

Market Surveillance & Compliance Panel Market Watch

Issue 62

Fourth Quarter (October to December 2021)

Executive Summary

The energy prices in the National Electricity Market of Singapore (“NEMS”) have been increasing continuously with the gradual recovery from the Covid-19 pandemic. This quarter marked the sixth consecutive quarter of increasing prices since Q2 2020 when the Covid-19 restrictions and measures were initially applied.

This quarter registered the highest quarterly average price recorded since the commencement of NEMS in 2003, which was nearly three times higher than Q3 2021. The Ministry of Trade and Industry (“MTI”) explained that the elevated electricity prices were due to a confluence of factors including recovering economic activity, severe weather events, and a series of gas production outages around the world that also impacted the Wholesale Electricity Market of Singapore. The global fuel shortage has been nudging up the prices of electricity over the past few months as spot gas prices have risen by around five times since March 2021. Singapore is not fully insulated from developments in the global energy market given that Singapore imports its energy requirements.¹ This has been exacerbated by the unplanned curtailment of piped natural gas supply from Indonesia as explained by the Energy Market Authority (“EMA”) in an investigation update.²

The sustained high fuel prices and unplanned curtailment of piped natural gas supply are reflected in Singapore’s wholesale electricity prices in Q4 2021. Amidst the soaring wholesale electricity prices, four electricity retailers had exited the retail side of the electricity market in Q4 2021.³ The rise in wholesale electricity prices has also trickled down to consumers, as SP Group announced that the household electricity tariff for Q1 2022 will increase by 5.6% from 24.11 cents/kWh to 25.44 cents/kWh.⁴

Chart 1. USEP and WEP by Quarter

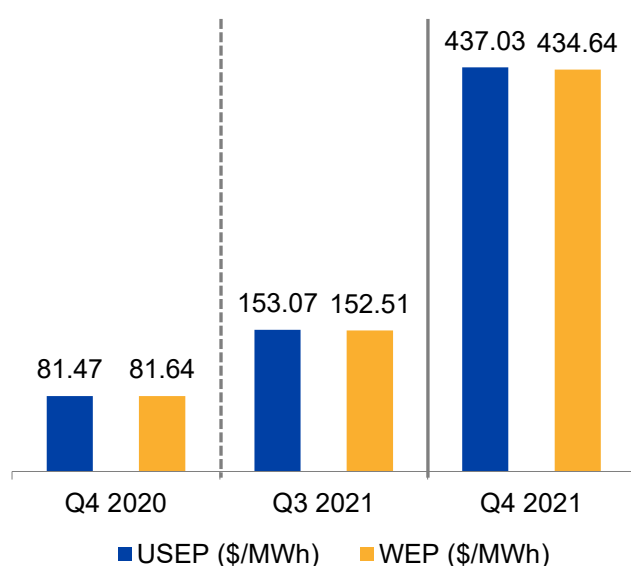


Table 1. Quarterly Outage Volume and Ancillary Service Prices

Quarter	Q4 2020	Q3 2021	Q4 2021
Total Outage Volume (MWh Cumulative)			
Planned Outage	2,826,405	2,086,571	2,214,128
Forced Outage	23,027	180,742	284,391
Ancillary Services (\$/MWh)			
Primary Reserve	0.80	1.42	1.89
Contingency Reserve	9.97	15.47	21.80
Regulation	9.19	16.59	30.63

The Uniform Singapore Energy Price (“USEP”) and the Wholesale Electricity Price (“WEP”) increased 185.51% to \$437.03/MWh and 184.98% to \$434.64/MWh respectively for a Q-o-Q comparison, which more than quadrupled compared with Q4 2020 (Chart 1). The increment was attributed to the rise in fuel oil price, an increase in the forced and planned outage volume, and generators shifting their energy offers to higher price tranches.

¹ MTI parliamentary reply, on 1 November 2021, to address energy-related matters - [Oral reply to PQs on Energy-related matters \(mti.gov.sg\)](https://www.mti.gov.sg/Oral-reply-to-PQs-on-Energy-related-matters)

² EMA’s investigation update - <https://www.ema.gov.sg/Electricity-Regulatory-Updates.aspx>

³ <https://www.channelnewsasia.com/commentary/energy-electricity-companies-exit-market-prices-consumer-2265976>

⁴ <https://www.straitstimes.com/singapore/consumer/electricity-gas-tariffs-to-increase-for-next-three-months-amid-rising-costs>

The rise in energy prices during Q4 2021 could be brought about by a combination of the following quarterly movements when compared to Q3 2021:

- 6.19% increment in the fuel oil price⁵ to US\$455.08/MT;
- 57.35% increase in the forced outage volume and 6.11% increase in planned outage volume;
- 1.95 percentage points decrease in supply cushion to 20.05%;
- 1.53% reduction in supply to 7,861 MW;
- 0.89% growth in demand to 6,282 MW; and
- 2.39 percentage points decrease in offers made at or below \$100/MWh to 74.23%.

The prices of ancillary services increased across the board this quarter as the monthly prices of contingency, reserve and regulation were all on the high side in October, November, and December. The regulation price was 84.66% higher this quarter than that of Q3 2021. The primary reserve and contingency reserve prices increased 33.20% to \$1.89/MWh and 40.91% to \$21.80/MWh respectively for a Q-o-Q comparison, despite decrease in the primary reserve and contingency reserve requirements. It is relevant to note that the periods of high contingency, reserve, and regulation prices coincided with periods of high USEP observed during the three months as ancillary services, such as contingency reserve, and regulation, are usually used to supplement tight supply conditions.

⁵ Daily average of IFO180 settlement price published by SGX Exchange Limited ("SGX") – [SGX Platts Singapore Fuel Oil 180cst Index Futures](#).

