

Market Surveillance & Compliance Panel Market Watch

Issue 63

First Quarter (January to March 2022)

Executive Summary

The energy prices in the National Electricity Market of Singapore (“NEMS”) fell for the first time after six consecutive quarters. Despite the fall, the energy prices registered the second-highest quarterly level since the commencement of NEMS in 2003.

The reduction in energy prices was observed in a context of lesser gas curtailment incidents when compared to the previous quarter. The gas supply from West Natuna has since resumed at contractual levels given the option generation companies have to switch from gas to backup fuels, improving the gas system stability and reducing extensive gas curtailments¹. A decline in the demand for electricity during the quarter was another contributing factor to the lower energy prices.

Chart 1. USEP and WEP by Quarter

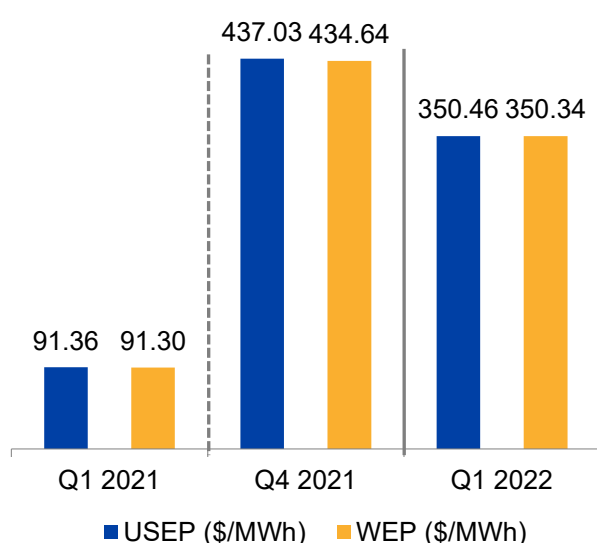


Table 1. Quarterly Outage Volume and Ancillary Service Prices

Quarter	Q1 2021	Q4 2021	Q1 2022
Total Outage Volume (MWh Cumulative)			
Planned Outage	3,282,376	2,214,128	4,743,129
Forced Outage	144,457	284,132	77,742
Ancillary Services (\$/MWh)			
Primary Reserve	0.81	1.89	0.45
Contingency Reserve	12.04	21.80	42.85
Regulation	10.35	30.63	56.33

The Uniform Singapore Energy Price (“USEP”) and the Wholesale Electricity Price (“WEP”) decreased 19.81% to \$350.46/MWh and 19.40% to \$350.34/MWh respectively for a QoQ comparison. This was the first drop observed in the quarterly energy price since Q2 2020. The decrease was attributed to the reduction in demand and the mechanisms implemented by the Government to reinstate the gas supply. Despite the drop in the USEP and WEP, Q1 2022 energy price registered the second-highest quarterly level since NEMS started in 2003.

The demand for electricity in Q1 2022 reduced 0.38% to 6,258 MW when compared to Q4 2021. Notably, the gas supply has since resumed at contractual levels in this quarter and the frequency of gas curtailment events has reduced.

The prices of ancillary services for contingency reserve and regulation increased this quarter as the monthly prices of contingency reserve and regulation were all on the high side in January, February, and March 2022. The increase in ancillary services price can be attributed to supplementing the tighter supply conditions in the market as planned outages increased 114.22% in Q1 2022. The regulation price was 83.92% higher this quarter than that of Q4 2021. On a QoQ comparison, the contingency reserve price increased 96.60% to \$42.85/MWh to supplement the tighter supply conditions, despite a slight reduction in the contingency reserve requirements. However, there was a decrease in the primary reserve price by 76.13% this quarter, coinciding with the reduction in the primary reserve requirements.

¹ Ministry of Trade and Industry. Written reply to PQs on Natural Gas. <https://www.mti.gov.sg/Newsroom/Parliamentary-Replies/2022/02/Written-reply-to-PQs-on-Natural-Gas>

