

Market Surveillance & Compliance Panel Market Watch

Issue 69

Third Quarter (July to September 2023)

Executive Summary

The energy prices in the National Electricity Market of Singapore (“NEMS”) declined after three consecutive quarters of growth, despite an increase in the fuel oil price and a tighter supply cushion. The lower energy price was primarily attributed to the weaker demand resulting from the lower temperature recorded in Q3 2023 and an increase in the energy offers in the lower price tranches.

As part of the initiatives to strengthen Singapore's energy market, the Energy Market Authority (EMA) introduced the Temporary Price Cap (TPC) mechanism on 1 July 2023 as a short-term measure to mitigate extreme price volatility and risk aversion in the Singapore Wholesale Electricity Market (“SWEM”). The TPC was designed to activate only during periods of high and sustained volatility in energy prices.

Chart 1. USEP and WEP by Quarter

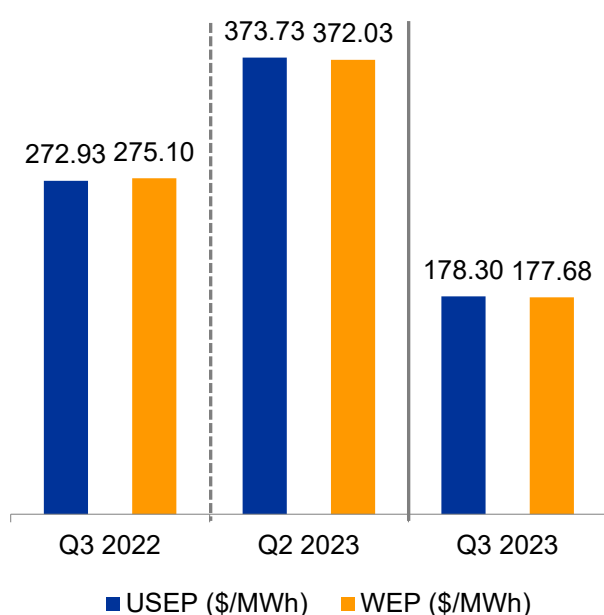


Table 1. Quarterly Outage Volume and Ancillary Service Prices

Quarter	Q3 2022	Q2 2023	Q3 2023
Total Outage Volume (MWh Cumulative)			
Planned Outage	4,594,616	4,490,522	5,238,376
Forced Outage	168,281	130,396	66,530
Ancillary Services (\$/MWh)			
Primary Reserve	1.97	0.38	1.00
Contingency Reserve	40.43	19.18	15.74
Regulation	51.76	51.57	34.47

The Uniform Singapore Energy Price (“USEP”) and the Wholesale Electricity Price (“WEP”) decreased by 52.29% to \$178.30/MWh and 52.24% to \$177.68/MWh respectively on a quarter-to-quarter comparison. This reduction is largely attributed to a decrease in the average demand level that dropped by 1.59% from 6,470 MW to 6,367 MW this quarter and a shift in the energy offers to lower price tranches. The total planned and unplanned outage volume increased by 16.65% this quarter and consequently, the average quarterly supply level reduced by 2.38% as compared to the last quarter. As the reduction in the supply outpaced the decrease in the demand, the supply cushion fell 0.7 percentage points to 11.02% this quarter.

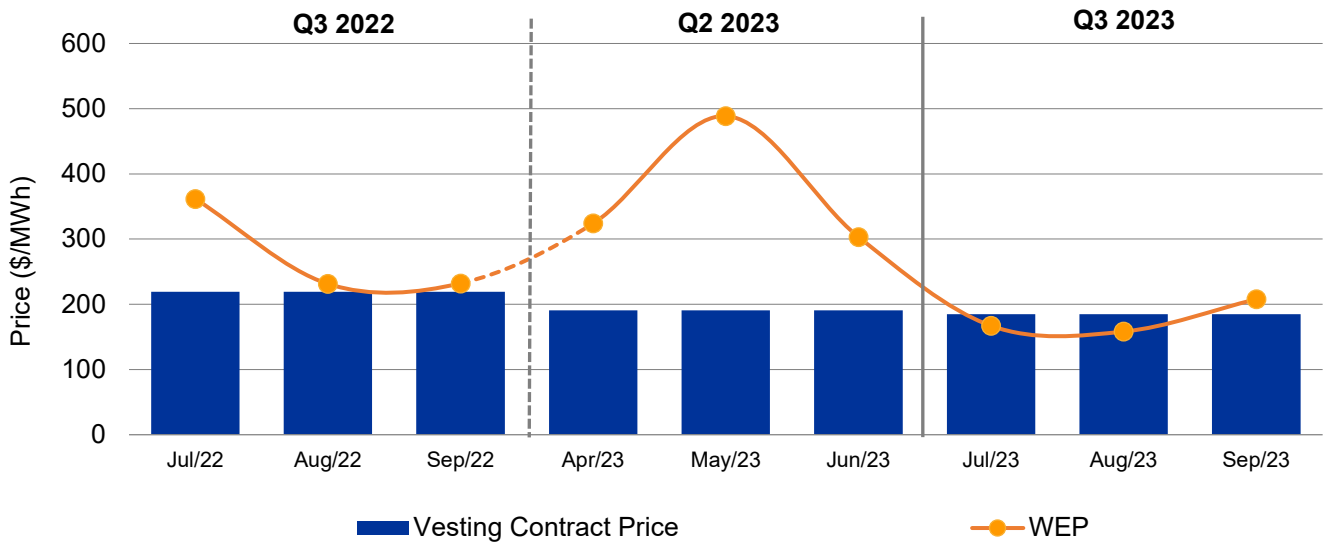
Since the introduction of TPC, it was observed that there were 3 instances of TPC activation on 5 July, 14 August, and 19 September 2023 and the activations lasted for 48, 48 and 61 periods respectively. As the TPC activation capped the USEP at the moving average price threshold¹, this could likely be one of the contributing factors to the reduction in the USEP observed this quarter.

The prices of ancillary services were mixed across the board. The price of the contingency reserve decreased by 17.93% to \$15.74/MWh, in line with the decrease in requirement by 1.40% to 396 MW. Likewise, the regulation price decreased by 33.16% to \$34.47/MWh in line with the lower USEP observed this quarter. On the other hand, the price of the primary reserve increased 162.62% to \$1.00/MWh this quarter, mainly driven by the high prices recorded in September 2023 due to tighter supply conditions and the increase in primary reserve requirement during the month.

