MWh and below \$200/MWh increased significantly in Q2 2022 when compared to Q1 2022. As a result, the monthly average WEP decreased from \$696.68/MWh in April to \$215.66/MWh in June 2022.

While the supply cushion contracted this quarter, 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. The measures that the Government has put in place to secure Singapore’s electricity supply, may have further influenced the energy offer price.

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

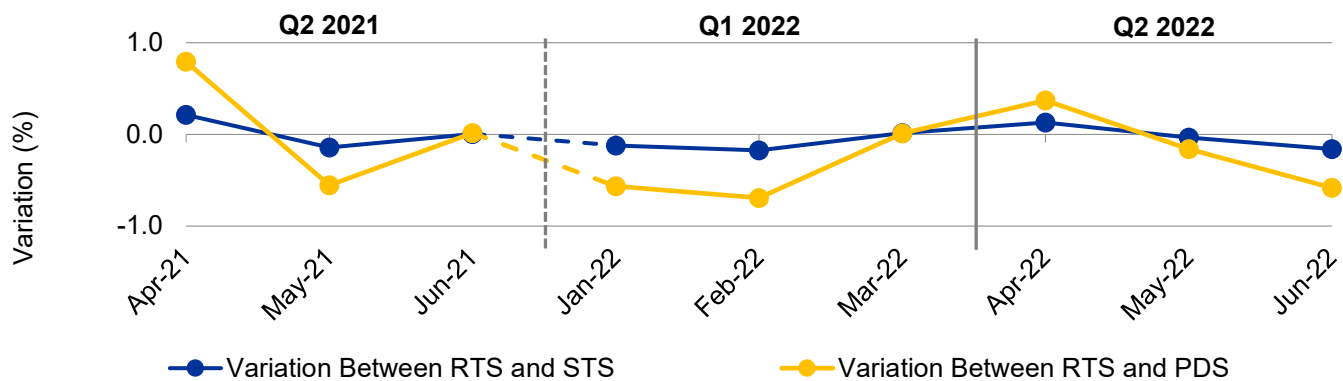
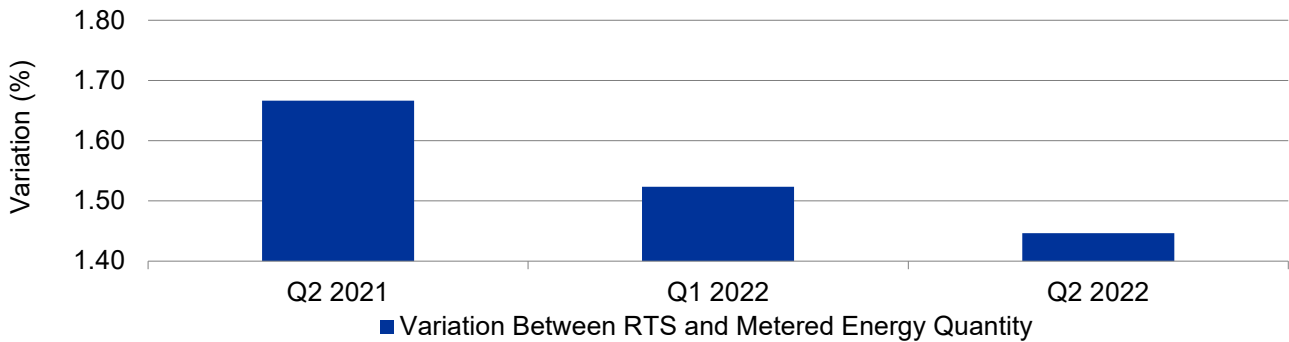


Chart 10 shows the variations in the pre-dispatch schedule (“PDS”) and short-term schedule (“STS”) against the real-time schedule (“RTS”). The variations between RTS and STS are usually slighter than variations between RTS and PDS because STS is generated more frequently and closer to the RTS.

The average load variations in Q2 2022 (0.11% for variation between RTS and STS and 0.37% for variation between RTS and PDS) were slightly lower than those registered in Q1 2022 (0.10% for variation between RTS and STS and 0.42% for variation between RTS and PDS). The lower load forecast variations in Q2 2022 could be attributed to the more consistent COVID-19 safe management measures that remained unchanged since 26 April 2022, as the electricity consumption is usually impacted by changes to the measures.