Prices in Q1 2022

Chart 2. Vesting Contract Price Versus WEP by Quarter

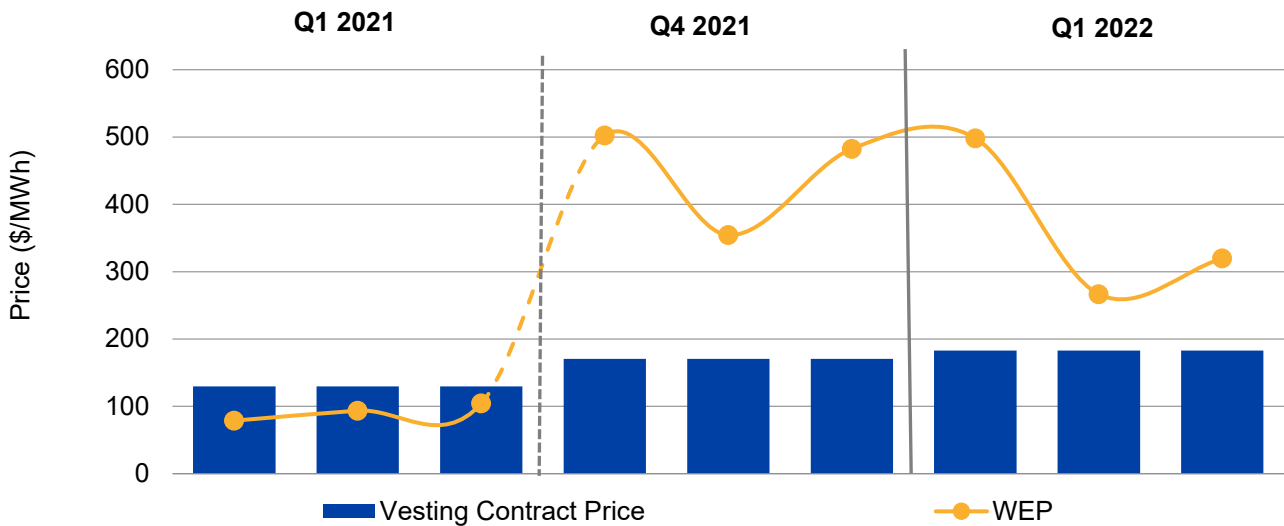


Chart 2 shows that the WEP went above the vesting contract price in Q1 2022. The difference between the vesting contract price and the WEP widened this quarter with the WEP clearing at \$350.34/MWh, significantly higher than Q1 2022 vesting contract price by 91.60%. In spite of the fact that the WEP was higher than the vesting contract price, the amount to be paid to vesting contract generators will be in accordance with the vesting contract price for Q1 2022. This is in line with EMA’s decision to curb the market power of the generation companies and provide a cushion to the consumers despite the volatile price spikes observed recently.

The vesting contract price increased 7.24% to \$182.85/MWh in Q1 2022, from \$170.50/MWh in Q4 2021, the highest level recorded since Q4 2014 at \$188.78/MWh. This represents a 41.12% increment when compared to Q1 2021, as a result of the increasing fuel oil price, as the latter was responding to geopolitical tensions between Russia and Ukraine.

Chart 3. Distribution of WEP Over Time

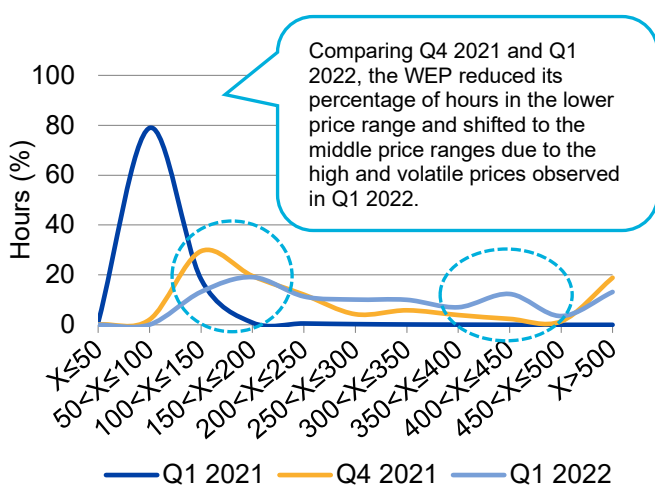
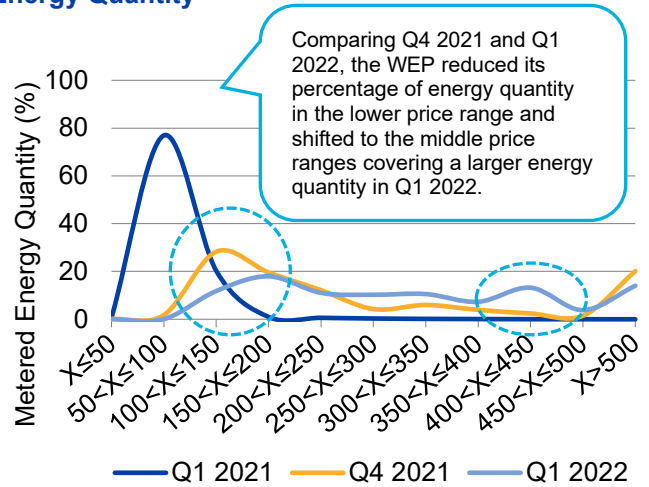


Chart 4. Distribution of WEP Over Total Metered Energy Quantity



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 Q1 2022, compared to the previous quarter and the previous year respectively.

The distribution of the WEP over time shifted higher in the middle price ranges in Q1 2022 when compared to Q1 2021 and Q4 2021 (Chart 3). The WEP in Q1 2022 was greater than \$150/MWh for 86.71% of the time, as opposed to 1.90% in Q1 2021, and 68.27% in Q4 2021. The rightward shift of the distribution curves from Q1 2021, Q4 2021, to Q1 2022 shown in Chart 3 reflected the high WEPs observed in Q1 2022, attributed to the increased fuel oil price.

It is noteworthy that the WEP lower than \$50/MWh in Q1 2022 was at 0% as compared to 0.88% in Q1 2021 and 0.11% in Q4 2021, as more energy offers moved into the middle price tranches observed in January, February, and March 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 the majority of the metered energy quantity in Q1 2022 and Q4 2021 when compared to Q1 2021 (Chart 4).