¹ <https://www.ema.gov.sg/resources/statistics/data-for-the-temporary-price-cap-mechanism>

Prices in Q3 2023

Chart 2. Vesting Contract Price Versus WEP by Quarter

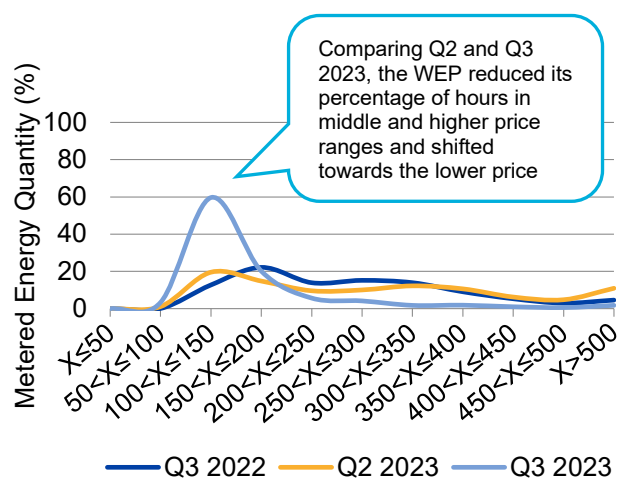
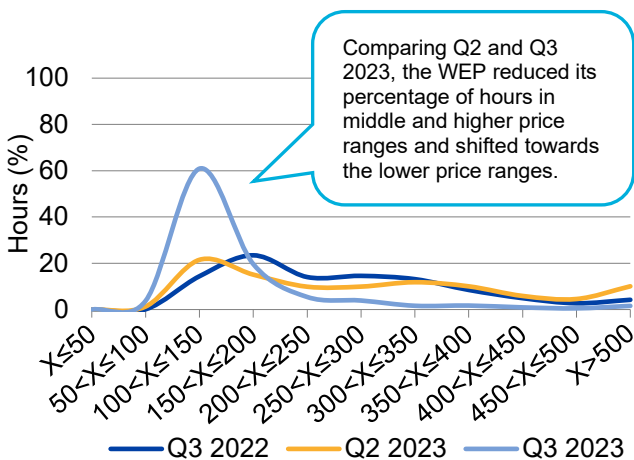


In Q3 2023, the WEP decreased by 52.24% from \$372.03/MWh in Q2 2023 to \$177.68/MWh. The difference between the vesting contract price and the WEP narrowed this quarter and marked the first quarter since Q4 2021 with average WEP levels below the vesting contract price. The objective of the vesting contract is to curb the market power of the generation companies and provide a cushion to the consumers in the event of higher prices. The narrowing difference between the vesting contract price and the WEP implies that the energy prices are gradually stabilising and are in line with EMA’s objective.

The WEP cleared 4.06% lower than the Q3 2023 vesting contract price as compared to the 48.79% increase recorded in Q2 2023. In contrast, the vesting contract price decreased by 2.95% from \$190.53/MWh in Q2 2023 to \$184.90/MWh in Q3 2023 despite the increase in fuel oil price this quarter.

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 across different price ranges, measured as a percentage of the total number of hours and a percentage of the total metered energy quantity for Q3 2023, compared to the previous quarter and the same quarter for the previous year.

As shown in Chart 3, the distribution of the WEP over time moved to the lower price ranges in Q3 2023 when compared to Q2 2023. The frequencies of WEP in the price range of \$100/MWh to \$150/MWh increased to 60.89 percentage points as compared to 21.50 percentage points in Q2 2023. The WEP was equal to or lower than \$100/MWh for 3.78% of the time, as opposed to 1.30% in Q2 2023. Compared to last year, it is noteworthy that 14.40 % of the time, the WEP was in the price range of \$100/MWh to \$150/MWh in Q3 2022, which is a reduction from 60.89% in Q3 2022. This was due to more energy offers moved to lower price tranches during July, August, and September 2023.

As shown in Chart 4, the distribution of the WEP in terms of percentage metered energy quantity in the market showed a similar change to its distribution based on the percentage number of hours. This suggests that the demand has maintained a consistent level throughout the day with low fluctuations on exceptional days. The WEP was in the lower price range for most of the metered energy quantity in Q3 2023, when compared to Q2 2023 and Q3 2022.

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

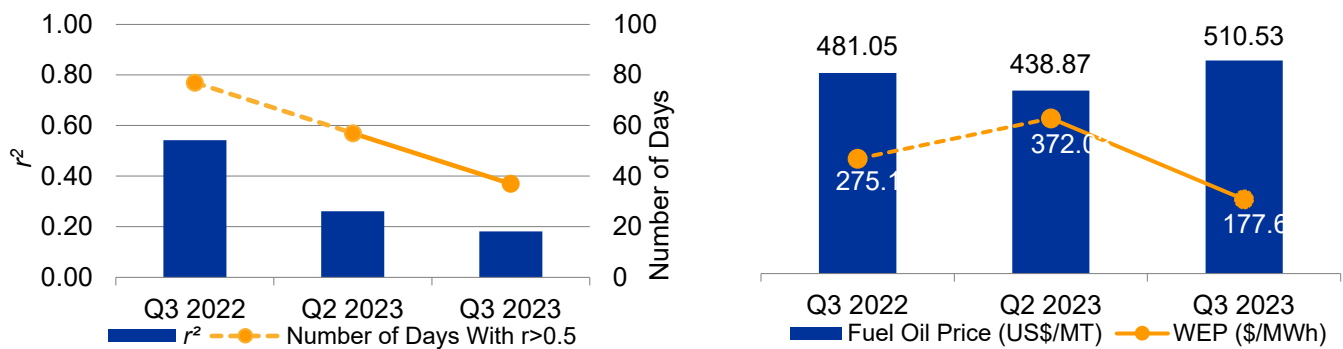


Chart 5 shows the proportion of variance in the WEP which could be explained by changes in the metered energy quantity measured by r^2 . It was observed that the correlation between the metered energy quantity and the WEP weakened with a lower r^2 at 0.18 obtained in Q3 2023 compared to 0.26 in Q2 2023, indicating that the metered energy quantity had a lesser impact on the WEP movements.

Correspondingly, there were 37 out of 92 days in Q3 2023 where r was greater than 0.5 compared to 57 out of 91 days in Q2 2023. This implies that the metered energy quantity and the WEP had a strong positive correlation over a limited time in Q3 2023 than in Q2 2023.