Prices in Q4 2021

Chart 2. Vesting Contract Price Versus WEP by Quarter

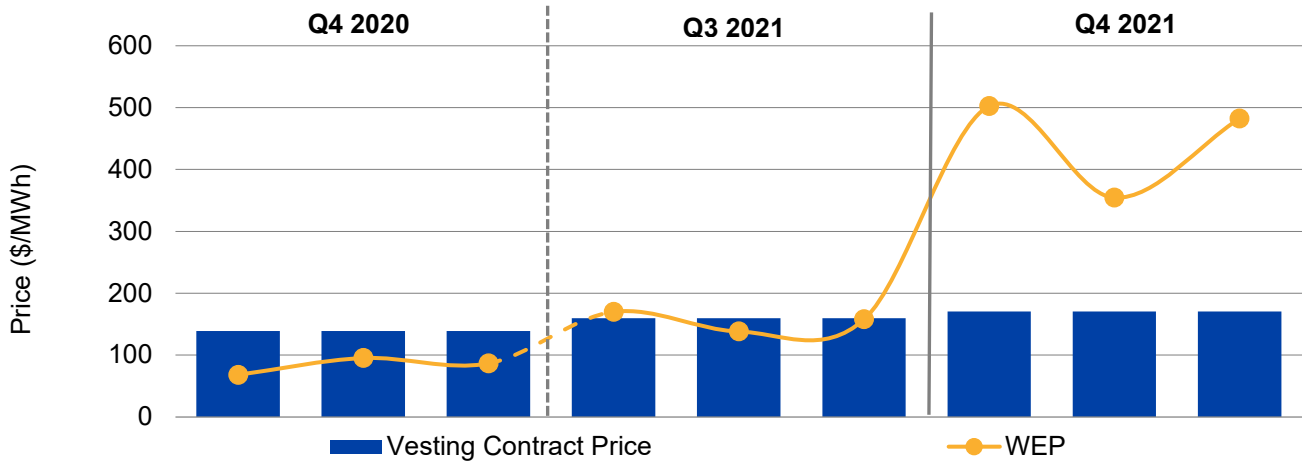


Chart 2 shows that the WEP moved upward across the quarters and went above the vesting contract price in Q4 2021, as the difference between vesting contract price and the WEP widened even more this quarter. The WEP in Q4 cleared at \$434.64/MWh, exceeding the Q4 2021 vesting contract price by 154.92%.

The vesting contract price in Q4 2021 increased 6.60% to \$170.50/MWh, from \$159.95/MWh in Q3 2021, the highest recorded since Q4 2018 at \$172.44/MWh (Chart 2). This represents a 22.54% increment when compared to Q4 2020, as a result of the increase in gas spot prices given the unprecedented scale of the global energy crunch and its forthcoming impact on the Singapore electricity generation.

Chart 3. Distribution of WEP Over Time

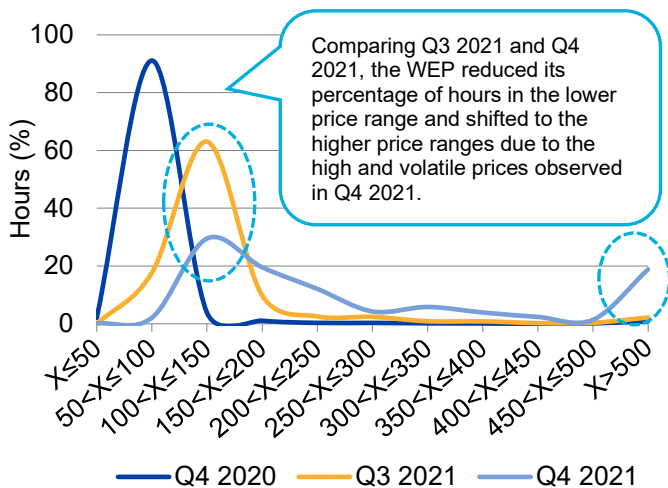
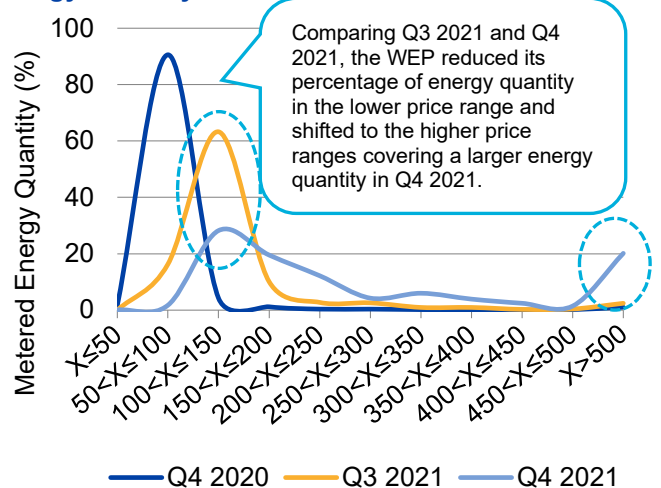


Chart 4. Distribution of WEP Over Total Metered Energy Quantity



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 Q4 2021, compared to the previous quarter and the previous year respectively.

The distribution of the WEP over time shifted to higher price ranges in Q4 2021 than in Q4 2020 and Q3 2021 (Chart 3). The WEP in Q4 2021 was greater than \$150/MWh for 68.27% of the time opposed to 3.06% in Q4 2020 and 19.32% in Q3 2021. The pronounced rightward shift of the distribution curves from Q4 2020, Q3 2021, to Q4 2021 shown in Chart 3 reflected the higher WEPs observed in Q4 2021, attributed to the increased fuel oil price.

It is noteworthy that out of the 68.27%, 18.86% of the time the WEP was higher than \$500/MWh in Q4 2021 opposed to 0.91% in Q4 2020 and 2.17% in Q3 2021, as more energy offers moved into significantly higher price tranches observed in October, November, and December 2021.

The distribution of the WEP in terms of percentage metered energy quantity in the market was similar to its distribution based on percentage number of hours. The WEP was in the higher price ranges for majority of the metered energy quantity in Q4 2021 than in Q4 2020 and Q3 2021 (Chart 4).