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

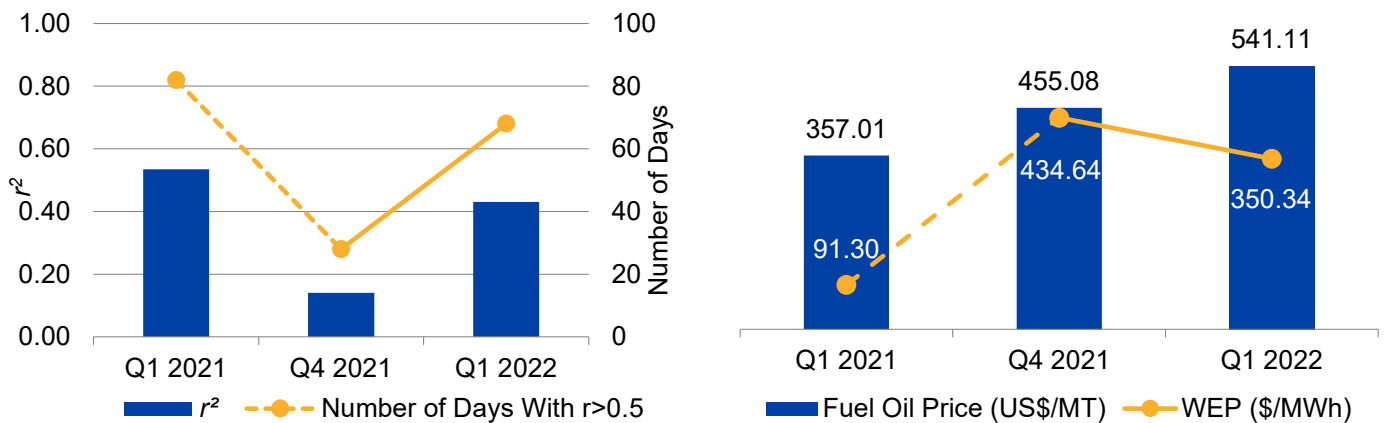


Chart 5 shows the proportion of variance in the WEP which could be explained by changes in the metered energy quantity measured by r^2 . It was observed that the correlation between the metered energy quantity and the WEP improved with a higher r^2 at 0.66 in Q1 2022 compared to 0.38 in Q4 2021 implying that the metered energy quantity had a greater influence on the WEP.

Meanwhile, there were 40 more days in Q1 2022 where r was greater than 0.5 compared with Q4 2021. This implied that the metered energy quantity and the WEP had a strong positive correlation over a longer period of time in Q1 2022 (68 out of 90 days), versus Q4 2021 (28 out of 92 days).

The observation from Chart 5 suggests that, unlike Q4 2021, the metered energy quantity was the key contributor to the WEP movements in Q1 2022. The r value of 0.66 in Q1 2022 showed that changes in the metered energy quantity could account for 65.66% of the changes in the WEP during the quarter.

As shown in Chart 6, the fuel oil price climbed 18.91% from US\$455.08/MT in Q4 2021 to US\$541.11/MT in Q1 2022 due to the geopolitical tensions between Russia and Ukraine. However, the WEP was reduced by 19.40% to \$350.34/MWh as compared to Q4 2021 when the WEP was at \$434.64/MWh. This was attributed to the reduction in the gas curtailment this quarter as the gas system stability situation improves with gas supply from West Natuna resuming back to normal.

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

Month/Quarter	Variation Between RTS and STS (\$/MWh)	Maximum Periodic Variation (\$/MWh)
January 2021	0.12	50.48
February 2021	1.56	170.10
March 2021	0.64	223.30
October 2021	122.96	2,666.43
November 2021	49.25	2,777.26
December 2021	68.34	2,469.15
January 2022	5.30	1,852.80
February 2022	-2.21	2,128.83
March 2022	3.48	2,544.09
Q1 2021	0.77	223.30
Q4 2021	80.18	2,777.26
Q1 2022	3.66	2,544.09

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 \$3.66/MWh in Q1 2022, which is \$76.53/MWh lower than the price variation observed in Q4 2021 at \$80.18/MWh and \$2.89/MWh higher than that in Q1 2021. The lower average price variation in Q1 2022 implied a more accurate price forecast for Q1 2022 and a reduction of 72.64% in the forced outages this quarter as shown in Table 1.

There were 1,258 periods of real-time USEP spikes (\geq \$400/MWh) in Q1 2022 (1 period in Q1 2021 and 998 periods in Q4 2021) and the price variation was at \$2,544.09/MWh in Q1 2022. One of the contributing factors that the maximum periodic variation was lesser than Q4 2021 by \$233.17/MWh was the improvement in the gas stability in the market evidenced by lower gas curtailment incidents as compared to the previous quarter.

Demand and Supply in Q1 2022

Chart 7. Average Forecast and Actual Demand

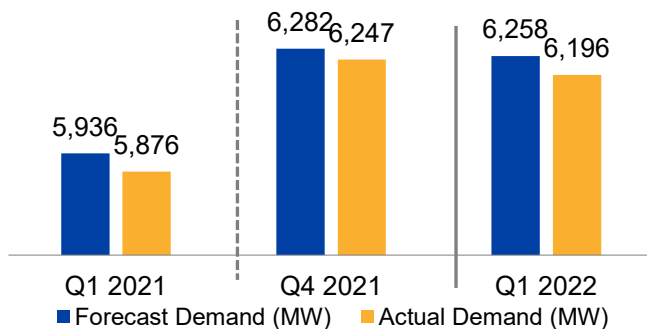
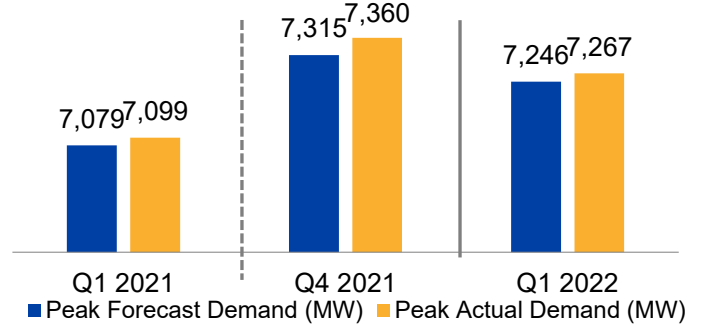


Chart 8. Peak Forecast and Actual Demand



The average forecast demand decreased 0.38% from 6,282MW in Q4 2021 to 6,258MW in Q1 2022 (Chart 7). Similarly, the average actual demand decreased 0.81%, from 6,247MW in Q4 2021 to 6,196MW in Q1 2022. Both the peak forecast and peak actual demand also decreased in Q1 2022 at 0.95% and 1.26% respectively when compared to Q4 2021.