As shown in Chart 6, the fuel oil price rose by 16.33% from US\$438.87/MT in Q2 2023 to US\$510.53/MT in Q3 2023. Similarly, when compared to the previous year, an increase of 6.13% from US\$481.05/MT was observed in Q3 2022. Despite the higher fuel oil price, the WEP reduced 52.24% to \$177.68/MWh this quarter from \$372.03/MWh in Q2 2023 most likely due to energy offer prices submitted at lower price ranges by generation companies and the activations of the TPC.

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

Month/Quarter	Variation Between RTS and STS (\$/MWh)	Maximum Periodic Variation (\$/MWh)
Jul-22	1.14	3,638.24
Aug-22	4.79	4,005.47
Sep-22	-2.45	477.89
Apr-23	5.19	3,187.11
May-23	14.65	1,899.24
Jun-23	9.28	4,107.30
Jul-23	-0.86	3,269.05
Aug-23	0.56	4,067.58
Sep-23	-11.08	4,500.00
Q2 2022	2.79	4,005.47
Q1 2023	9.71	4,107.30
Q2 2023	4.17	4,067.58

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”), along 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 \$4.17/MWh in Q3 2023, which is \$5.54/MWh lower than the price variation observed in Q2 2023 at \$9.71/MWh but \$1.3.7/MWh higher than that in Q3 2022. The lower price variation implies a more accurate price forecast as compared to Q2 2023 this was likely due to a lower number of periods of USEP spikes (137 periods in Q3 2023 and 916 periods in Q2 2023).

Demand and Supply in Q3 2023

Chart 7. Average Forecast and Actual Demand Versus Average Temperature

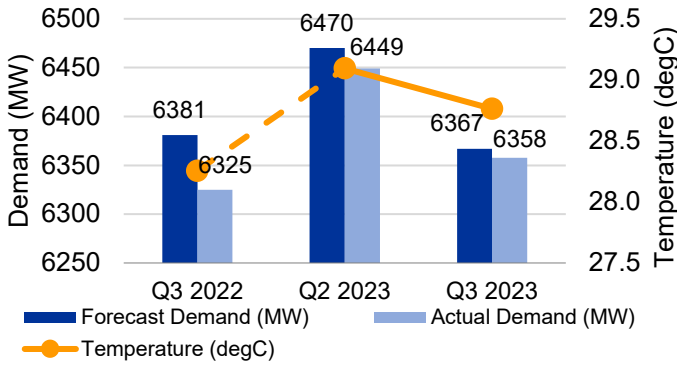


Chart 8. Peak Forecast and Actual Demand

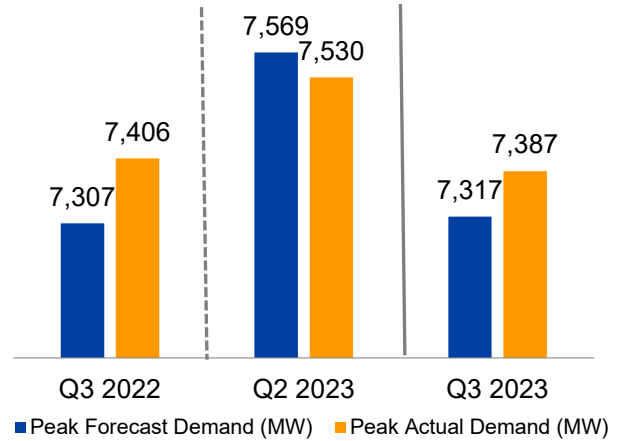
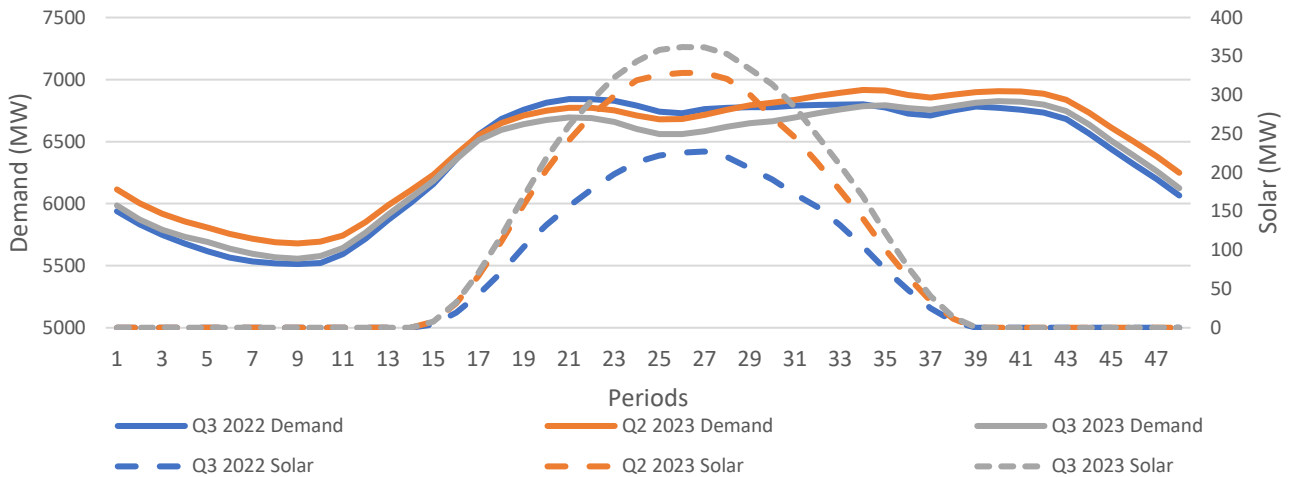


Chart 7 illustrates the relationship between the average actual and forecast demand against the average temperature. The average forecast and actual demand in Q3 2023 decreased by 1.59% from 6,470 MW to 6,367 MW and by 1.42% from 6,449 MW to 6,358 MW respectively from Q2 2023. Similarly, both the peak forecast and peak actual demand reduced in Q3 2023 by 3.33% and 1.91% respectively when compared to Q2 2023 (Chart 8). The lower demand in Q3 2023 was likely driven by the cooler weather conditions experienced as the average temperature in Singapore dropped from 29.10 °C in Q2 2023 to 28.80°C coupled with higher solar generation in the quarter.

Chart 9. Average Demand and Solar Generation periodic profiles



Comparing the demand profile in Q3 2023 to those in Q2 2023 and Q3 2022 (Chart 9), the peak demand levels shifted to the later part of the day. Given that the Singapore demand profile has considered solar generation, it was observed that there was a dip in the demand levels at around period 25 for all three quarters, in line with the peak solar generation profiles.

