Special report: Wholesale gas short term transactions reporting

Insights into the reporting of short term bilateral gas supply and swap transactions to the Gas Bulletin Board

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AUSTRALIAN ENERGY REGULATOR

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1 Executive summary

This is the first special report the Australian Energy Regulator (AER) has published since adopting a new model of wholesale market quarterly reports in Q1 2023. The publication of special reports replaces focus stories that were previously included in the wholesale markets quarterly report series.

The focus of this report is the reporting of bilateral short term gas supply and swap transactions (short term transactions) to the east coast Gas Bulletin Board which commenced on 15 March 2023. Most gas traded on the east coast is bilateral between participants, rather than taking place through Australian Energy Market Operator (AEMO) facilitated markets. High-quality information on these transactions is vital for participants, policy makers and regulators, including the AER. Sellers and buyers can use pricing information from these transactions when recontracting, while for policy makers and market bodies the location of volumes could inform the potential for new market trading locations. This data, combined with other data including the new pipeline data to be reported from late 2023, will assist to provide a more complete view on how gas is sold, stored, transported, and delivered.

The aim of this special report is three-fold:

- share the insights and feedback from our engagement with industry on the usefulness of current reporting and how it can be further developed.
- to respond to that feedback and provide analysis and insights into transactions reported to date, promoting awareness and transparency around the data and aiding price discovery in the gas market.
- contribute to the AEMO anticipated review of the Gas Bulletin Board reporting in 2024, which may also inform consideration of amendments to the National Gas Rules.

Chapter 2 of the report provides context to why short term bilateral contract reporting was added as a requirement to the National Gas Rules and highlights how the reporting on this new data sits alongside other pre-existing data reporting. Chapter 3 then highlights how we and AEMO have been reporting on this contract data.

Chapter 4 summarises our engagement with 12 Gas Bulletin Board participants during August 2023 on the usefulness of the data reported to date and shares their thoughts on how the data could be developed further. Despite most participants having reported a transaction, they mostly indicated they lacked awareness of, or had not so far gained great value from, the AEMO or AER aggregated data sets.

Chapter 5 of the report discussed valuable insights we have been able to draw from the data collected and analysed despite the limitations we have identified with the current data since commencement of the new transparency regime. We present analysis which aims to address some of the stakeholder feedback and identify new and informative ways of reporting on this data, including by reporting on prices by delivery date and by using box plots to provide greater information on the distribution of prices.

We report on supply transactions from the first nearly eight months of industry reporting. Our analysis finds that bilateral short term gas supply is higher in volume than participant trade

through AEMO's facilitated markets. It highlights that the volume weighted average (VWA) price of 2024 delivered gas was just under $16 per gigajoule (GJ), around $3/GJ higher than for gas deliveries in 2023. This price difference is likely to be partially explained by gas sales by producers for deliveries for 2023 being subject to a $12/GJ price cap, whereas for 2024 gas deliveries pricing was not restricted until 11 September 2023, when the transitional period ended for the mandatory Gas Code of Conduct.[1]

We also report on swap transaction data - albeit a less workable dataset than supply data, which is explained in the chapter. Despite data limitations we were able to respond to stakeholder feedback and provide price differentials for both location and time swaps where we could match swap transactions. Same day location swaps between north and south regions were frequently priced at $0/GJ, which aligns with transport auction prices of $0/GJ for the same days. On the other hand, time swap reporting suggested winter buyers are prepared to pay up to $3/GJ to swap summer gas out.

Chapter 6 summarises our suggestions for future AEMO and AER reporting to address industry feedback and increase the usefulness of the reporting. We have also made suggestions on how to improve on the reporting of the data by participants that will greatly assist in ensuring more accurate reporting and analysis.

Following this report, we intend to continue to report on this information through our wholesale market quarterly reports and we intend to engage more broadly in 2024 with industry and policy makers, on the usefulness of the data and our suggestions for data improvements. This is timely as AEMO conducts its biennial review of the Gas Bulletin Board in 2024. We will also continue to clarify obligations and monitoring compliance with reporting requirements in line with one of the AER's 2023–24 Compliance and Enforcement priorities, which is to clarify obligations and monitor compliance with reporting requirements under the new Gas Market Transparency Measures.[2]

[1] On 23 December 2022, the Competition and Consumer (Gas Market Emergency Price) Order 2022 came into effect for 12 months introducing a price cap on gas of $12/GJ that applied to gas producers and affiliates of gas producers that has not been granted an exemption. Trades on the Short Term Trading Markets (STTMs) or Declared Wholesale Gas Market (DWGM) and near-term (next 3 day) trades and offers on the Gas Supply Hub Exchange were also exempted. The mandatory Gas Code of Conduct commenced on 11 July 2023 for contracts of 12 months and longer, with a 2-month transitional period to allow companies to adapt to new conduct provisions, record keeping and reporting obligations. The transitional period ended on 11 September 2023.

[2] AER, AER compliance and enforcement priorities 2023–24, Australian Energy Regulator, June 2023.

2 Context for the new transactions reporting

On 23 June 2022, the National Gas Amendment (Market Transparency) Rule 2022 (Gas Transparency Measures) commenced. The goal of the Gas Transparency Measures was to address information gaps across the east coast gas industry. By facilitating a greater understanding of the conditions around gas market supply, demand and price, the reforms aim to promote competition and efficient market development. The reforms come at a critical time, with forecast gas supply continuing to be tight and policy makers looking at the role of gas in the energy sector's transition to a lower carbon emitting future.

The reporting of short term transactions by AEMO was an important element of these reforms and on 15 March 2023 market participants started submitting this information to AEMO, which in turn commenced publishing aggregated information on the Gas Bulletin Board.[3]

Policy makers specifically intended this information to assist market participants with the formation of price expectations. Prior to the reform implementation, there was a gap in the reporting of timely, publicly available information on short term bilateral contracts. Stakeholders considered these contracts were traded to a significant degree and important to price formation.[4] Publicly available reports such as the AER's wholesale markets quarterly and the ACCC's Gas Inquiry Reports are released with a lag of between 3 to 6 months from the trading periods they relate to. The intention behind the regular reporting of short term transactions by AEMO was to complement this information and provide market participants with data that is updated more regularly. Under the National Gas Rules, AEMO has discretion over the time frames for publishing its data.

Under the legislation, the AER has the responsibility for monitoring the timely, accurate and complete reporting of short term transaction information. To perform this role, the AER receives individual transaction level data directly from AEMO. While performing this compliance role, the AER has also developed analysis to include in its broader performance reporting on the wholesale gas markets.

Box 1: Short term transactions defined

Short term gas supply transactions

Bilateral contracts (greater than 1 terajoule (TJ)) negotiated directly between a seller and buyer outside of a gas trading exchange or regulated gas market with lengths of 1 day up to a

[3] AEMO, LNG and short term transactions, Australian Energy Market Operator, accessed 15 November 2023.

[4] ACCC and GMRG, ACCC and GMRG joint recommendations measures to improve the transparency of the gas market, Australian Competition and Consumer Commission and Gas Market Reform Group, pp.29, 21 December 2018.

year have been reported. These contracts are negotiated directly between a buyer and a seller who are identified with the transaction along with the location of delivery. In addition to the price and total quantity, the following specific 'non-price' terms are also required to be reported with the transaction:

(a) MDQ (the maximum daily quantity that can be required to be supplied on a day)

(b) Take or Pay (the minimum amount of gas that may be sold on a day).

Lastly, the transaction must also include information on whether the price varies by reference to a change in the value of an index or rate, and if the transactions include any price escalation mechanism.

For 1-day transactions, a relatively small portion of transactions have involved pricing agreed under master arrangements in 2022, prior to reporting commencing on 15 March 2023. These arrangements include 'as available' arrangements reliant on the seller accepting nominations (firming nominations) the day before (in 2023). However, most contracts reported have been firm commitments to future supply over longer time frames of a week or more where the price has been agreed after 15 March 2023.

Short term gas swap transactions

A gas swap is a bilateral contract (greater than 1 TJ) to exchange gas over time, location or a combination of both outside of a gas trading exchange or regulated gas market. Price and quantity information are also reported, as well as the same 'non-price' terms as for short term gas supply transactions.

Depending on the type of swap, parties must agree on the date to receive gas and return gas, as well as one or more delivery locations. Participants are required to report swaps according to 3 categories:

1) location swap
2) time swap
3) location and time swap.

A location swap represents virtual transportation and our analysis shows it has been transacted by a range of participants that hold gas supply contracts in the north and south and see some benefit to swap some gas by location. This occurs where corresponding needs exist to top up customer demand in one region by selling surplus gas in another region.

A time swap represents virtual storage and our analysis shows it has been transacted between Exporter/Producers and GPG Gentailers to place more gas with GPG Gentailers to meet winter demand and more gas with Exporter/Producers over the Asian winter (our summer).[5]

[5] The GPG Gentailer participant category includes market participants with a generation and retail presence. The Exporter/Producer participant category includes market participants that are producing gas for the domestic market and/or the international export market.