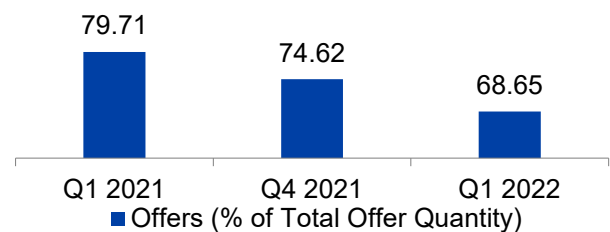
The lower demand in Q1 2022 was likely due to:

- Lower reading of Singapore Purchasing Managers' Index ("PMI"). The reading of the PMI, a key barometer of the Singapore manufacturing economy, registered a lower figure this quarter, and
- More public holidays during Q1 2022 as compared to the previous quarter in Q4 2021.

Table 3. Quarterly Average Supply and Supply Cushion

Quarter	Q1 2021	Q4 2021	Q1 2022
Average Supply (MW)	7,865	7,861	7,666
Supply Cushion (%)	24.60	20.11	18.38

Chart 9. Offers At or Below \$100/MWh²



The quarterly average supply in Q1 2022 decreased 2.48% to 7,666MW from 7,861MW in Q4 2021 (Table 3), in line with the lower forecast demand that the generators used as a reference to adjust their energy offers accordingly. The shrink in supply could be attributed to the behaviour of generators, as they responded to lower demand forecasts by offering less generation to the market.

With a smaller contraction in demand than that in supply, the resultant supply cushion weakened to 18.38 percentage points from 20.11 in Q4 2021. This is the lowest quarterly average supply cushion recorded since the NEMS started in 2003.

The energy supply in Q1 2022 was more expensive with the proportion of energy offers priced at or below \$100/MWh shrinking 5.97 percentage points compared to Q4 2021 and 11.06 percentage points compared to Q1 2021 (Chart 9). The energy supply in Q1 2022 was offered at a higher tranche when compared to Q4 2021 and Q1 2021 as explained in Charts 3 and 4, where the WEP shifted to higher price ranges.

² Note: Table 3 and Chart 9 figures has been revised based on current calculation methodology

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

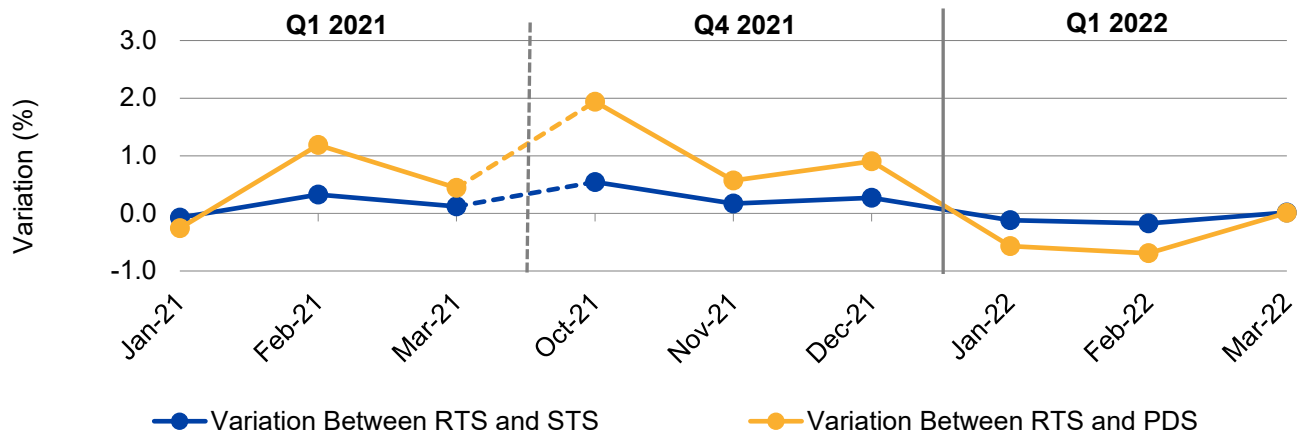
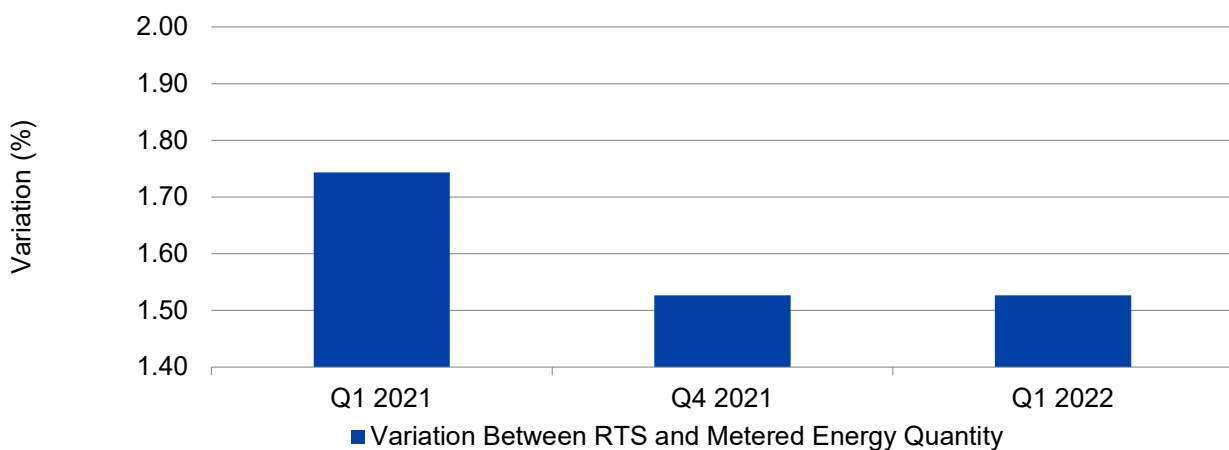


Chart 10 shows the variations in the pre-dispatch schedule (“PDS”) and short-term schedule (“STS”) against the real-time schedule (“RTS”). In Q1 2022, the average monthly variations remained relatively small, and it was observed that both the variations in PDS and STS were mostly negatively correlated to RTS. This indicated that the real-time dispatch schedule recorded a lower than forecasted schedule as compared to the Q4 2021.