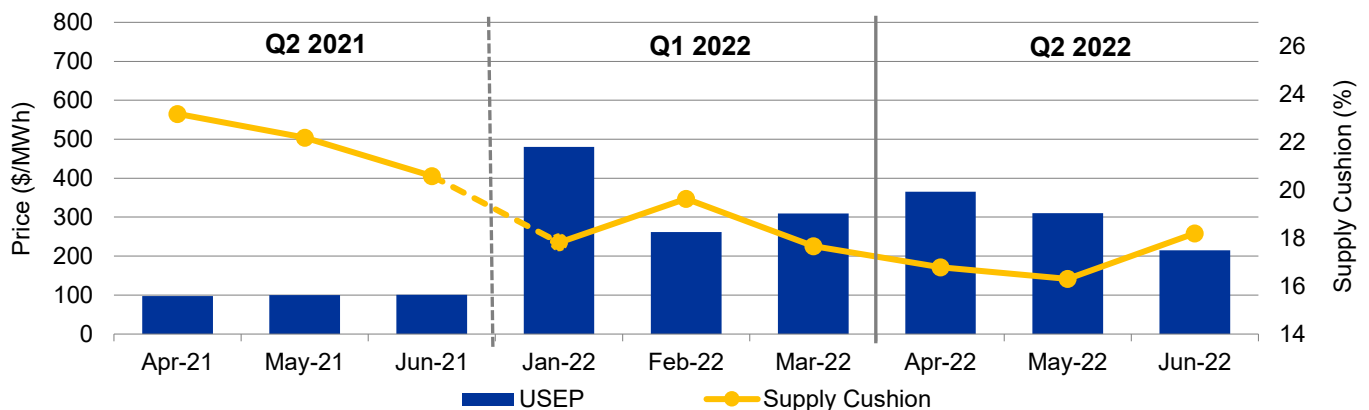
⁵ Note: Chart 9, 10 and 11 figures have been revised based on current calculation methodology

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



Q2 2022 outperformed Q1 2022 to record 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). A possible reason for the falling variation across the quarters is the progressive reduction in metering errors. The meter readings have become more accurate and reflective of the households’ actual electricity consumption as EMA has been working with the SP Group to install advanced meters across Singapore. Therefore, the RTS has shown higher accuracy than before.

Chart 12. USEP and Supply Cushion



On the monthly level, the supply cushion and the USEP moved in tandem from April to May 2022, which was counterintuitive (Chart 12). This suggests that there were factors besides changes in demand and supply fuelling the movements in the USEP during those months. A possible reason would be the decrease in fuel oil price from US\$696.68/MT in April to US\$668.84/MT in May, which may have led to a slight decline in the USEP from April to May.

Meanwhile, the supply cushion and USEP moved in opposite directions from May to June 2022. When the supply cushion increased to 18.19% in June from 16.30% in May, the USEP decreased 30.59% from \$310.20/MWh in May to \$215.30/MWh in June. This is in line with our understanding that the supply cushion is inversely correlated with the USEP. In addition, the fuel oil price fell from US\$668.84/MT in May to US\$641.26/MT in June, which may have further contributed to the lower USEP observed in June 2022.