Chart 5. Correlation Between WEP and Metered Energy Quantity

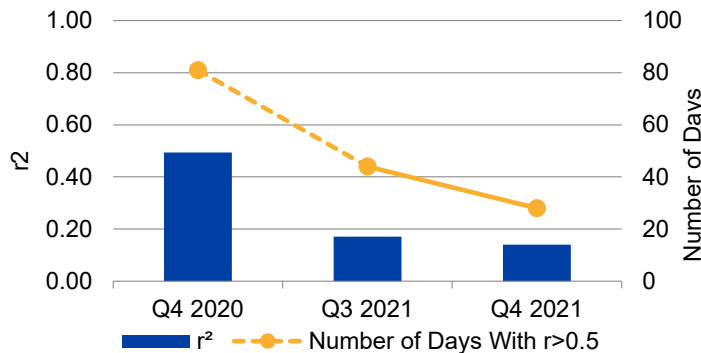


Chart 6. WEP Versus Fuel Oil Price

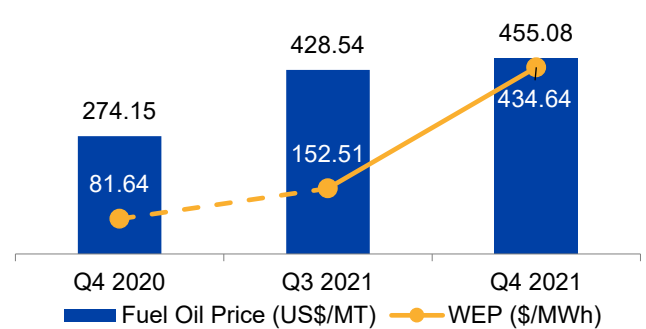


Chart 5 shows the proportion of variance in the WEP which could be explained by changes in the metered energy quantity measured by r^2 . It was observed that changes in the metered energy quantity for Q4 2021 had minimal impact on the WEP movements, as r^2 dropped from 0.17 in Q3 2021 to 0.14 in Q4 2021.

Correspondingly, there were 16 fewer days in Q4 2021 where r was greater than 0.5 compared with Q3 2021. This implied that the metered energy quantity and the WEP had a strong positive correlation over only a limited time Q4 2021 (28 out of 92 days), versus Q3 2021 (44 out of 92 days).

The observation from Chart 5 suggests that, unlike Q4 2020, the metered energy quantity was not the key contributor to the WEP movements in Q4 2021. The r value of 0.38 in Q4 2021 showed that changes in the metered energy quantity could only account for 37.50% of the changes in the WEP during the quarter.

Given the unprecedented global energy crunch, fuel oil price rose across the quarters (Chart 6) and recorded the highest price of US\$455.08/MT this quarter since market started. The fuel oil price was 6.19% higher this quarter than US\$428.54/MT in Q3 2021 and observed an increase of 66.00% from US\$274.15/MT in Q4 2020. The WEP moved in tandem with the increase in the fuel oil price, which is an important cost component of electricity generation. Together with the high and volatile prices observed this quarter, the WEP increased 184.98% from \$152.51/MWh in Q3 2021 to \$434.64/MWh, which more than quadrupled the WEP of \$81.64/MWh seen in Q4 2020.

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

Month/Quarter	Variation Between RTS and STS (\$/MWh)	Maximum Periodic Variation (\$/MWh)
October 2020	0.24	21.50
November 2020	0.91	621.55
December 2020	2.82	373.22
July 2021	10.39	837.32
August 2021	-9.84	-823.74
September 2021	7.77	2,692.17
October 2021	122.96	2,666.43
November 2021	49.25	2,777.26
December 2021	68.34	-2,469.15
Q4 2020	1.32	621.55
Q3 2021	9.33	2,692.17
Q4 2021	80.18	2,777.26

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

The average variation between the forecast USEP in the STS and the real-time USEP increased to \$80.18/MWh in Q4 2021, which is \$70.85/MWh higher than the price variation observed in Q3 2021 at \$9.33/MWh and \$78.86/MWh higher than that in Q4 2020. The greater average price variation in Q4 2021 was because of the volatile prices observed, which implied a less accurate price forecast in Q4 2021.

There were 998 periods of real-time USEP spikes (\geq \$400/MWh) in Q4 2021 (123 periods in Q3 2021 and 48 periods in Q4 2020) and the largest price variation was as high as \$2,777.26/MWh in Q4 2021, versus \$2,692.17/MWh in Q3 2021 and \$621.55/MWh in Q4 2020.

Demand and Supply in Q4 2021

Chart 7. Average Forecast and Actual Demand

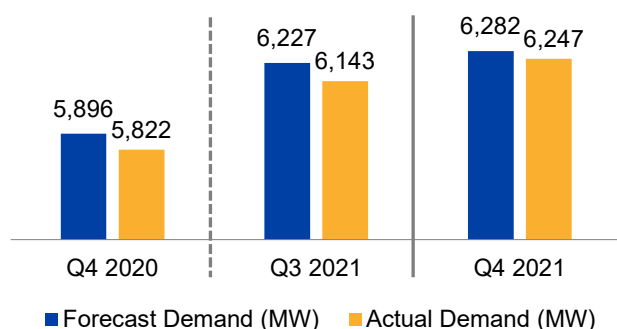
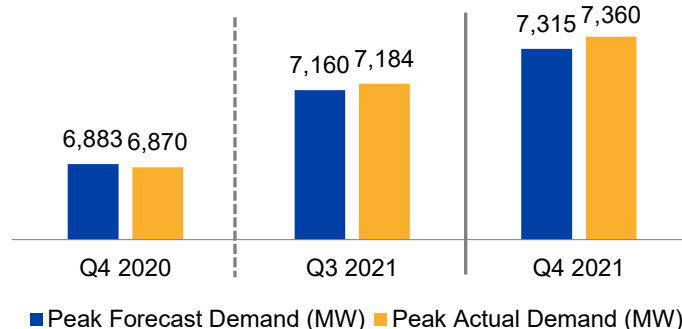


Chart 8. Peak Forecast and Actual Demand



The average forecast demand increased 0.89% from 6,227MW in Q3 2021 to 6,282MW in Q4 2021 (Chart 7). Similarly, the average actual demand increased by 1.69%, from 6,143MW in Q3 2021 to 6,247MW in Q4 2021. Both the peak forecast and peak actual demand also increased in Q4 2021 at 2.17% and 2.45% respectively when compared to Q3 2021.