3 How we and AEMO have reported on transactions to date

AER reporting

The AER commenced reporting of short term transaction data in the Q2 2023 wholesale markets quarterly report.[6] Our initial aim was to provide forward price information to the market by reporting a VWA price and quantities based on delivered dates. In our Q3 2023 wholesale markets quarterly report the pricing was further broken down for Queensland and Victoria, where most of the trade has occurred, and reported prices for 2023 and 2024.[7] In both these reports the VWA minimum and maximum price accounting for all transactions on specific days of trade within that period was also reported as an indicative price range. Where there were not enough transactions reported, or not enough participants reporting in a period, the data was aggregated over a longer time frame.

AEMO reporting

AEMO has a responsibility to publish gas transaction information under rule 195C of the National Gas Rules.[8] This rule specifies how AEMO must publish short term transactions and prohibits the publishing of names of parties transacting and requires that the data is unidentifiable. AEMO is empowered to determine its arrangements for anonymous reporting of short term transactions published as part of its Gas Bulletin Board aggregation methodology.[9] To ensure anonymity, AEMO only publishes data for a jurisdiction in a reporting period that has at least 3 transactions. If this test is not met, no data is published for the period. Additionally, AEMO has discretion over data publication timeframes.

AEMO separately report on short term gas supply transactions and swap transactions. These are further broken down by state and published on the Gas Bulletin Board as separate CSV files. The frequency of reporting was a discretionary decision that AEMO made prior to receiving the data. It was decided that Victoria and Queensland would be reported weekly and the other states would be reported monthly. The decision to publish different time frames was based on the higher trading activities in Victoria and Queensland compared with the other states. There may not have been sufficient transactions reported for the other states to maintain confidentiality if the reporting frequency was also weekly.

In Appendix A, example screenshots of AEMO's reporting are provided for short term gas supply transactions in Victoria and South Australia and short term gas swap transactions in Queensland.

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[6] AER, Wholesale markets quarterly Q2 2023, Australian Energy Regulator, 20 July 2023.

[7] AER, Wholesale markets quarterly Q3 2023, Australian Energy Regulator, 19 October 2023.

[8] AEMO, Energy Rules, Australian Energy Market Operator, accessed 13 November 2023.

[9] AEMO, BB Aggregation Methodology, Australian Energy Market Operator, accessed 16 November 2023.

4 Mixed stakeholder feedback on the usefulness of current reporting

During August 2023 we met with 12 stakeholders to discuss short term transaction reporting, including Gas Bulletin Board participants that are sellers responsible for reporting transactions and buyers expected to use the data reported to AEMO.

We asked a standard list of questions in each meeting to test engagement with the data and received insightful feedback from participants on the usefulness of how the data is currently presented and how it could be improved.

Feedback on the usefulness of short term transactions reporting was mixed. Some users expressed that the information is useful to supplement other sources of information when forming a view of the market. Others said that they do not look at the data at all. For some, it was the first time they had seen the AEMO or AER data and they had been unaware of it. Most stakeholders mentioned that they rely on other sources of information, such as ACCC reports, broker reports, international indices and internal research.

Large, sophisticated users indicated they relied on internal information, indices and their own unique views of the market when deciding when to transact or in forming price expectations. Despite this, most stakeholders reported an interest in the gas swaps transactions, with some noting there is a scarcity of available data.

Suggestions to improve short term supply reporting

Given general doubts over the benefits of the initial reporting, we revisited the proposal for reporting every trade on an anonymised basis, first considered during the rule consultation process. Industry views were mixed – many preferred to continue to improve existing aggregated reporting, rather than publishing each trade, citing anonymity concerns. Others said it would make filtering the data for industry easier and remove aggregation requirements on AEMO.

Stakeholders questioned the use of aggregating prices for supply delivery over multiple years. For instance, in the Victorian short term gas supply transaction table (shown at Appendix A), the VWA price contained the price for supply in years 2023 to 2027. Stakeholders mentioned that this made it particularly difficult to draw meaningful conclusions. Another suggestion to provide greater insights was to report the number of contracts per transaction period.

Industry generally agreed that the reporting by state was desirable but noted the trade-off that this could lead to less data points and prevent reporting under aggregation rules. If possible, stakeholders supported continuing weekly reporting for Victoria and Queensland, as the majority of short term transactions occur in these states, and extending to other states if the data permits. Since the reporting frequency is discretionary, AEMO could revise this.

Some stakeholders suggested distinguishing ‘as available’ from ‘firm’ sales because the services feature different levels of security of supply. Those that suggested not splitting cited regulatory burden in reporting and highlighted that once firmed up ‘as available’ had the same

firmness. Some stakeholders suggested ceasing requiring industry to report on ‘as available’ transactions.

Other comments suggested the inclusion of information about price linkages (for example, fixed price, oil linked, etc.) and optionality (take-or-pay or other non-price terms).

A couple of stakeholders mentioned that it is difficult to reconcile data reported across multiple regulatory authorities.

Interest in swap transactions was high and indicated a change in reporting is needed

Stakeholders expressed particular interest in the reporting of short term gas swap transactions because there is a scarcity of publicly available swap information. Currently both parties to a swap transaction report the transaction price to AEMO, which includes the commodity price, and this price is reported on to the Gas Bulletin Board (see Appendix A for a screenshot example of how AEMO reports short term gas swap transactions). However, a common response from industry was that the reported price should focus on the price delta, which is the price differential between the two sides of a swap arrangement (Box 2). AEMO’s current reporting on short term gas swap transactions does not enable participants to identify this information.

Stakeholders also agreed on the need to separate swap transaction reporting by the type of swap, whereas currently swap pricing reported by AEMO is aggregated without differentiating time swaps from location swaps.

Another issue raised was the length of swaps. Swaps can vary in length from days to multiple months. The duration of swaps represents different products with a couple of participants particularly interested to understand seasonal priced swaps which involve time swaps over summer and winter periods. However, under the current reporting framework swaps of all durations are aggregated into a single price.

Most stakeholders agreed that the breakdown by states were useful. However, one participant emphasised the desirability of more granular information on prices between intra-state or interstate locations rather than just by regions.

Box 2: Swap price differential explained

The term price differential is used by industry participants to describe the difference between the commodity prices on the buy and sell legs of swap transactions. The price differential informs the market of the value of the services provided by swap transactions, whether that be for virtual transport between two points (location swap) or virtual storage (time swap).

Location swap example

Party A needs 1 TJ of gas to be delivered at the Moomba Trade Point on 1 November. Party A approaches party B to ask if they have available gas at the location and offers to provide gas at the Wallumbilla High Pressure Trading Point in return. Party B does have 1 TJ of gas at the Moomba Trade Point and they enter negotiations for a location swap.

After negotiating, party A agrees to buy 1 TJ of gas at $11.30/GJ for delivery to the Moomba Trade Point on 1 November 2023. In return, party B agrees to buy 1 TJ of gas from party A for $11/GJ for supply at the Wallumbilla High Pressure Training Point for delivery on the same date. The price differential from this location swap transaction was $0.30/GJ paid by party A.

Time swap example

Party A has 1 TJ of gas surplus to requirement at Wallumbilla High Pressure Training Point. Party B needs gas now to meet supply obligations, but forecasts it has sufficient supply in 6 months. Party B approaches party A and they enter negotiations for a time swap.

After negotiating, party B agrees to buy 1 TJ of gas the following day for $11/GJ for delivery at the Wallumbilla High Pressure Training Point from party A. In return, party A agrees to buy 1 TJ of gas for $10.50/GJ for delivery at the same location in 6 months. The price differential from this time swap transaction was $0.50/GJ paid by party B.

Location and time swap

It is possible to have a swap that incorporates the elements of a time and location swap. These transactions operate in the same way as the examples above but have different delivery locations and a period of time between the two legs of the swap.

5 Insights from the data reported since commencement

Our analysis focused on all short term transactions reported to the Gas Bulletin Board between 15 March 2023 and 31 October 2023.[10] Through our analysis we aimed to:

- address key stakeholder feedback in the way transactions are reported, specifically in relation to price reporting.
- provide additional insights into supply and swap transactions.
- identify issues or shortcomings in the way transactions are reported and the impact of those on the analysis of the data.
- provide insights and ideas on how the information could be reported on in the future.

Our analysis identified challenges with the data

We have been working closely with AEMO and market participants to ensure accurate reporting of short term transactions to the Gas Bulletin Board since reporting commenced. In May we engaged with several market participants to clarify some of the reporting observed in the first weeks since going live. In preparing this report, we also identified potential further challenges in the way transactions are reported that affected our ability to analyse the data. Below is a list of some of these challenges and issues identified:

- The reporting of the buyer participant field is a free text field. To date sellers have reported transactions reflecting sales to 101 different buyer participants, which in many instances are the same participant but due to lack of naming convention results in numerous variations of the same buyer being reported.
- The location name field in the reporting is a free text field. With no consistent naming convention almost 150 different location names were reported. For example, more than 20 different variations of reporting against the Wallumbilla High Pressure Trading Point were identified. It was also not always evident from the location field name reported where exactly that location is.
- Instances were identified where there was a significant difference between the transaction quantity reported for the supply period and the maximum daily quantity.
- Errors in participants' reporting related to prices and pricing structures including misreporting of $0/GJ prices. These were mostly corrected once identified.