Table 3. Quarterly Average Supply and Supply Cushion

Quarter	Q2 2022	Q2 2023	Q3 2023
Average Supply (MW)	7,217	7,326	7,151
Supply Cushion (%)	11.67	11.77	11.02

Table 3 shows a reduction in the quarterly average supply in Q3 2023 by 2.38% to 7,151 MW from 7,326 MW in Q2 2023 and 0.92% from 7,217 MW in Q3 2022. The lower supply availability could be attributed to the lower demand forecast and higher planned and unplanned outage volume. As observed in Table 1, the planned and unplanned outage volume in Q3 2023 increased by 16.65% and 14.01% from Q2 2023 and Q3 2022 respectively. With a smaller decrease in demand and a larger reduction in supply, with the corresponding supply cushion declining by 0.75 percentage points from 11.77% in Q2 2023 to 11.02% in Q3 2023.

Chart 10. Trend Of Energy Offer Price Proportion

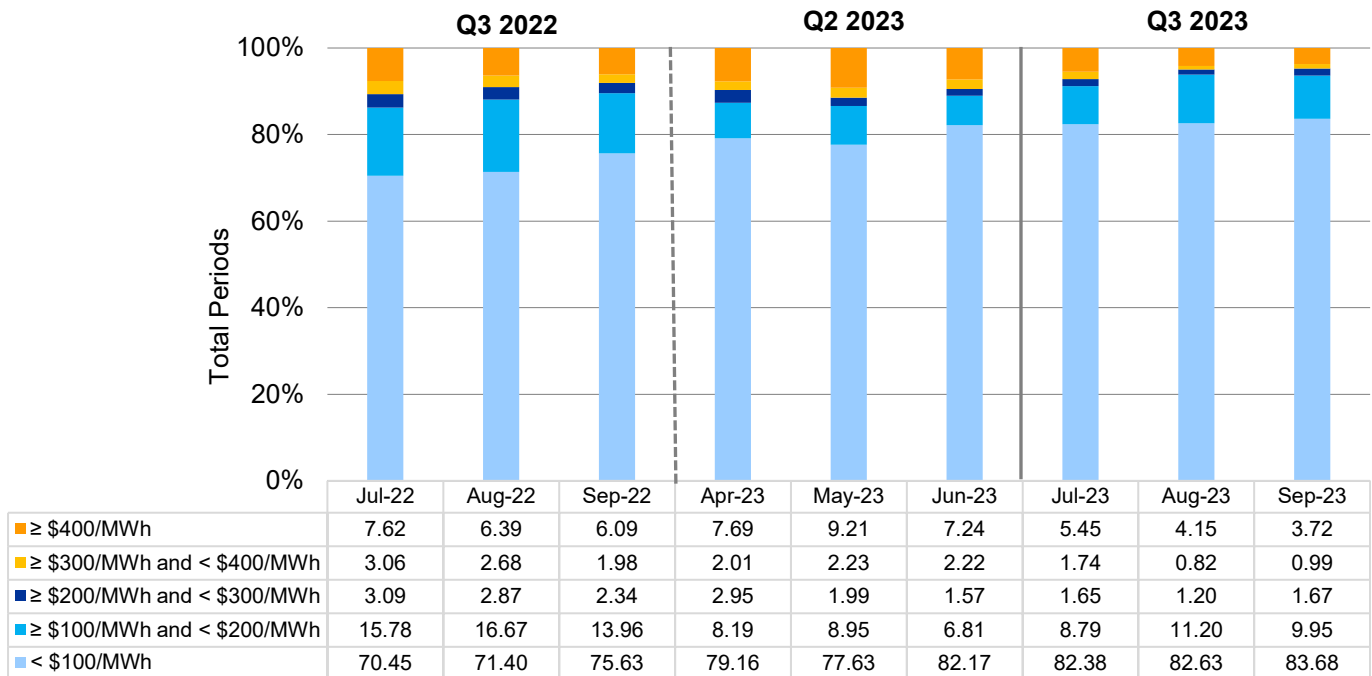


Chart 10 shows a reduction in the proportion of energy offers priced at or above \$200/MWh in Q3 2023 when compared to Q2 2023, as more proportion of energy offers priced at or above \$200/MWh have shifted to price tranches below \$200/MWh. Correspondingly, the proportion of energy offers below \$100/MWh increased significantly in Q3 2023 as compared to Q2 2023.

The proportion of energy offers below \$100/MWh increased from 79.65% in the last quarter to 82.90% this quarter, as a result, the monthly average WEP decreased from \$372.03/MWh in Q2 2023 to \$177.68/MWh in Q3 2023. 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.

Chart 11. Monthly Average Variation Between Real-Time Dispatch Schedule and Forecast Load

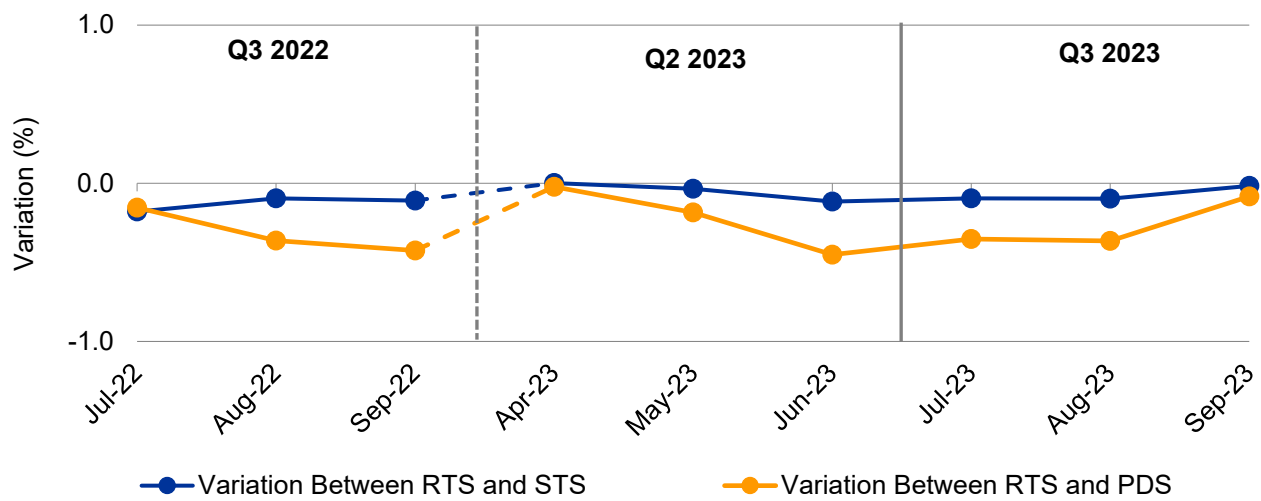


Chart 11 shows the variations in the pre-dispatch schedule (“PDS”) and short-term schedule (“STS”) against the real-time schedule (“RTS”). In Q3 2023, the average monthly variations remained relatively small, and it was observed that both the variations in the PDS and the STS were negatively correlated to the RTS. This indicated that the real-time dispatch schedule recorded a lower than forecasted schedule. The average load variation in Q3 2023 was 0.07 percentage points for variation between the RTS and the STS as compared to 0.05 percentage points in Q2 2023. The percentage points for variation between the RTS and the PDS was 0.27 for Q3 2023 which was higher than those registered in Q2 2023 at 0.22 percentage points. The variations between the RTS and the STS reduced in comparison to the variations between the RTS and the PDS, indicating a more accurate load forecasting nearer to real-time as the STS is generated more frequently and closer to the RTS.

