

Preface to the guide

Each week the AER publishes a **the Gas weekly report** to assist in monitoring the National Gas Market Bulletin Board (**BB**), the Victorian Declared Wholesale Gas Market (**Victorian gas market or VGM**), the Short Term Trading Markets (**STTM**) and the Wallumbilla and Moomba Gas Supply Hubs (**GSHs**). This guide is designed to introduce readers to the layout of the gas weekly report and help readers understand the figures and underlying concepts.

AER monitoring role

The AER has been publishing a Gas Weekly report since June 2009. All past reports are available on the AER's website. The report is an outcome from the AER's daily monitoring of gas markets and provides a snapshot of each week, highlighting significant events. The report forms part of the AER's overall gas market reporting, which also includes the publication of long term statistics as well as stand-alone gas event reports.

Background on the Bulletin Board and Gas markets

The BB commenced in July 2008. The main purpose of the BB is to promote basin-on-basin and pipeline-on-pipeline competition through market transparency by publishing daily gas production data, pipeline capacity and gas flow information for all pipeline systems. It is not a gas market.

The Victorian Gas Market commenced in 2001 as a daily market to manage gas flows in Victoria and to allow market participants to buy and sell gas at a spot price. In 2007, the spot market was altered to schedule gas five times a day, increasing scheduling and pricing efficiency.

Adelaide and Sydney STTM commenced in September 2010 and a Brisbane STTM commenced in December 2011. STTMs are daily wholesale gas spot markets at selected hubs (see figure 5.1 to the guide) that link transmission pipelines and distribution systems.

In both the Victorian gas market and the STTMs, participants that trade gas typically hold gas supply and pipeline transport contracts. Based on these contracts, participants offer to supply gas into the markets for a certain price, or take gas for a certain price. Participants make offers/bids into a spot market where gas is scheduled and prices set. While both are spot markets, the VGM is scheduled five times a day with a 6 am, 10 am, 2 pm, 6 pm and 10 pm price; whereas the STTM is only scheduled once a gas day with one price. Other differences between the VGM and the STTMs are listed in an appendix at the back of this guide.

The GSH at Wallumbilla in Queensland commenced trading on 20 March 2014. It provides a trading platform for which gas can be sold and delivered at one of the three major connecting pipelines at Wallumbilla. Participation in the market is voluntary and it is designed to complement existing bilateral gas supply and transportation agreements for that area. On 1 June 2016, the Moomba hub commenced operation, facilitating further trading options at two new locations and introducing a spread product for trades between Moomba and Wallumbilla locations. On 28 March 2017, transition to a single product at Wallumbilla introduced a new zone and spread product between Wallumbilla and South East Queensland.

Source of data:

Figures in the Gas weekly report are sourced from data published by the Australian Energy Market Operator (**AEMO**) on the AEMO website, www.aemo.com.au or on the gas bulletin board www.gasbb.com.au as noted below.

Long term statistics and explanatory material

The AER also publish a range of [longer term statistics](#) on the performance of the gas sector including gas prices, production, pipeline flows and consumer demand.

Summary section of gas weekly reports

The summary section of the gas weekly reports highlights the most significant events of the week across all gas markets.

Market overview section of gas weekly reports

The market overview section of the gas weekly reports provides a high-level analysis of price, demand and key ancillary payments for each market for the week, with more detail on significant market events.