[10] The dataset used in this analysis was extracted on 3 November 2023 and all prices and volumes reported are accurate at this point in time.

- Participants amended or even cancelled reported transactions, in line with changes in contractual outcomes. This in itself is not a concern and should be done by participants, but it underscores that prices and volumes reported are accurate at a point in time only.
- Participants reported contracts longer than 12 months.
- Both sides of swap transactions have in some instances not been reported and in other cases it appears some counter parties have incorrectly reported swap transactions as supply transactions.
- The same swap transaction has been reported differently between participants, which made matching swap transactions difficult.[11]
- When comparing the same swap transaction reported by the 2 parties to the transactions, there are sometimes inconsistencies between the trade date, maximum daily quantity and take or pay quantity reported.
- Information on the pricing structure underpinning the transactions is not a mandatory field in the submission to AEMO and participants have often not provided any information in this field. Around 65% of all transactions reported had no price structure information provided.

Despite the challenges identified above we were still able to draw meaningful insights from the data.

The following assumptions were made in the analysis of this data:

- where it was clear from the data that there was an error in reporting, transactions were excluded from the analysis.[12] We only excluded around 2.5% of the overall transactions reported from the final analysis.
- buyer and seller participants were grouped together by their common names.[13]
- participants have often not provided information on the pricing structure to AEMO – we have assumed that non reporting of this information reflects fixed price agreements.[14]
- to report on transactions based on the supply period we separated out transactions into the corresponding delivery months of the contract – to do this we assumed that the transaction quantity reported is equally split over the transaction delivery period.[15]

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[11] An example of where participants report the same swap transaction differently is where one participant reported one transaction while the counter party reported the same transaction as multiple transactions over the supply period.

[12] Some examples of excluded transactions from the analysis were swap transactions reported as supply transactions or where it was evident that the transaction quantity does not align with the maximum daily quantity reported.

[13] Where a participant was reported in one transaction as ABC Ltd and in another transactions as ABC Limited they were grouped together as ABC.

[14] In June we wrote to 15 participants that had submitted a May transaction and confirmed no entry meant fixed price.

We took a conservative approach in the way we analysed and aggregated the data to ensure that participant confidentiality is maintained. In Table 1 is a list of the participant categories we used to aggregate the data as well as the number of participants that have appeared in reported transactions in each category.

Table 1 Participant categories

Participant category	Number of participants
Exporter/Producer	15
GPG Gentailer	10
Industrial	26
Retailer	6
Trader	4

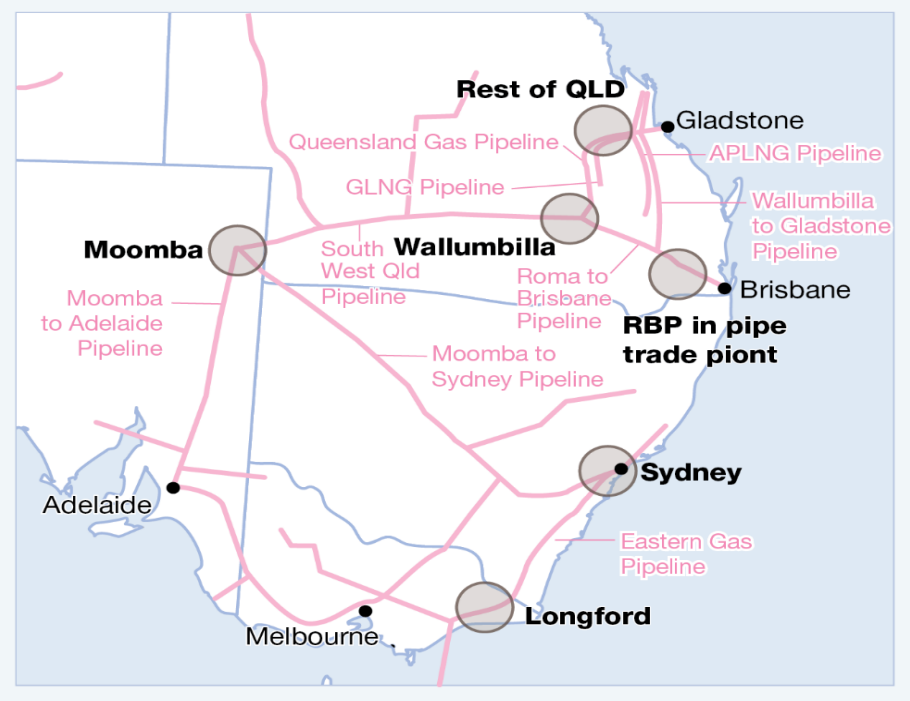
Notes: For the purposes of our reporting, the GPG Gentailer participant category includes market participants with a generation and retail presence, while the Exporter/Producer participant category includes market participants that are producing gas for the domestic market and/or the international export market.
Source: AER analysis using Natural Gas Services Bulletin Board data up to 31 October 2023.

Most short term transactions reported can be grouped into a few main locations on the east coast that align with production areas or main city centres. For our analysis we grouped most of the transactions into locations at Longford, Sydney, Moomba, Wallumbilla, the Roma to Brisbane in pipe trade point, and the rest of Queensland (Figure 1).[16]

[15] If a contract was traded in June 2023 for 92 TJ for delivery in Q4 2023 we would assume that the 92 TJ will be split equally over the 92 gas days of the delivery window (October 2023 to December 2023). In our example 30 TJ will be delivered in November 2023 and 31 TJ in October and December 2023.

[16] The rest of Queensland grouping includes rural locations like Mt Isa and Ballera, but also locations related to gas fields and pipelines transporting gas for export from Gladstone.

Figure 1 Major gas trading locations



Source: AER analysis using Natural Gas Services Bulletin Board data.

Short term gas supply was mostly fixed price contracts longer than a week

More than 85% of the volume of supply transactions reported up until 31 October 2023 were in Queensland and Victoria, where most gas production on the east coast occurs. Just over 80 PJ of gas was traded as short term gas supply transactions (up to a year in length), compared with around 25 PJ of gas traded through the Gas Supply Hub, which reported no transactions greater than a month (Figure 2).[17] This highlights the significance of bilateral contract reporting and its scope to provide valuable insights and transparency to the market on future pricing.

[17] The Gas Supply Hub is an AEMO facilitated market with standardised products, which presently trades at more limited locations than available for bilateral trading – with the most traded location being Wallumbilla. Short term gas supply transactions at Wallumbilla were 22.1 PJ compared with 19.5 PJ traded through the Gas Supply Hub for delivery at the Wallumbilla trading location.

Figure 2 Comparison of transaction length and price structures between short term gas supply transactions and the Gas Supply Hub

Notes: The short term supply transactions were grouped into trades with a supply period of 1 day, greater than 1 day up to a week, greater than a week up to a month and greater than a month up to a year. Similarly for the Gas Supply Hub transactions, all product types traded through the exchange or off market were grouped into the same delivery lengths. Short term supply transactions were also grouped into the 3 main pricing structures observed in the reporting namely fixed prices, pricing structures linked to the spot markets and all other pricing structures that did not fit into these 2 categories.
Source: AER analysis using Natural Gas Services Bulletin Board and Gas Supply Hub trades data up to 31 October 2023.

Of the reported short term gas supply transactions, almost 50% of all transactions were for a delivery window of longer than a month. During the same period, the Gas Supply Hub had no transactions reported with delivery windows longer than a month. It is worth noting though that the way short term gas supply transactions are reported in our analysis there is a bias towards the data being skewed to show more transactions in the '>week up to 1 month' category. This is due to the disaggregated reporting of some transactions to account for changes – such as price, maximum daily quantity, etc. – across a contract.[18]

[18] An example of where a short term gas transaction reported can be skewed toward a transaction of '>week up to a month' is where a transaction for a year in length with different price terms in each month will be reported as 12 separate transactions to AEMO to capture the price variation over the term of the contract. In our analysis these transactions will be grouped in the category '>week up to 1 month', when in effect it really is one transaction that better fits the category '>1 month up to a year'.