The average load variation in Q1 2022 was 0.10 percentage points for variation between RTS and STS and 0.42 percentage points for variation between RTS and PDS, lower than those registered in Q4 2021. In Q4 2021, the variation between RTS and STS was 0.33 percentage points and 1.14 percentage points for variation between RTS and PDS.

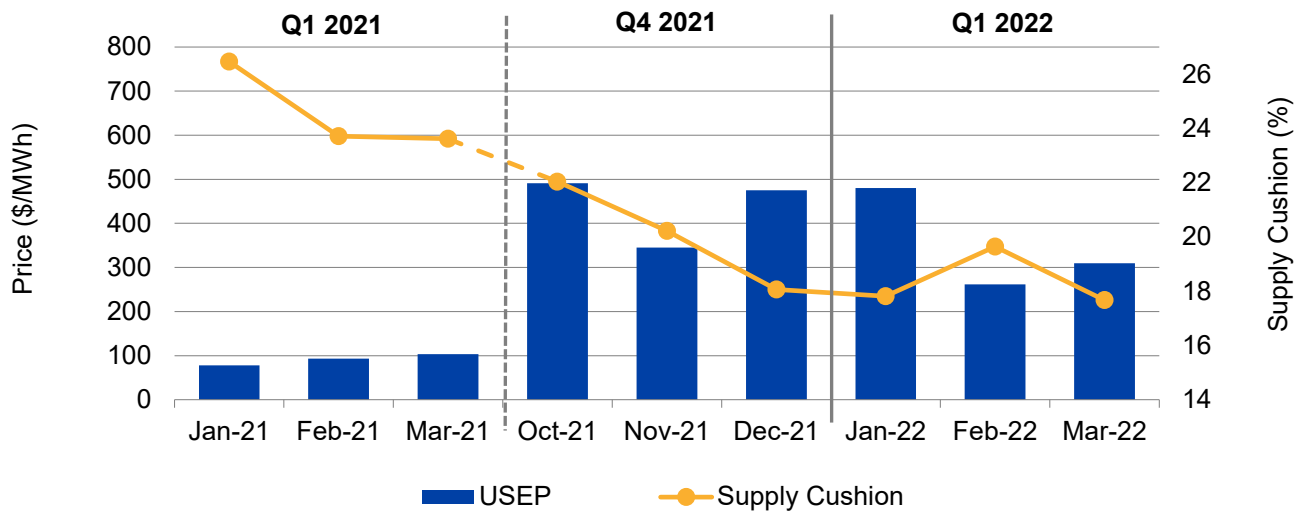
The lower variations in Q1 2022 could be a result of consumers and businesses making lesser changes to their electricity consumption, as it was not the first time Singapore experienced different safe management measures to curb the spread of the Covid-19. Additionally, STS are generated more frequently and closer to the RTS, hence the load variation tends to be smaller.

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



Q1 2022 observed the smallest quarterly average load variation between the RTS and the metered energy quantity recorded in the NEMS since 2003. It maintained the same variation as Q4 2021 as EMA works with the SP Group to install advanced meters across Singapore and encourages households to submit their own meter readings. Therefore, the variation between the RTS and the metered energy quantity will have higher accuracy than before. The installation for all 1.4 million households would be on track to be completed by 2024 and as of now, more than 500,000 advanced meter installations were completed.

Chart 12. USEP and Supply Cushion



In Q1 2022, the supply cushion averaged at 18.38% as compared to 20.11% in Q4 2021. It was observed that the higher USEP was inversely correlated with the lower supply cushion.

On the monthly level, similar inverse correlation was observed for January, February, and March 2022 where the higher supply cushion correlates with a lower USEP. The highest monthly USEP for the quarter was recorded in January 2022 at \$480.21/MWh, with a monthly supply cushion level at 17.82%. The USEP reduced 19.81% to \$350.46/MWh in Q1 2022 as compared to Q4 2021 due to lower gas curtailment as EMA has been working closely with Piped Natural Gas (“PNG”) importers and key gas users in Singapore to better manage the balance of gas supply and demand.