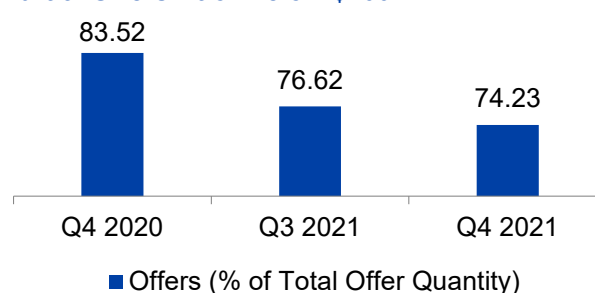
The stronger demand in Q4 2021 was likely due to:

- increase in economic activity following Singapore's transition from the Stabilisation Phase to Transition Phase in the second half of Q4 2021;⁶ and
- warmer weather conditions experienced in Q4 2021 – the average temperature in Singapore rose to 28.34°C from 28.19°C in Q3 2021 as the demand for electricity usually correlates to the temperature positively.

Table 3. Quarterly Average Supply and Supply Cushion

Quarter	Q4 2020	Q3 2021	Q4 2021
Average Supply (MW)	7,622	7,983	7,861
Supply Cushion (%)	22.63	21.99	20.05

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



The quarterly average supply in Q4 2021 decreased 1.53% to 7,861MW from 7,983MW in Q3 2021 (Table 3), despite the slightly higher forecast demand. The decline in supply availability could be attributed to the higher maintenance level of generation units. The total planned and unplanned maintenance increased by 10.20% from Q3 to Q4 2021 (refer to Table 1).

Given the growth in demand and reduction in supply, the corresponding supply cushion contracted 1.95% from 21.99% in Q3 2021 to 20.05% in Q4 2021. This is the lowest quarterly average supply cushion recorded since the market started.

As a result, the energy supply in Q4 2021 was offered at higher price tranches when compared to Q3 2021 and Q4 2020 with a reduction in the proportion of energy offers priced at or below \$100/MWh by 2.39 percentage points compared to Q3 2021 and 9.29 percentage points compared to Q4 2020 (Chart 9). The reduction in energy offers at lower price tranches was also reflected in Charts 3 and 4, where the WEPs shifted to higher price ranges. The contribution factors include the higher fuel price and increased outage volume, mentioned in Chart 1 and Table 1.

⁶ In the first half of Q4 2021, Singapore was in the Stabilisation Phase where the safe management measures were tightened (for example, group sizes for social gatherings and dining were reduced and the default working arrangement was reverted to work-from-home). Singapore entered the Transition Phase to COVID-19 Resilience on 22 November 2021 where the safe management measures were eased.

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

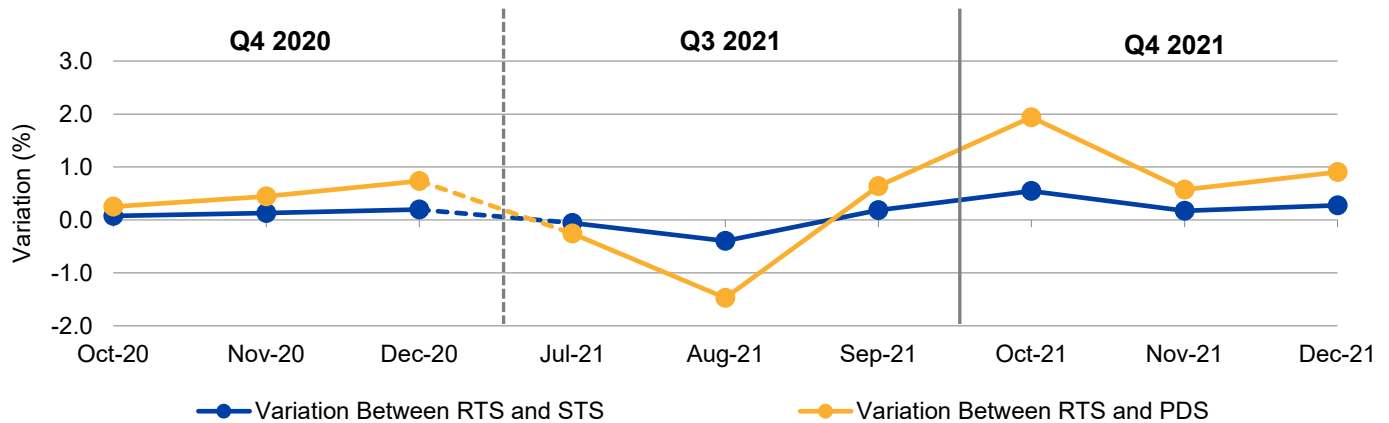
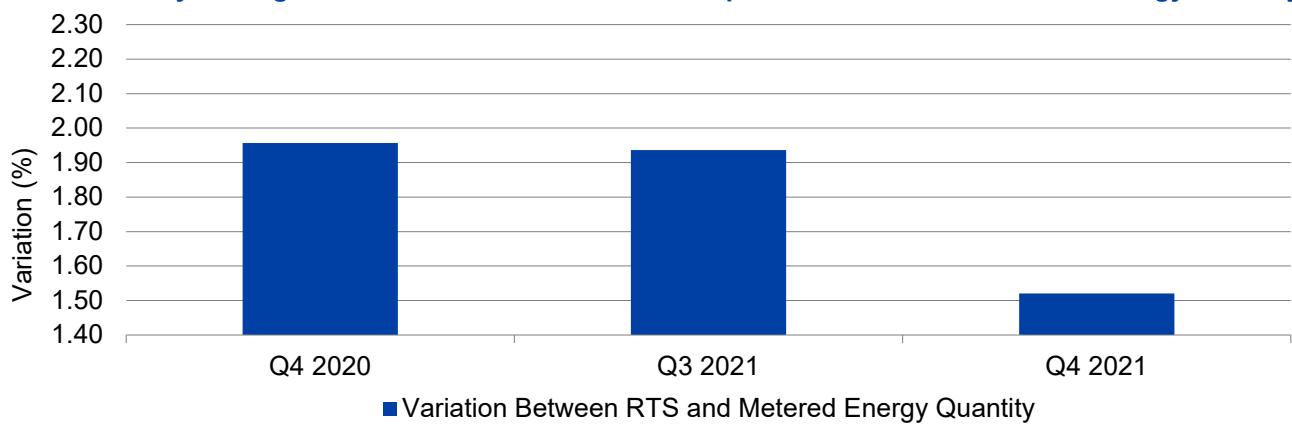