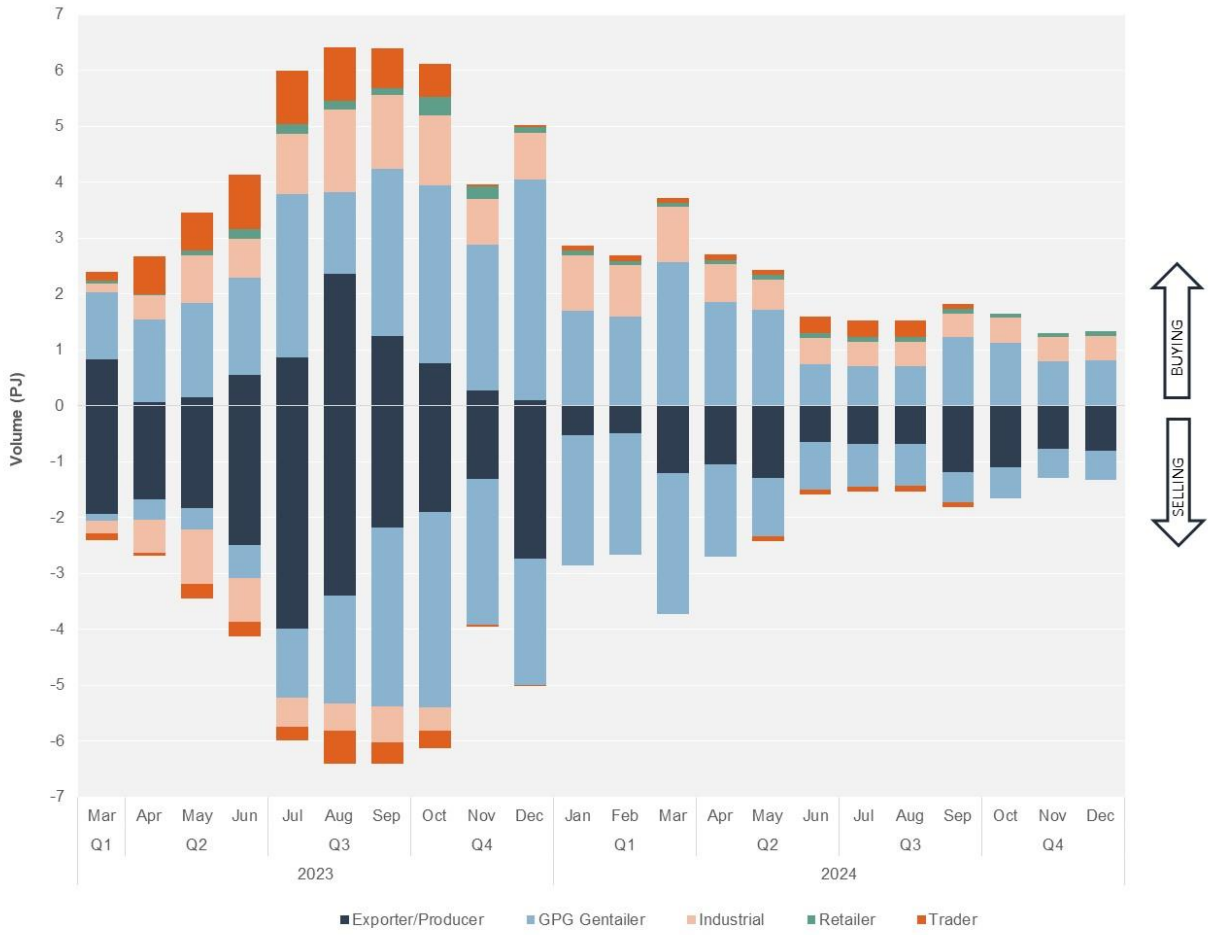
Around 90% of all short term supply transactions reported were fixed price contracts. Just over 7% were linked to spot market prices and the remainder were linked to other pricing structures.[19] The majority of spot market price linked transactions reported were for delivery lengths of one day and would mostly be 'as available' contracts linked to master sale agreements. In contrast, most fixed price contracts were for delivery lengths of a week up to a year, with some participants also reporting contracts entered into for delivery as far out as 2026 and 2027.

Exporter/Producers and GPG Gentailers are the most active trading participants

Most short term gas supply transactions for delivery in 2023 were sales by Exporter/Producers (50%) and GPG Gentailers (35%) (Figure 3). By comparison Exporter/Producers bought only 15% of gas for delivery in 2023, with GPG Gentailers the most active buyers (50%) followed by Industrial participants (almost 20%). For delivery windows into 2024, Exporter/Producers have been only on the sell side so far, with GPG Gentailers reporting higher sale volumes, especially in the first 4 months of the year. On the buy side for 2024, GPG Gentailers (62%) and Industrials (29%) are so far dominant.

[19] Examples of spot market linked pricing structures were prices linked mostly to the DWGM 6 am schedule prices or the STTM ex ante prices plus additional fixed price terms; for example, 'linked to DWGM 6 am price plus $X/GJ'. Examples of pricing structures categorised as 'other' pricing structures were prices linked to specific contractual terms and formulas or prices linked to an oil price or oil index.

Figure 3 Trade by participant grouping based on supply dates



Notes: The analysis is based on supply dates.
Source: AER analysis using Natural Gas Services Bulletin Board data up to 31 October 2023

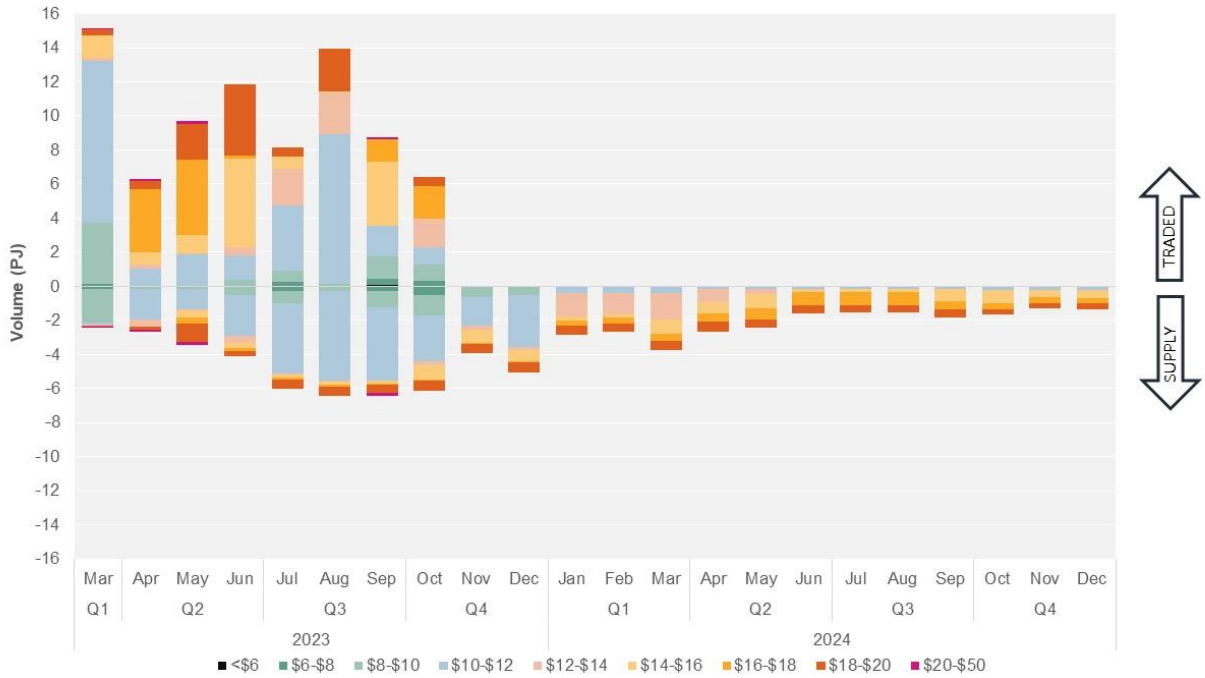
Supply volumes peaked during August at 6.4 PJ, which coincided with annual peak winter demand for gas. Supply volumes are also strong leading into December, already sitting at just over 5 PJ in line with expectations for a warmer summer and possible higher GPG demand. This is reflected in the almost 80% of all gas bought for December attributed to GPG Gentailer participants. 2024 supply forward volumes are between a high of 3.7 PJ in March and a low of 1.3 PJ in November but are expected to continue to increase as more contracts are entered into in the leadup to next year.

2024 gas deliveries traded in higher price bands than 2023

Of the 80 PJ traded up until the end of October 2023, 47 PJ was for delivery in 2023, 25 PJ for delivery in 2024 and the remainder for delivery in 2025 to 2027 (Figure 4). In Q1 2023 a large

portion of the trade appeared to include volumes from the January expression of interest by Shell's QGC business to sell 8 PJ of gas for delivery in 2023.[20]

Figure 4 Traded versus delivery quantities and price bands



Notes: Traded refers to the trade date of the short term supply transaction, while supply refers to the month the gas volume will be supplied.
Source: AER analysis using Natural Gas Services Bulletin Board data up to 31 October 2023

It is worth noting that for 2023 deliveries a regulated price cap of $12/GJ applied to Exporter/Producer participants.[21] More than 85% of gas delivered in Q3 2023 was in price bands lower than $12/GJ, reflecting the $12 price cap but also that spot market prices declined over this period leading to lower prices for all groups of participants.[22]

However, very little gas has been traded below $12/GJ going into 2024. The highest price bands observed were during Q2 2023, which was partly related to transactions being reported for delivery in 2024 and beyond in price ranges between $16/GJ and $20/GJ. This could indicate that buyers at that point in time were willing to pay a premium for gas delivery in 2024. However, we have observed that prices for short term gas supply transactions entered into in Q3 for delivery in 2024 were roughly 15% below those entered into in Q2, suggesting that

[20] Shell, Shell announces expression of interest for domestic customers, 23 January 2023.