Figure 1 in each gas weekly report shows: the average daily prices for the week and average financial year-to-date prices in each market; and percentage changes in price from the previous week and previous financial year-to-date.¹ The figure shows ex ante prices which are a price derived from scheduled offers to sell and buy gas into the market before gas day. Figure 1 below provides an example of the prices chart. Price differences between markets reflect various factors, including differences in competitive conditions between gas hubs—for example, differences in upstream/downstream participation. Differences between transport and production costs also affect prices. Further, Victorian gas prices exclude the cost of pipeline transport to the hub, so are not directly comparable to the STTM price which represents a delivered (to the hub) cost of gas.²

Figure 1: Average daily prices and demand – all markets (\$/GJ, TJ)

	Victoria		Sydney		Adelaide		Brisbane	
	Price	Demand	Price	Demand	Price	Demand	Price	Demand
26 Mar - 01 Apr 2017	8.91	408	9.92	207	9.53	44	8.40	81
% change from previous week	20	26	2	-6	9	16	5	1

¹ The daily imbalance weighted average for the five ex ante schedule prices on each gas day is used for Victoria. Prices for the STTM hubs reflect the average of seven daily ex ante prices. Average daily quantities are displayed for each region. The quantities for Victoria represent the beginning of day forecast gas quantities which set the 6 am price. Ex ante schedule quantities are shown for the STTM.

² The cost of withdrawing gas from the VGM is published on the AER website. For 2011, the cost of withdrawals into the Melbourne zone of the VGM was about 37 cents per GJ. See APA GasNet's (Victorian gas transmission pipeline) current access arrangement tariffs, available from the AER at www.aer.gov.au

	Victoria		Sydney		Adelaide		Brisbane	
	Price	Demand	Price	Demand	Price	Demand	Price	Demand
16-17 financial YTD	8.26	519	8.33	240	8.74	60	8.22	84
% change from previous financial YTD	87	-3	82	3	70	2	99	1

AEMO Victorian Gas Market data: INT041 report; INT108; and INT153 reports, STTM data: INT651; and INT652 reports, GSH data: calculated using daily trade information.

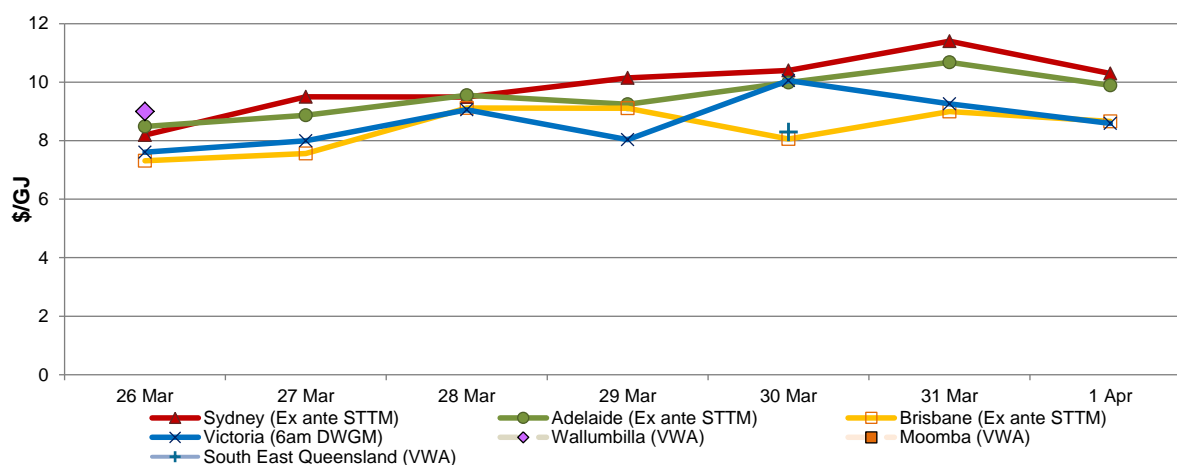
Figure 2 shows volume weighted average prices at locations associated with the Wallumbilla and Moomba voluntary GSH. Trades in these voluntary markets may not occur daily and volumes shown represent the total quantity traded over the included periods, as opposed to the average daily quantities shown for the other markets.