Chart 13. Capacity Ratio by Generation Type

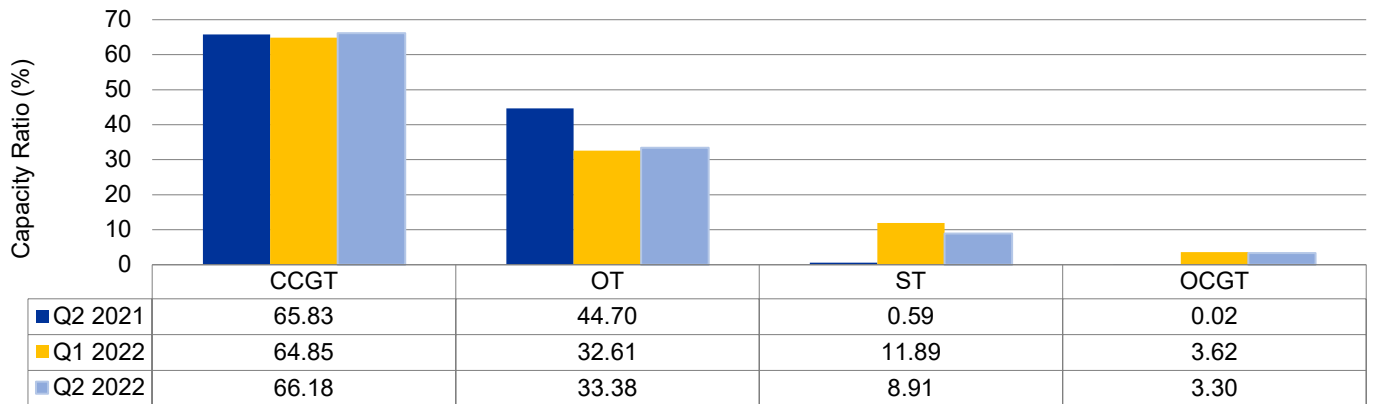


Chart 13 shows the quarterly average capacity ratios of the four generation types in the NEMS. Besides other units (“OT”) and steam turbine (“ST”), the movements in the capacity ratios were in line with the higher demand in Q2 2022 (refer to Chart 7), as the increased demand for electricity called for higher utilisation from the main generation types.

Compared to Q1 2022, the capacity ratio of combined cycle gas turbine (“CCGT”) increased 1.33 percentage points to 66.18% in Q2 2022, and the capacity ratio of OT increased 0.77 percentage points to 33.38% in Q2 2022. On the other hand, the capacity ratios of ST and open cycle gas turbine (“OCGT”) units decreased by 2.98 and 0.32 percentage points respectively.

The higher capacity ratios of CCGT and OT units could be attributed to the directions from EMA for the generation companies to generate electricity using gas from the SLF and the generation companies’ own fuel. The slightly lower capacity ratio of OCGT units observed was in line with the lower USEP levels in Q2 2022, as OCGT units tend to have energy offers in the higher price tranches, and the lower USEP levels in Q2 2022 could have discouraged OCGT to increase their offer quantities.

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

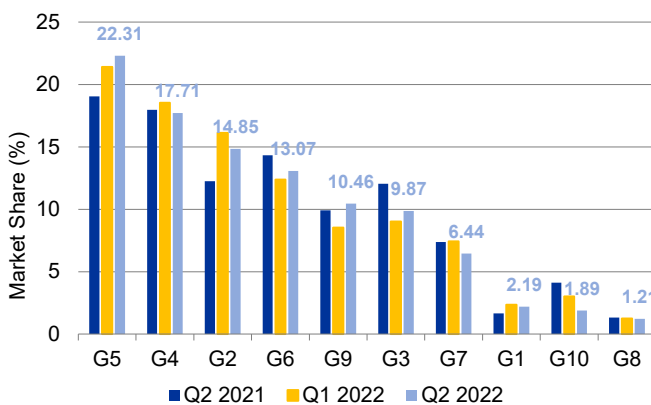
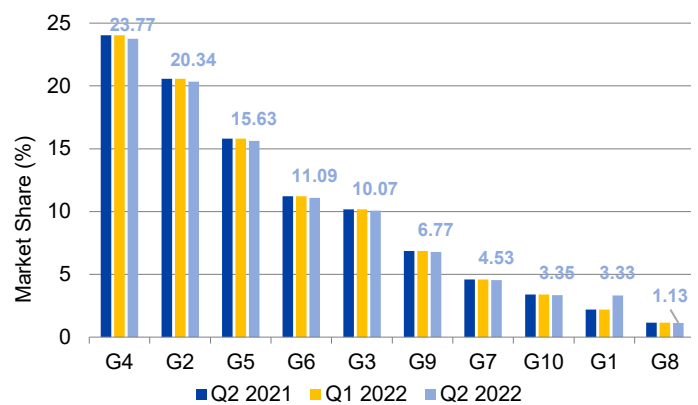


Chart 15. Market Share in Percentage of Generation Companies Based on Maximum Generation Capacity



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. ⁶

Chart 14 shows that G5, G4, and G2 are the three largest generation companies based on the metered energy quantity. The three generation companies held 54.87% of the total market share in Q2 2022, a decrease from 56.05% in Q1 2022 and an increase from 49.24% in Q2 2021. While the top six generation companies with the largest market shares remained unchanged, G9 recorded the greatest increase of 1.94 percentage points, and G10’s market share shrunk the most with a reduction of 1.26 percentage points.