The forecasted schedule was slightly over-forecasted as both the variations in the PDS and the STS were largely negatively correlated to the RTS. This could be attributed to the variations in the temperature from July to September 2023 – with the average temperature in July at 28.55°C, rising to 28.84°C in August, and a slight increase to 28.90°C in September.

Chart 12. Quarterly Average Variation Between Real-Time Dispatch Schedule and Metered Energy Quantity

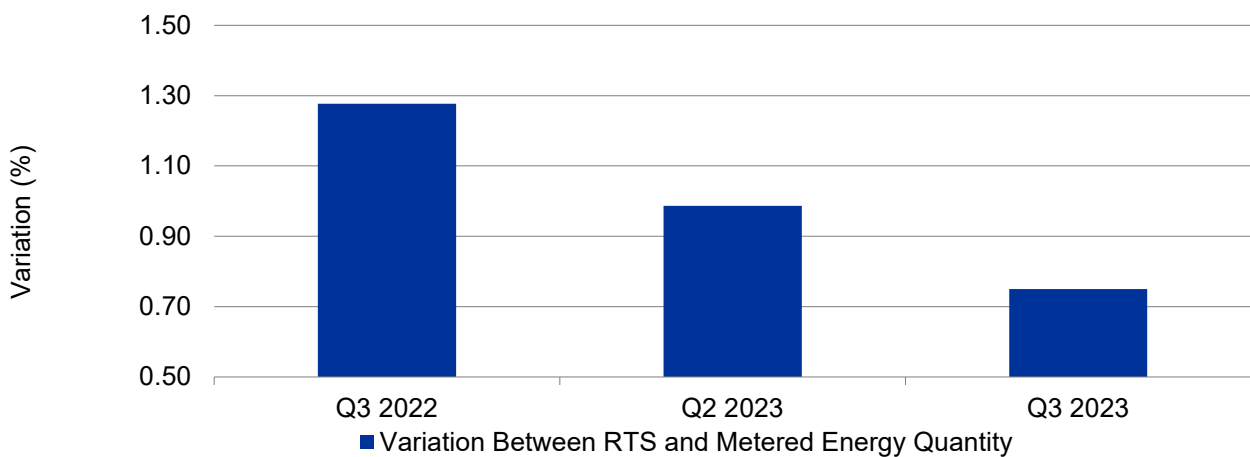
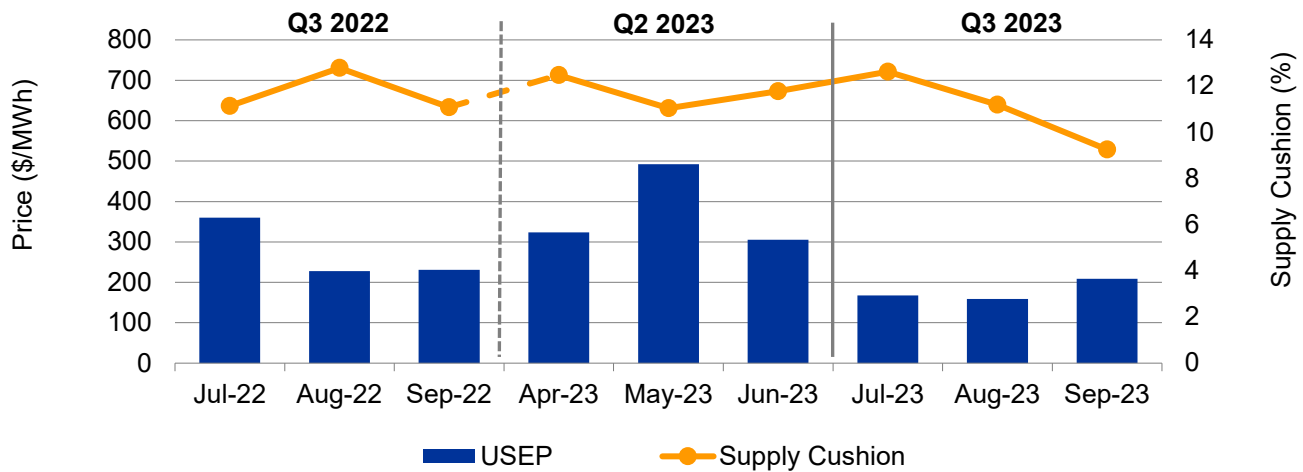


Chart 12 shows that Q3 2023 outperformed Q2 2023 and recorded a smaller variation in the quarterly average load variation between the RTS and the metered energy quantity. The average monthly load variation between the RTS and the metered energy quantity reduced from 0.99% in Q2 2023 to 0.75% in Q3 2023. The reduction implied a continual improvement of load forecast accuracy in comparison to Q2 2023 and Q3 2022.

Chart 13. USEP and Supply Cushion



In Q3 2023, the supply cushion averaged 11.02% compared to 11.77% in Q2 2023. It was observed that both the USEP and the supply cushion reduced this quarter, which was counterintuitive.

On the monthly level, a similar inverse correlation was observed for July and August 2023, where the higher supply cushion correlates with a lower USEP and vice versa. The highest monthly average USEP for the quarter was recorded in September 2023 at \$208.59/MWh, corresponding to the lowest monthly average supply cushion level of 9.25%. This could be attributed to the higher temperature observed in September 2023.

Despite the tighter supply cushion this quarter, the USEP reduced 52.29% to \$178.30/MWh in Q3 2023 as compared to \$373.73/MWh in Q2 2023. This could be attributed to a shift of energy offers to the lower price ranges and a lower average demand which fell from 6,377 MW in Q2 2023 to 6,367 MW in Q3 2023, which could have further driven the reduction in the USEP.