Figure 2: Average prices and total quantity – Gas supply hub (\$/GJ, TJ)³

	Moomba		South East Queensland		Wallumbilla	
	Price	Quantity	Price	Quantity	Price	Quantity
26 Mar - 01 Apr 2017	-	-	8.30	40	8.98	14
% change from previous week	-	-	-	-	5	-87
16-17 financial YTD	-	-	8.30	40	8.39	6462
% change from previous financial YTD	-	-	-	-	114	-1

Figure 3 in each gas weekly report shows the daily prices over the week as they are defined in figures 1 and 2.

Figure 3: Daily gas market prices (\$/GJ)



³ The prices shown for the GSH in Moomba, South East Queensland and Wallumbilla are volume weighted average (VWA) prices for all products traded across the period. The total quantity contributing to the weighted price is displayed for these GSH. Reported values for Moomba are the aggregate of trades on the Moomba to Adelaide Pipeline (MAP) and the Moomba to Sydney Pipeline (MSP). Historic trades for RBP and SWQP are grouped under WAL, (including in-pipe trades on the RBP).

Figure 4 in each gas weekly report shows; the average daily ancillary payments over the week for the VGM; the service payments for MOS balancing gas in each hub of the STTM; and percentage changes in price from the previous week and previous financial year-to-date. These represent payments for gas required to supply the market in addition to the gas provided through the normal scheduling process. As ancillary payments in the VGM for gas injected out of merit order occur on a less frequent basis, only positive payments for the current and previous week are displayed in the figure.

Figure 4: Average ancillary payments (\$000)

	Victoria Ancillary Payments*	Sydney MOS	Adelaide MOS	Brisbane MOS
Week	-	28.81	33.82	1.24
% change from previous week	-	-11	243	-20
15-16 financial YTD		27.66	9.47	1.57
% change from previous financial YTD		80	-26	-8

AEMO Victorian Gas Market data: INT117b, STTM data: INT663.

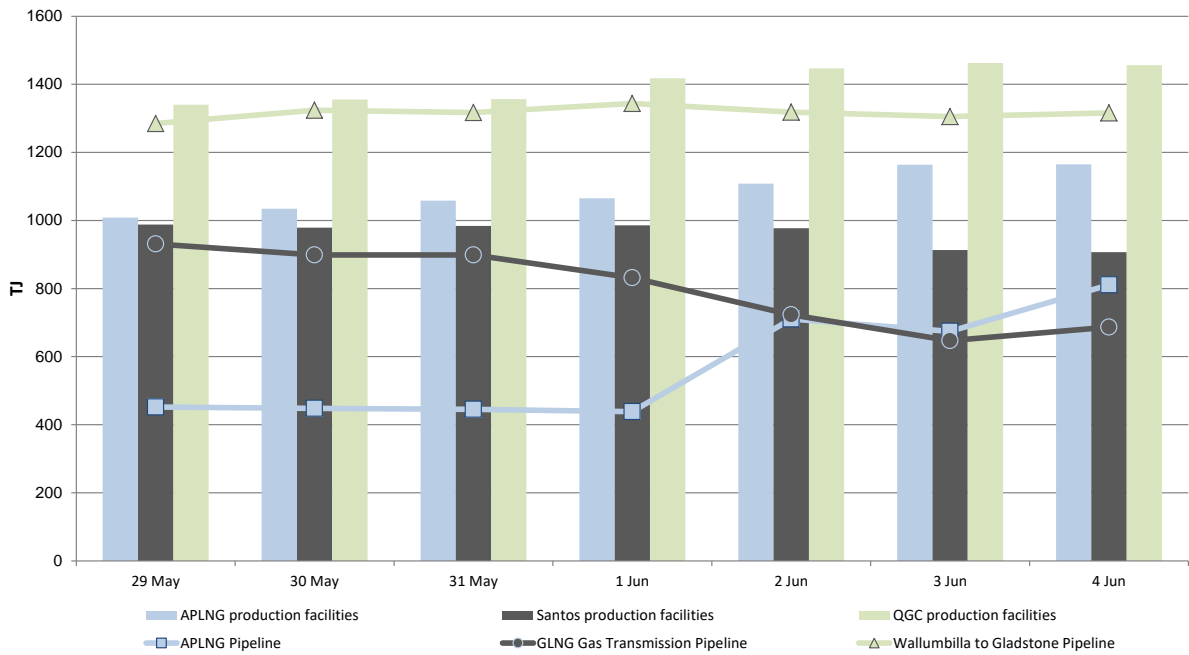
Figure 5 shows the quantity and volume weighted prices of products traded in the Gas Supply Hub locations at Wallumbilla and Moomba. Non-netted products for off-market trades that may occur in Wallumbilla are shown in the GSH section of the report, but are not included in this figure.