Chart 10 shows the load variations in pre-dispatch schedule (“PDS”) and STS compared to RTS. The average load variations in Q4 2021 (0.33 for variation between RTS and STS and 1.14 for variation between RTS and PDS, in percentage points) were greater than those registered in Q3 2021 (0.21 for variation between RTS and STS and 0.79 for variation between RTS and PDS, in percentage points).

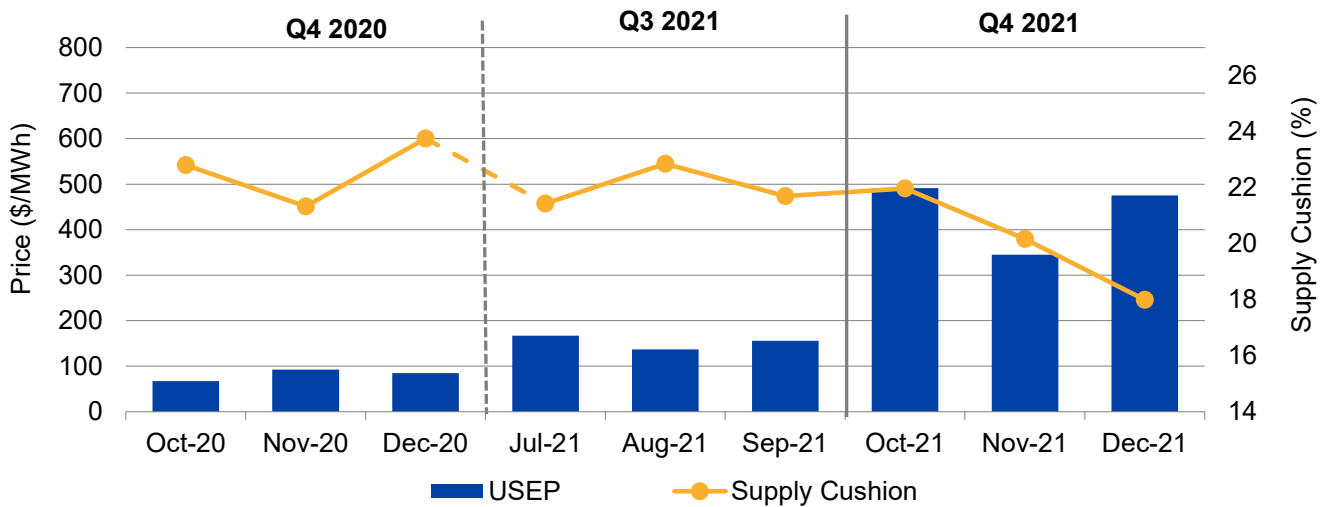
The larger variations in Q4 2021 could be explained by the drastic changes in temperature from October to November – the average temperature in October was 28.65°C which dropped to 28.10°C in November before coming back up to 28.29°C in December. As a result, the system load of RTS was over forecasted in October by 1.94% compared to PDS and 0.54% against STS. The variations between RTS and STS reduced in comparison to the variations between RTS and PDS, indicating a more accurate load forecasting nearer to the real-time.

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



Q4 2021 observed the smallest quarterly average load variation between the RTS and the metered energy quantity recorded in the NEMS since 2003. A possible reason for the falling variation would be a progressive reduction in metering errors, as the EMA work with the SP Group to install advanced meters across Singapore and encourage households to submit their own meter readings. Thus far, more than 500,000 advanced meter installations were completed and the installation for all 1.4 million households would be on track to be completed by 2024. Therefore, the variation between the RTS and the metered energy quantity dipped further to 1.52% in Q4 2021.

Chart 12. USEP and Supply Cushion



In Q4 2021, the supply cushion and the USEP moved in tandem from October to November 2021, which was counterintuitive. 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 of fuel oil price from US\$496.07/MT in October to US\$457.98/MT in November, resulting in a fall in the USEP from October to November. In December, the USEP rebounded despite the lower fuel oil price, as the impact of the record low supply cushion had likely outweighed the impact of lower fuel oil price on the USEP. The December supply cushion recorded the lowest monthly supply cushion since the start of the market.

It is also worth noting that the USEP more than doubled from September to October 2021. This could be due to the higher offer prices submitted by the generators in October, compared to September 2021, as the proportion of offers at or below \$100/MWh reduced from 76.75% in September to 73.43% in October 2021. Therefore, the reduction in the volume of cheaper offers in the market could have resulted in the sharp increase in the USEP observed in October 2021.