Chart 14. Capacity Ratio by Generation Type

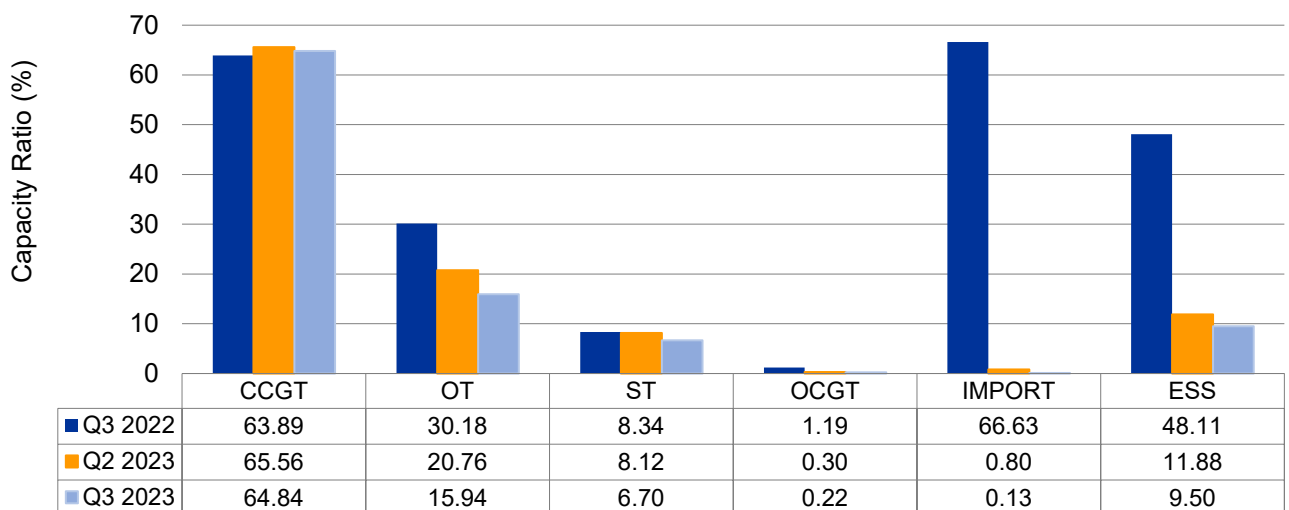


Chart 14 shows the quarterly average capacity ratios of the six generation types in the NEMS which comprise Combined-Cycle Gas Turbine (“CCGT”), Others (“OT”), Steam Turbine (“ST”), Open-Cycle Gas Turbine (“OCGT”), imports (“IMPORT”), and Energy Storage System (“ESS”).

Compared to Q3 2023, the capacity ratios reduced across all generation types. CCGT, OT, ST, OCGT, IMPORT, and ESS decreased by 0.72, 4.82, 1.42, 0.08, 0.67, and 2.38 percentage points respectively. The reduction in capacity ratio of all six generation types are in line with the lower demand and the lower plant availability given the higher planned and unplanned outage volume as indicated in Table 1.

Chart 15. Market Share in Percentage of Generation Companies Based on Metered Energy Quantity²

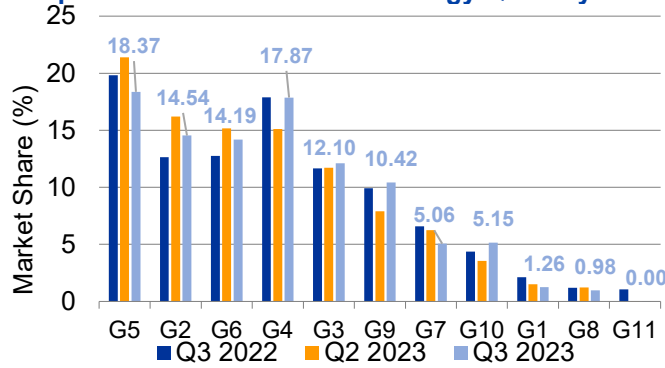
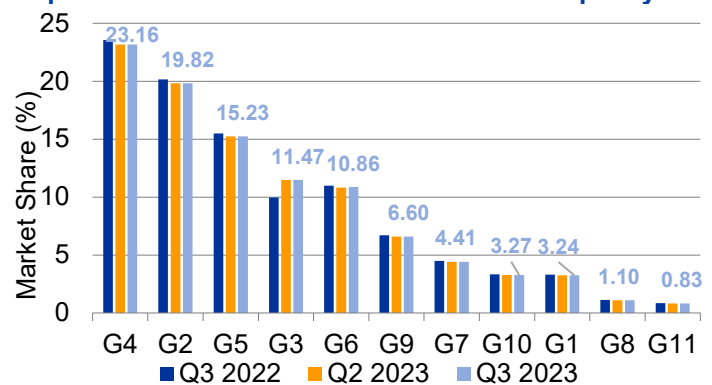


Chart 16. Market Share in Percentage of Generation Companies Based on Maximum Generation Capacity³



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.

As shown in Chart 15, G2 and G4 are the top three largest generation companies based on the metered energy quantity with G4 surpassing G6 when compared to the previous quarter. The generation companies that are in the top three positions held 50.78% of the total market share in Q3 2023, a reduction from 52.74% in Q2 2023 and an increase of 0.31 percentage points from 50.47% in Q3 2022. G4 recorded the greatest increase of 2.77 percentage points, while G5’s market share shrunk the most with a reduction of 3.03 percentage points.

As shown in Chart 16, the distribution of market share based on generation capacity was still above 50% – the big three generation companies held 58.22% of the total market share in Q3 2023, a slight reduction from 58.25% in Q2 2023. The market share of G6 had a reduction of 0.04 percentage points from 10.82% in Q2 2023 to 10.86% in Q3 2023 due to a slight increase in the registered capacity for an existing facility. There were no new generation facilities registered this quarter.