Figure 5: Gas supply hub products traded for the current week (\$/GJ, TJ)

	Moomba		South East Queensland		Wallumbilla*	
	VWA price	Quantity	VWA price	Quantity	VWA price	Quantity
Balance of day	-	-	-	-	9.00	7.5
Daily	-	-	8.30	20.0	-	-
Day ahead	-	-	8.30	20.0	8.95	6.0
Weekly	-	-	-	-	-	-
Monthly	-	-	-	-	-	-
Total	-	-	8.30	40.0	8.98	13.5

Figure 6 shows Bulletin Board pipeline flows for the three LNG export pipeline facilities and the production output at related production facilities in the Roma region.⁴

Figure 6: LNG export pipeline and production flows (TJ)

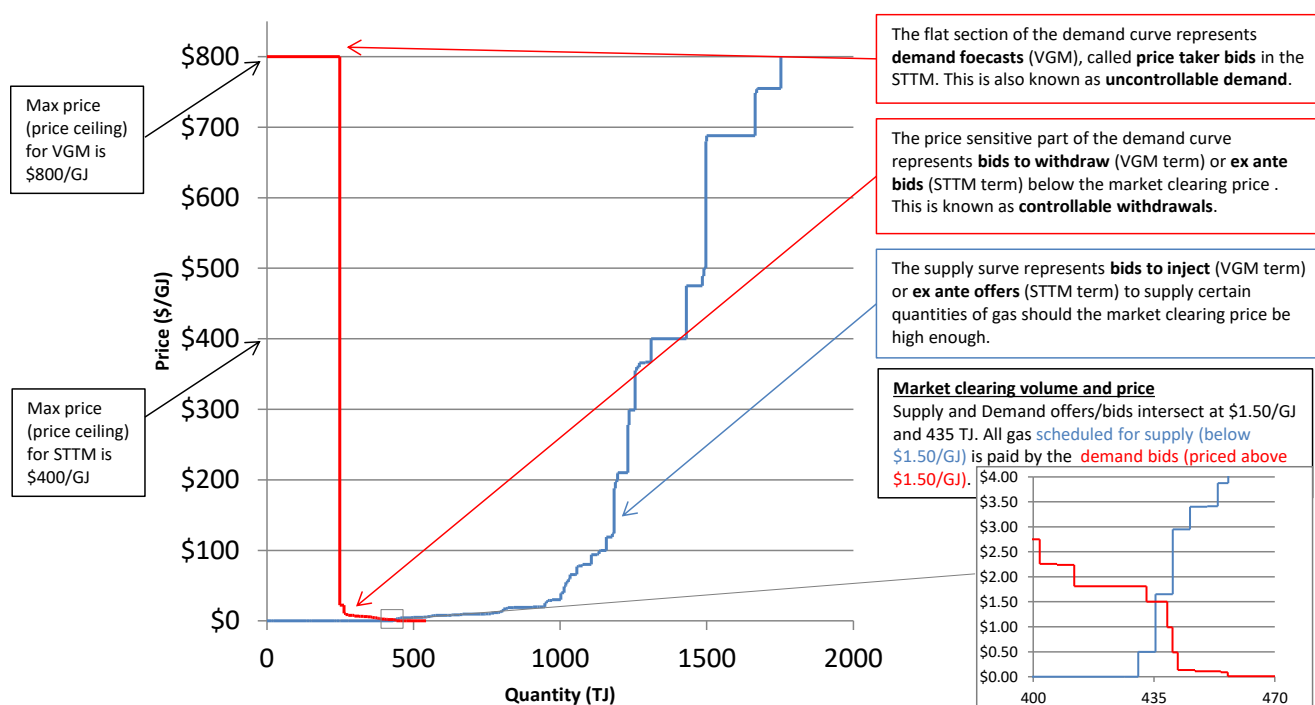


⁴ Production quantities represent flows from facilities operated by APLNG, Santos and QGC. Gas from individual facilities may also supply the domestic market, other LNG projects or storage facilities. A number of production/storage facilities around Roma are not currently represented in the data. Only available data for facilities operated by the three LNG export projects is displayed in this figure.

Market prices

The price data for Victoria in the above figures is an average imbalance weighted daily price. An ex ante price is determined five times a day from the intersection of the supply and demand curves, after adjusting for any physical⁵ or contractual constraints on gas supplies (Figure A).

Figure A: Market scheduling and ex ante price



The weighted daily price is determined by:

- weighting the 6 am ex ante price by scheduled imbalances (differences between participant scheduled gas to and from the market) for the whole gas day⁶
- weighting the subsequent four prices by changes to the respective scheduled daily imbalances through the day

Therefore, the 6 am price is significantly more heavily weighted than the other schedule prices during the day.⁷

How each price is determined by bids and demand forecasts is discussed below.

Ancillary payment data shown in figure 3 are determined outside the primary ex ante market. The ancillary payments are made for bids scheduled out of merit order to relieve transmission constraints. These prices are therefore higher than the market price. Typically the constraints may arise only a few times a year, more often in winter, due to one or more of:

- a very low line pack level in the system at the start of the gas day