Chart 13. Capacity Ratio by Generation Type

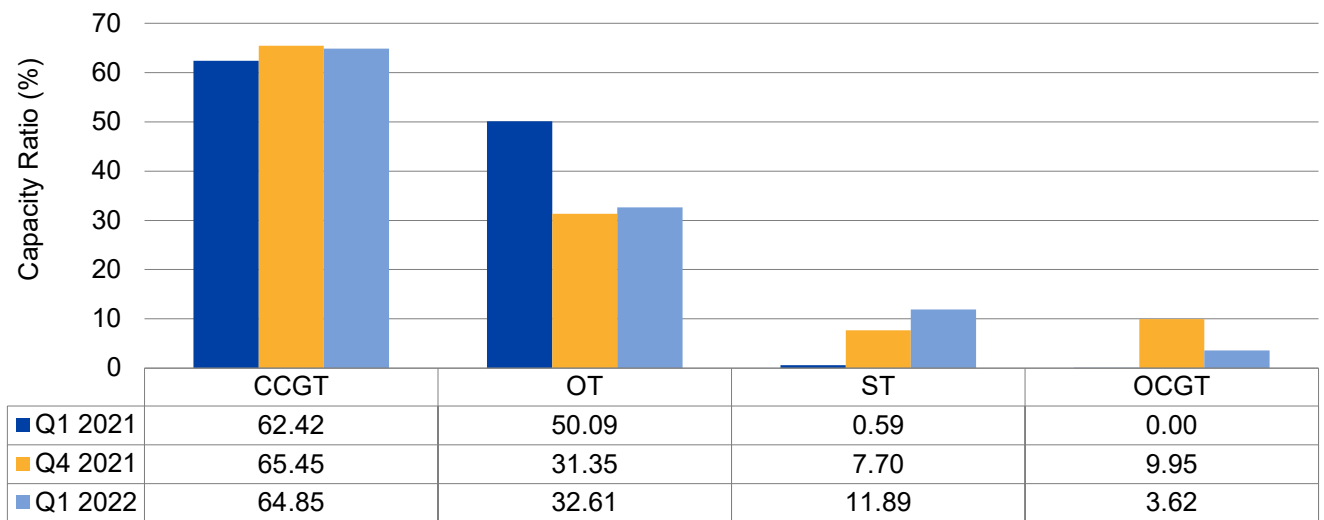
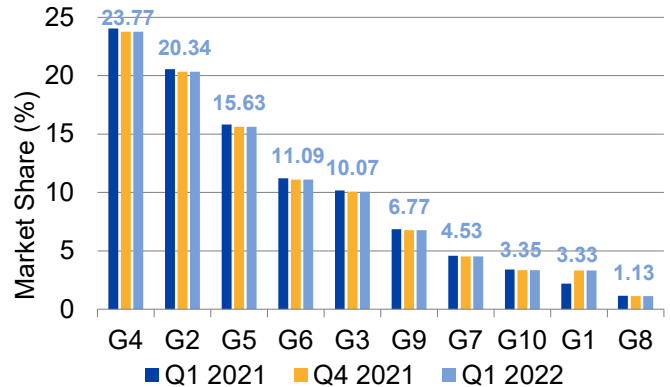
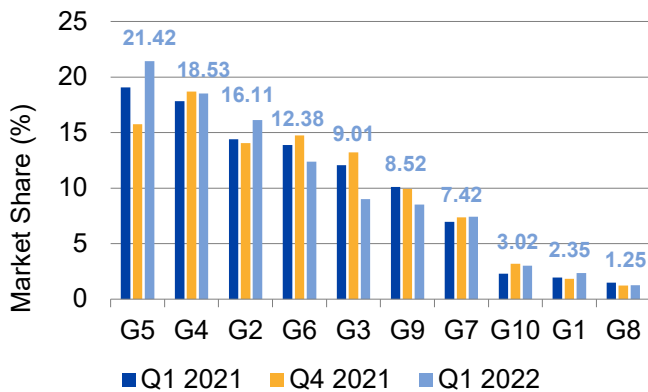


Chart 13 shows the quarterly average capacity ratios of the four generation types in the NEMS. Besides other units (“OT”) and steam turbine (“ST”), the movements in the capacity ratios were in line with the lower demand in Q1 2022 (refer to Chart 7), as the lower demand for electricity called for lesser utilisation from the main generation types.

Compared to Q4 2021, the capacity ratio of combined cycle gas turbine (“CCGT”) reduced 0.60 percentage points in Q1 2022, and the capacity ratio of open cycle gas turbine (“OCGT”) units decreased 6.33 percentage points to 3.62% in Q1 2022. On the other hand, the capacity ratios of ST and OT units increased 4.19 and 1.26 percentage points respectively. The lower capacity ratio of OCGT units is in line with the lower USEP levels observed in Q1 2022, as OCGT units tends to have energy offers on the higher price ranges and the lower USEP levels in Q1 2022 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.

Chart 14 shows that G4, G5 and G2 are the three largest generation companies based on the metered energy quantity. The three generation companies held 56.05% of the total market share in Q1 2022, an increase from 48.41% in Q4 2021 and 51.30% in Q1 2021. While G5 moved to the first place, it recorded the greatest increase in market share, with an increase of 5.66 percentage points from 15.76% to 21.42% in Q1 2022. G3 shrunk the most at a reduction of 4.21% in their market share in Q1 2022 despite maintaining in the fifth place.

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 Q1 2022 (Chart 15), maintaining the same percentage as of Q4 2021. There is no new generation company registering any generation registered facilities in the Singapore Wholesale Electricity Market for this quarter thus there is no significant change to the maximum generation capacity.

Chart 16. Market Share in Percentage of Generation Types Based on Metered Energy Quantity³

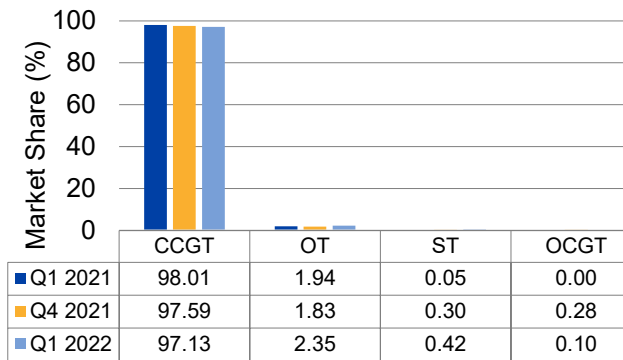
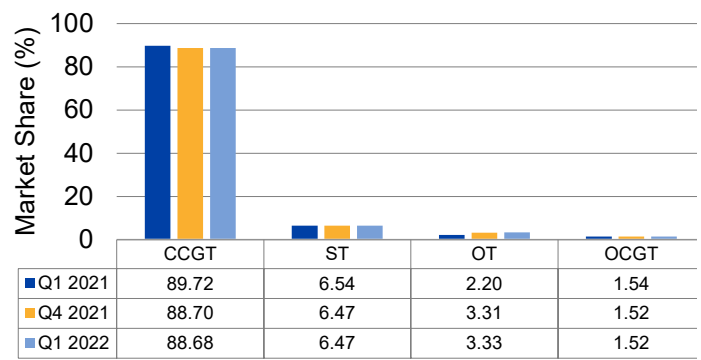