Chart 17. Market Share in Percentage of Generation Types Based on Metered Energy Quantity⁴

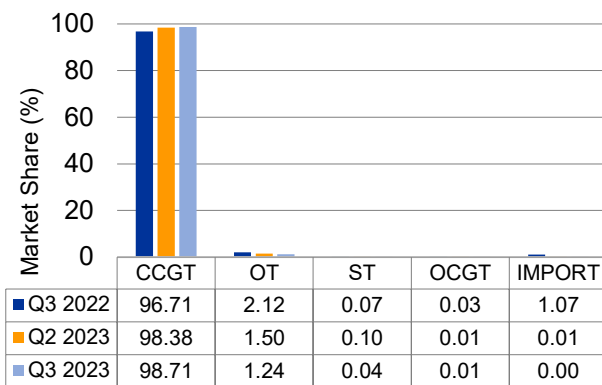
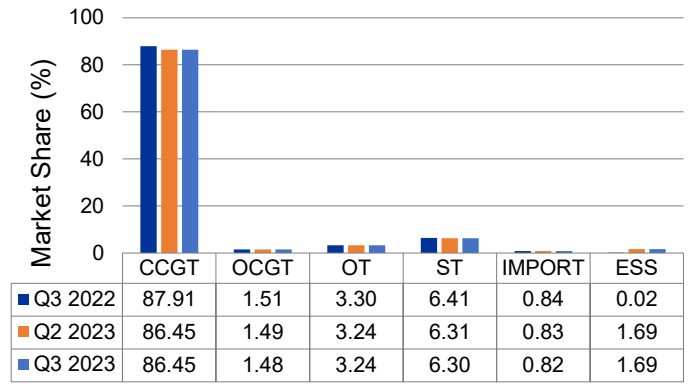


Chart 18. Market Share in Percentage of Generation Types Based on Maximum Generation Capacity



Most of the generation in the NEMS is produced by CCGT units (98.71% of the metered energy quantity in Q3 2023 as shown in Chart 17), as the market moves towards the most efficient generation technology (86.45% of the total maximum generation capacity in Q3 2023 as shown in Chart 18).

As shown in Chart 17, the market share of CCGT for metered energy quantity increased 0.34 percentage points from 98.38% in Q2 2023 to 98.71% in Q3 2023. This could be attributed to a decrease in the proportion of the market share for the rest of the generation types. The market share of OCGT, ST and IMPORT for total maximum generation capacity in Chart 18 was reduced in Q3 2023 due to an increase in the registered capacity for an existing CCGT.

² Exclude intermittent generation facilities and Market Participants with net negative quarterly metered energy quantity.

³ Exclude intermittent generation facilities and Market Participants with less than 10 MW maximum generation capacity. The actual capacities of the ESS facilities were used for the computation.

⁴ Exclude intermittent generation facilities and Market Participants with net negative quarterly metered energy quantity.

Chart 19. Frequency of the Number of Generation Companies as Pivotal Supplier (PS) Per Period

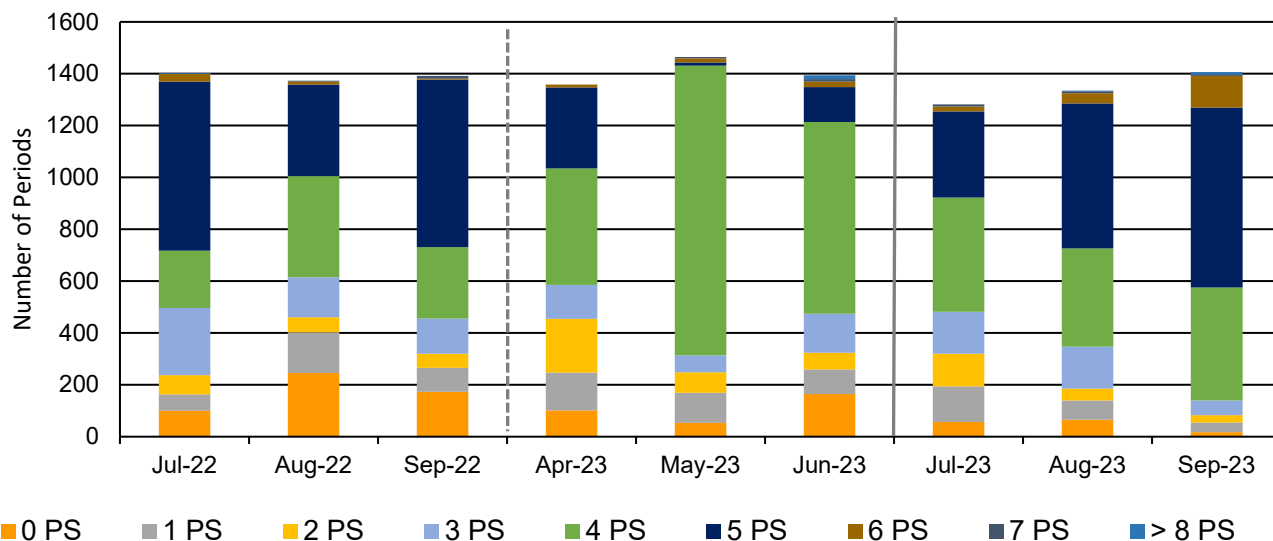


Chart 19 shows the number of trading periods with the number of pivotal suppliers per period for each month in Q3 2022, Q2 2023, and Q3 2023.

In Q3 2023, there were 3,435 periods with 4 or more pivotal suppliers per period, higher than what was observed in Q2 2023 with 3,189 periods. The lower supply cushion this quarter could likely be the reason for the increasing frequency of more than 4 generation companies as pivotal suppliers per period as compared to the previous quarter. Given the tighter supply cushion recorded this quarter (Chart 13), more generation companies were identified as pivotal suppliers with the potential ability to exercise unilateral market power.