Chart 13. Capacity Ratio by Generation Type

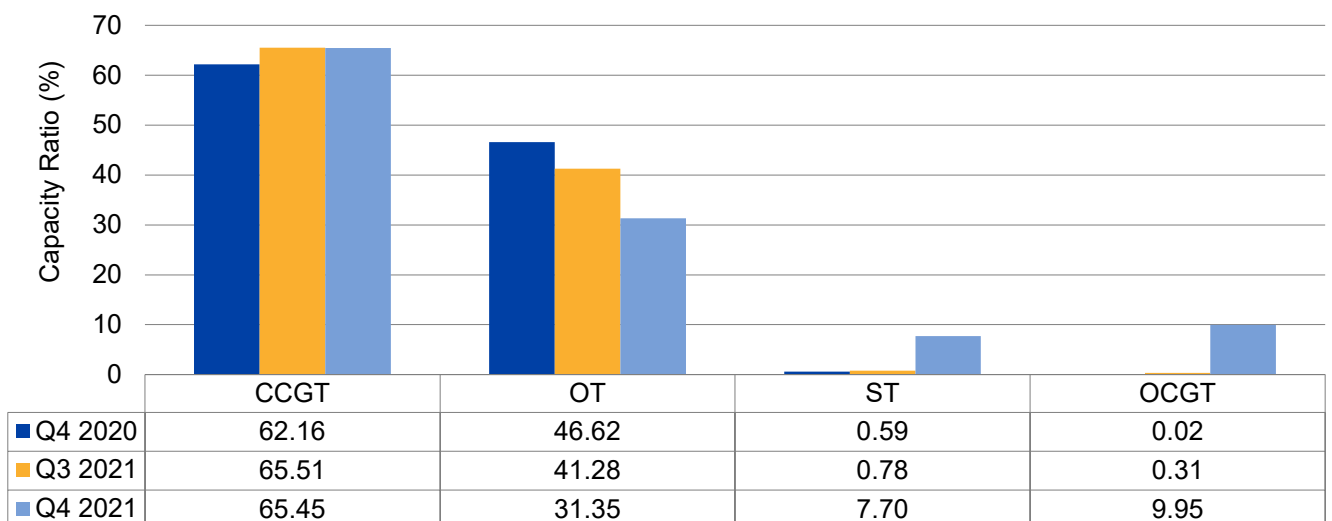
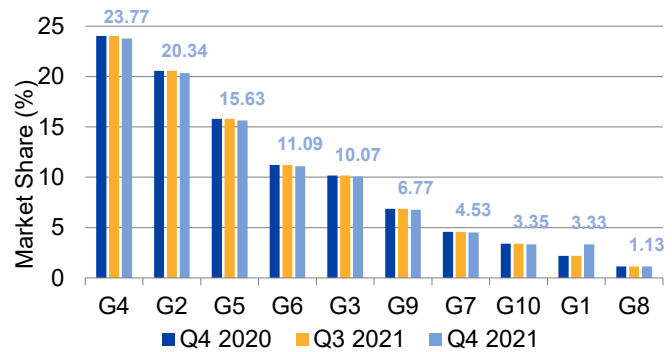
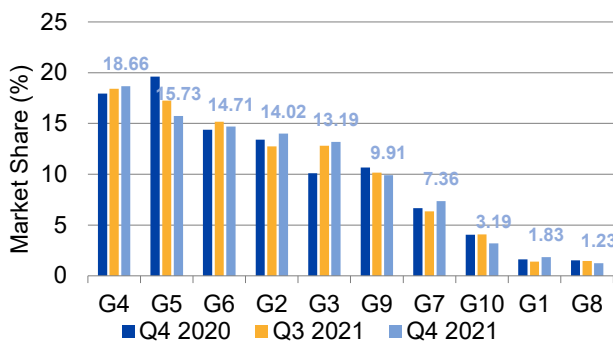


Chart 13 shows the quarterly average capacity ratios of the four generation types in the NEMS. Besides other units (“OT”), the movements in the capacity ratios were in line with the higher demand in Q4 2021 (refer to Chart 7), as the increased demand for electricity called for higher utilisation from the main generation types.

Compared to Q3 2021, the capacity ratio of combined cycle gas turbine (“CCGT”) reduced 0.06 percentage points from Q3 to Q4 2021, while the capacity ratio of OT units decreased 9.93 percentage points to 31.35% in Q4 2021 as a larger capacity of OT units was under planned maintenance. On the other hand, the capacity ratios of steam turbine (“ST”) and open cycle gas turbine (“OCGT”) units increased 6.92 and 9.64 percentage points respectively. The higher capacity ratio of OCGT units is in line with the higher USEP levels observed in Q4 2021, as OCGT units usually have more expensive energy offers and the high USEP levels in Q4 2021 could have incentivised 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

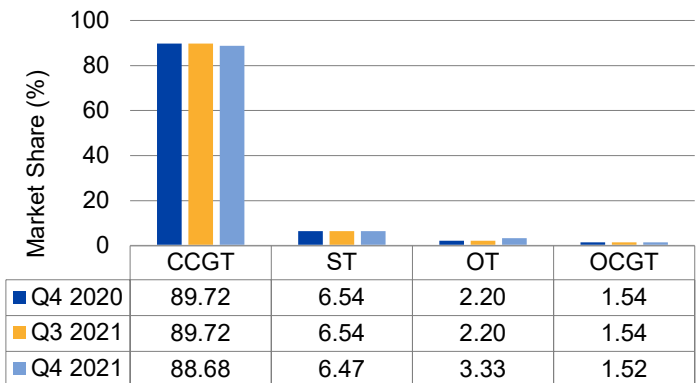
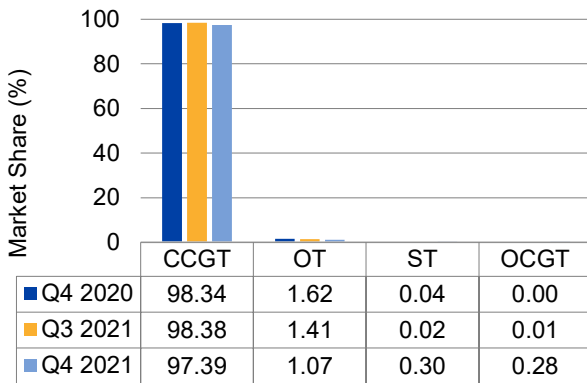


Charts 14 and 15 are the market share comparison in the NEMS based on metered energy quantity and maximum generation capacity by generation companies.