[21] Australian Government, Competition and Consumer (Gas Market Emergency Price) Order 2022, December 2022.

[22] Prices above $12/GJ for deliveries in 2023 reflect largely sales of gas by participants not subject to the price cap, including GPG Gentailers and Retailers but also in some cases sales by regulated participants including Exporter/Producers at prices agreed before the price cap came into effect.

participant expectations for 2024 may have improved as the year has gone on.[23] Another contributing factor to the higher price bands reported in Q2 this year was the higher spot market prices, particularly in May and into June. This was driven by Longford supply constraints, transportation constraints moving gas from north to south, and higher Victorian demand.[24]

Volume weighted average prices for 2023 lower than in 2024

The average VWA price for supply in 2024 is $15.88/GJ with a low in Q1 2024 of $14.64/GJ and high in Q3 2024 of $16.86/GJ. To preserve anonymity when reporting prices and volumes by month in 2024 we have not separated between Queensland and southern states, unlike for 2023. The average VWA price for Queensland in 2023 is $11.98/GJ compared with $13.15/GJ in the southern states for an average price differential of $1.16/GJ for the year (Figure 5).[25] Overall, 2023 gas supply was priced about $3/GJ lower than 2024 supply.

The 2023 price differential between Queensland and the southern states may be explained by southern deliveries being more likely to reflect recovery of long-distance transportation costs from Wallumbilla/Moomba, whereas northern deliveries are more likely to be sales directly at, or close to, gas fields. The 2023 price differential between north and south was most prominent during May given volatile spot market prices and because bilateral trades reported in the south (but not north) had spot market linked pricing. During Q3 the difference between prices in Queensland and the southern states was as low as $0.36/GJ in July, which highlights gas supply was ample during the 2023 winter. However, in Q4 2023, prices in the southern states have steadily increased while Queensland prices remained around $12/GJ. A price differential is currently projected of $2.32/GJ in December.[26]

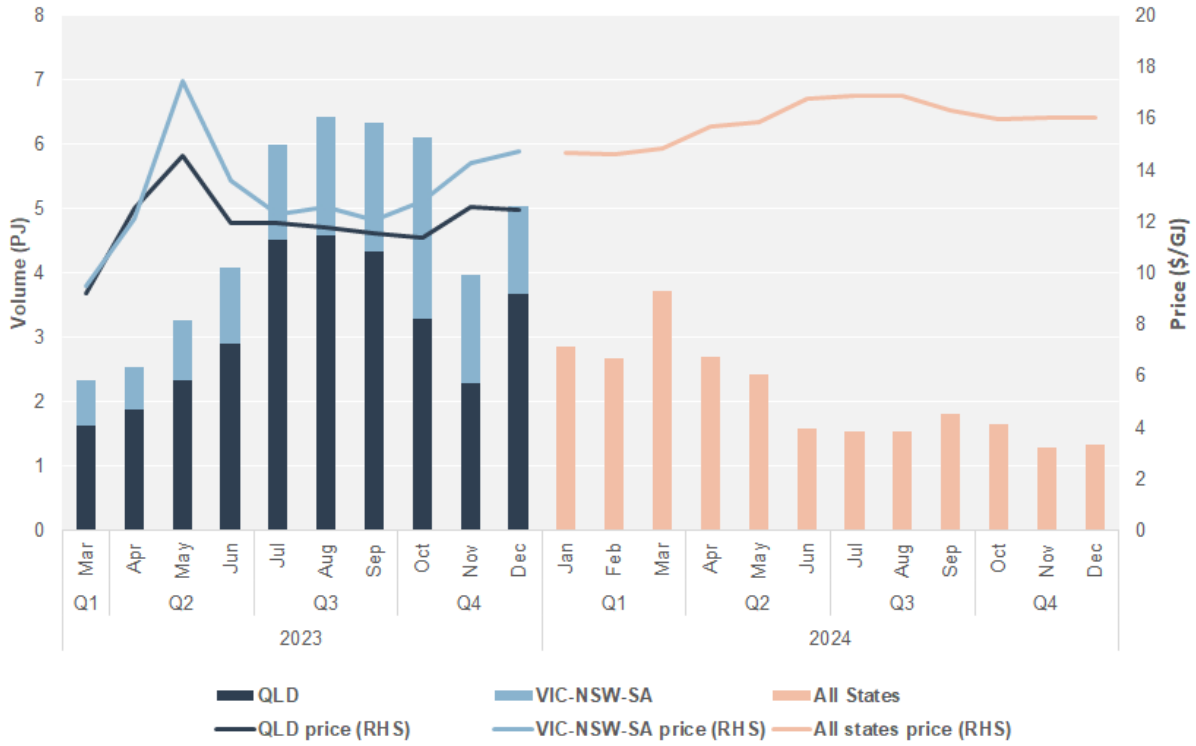
[23] AER, Wholesale markets quarterly Q3 2023, Australian Energy Regulator, 20 July 2023.

[24] AER, Wholesale markets quarterly Q2 2023, Australian Energy Regulator, 19 October 2023.

[25] The southern states refer to Victoria, New South Wales and South Australia.

[26] This is based on reported transactions up to 31 October 2023.

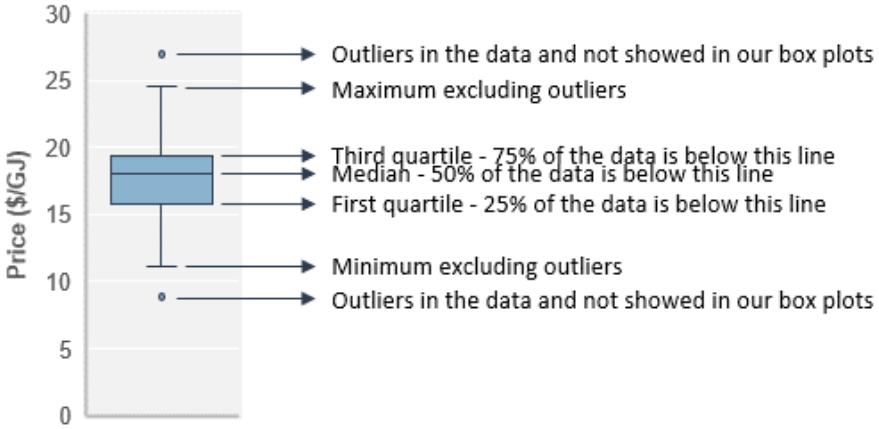
Figure 5 Volume weighted average price and supply volumes



Notes: The above volume weighted prices and quantities are based on the supply dates of the reported transactions and include all pricing structures. For 2023 the analysis is split between Queensland as an indicative northern price while Victoria, New South Wales and South Australia (VIC-NSW-SA) are grouped together for an indicative southern price. For 2024 all 4 states are grouped together.
Source: AER analysis using Natural Gas Services Bulletin Board data up to 31 October 2023.

In our analysis of prices for short term transactions we have used box plots to provide insight to participants on the distribution of prices. A box plot provides a visual representation of the distribution of the underlying prices of the short term supply transactions and the price differentials for location and time swaps (Figure 6).

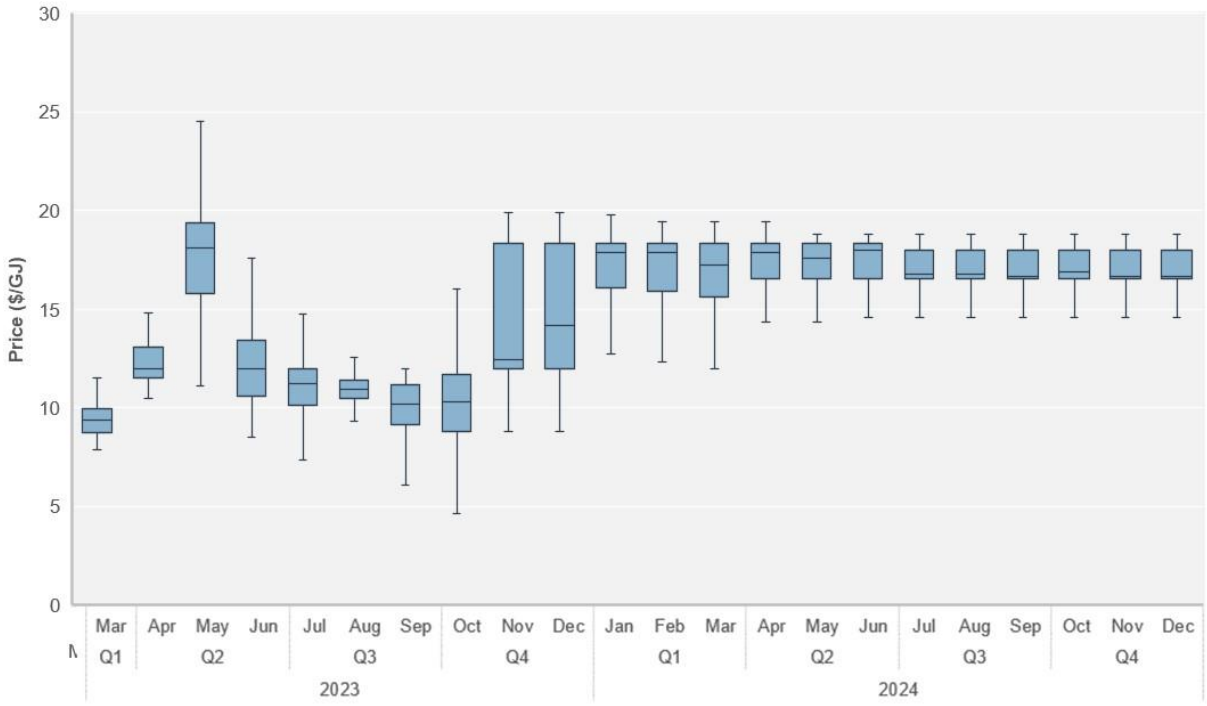
Figure 6 Box plot graph explained



Notes: This is an example on how to interpret the box plot graph.