Chart 17. Market Share in Percentage of Generation Types Based on Maximum Generation Capacity



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

As seen in Chart 16, the CCGT market share had a small downtick of 0.46 percentage points from 97.59% in Q4 2021 to 97.13% in Q1 2022, based on the metered energy quantity. This could be attributed to an increase in the proportion of the market share of other generation types, such as OT and ST units.

The market share distribution based on maximum generation capacity has seen slight changes in Q1 2022 (Chart 17) as there was entry of new generation registered facilities in the NEMS in Q4 2021.

Chart 18. Frequency of Generation Companies as Single Pivotal Supplier

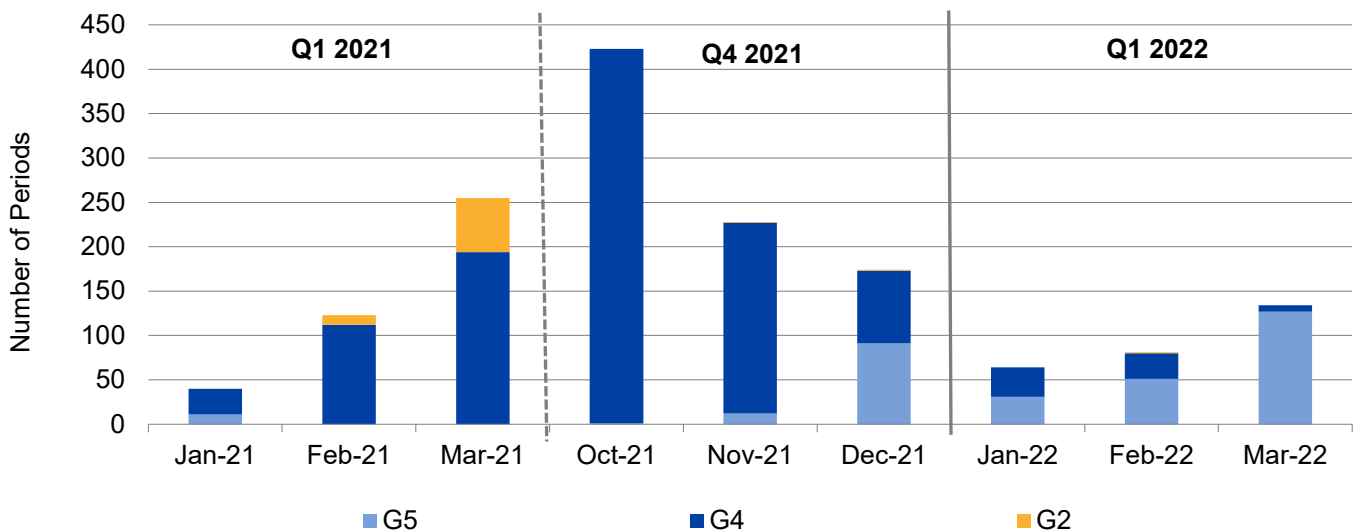


Chart 18 shows the number of trading periods with a single pivotal supplier in the NEMS for each month in the three quarters under review. A single pivotal supplier was present in 1.60% of the total number of periods in Q1 2022, 14.68%, and 6.16% lower than in Q4 2021 and Q1 2021 respectively. G5 overtook G4 as the main price-setting generation company in the market in Q1 2022 and its price-setting frequency grew from 12.61% of the total number of price-setting period in Q4 2021 to 74.91% in Q1 2022, where it occupied 209 out of 279 single pivotal supplier period in Q1 2022. There was a total of 4,320 dispatch periods in Q1 2022.

³ Registered capacity excludes battery and Chart 16 figures has been revised based on current calculation methodology.