Chart 14 shows that G4, G5 and G6 are the three largest generation companies based on the metered energy quantity. The big three generation companies held 48.41% of the total market share in Q4 2021, a gradual decrease from 50.85% in Q3 2021 and 51.95% in Q4 2020. While G5 remained in the second place, it recorded the greatest decrease in market share, with a drop by 1.51 percentage points from 17.24% to 15.73% in Q4 2021. G2 gained the most market share in Q4 2021, replacing G3 in the fourth place, with an increase of 1.28 percentage points.

The distribution of market share based on generation capacity was still concentrated – the big three generation companies held 59.73% of the total market share in Q4 2021 (Chart 15), a slight drop from 60.43% in Q3 2021. The market share of G1 had increased by 1.13 percentage point from 2.20% in Q3 2021 to 3.33% in Q4 2021 as a new generation company has successfully registered two generation registered facilities in the Singapore Wholesale Electricity Market.

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**



In Chart 16, it was reflected that most of the generation in the NEMS is produced by CCGT units. This was in line with the sustained efforts and uses of efficient generation technology. The CCGT market share had a small downtick of 0.99 percentage points from 98.38% in Q3 2021 to 97.39% in Q4 2021, based on the metered energy quantity (Chart 16). This could be attributed to the larger proportion of market share of other generation types, such as OCGT and ST units.

The market share distribution based on maximum generation capacity has seen slight changes in Q4 2021 (Chart 17) as there was entry of new generation registered facilities under G1 in the NEMS.

Chart 18. Frequency of Generation Companies as Single Pivotal Supplier

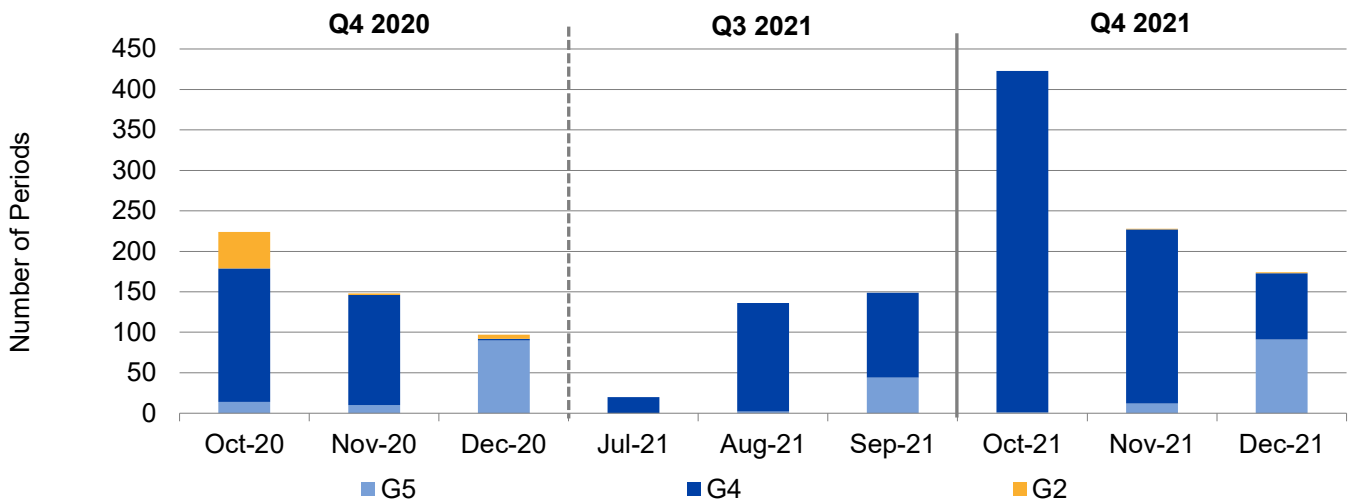


Chart 18 shows the number of trading periods with a single pivotal supplier in the NEMS for each month in the three quarters under review. A single pivotal supplier was present in 18.68% of the total number of periods in Q4 2021, 11.75% higher than 6.93% in Q3 2021 and 8.06% higher than 10.62% in Q4 2020. G4 remained as the main price setting generation company in the market in Q4 2021 and its price setting frequency grew from 84.64% of the total number of price setting period in Q3 2021 to 87.15% in Q4 2021, where it occupied 719 out of 825 single pivotal supplier period in Q4 2021. There was a total of 4,416 dispatch periods in Q4 2021.