The distribution in prices for 2023 are mostly larger compared with 2024, with significantly more transactions reported in 2023 and more volatility in prices. Price volatility was most evident in May and June when spot market prices spiked higher and late September and early October when spot market prices hit multi-year lows (Figure 7). November and December 2023 prices also show large price spreads, with trade for supply in these months occurring throughout the year. In 2023, apart from May, November and December, the median price was at or below $12/GJ.

Figure 7 Price distribution for supply transactions grouped by month



Notes: The price distributions are based on the actual prices reported for all the transactions within the month of supply and includes all pricing structures. This analysis excludes outliers in the data and is not displayed on the box plot.
Source: AER analysis using Natural Gas Services Bulletin Board data up to 31 October 2023.

For supply in 2024 the median price in the first half of the year is closer to $18/GJ, whereas in the second part of 2024 the median price is closer to $17/GJ. The price range for 2024 varies between lows of around $12/GJ and highs around $19.50/GJ. As 2023 draws to a close, more supply contracts for 2024 are expected following resolution of exemption applications under the mandatory Gas Code of Conduct.[27] We will continue to report on future prices in our wholesale market quarterly reports.

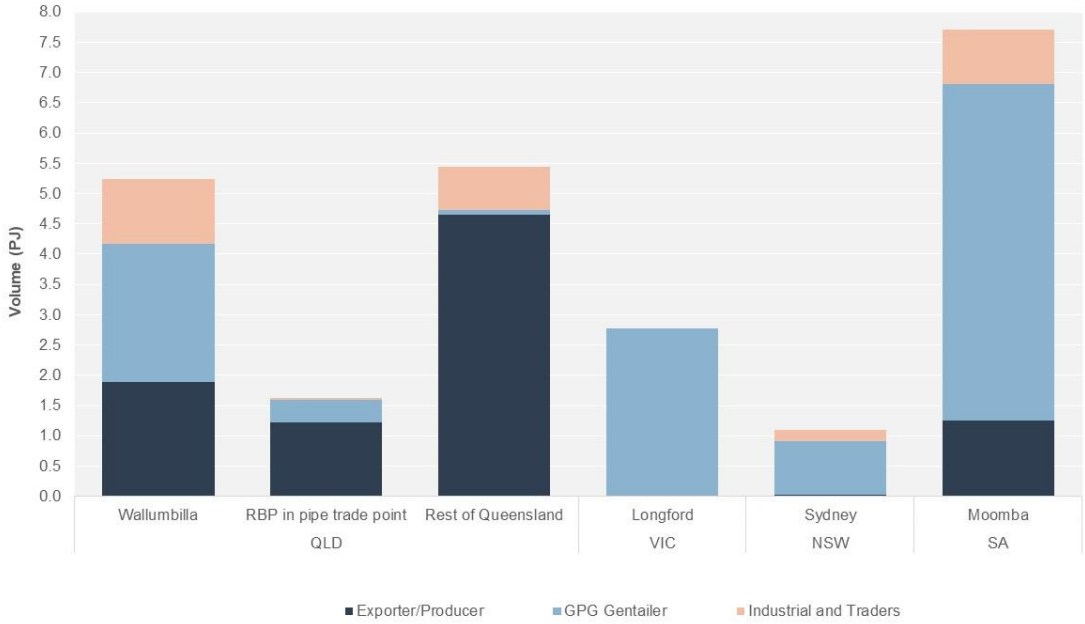
[27] Australian Government, Joint media release: Gas Code secures supply for domestic market., 27 November 2023

Queensland and Moomba are most prominent in matchable location swaps

Location swaps represent virtual transportation, where 2 parties swap gas between 2 locations. Most of the location swaps occur between a few main locations on the east coast that mainly align with production areas or main city centres (see Figure 1 which shows a map of main trading locations).

Just over 50% of all location swaps were reported in Queensland, followed by just over 30% in South Australia (Figure 8). Exporter/Producer location swaps solely occurred in Queensland and South Australia, which aligns closely with where gas fields and major production infrastructure are located. GPG Gentailer location swaps align with where gas is produced in the north, in the south at Longford as an entry point into the Victorian market, and also around the Sydney market.

Figure 8 Participant location swaps grouped by main areas



Notes: The volumes of both parties reporting the swap transaction to AEMO is included in the analysis. The rest of Queensland grouping includes rural locations like Mt Isa and Ballera, but also locations related to gas fields and pipelines transporting gas for export to Gladstone. This analysis does not include swaps reported at locations outside of Sydney in NSW and Longford in Victoria. We have grouped Industrial and Trader participants together for this analysis.
Source: AER analysis using Natural Gas Services Bulletin Board data up to 31 October 2023.

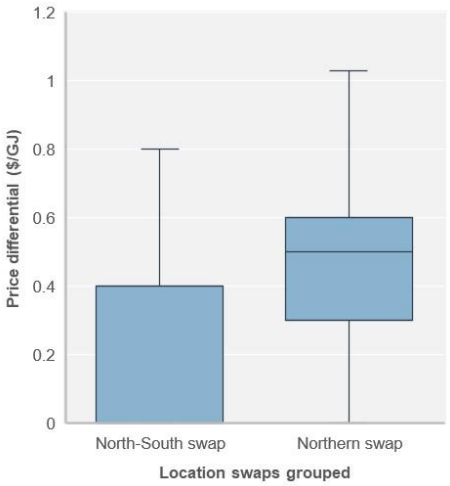
Almost 50% of all the Exporter/Producer location swaps in Queensland are between Exporter/Producers, mostly at locations related to production or export of gas. Almost one-third of all location swaps for GPG Gentailers for the whole east coast occur between GPG Gentailers.

To analyse what locations participants are mostly swapping gas between, as well as any price differentials reported, transactions first needed to be matched in the data. Due to difficulties arising from how transactions are reported, discussed at the beginning of this chapter, we were only able to match with confidence around 35% of all reported transactions. For these

matched transactions, the three most frequent location swaps that have been reported are between Wallumbilla and the rest of Queensland, Moomba and Sydney, and Moomba and the rest of Queensland. Other frequent location swaps are between Wallumbilla and Sydney, Wallumbilla and Moomba and Wallumbilla and the RBP in pipe trade point.

With less than half of the location swaps matched it was necessary to group the data into two main location swaps – namely, a 'north-south swap' and a 'northern swap'. This was required to obtain a large enough sample set to publish aggregated price differentials between locations (Figure 9).[28]

Figure 9 Price differential distribution for grouped location swaps



Notes: The price differential distribution is calculated only for matched location swap transactions. This analysis excludes outliers in the data and is not displayed on the box plot.
Source: AER analysis using Natural Gas Services Bulletin Board data up to 31 October 2023.

The median north-south location swap price differential was $0/GJ, with 75% of the price differentials below $0.40/GJ and a maximum price differential of $1.25/GJ. For the northern location swaps the median price differential was $0.50/GJ, with 75% of the price differentials below $0.60/GJ and a maximum price differential of $1.03/GJ.