Chart 20. Trend of Price Setting Generation Companies

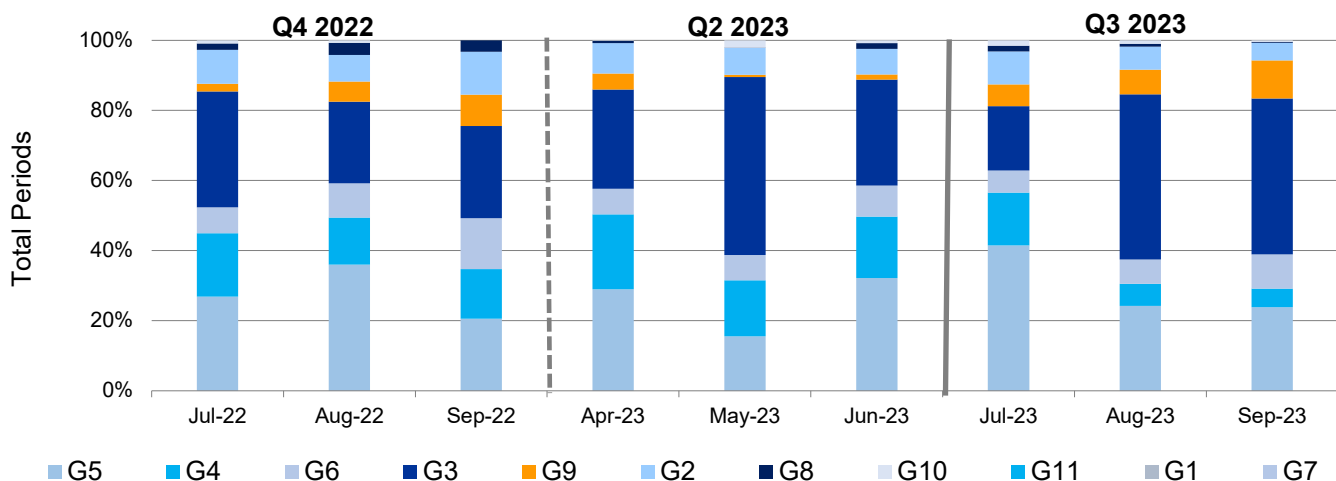


Chart 20 shows the monthly breakdown of price-setting generation companies in Q3 2023, Q2 2023, and Q3 2022. G3, G5, and G4 remained the top three highest frequency price-setting generation companies in the market in Q3 2023, similar to Q2 2023 and Q3 2022. The price setting frequency for G3 and G4 dipped by 0.72 and 8.99 percentage points respectively, but G5 grew 5.09 percentage points in Q3 2023 compared to Q2 2023.

Chart 21. Demand Response Activations

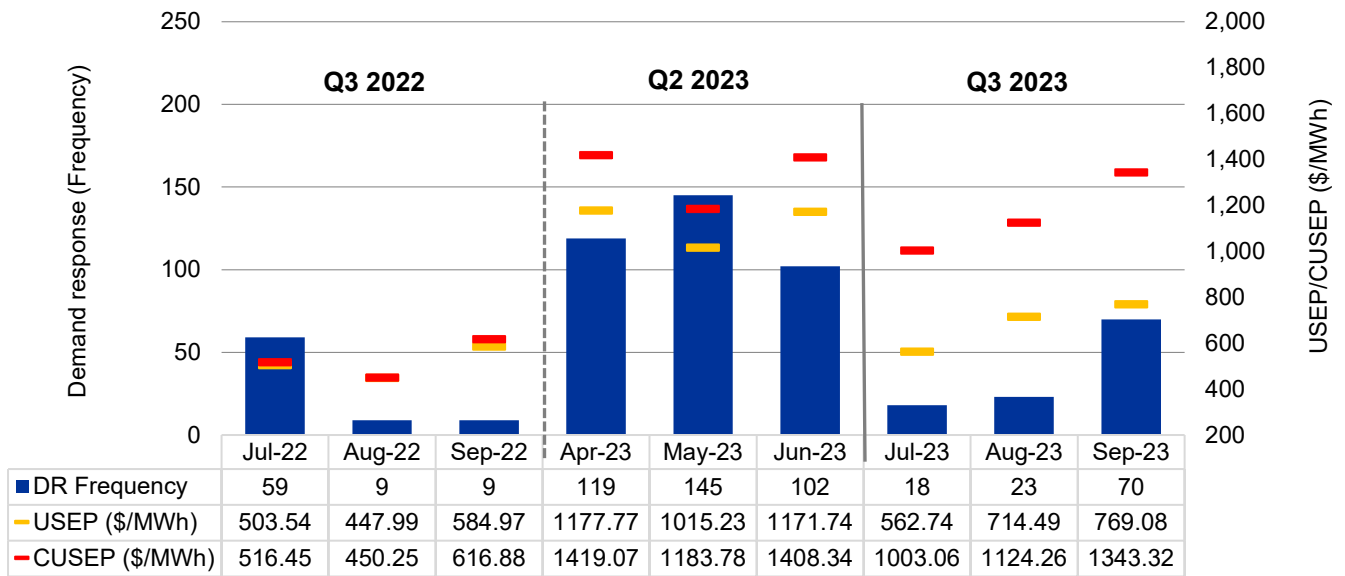


Chart 21 lists the Demand Response (“DR”) activations in Q3 2023, Q2 2023 and Q3 2022, and the associated USEP and counterfactual USEP (“CUSEP”) during those periods with DR activations.

There were 111 DR activations in Q3 2023, which was lower than the cumulative total of 366 occurrences recorded from the DR activation in Q2 2023. The daily average USEP for periods with DR activation in Q3 2023 was \$724.31/MWh, while the average CUSEP was \$1,242.75/MWh without DR curtailment.

The number of DR activations is usually reflective of the USEP levels and the USEP level in Q3 2023 was relatively lower compared to Q2 2023 (quarterly average USEP \$724.31/MWh in Q3 2023 and \$1,111.69/MWh in Q2 2023). It was noted that some of the DR activations coincide with the lower WEP observed, while the lower WEP could be due to the decrease in demand and generators shifting their energy offers to lower price tranches in Q3 2023.

Compliance Statistics for Q3 2023



Potential Breaches of the Market Rules⁵



Determinations*



Enforcement

<p><u>99 cases in total</u></p> <p>0 non-gate closure 99 gate closure</p>	<p><u>147 determinations in total</u></p> <p>13 cases determined to be in breach 2 cases determined to take no further action 132 cases determined not to be in breach</p>	<p><u>13 cases in total</u></p> <p>0 financial penalty 3 non-compliance letters 0 suspension order 0 termination order 0 other MSCP order \$0 of financial penalty imposed \$4,000 of costs awarded</p>
--	---	--

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

The MSCP issued 3 rule breach determinations in Q3 2023 to:

- i. 8 cases from Diamond Electric Pte. Ltd. regarding failure to comply with gate closure rules in February and March 2023 (\$2,000 costs)
- ii. 4 cases from Diamond Electric Pte. Ltd. regarding failure to comply with gate closure rules on 21 March 2023 (\$2,000 costs)
- iii. 1 case from Keppel Electric Pte Ltd regarding failure to immediately submit offer variations on 27 July 2023, 12 September 2022, 20 October 2022, and 21 February 2023.

⁵ Revision to the Potential Breaches of the Market Rules to differentiate gate closure and non-gate closure cases.

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
- Philip Chua
- Professor Euston Quah
- Dr Stanley Lai
- Yeo Yek Seng

Disclaimer

© 2023 Energy Market Company Pte Ltd.
All rights reserved.

Unless authorised by law, no part of this publication may be reproduced or distributed without prior permission from EMC. This publication is meant only for general information and nothing in it may be construed as advice. Whilst the MSCP has taken reasonable care in the preparation of this publication, the MSCP does not warrant its suitability for any purpose. You should always consult your professional advisers before making any decision.

If you have any specific query or feedback for the improvement of this publication, you may write to mau@emcsg.com.