⁶ Registered maximum capacity and metered energy quantity exclude battery, intermittent generation and electricity imports.

As shown in Chart 15, the distribution of market share based on generation capacity was still above 50% – the big three generation companies held 59.73% of the total market share in Q2 2022, maintaining the same percentage as of Q1 2022. There are no new generation companies registering new generation facilities in the Singapore Wholesale Electricity Market for this quarter and thus, there is no significant change to the maximum generation capacity.

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

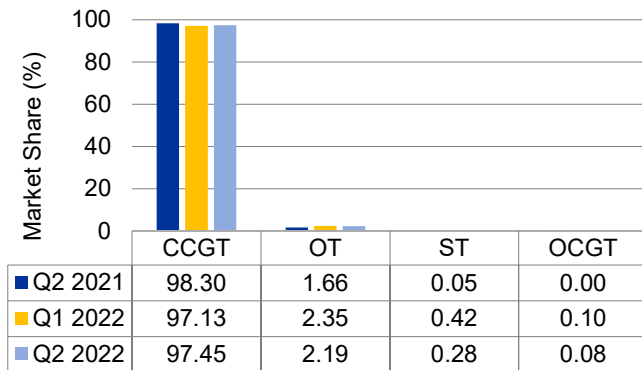
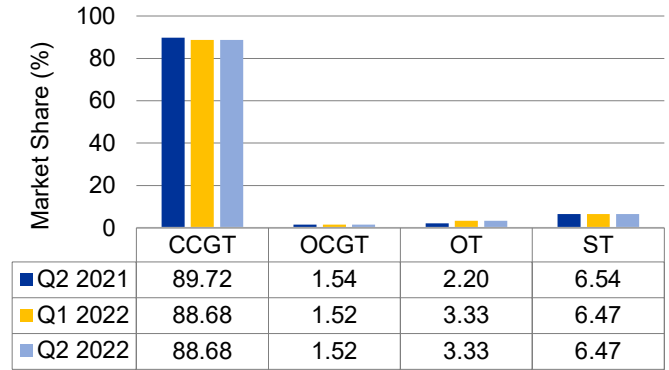


Chart 17. Market Share in Percentage of Generation Types Based on Maximum Generation Capacity



As the NEMS moved towards the most efficient generation technology type, the generation of CCGT units has been dominating the market and staying above the 97.00% mark since 2016.

As seen in Chart 16, the CCGT market share had a small increase of 0.32 percentage points from 97.13% in Q1 2022 to 97.45% in Q2 2022, based on the metered energy quantity. This could be attributed to the measures that the Government has put in place as the EMA is able to direct the generation companies to generate electricity using gas from the SLF, if they foresee potential shortages.

The market share distribution based on maximum generation capacity remains unchanged in Q2 2022 (Chart 17) as there was no entry of new generation facilities in the NEMS this quarter.