For the matched transactions, the very low median price for north-south location swaps seems surprising. However, day before location swaps were common and a substitute service would be day ahead auction transportation, which over the same period on the SWQP and MSP was frequently $0/GJ.[29]

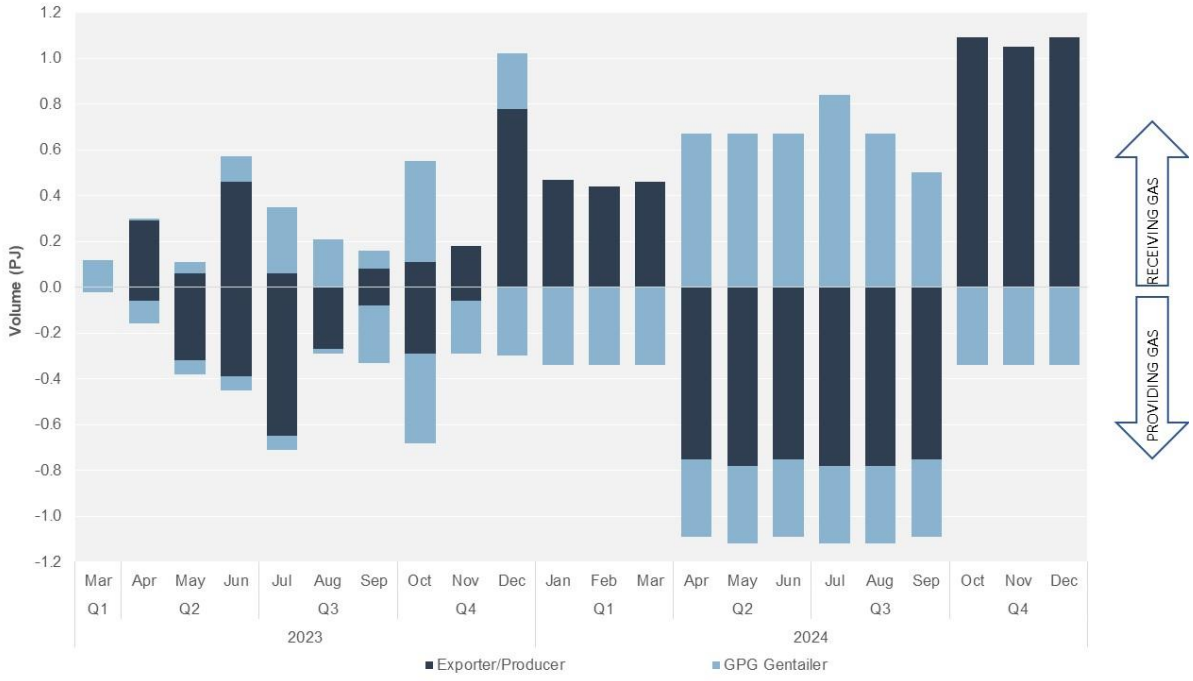
[28] North-south location swaps for example would include location swaps between Moomba and Sydney, Wallumbilla and Longford or the RBP in pipe trade point and Sydney. Northern location swaps for example would include location swaps between Moomba and Wallumbilla, the rest of Queensland and Wallumbilla or Wallumbilla and the RBP in pipe trade point.

[29] During the period 15 March to 31 October, almost 17 PJ of auction capacity was won on auction routes moving gas south on the SWQP and south on the MSP from Moomba to delivery locations at Culcairn and Wilton. Around 83% of this auction capacity won cleared at $0/GJ.

Seasonal time swaps between Exporter/Producers and GPG Gentailers

Time swaps represent virtual storage where two parties swap gas for delivery at different times. The reported transactions first needed to be matched in the data to analyse which participants are using time swaps, distinguishing between different time frames and price differential information. Due to difficulties arising from how transactions are reported, discussed at the beginning of this section, we were only able to match with confidence around 50% of all reported time swap transactions. Of the matched transactions, just over 75% of these transactions were between Exporter/Producers and GPG Gentailers.
Exporter/Producers usually favour higher export volumes during the Australian summer when domestic demand is low and export prices are highest due to the Northern Hemisphere winter, while GPG Gentailers have the highest demand during winter months. Over 2023 and 2024, we were able to match just over 12 PJ of time swap transactions between Exporter/Producers and GPG Gentailers. It showed a general pattern of Exporter/Producers supplying gas to GPG Gentailers over the winter months when domestic demand is high, in return for receiving the gas back over the summer months when export demand is at its highest (Figure 10).

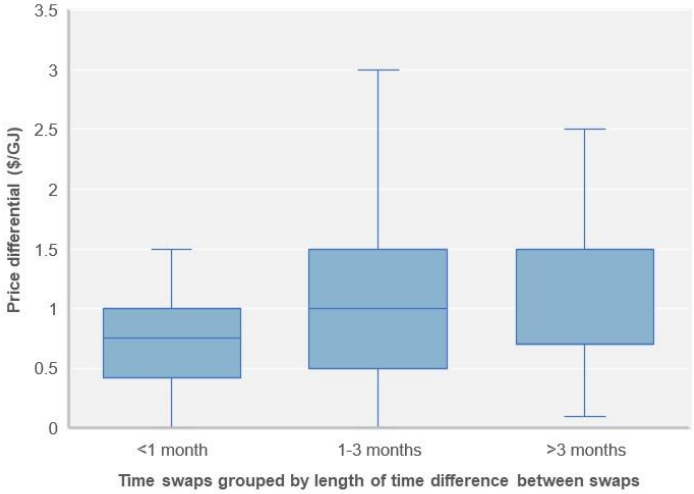
Figure 10 Matched time swaps between Exporter/Producer and GPG Gentailer participants



Notes: The volumes are only of matched time swap transactions between Exporter/Producers and GPG Gentailers reported to AEMO.
Source: AER analysis using Natural Gas Services Bulletin Board data up to 31 October 2023.

With only half of the time swaps matched it was necessary to group the data by the length of the time swap to ensure we have a large enough sample set to publish aggregated price differentials for time swaps. The 3 time swap groupings we used to report on price differentials were time swaps with a time difference of less than 1 month, a time difference between 1 and 3 months and a time difference greater than 3 months (Figure 11).

Figure 11 Price differential distribution for matched time swaps



Notes: The price differential distribution is calculated only for matched time swap transactions. This analysis excludes outliers in the data and is not displayed on the box plot.
Source: AER analysis using Natural Gas Services Bulletin Board data up to 31 October 2023.

Time swaps with a time difference of less than 1 month reflect swaps between participants of days or weeks and have the smallest price differential distribution, with the median price differential $0.75/GJ and a maximum price differential of $1.50/GJ. Time swaps longer than 3 months generally reflect more seasonal time swaps, where gas is swapped between summer and winter. The median price differential for these time swaps was $0.70/GJ, with 75% of the price differentials below $1.50/GJ and a maximum price differential of $2.50/GJ. We have generally also observed that the participant receiving gas in winter pays the higher premium. More than 60% of time swaps grouped as 1 to 3 months are for time swaps from one month to the next. This grouping has the widest spread of price differentials, with a median price differential $1/GJ and a maximum price differential of $3/GJ, reflecting a distribution of pricing within and across seasons.

6 Suggestions for future reporting

AEMO's current reporting arrangements were informed by consultation with industry and initial decisions were made to report by region according to weekly and monthly frequencies. These frequencies were set with a view to having enough transactions to allow reporting in accordance with a defined aggregation methodology (3 transactions for each period to report). Following experience with reporting over 2023, the AER considered it is timely to review reported data, the form and function of that reporting, and how it might be aggregated differently. This report forms a key evidence base for such consideration by AEMO.

AEMO will be conducting its biennial review of the Gas Bulletin Board in 2024. AEMO would need to undertake an assessment of the costs of any proposed changes, and they will need to be consulted on. Some changes may be able to be dealt with by AEMO via the procedures, but any Rule changes would likely need to be progressed to the Australian Energy Market Commission (AEMC).

Reporting all transactions

Some participants have suggested that AEMO should report all transactions without identifying the transacting parties. This would be a departure from the current data aggregation requirements in the National Gas Rules. This report does not consider this approach further, mostly because our initial approach attempted to see if the aggregated data could be made more insightful.[30]

Tailored short term transaction reporting

Price reporting based on future supply dates

In August, the industry participants the AER interviewed expressed significant interest in gas pricing over future season and future year periods. Our findings indicate that around 25 PJ has been reported up to 31 October 2023 for delivery in 2024, with transactions already reported as far out as 2027. This indicates a possibility in highlighting delivered pricing for future periods, potentially separate to price reporting based on trade dates.

A couple of stakeholders noted that they are now looking in multiple places to source information as to future year gas prices, including ACCC reports. The ACCC reports on contracts 1 year and longer when presenting future year prices. Its reporting captures a different data set than reported here and includes prices in multi-year agreements, such as a 3-year agreement struck from 2024 to 2026.[31] These aren't short term transactions and won't

[30] The idea of individual transaction reporting was raised in the consultation phases when issues of co-ordinated pricing effects were also considered, ACCC, Measures to improve the transparency of the gas market, Australian Competition and Consumer Commission, pp. 29, accessed 17 November 2023.

[31] ACCC, Gas Inquiry June Interim Report, Australian Competition and Consumer Commission, accessed 17 November 2023.

be reported to AEMO. However, there are examples of 3-year supply arrangements that have been split into separate 1-year contracts which have been reported as short term transactions.

Consideration could be given to testing the value of extending transaction reporting to AEMO to all contracts, regardless of length, to capture all transactions and to provide more high-quality, frequent information to industry. This would assist with the challenge that the limited number of individual transactions reported for following years restricts how frequently this data can be reported by AEMO. It would also provide potential benefits over time should single place reporting reduce the need for contract collection by the ACCC or the AER.

Although we did not receive specific feedback from participants on different reporting, we consider it could be feasible for AEMO to move to a table format that resembles the ACCC LNG netback price series.[32] This would include a trade date column and a delivery window row. Another approach could be to update future delivery data each month to include a new VWA price – that is for months in Q2 2024, January 2024 prices could reflect an average of deliveries traded in January 2024 for Q2 2024 and then February 2024 could contain 2 months of data (January and February).

We intend to continue presenting short term transaction data in our wholesale market quarterly reports, including alternative ways of presenting this data such as the box plots in section 6, which provides more granular information on the price distribution.