- extreme demand due to frigid weather

⁵ Physical constraints result in certain supply offers not being included in the offer curve (the blue line in figure A). The VGM and STTM each have different pricing mechanisms built into the markets which compensate participants when supply offers cannot be sourced in merit order.

⁶ The magnitudes of positive and negative imbalances (or changes to these) for all Participants are included.

⁷ A 'trade' weighted daily price for Victoria using both imbalance and deviations to weight prices at each schedule would be a better approach to weighting, but the allocation data is not available when this report is prepared.

- large forecast errors due to unexpected weather changes
- unexpected levels of very high demand from gas fired generation.

Typically, gas bid from an LNG facility near Melbourne is best able to overcome these constraints and therefore attracts the most ancillary payments.

The beginning of day (**BOD**) demand forecasts are also shown in figure 1. The Victorian gas market is the most weather sensitive of all the wholesale gas markets. The BOD demand forecast is a critical input into the 6 am price of gas which in turn is the most important price in determining the daily imbalance price in the market.

The ex ante price and scheduled quantity are set before the gas day by the intersection of the gas supply and demand curve, as shown in figure A. Prices generally rise with increases in scheduled ex ante quantities of gas.

The ex post price in the STTM is set the day after the gas day using the same supply curve as the ex ante market. However, the total allocated quantity (actual allocated demand) replaces scheduled quantities as the demand curve. The ex post price is determined where the two curves intersect. If more gas is allocated (used) than scheduled, the ex post price is typically higher than the ex ante price.

The market operator service (**MOS**) ‘pipeline balancing’ service allocates differences in final nominated gas (which may differ from scheduled gas) and allocated gas quantities to the hub each day, to manage imbalances in supply and demand through contractual line pack arrangements. MOS payments are made to trading participants in response to supply offers based on pipeline contracts.