Chart 19. Trend of Price Setting Generation Companies

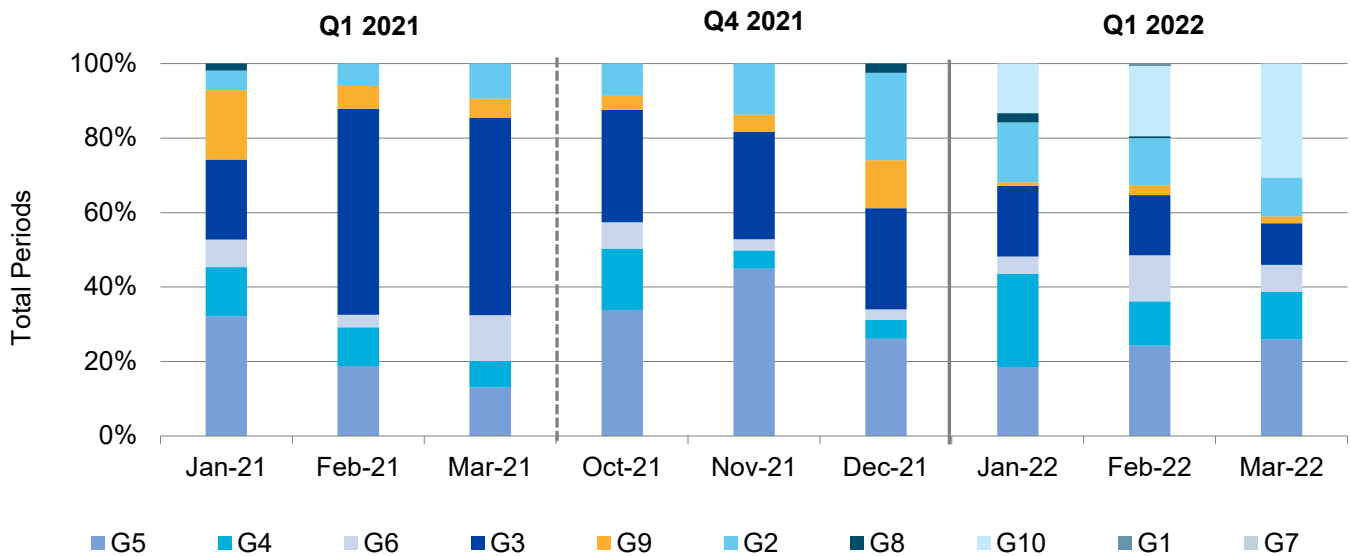


Chart 19 shows the monthly breakdown of price-setting generation companies in Q1 2021, Q4 2021, and Q1 2022. G5 maintained as the main price-setting generation company in the market in Q1 2022 and Q4 2021, a price setter could potentially influence the market clearing price. G3 set prices for 15.55% of the total number of price-setting periods in Q1 2022, a decrease from 28.92% in Q4 2021. G4 exchanged position with G3 and was the second-highest price-setting frequency at 16.26% in Q1 2022 from 9.66% in Q4 2021.

Chart 20. Demand Response Activations

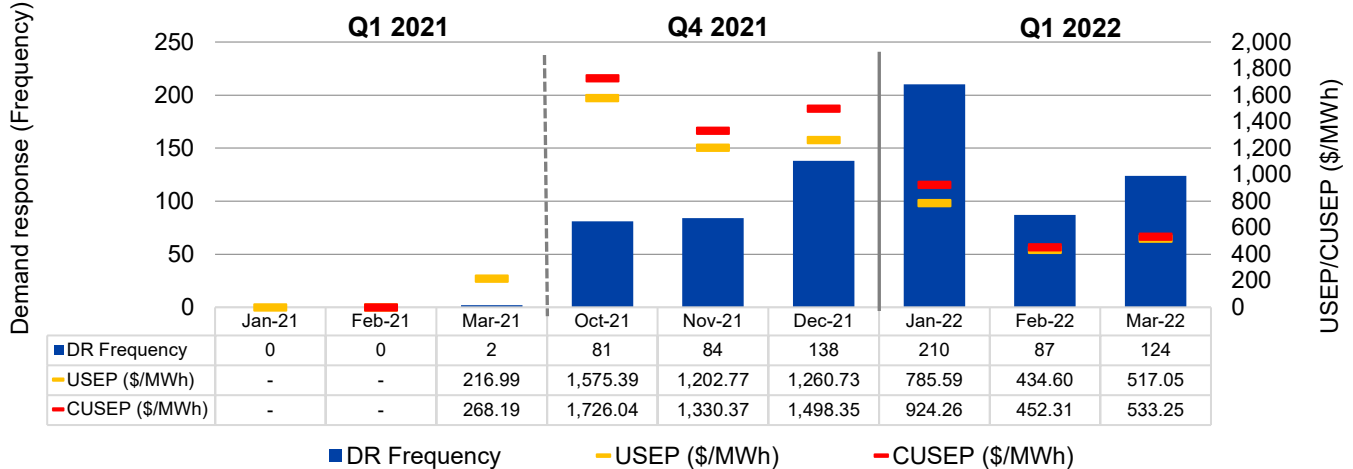


Chart 20 lists the Demand Response (“DR”) activations in the three quarters under review, and the associated USEP and counterfactual USEP (“CUSEP”) during those periods with DR activations.

There were 421 DR activations in Q1 2022, which was higher than the cumulative total of 303 occurrences recorded from the DR activation in Q4 2021. The daily average USEP for periods with DR activation in Q1 2022 was \$633.96/MWh, while the average CUSEP was \$711.56/MWh without DR curtailment. The high number of DR activations coincided with the high and volatile WEPS observed in Q1 2022 due to the rise in fuel oil price, an increase in planned outage volume and generators shifting their energy offers to higher price tranches in Q1 2022.

Compliance Statistics for Q1 2022



Potential Breaches of the Market Rules



Determinations*



Enforcement

114 cases in total

0 self-report
114 referrals/complaints
0 MSCP initiative

568 determinations in total

8 cases determined to be in breach
388 cases determined to take no further action
172 cases determined not to be in breach
0 cases determined to be event of default

8 cases in total

6 financial penalty
2 non-compliance letters
0 suspension order
0 termination order
0 other MSCP order
\$234,000 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 Q1 2022 to:

- i. 5 cases from Singapore Refining Company Private Limited regarding failure to comply with gate closure rules on 1 September 2021 (Financial penalty \$4,000, \$2,000 costs)
- ii. 2 cases from Keppel Merlimau Cogen Pte Ltd regarding failure to comply with gate closure rules on 27 September 2021 (Letter of non-compliance, \$2,000 costs)
- iii. 1 case from Tuas Power Generation Pte. Ltd. regarding failure to comply with gate closure rules on 26 November 2021 (Financial penalty \$230,000, \$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, 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 [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 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:

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

Disclaimer

© 2021 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.