Explicit reporting of fixed price transactions

Our analysis indicates that just over 20% of all bilateral trade reported is occurring on a more near-term basis – that is, up to a week out. About one-third of these transactions are linked to spot markets. Further, a couple of stakeholders highlighted for longer term pricing they would value knowing if the pricing was fixed or linked to another price such as oil. It would be worth considering whether there is value to separately report fixed prices.

Reporting of swap transactions poses particular challenges

Some of the considerations above related to gas supply transactions could be applied to swap transactions.

However, the main comment in relation to swaps is to highlight the likelihood that the reporting of swaps will continue to be a challenge for both AEMO and the AER. This is mainly due to difficulties in matching swap transactions because the current reporting requires both parties to the swap transaction to report separately. While we will continue to monitor and enforce compliance with the current requirements, we suggest consideration of validation and confirmation processes so only one side of the swap reports.

[32] ACCC, LNG netback series, Australian Competition and Consumer Commission, pp. 48, accessed 17 November 2023.

Other reporting

In considering the data presented for this report, we also consider that, as the time series builds, there may be value in reporting periodically on other information including:

- the average take or pay percentage in contracts
- the different ways prices are linked to other indices, for example:
  - STTM or DWGM linked.
  - Japan Korean Marker (JKM) (no observations to date).
  - Brent Oil (limited observations to date).

Understanding yearly trends over time in take or pay levels or types of pricing mechanisms is likely to enrich industry's understanding of the types of contracts available. Some participants indicated interest in more frequent price reporting broken down by different take or pay levels; however, this could dilute the transactions available to aggregate.

Participant reporting to AEMO can be improved

As highlighted in the previous chapter, the way some of the transaction information is reported creates difficulty in matching and analysing the data. In particular, the reporting of the buyer participant and the location for supply or swap are free text fields, resulting in inconsistent reporting by participants. Furthermore, the price structure field is not mandatory and with most participants reporting nothing in this field, it is unclear whether or not the pricing structure is fixed.

To improve reporting, additional validations or processes are likely to be required but we suggest that major improvements could come from a requirement to use unambiguous identifiers. For example, AEMO could require the use of ABNs for buyer name reporting and Gas Bulletin Board connection point IDs (or Facility ID for in pipe trades) when describing delivery locations. We also recommend that the price structure field be mandatory, where participants explicitly state whether the transaction is a fixed price.

7 AER next steps

The reporting of bilateral trade to the Gas Bulletin Board is an important reform measure that increases transparency of the east coast gas markets. We intend to continue to report on this information through our wholesale market quarterly reports and work closely with AEMO and market participants to ensure the reporting is accurate, timely and adds value.

Our analysis also highlighted areas where we intend to undertake further work. This is in line with one of the AER 2023–24 Compliance and Enforcement priorities, which is to clarify obligations and monitor compliance with reporting requirements under the new Gas Market Transparency Measures.[33]

[33] AER, AER compliance and enforcement priorities 2023–24, Australian Energy Regulator, June 2023.

Appendix A – AEMO reporting to the Gas Bulletin Board on short term transactions

The reporting of the short term transactions data by AEMO is to the Gas Services Bulletin Board.[34] The volume weighted average price of all transactions is reported and expressed in dollars per GJ. For Victoria and Queensland, AEMO has been reporting supply transactions on a weekly basis (see Figure 12 for Victorian example).

Figure 12 Screenshot of AEMO reporting of supply transactions in Victoria

PeriodID	State	Quantity (TJ)	VolumeWeightedPrice ($)	TransactionType	SupplyPeriodStart	SupplyPeriodEnd
06-Mar-2023 to 12-Mar-2023	VIC					
13-Mar-2023 to 19-Mar-2023	VIC					
20-Mar-2023 to 26-Mar-2023	VIC	1427	14.98241	Supply	22/03/2023	31/12/2024
27-Mar-2023 to 02-Apr-2023	VIC	764.2	14.821389	Supply	29/03/2023	30/11/2023
03-Apr-2023 to 09-Apr-2023	VIC	1825	18	Supply	1/01/2025	31/12/2025
10-Apr-2023 to 16-Apr-2023	VIC					
17-Apr-2023 to 23-Apr-2023	VIC	825.41586	16.538546	Supply	19/04/2023	31/12/2024
24-Apr-2023 to 30-Apr-2023	VIC	603.27136	14.502896	Supply	1/07/2023	31/12/2024
01-May-2023 to 07-May-2023	VIC	19.5	13.454615	Supply	4/05/2023	12/05/2023
08-May-2023 to 14-May-2023	VIC					
15-May-2023 to 21-May-2023	VIC	3943	17.415242	Supply	1/06/2023	31/12/2027
22-May-2023 to 28-May-2023	VIC	1054.08	18	Supply	1/01/2024	1/01/2025
29-May-2023 to 04-Jun-2023	VIC					

Notes: Missing rows indicate insufficient data to aggregate
Source: AEMO Gas Services Bulletin Board.

For the period between 20 March 2023 and 26 March 2023, a supply quantity of 1,427 TJ and volume weighted average price of $14.98241/GJ was reported, with the earliest start date of supply on 22 March 2023 and the latest end date of supply on 31 December 2024.

For New South Wales, the Northern Territory, South Australia and Tasmania, reporting of supply transactions is on a monthly basis (see Figure 13 for South Australian example).

Figure 13 Screenshot of AEMO reporting of supply transactions in South Australia

PeriodID	State	Quantity (TJ)	VolumeWeightedPrice ($)	TransactionType	SupplyPeriodStart	SupplyPeriodEnd
01-Mar-2023 to 31-Mar-2023	SA	646.717	9.574723	Supply	16/03/2023	1/04/2023
01-Apr-2023 to 30-Apr-2023	SA	828.04948	13.602387	Supply	2/04/2023	31/03/2024
01-May-2023 to 31-May-2023	SA	710.945	17.960396	Supply	1/05/2023	1/06/2023
01-Jun-2023 to 30-Jun-2023	SA	797.851	11.863493	Supply	2/06/2023	1/07/2023
01-Jul-2023 to 31-Jul-2023	SA	1128.482	10.32117	Supply	2/07/2023	31/08/2023
01-Aug-2023 to 31-Aug-2023	SA	1355.927	11.008027	Supply	2/08/2023	30/09/2023
01-Sep-2023 to 30-Sep-2023	SA	654.296	10.117443	Supply	2/09/2023	31/10/2023
01-Oct-2023 to 31-Oct-2023	SA	468.233	9.313547	Supply	2/10/2023	1/11/2023

Source: AEMO Gas Services Bulletin Board.

[34] AEMO, Short term transactions and swaps, Australian Energy Market Operator, accessed 15 November 2023.

For the period between 1 April 2023 and 30 April 2023, a supply quantity of 828.04948 TJ and volume weighted average price of $13.602387/GJ was reported, with the earliest start date of supply on 2 April 2023 and the latest end date of supply on 31 March 2024.

Swap transactions are reported on the same frequency as supply transactions, with only Victoria and Queensland being reported on a weekly basis (see Figure 14 for Queensland example).

Figure 14 Screenshot of AEMO reporting of swap transactions in Queensland

PeriodID	State	Quantity (TJ)	VolumeWeightedPrice ($)	TransactionType	SupplyPeriodStart	SupplyPeriodEnd
13-Mar-2023 to 19-Mar-2023	QLD	742	9.355256	SWAP	15/03/2023	26/03/2023
20-Mar-2023 to 26-Mar-2023	QLD	2210.918	10.721547	SWAP	17/03/2023	31/12/2023
27-Mar-2023 to 02-Apr-2023	QLD	3177.551	10.982925	SWAP	18/03/2023	31/12/2023
03-Apr-2023 to 09-Apr-2023	QLD	781.9	10.998848	SWAP	4/04/2023	12/06/2023
10-Apr-2023 to 16-Apr-2023	QLD	577.952	10.628166	SWAP	10/04/2023	30/11/2023
17-Apr-2023 to 23-Apr-2023	QLD	230	11.136956	SWAP	17/04/2023	27/05/2023
24-Apr-2023 to 30-Apr-2023	QLD	1997.5	11.176821	SWAP	24/04/2023	30/06/2023
01-May-2023 to 07-May-2023	QLD	549.991	11.802461	SWAP	2/05/2023	30/06/2023
08-May-2023 to 14-May-2023	QLD	737.01	11.529165	SWAP	9/05/2023	30/09/2023
15-May-2023 to 21-May-2023	QLD	356.5	11.631136	SWAP	16/05/2023	30/06/2023
22-May-2023 to 28-May-2023	QLD	1804.599	11.667529	SWAP	23/05/2023	31/12/2023
29-May-2023 to 04-Jun-2023	QLD	1789.386	11.353409	SWAP	29/05/2023	31/12/2023

Source: AEMO Gas Services Bulletin Board.

For the period between 27 March 2023 and 2 April 2023, a swap quantity of 3,177.551 TJ and volume weighted average price of $10.982825/GJ was reported, with the earliest start date of supply on 18 March 2023 and the latest end date of supply on 31 December 2023.