Detailed market analysis

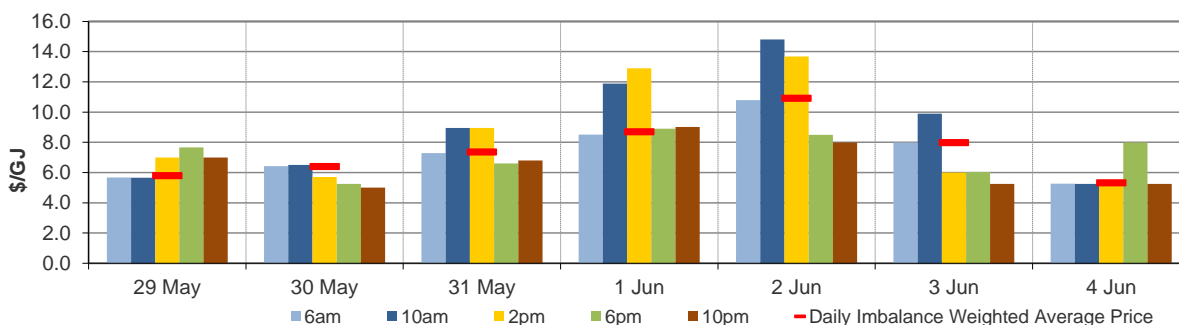
Following the market overview, each gas weekly report may contain a section where significant events in the Victorian gas market, STTM, BB and GSH are discussed.

1. The detailed Victorian gas market section

After the market overview section of the gas weekly report, the next sections look in detail at the Victorian gas market and each of the STTM hubs in turn.

Figure 1.1 in each gas weekly report shows the Victorian gas market ex ante prices at 6 am, 10 am, 2 pm, 6 pm and 10 pm, along with the daily imbalance weighted average price. An example of a figure 1.1 chart is provided below.

Figure 1.1: Prices by schedule



The main drivers of price are demand forecasts (explained under figure 1.2) and gas bids (volume/price offers) to supply or take gas from the market (explained below under figures 1.3 and 1.4). Price outcomes reflect the intersection of demand forecasts and price sensitive bids to take gas (the demand curve) and offers to supply gas to the Victorian gas market (the supply curve).

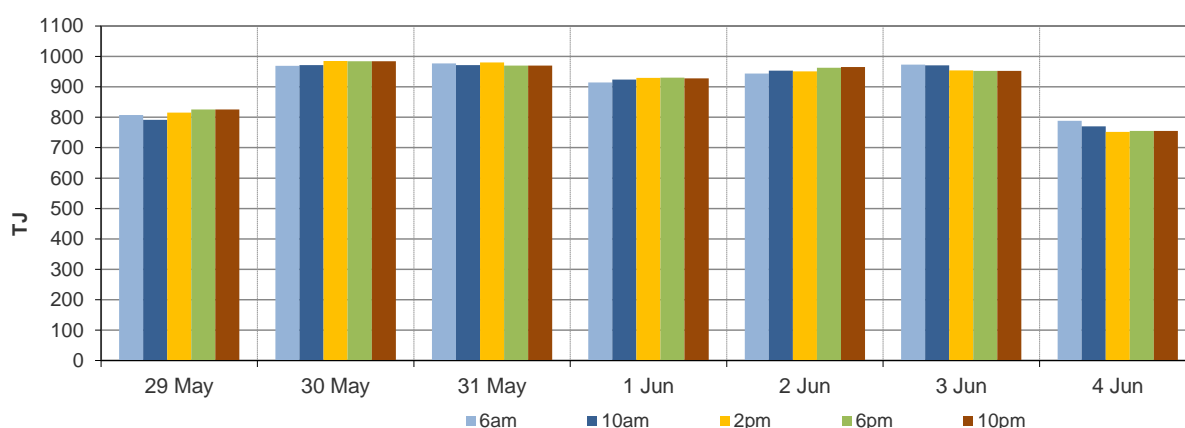
Prices can be affected by transmission constraints that limit how much gas can be delivered through a pipeline in a timely fashion, and production (contractual) constraints that limit flows at system injection points from time to time.