Chart 19. Trend of Price Setting Generation Companies

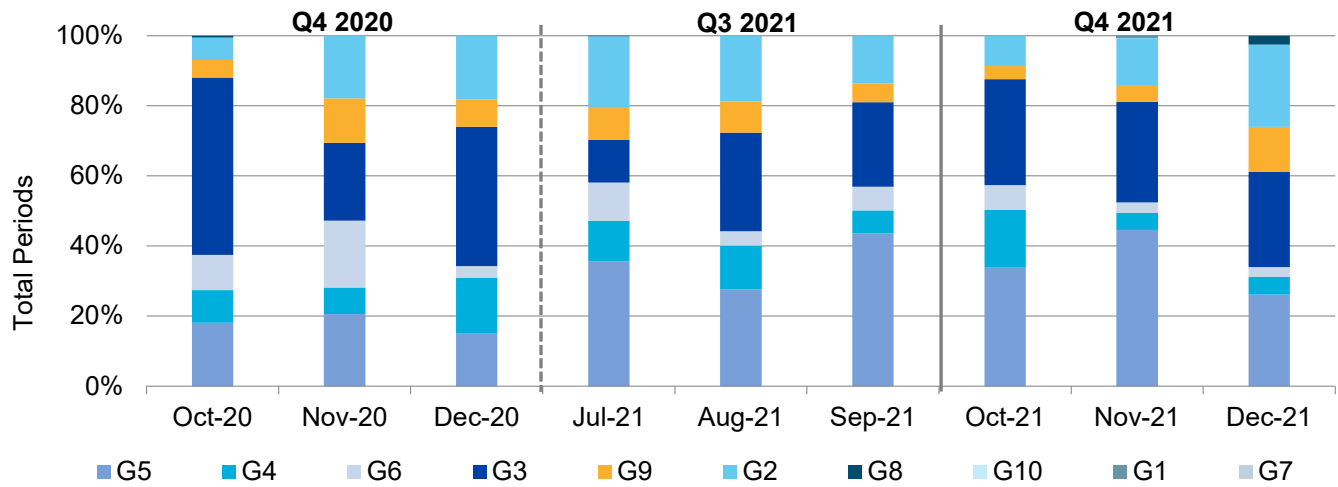


Chart 19 shows the monthly breakdown of price setting generation companies in Q4 2020, Q3 2021, and Q4 2021. G5 remained as the main price setting generation company in the market in Q4 2021. G5 set prices for 35.11% of the total number of price setting periods in Q4 2021, a slight fall from 35.45% in Q3 2021. G3 remained as the second highest price setting frequency at 28.86% in Q4 2021 from 20.49% in Q3 2021.

Chart 20. Demand Response Activations

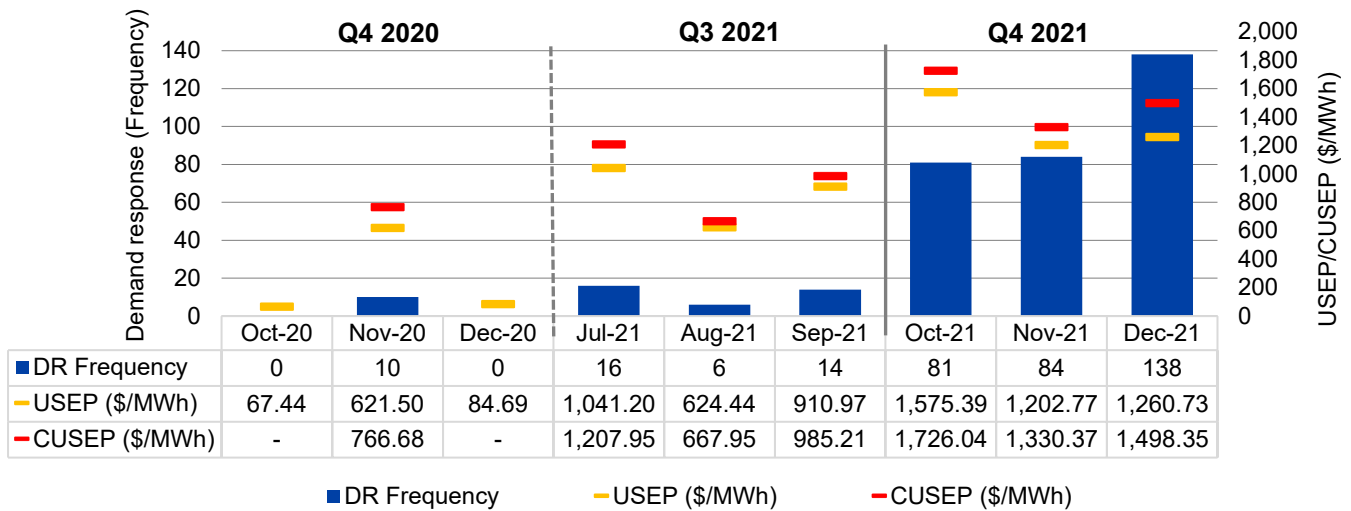


Chart 20 lists the Demand Response (“DR”) activations in the three quarters under review, and the associated USEP and counterfactual USEP (“CUSEP”) during those periods with DR activations.

There were 303 DR activations in Q4 2021, which was higher than the cumulative total of 65 occurrences recorded from the first DR activation on 17 April 2018 to Q3 2021. The daily average USEP for periods with DR activation in Q4 2021 was \$1,328.78/MWh, while the average CUSEP was \$1,512.65/MWh without DR curtailment. The high number of DR activations coincided with the high and volatile WEPs observed in Q4 2021 due to the rise in fuel oil price, an increase in the forced and planned outage volume, and generators shifting their energy offers to higher price tranches, as explained in sections of executive summary and prices in Q4 2021.

Compliance Statistics for Q4 2021



Potential Breaches of the Market Rules



Determinations*



Enforcement

536 cases in total

2 self-report
534 referrals/complaints
0 MSCP initiative

72 determinations in total

6 cases determined to be in breach
3 cases determined to take no further action
59 cases determined not to be in breach
4 cases determined to be event of default

10 cases in total

1 financial penalty
5 non-compliance letters
2 suspension order
1 termination order
1 other MSCP order
\$3,500 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 Q4 2021 to:

- i. 1 case from YTL PowerSeraya Pte. Limited regarding failure to comply with gate closure rules on 15 June 2021 (Financial penalty \$3,500, \$2,000 costs)
- ii. 5 cases from Singapore Refining Company Private Limited regarding failure to comply with gate closure rules on 19 August 2021 (Letter of non-compliance, \$2,000 costs)

The MSCP issued three other determinations in Q4 2021 to:

- i. On 20 October 2021, the MSCP conducted and concluded a suspension hearing concerning the event of default by SilverCloud Energy Pte. Ltd. ("SilverCloud") and determined to issue a suspension order to SilverCloud;
- ii. On 22 October 2021, the MSCP conducted and concluded a suspension hearing concerning the event of default by UGS Energy Pte. Ltd. ("UGS") and determined to issue a suspension order to UGS; and
- iii. On 21 December 2021, the MSCP issued a termination order to SilverCloud on the same event of default related to the issuance of the suspension order on 20 October 2021.

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

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