Chart 18. Frequency of Generation Companies as Single Pivotal Suppliers

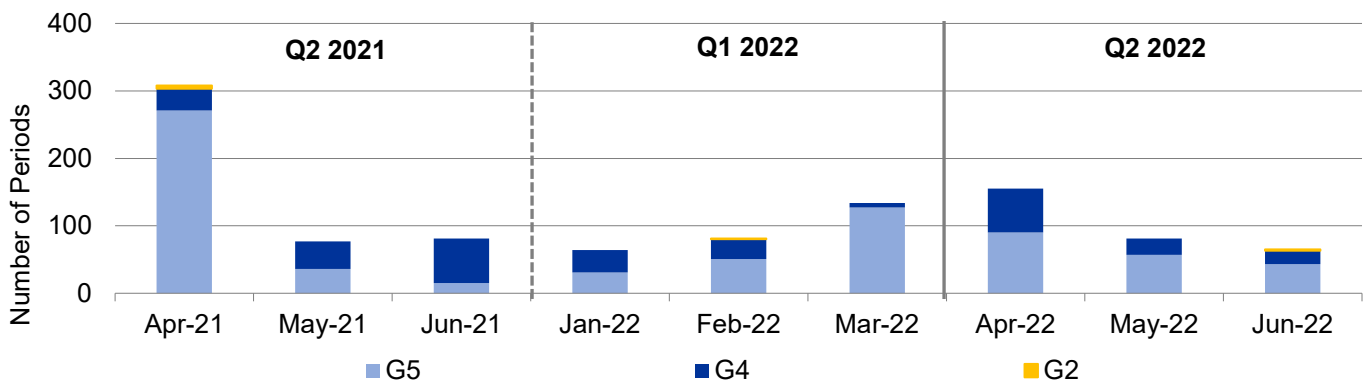
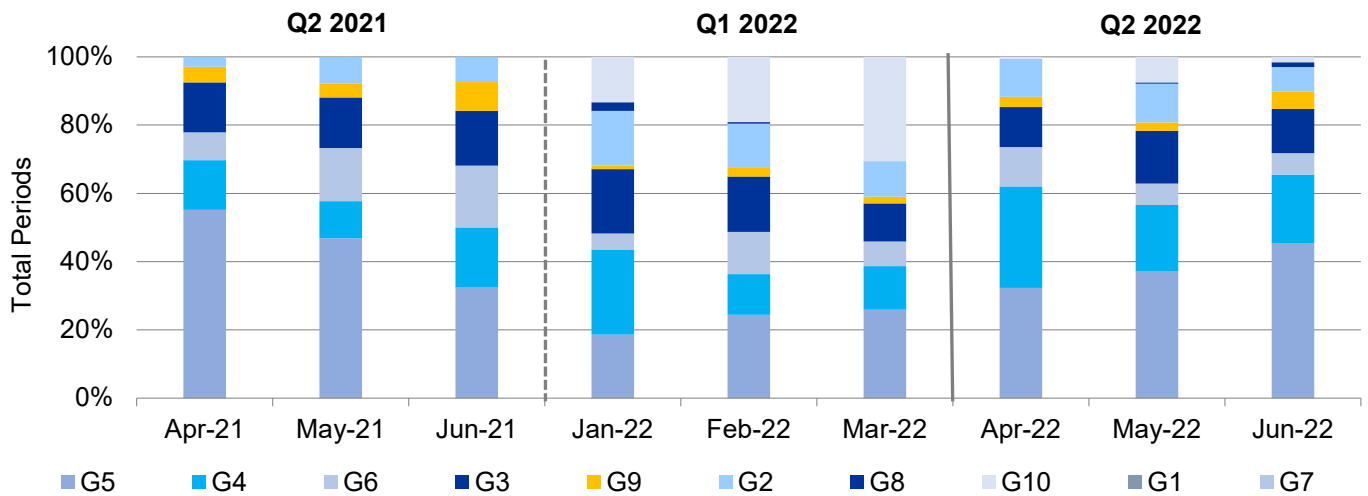


Chart 18 shows the number of trading periods with a single pivotal supplier in the NEMS for each month in the three quarters under review. A single pivotal supplier was present in 6.89% of the total number of periods in Q2 2022, 0.43% higher and 3.78% lower than in Q1 2022 and Q2 2021 respectively. G5 remained the main single pivotal supplier in the market in Q2 2022 where it occupied 190 out of 301 single pivotal supplier periods in Q2 2022. There was a total of 4,368 dispatch periods in Q2 2022.

Chart 19. Trend of Price Setting Generation Companies



A price setter could potentially influence the market clearing price and chart 19 shows the monthly breakdown of price-setting generation companies in Q2 2022, Q1 2022, and Q2 2021. G5 remained the main price-setting generation company in the market in Q2 2022, Q1 2022 and Q2 2021, with price-setting frequency at 38.32% in Q2 2022, an increase from 23.01% in Q1 2022. G4 replaced G10 to be the generation company with the second-highest price-setting frequency at 22.91% in Q2 2022 from 16.29% in Q1 2022 as G10 was under planned maintenance more frequently and could not be offered to the market.