Figure 1.2 in each gas weekly report shows the Victorian gas market demand forecasts used for scheduling across the gas day and over the week. Demand forecasts can affect ex ante market prices; for example, if demand forecasts increase on the gas day from the 6 am schedule (because weather forecasts change), the price may increase.

Market participants might update forecasts during the day to reflect changes in forecast demand due to weather, electricity demand or other factors. AEMO aggregates individual demand forecasts to collate an overall demand forecast. However, it may override this from time to time if aggregate forecasts vary significantly from AEMO's independent system forecast.⁸

An example of a figure 1.2 chart is provided below.

Figure 1.2: Demand forecasts

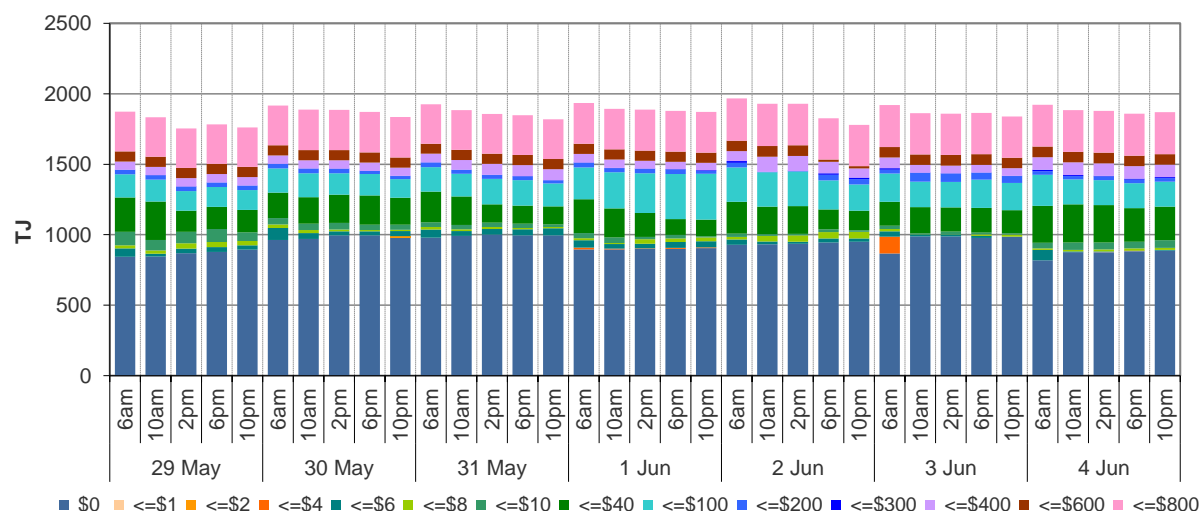


AEMO Victorian Gas Market data: INT108, INT153 reports.

Figures 1.3 and 1.4 in each gas weekly report compare injection and withdrawal bids by price band submitted for the five daily schedules for the Victorian gas market. Examples of these charts are provided below.