Chart 20. Demand Response Activations

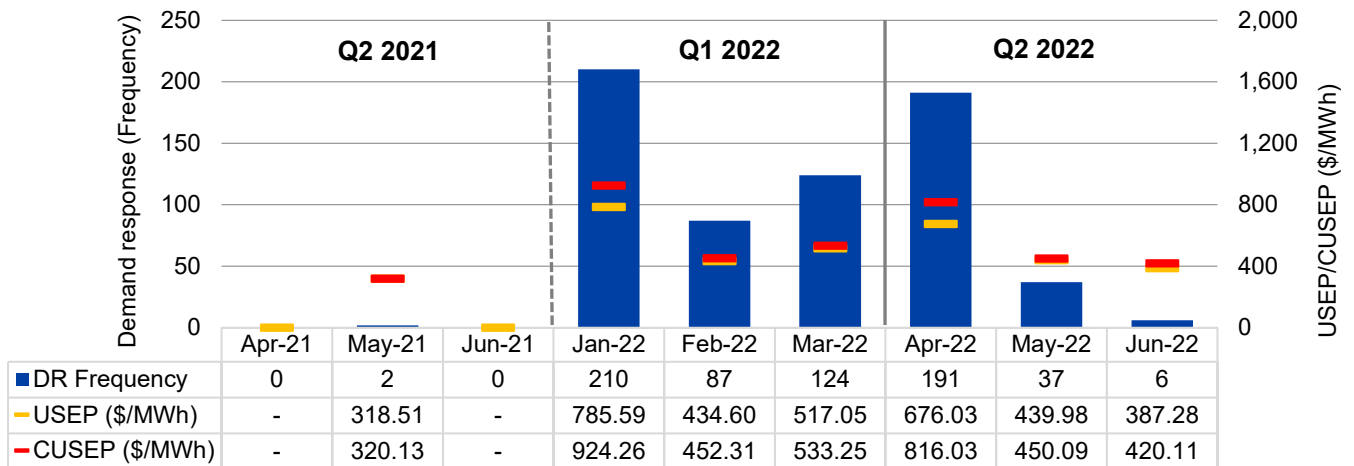


Chart 20 lists the Demand Response (“DR”) activations in the three quarters under review, and the associated USEP and counterfactual USEP (“CUSEP”) during those periods with DR activations. The daily average USEP for periods with DR activation in Q2 2022 was \$631.30/MWh, while the average CUSEP was \$748.02/MWh without DR curtailment.

There were 234 DR activations in Q2 2022, which was lower than the cumulative total of 421 occurrences recorded from the DR activations in Q1 2022. The number of DR activation is usually reflective of the number of USEP spike and there was more USEP spike in Q1 2022 compared to Q2 2022 (1258 USEP spikes in Q1 2022 and 786 USEP spikes in Q2 2022). Apart from the number of periods of USEP spike, the reduced number of DR activations coincided with fewer periods of the contingency reserve and regulation shortfalls this quarter, which could be attributed to the measures that the Government has put in place to secure Singapore’s electricity supply.

Compliance Statistics for Q2 2022



Potential Breaches of the Market Rules



Determinations*



Enforcement

116 cases in total

0 self-report
116 referrals/complaints
0 MSCP initiative

112 determinations in total

3 cases determined to be in breach
0 cases determined to take no further action
109 cases determined not to be in breach
0 cases determined to be event of default

3 cases in total

3 financial penalty
0 non-compliance letters
0 suspension order
0 termination order
0 other MSCP order
\$16,000 of financial penalty imposed
\$4,000 of costs awarded

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

The MSCP issued two rule breach determinations in Q2 2022 to:

- i. 2 cases from Tuas Power Generation Pte. Ltd. regarding failure to comply with gate closure rules on 16 February 2022 (Financial penalty \$14,000, \$2,000 costs)
- ii. 1 case from Shell Eastern Petroleum (Pte) Ltd regarding failure to comply with gate closure rules on 16 June 2022 (Financial penalty \$4,000, \$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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