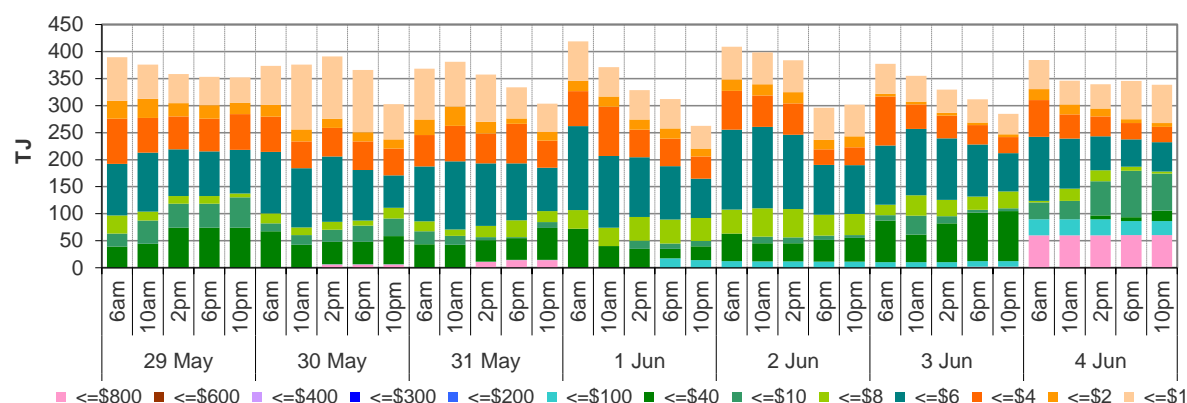
⁸ See the Wholesale Market Gas Scheduling Procedures (Victoria) and Demand override methodology on the AEMO website, www.aemo.com.au. Overrides are applied on a conservative basis to minimise market impacts and the trigger points and adjustments depend on season, demand level and the particular schedule on a gas day, as well as differences in the two forecasts. Ad hoc operational forecasts (no price change) may occur between standard schedule times on occasions to manage threats to system security that can arise at very short notice.

Figure 1.3: Injection bids by price bands



AEMO Victorian Gas Market data: INT131 report

Figure 1.4: Withdrawal bids by price bands



AEMO Victorian Gas Market data: INT131 report

Market participants can submit injection bids for each injection point where it has contracted gas supply. These bids form the supply curve.

Each bid is submitted in up to ten price-quantity bid steps. Bids in Victoria range from \$0/GJ to market price cap of \$800/GJ. Market participants may also submit 'controllable' withdrawal bids for system withdrawal points; for example into underground storage or for export to an interconnecting pipeline system. These bids form part of the demand curve and so also affect the market price (see under figure A).

Given there are many market participants, nine system injection points and several system withdrawal points, there are hundreds of bid steps in every schedule. For analysis purposes, the injection and withdrawal bid steps for each schedule are grouped into price bands as shown in figure 1.3 and figure 1.4.

The bids shown in these charts do not reflect physical or contractual constraints at gas plants or injections points or physical transmission constraints. Consequently, the total injection bids shown generally significantly exceed the actual quantity of gas that is physically deliverable across the system on a day.

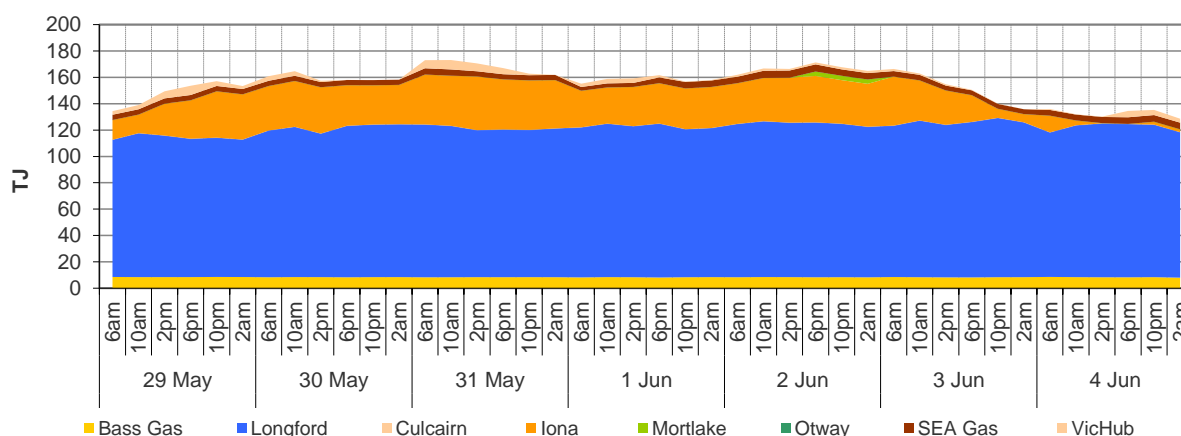
Figure 1.5 in each gas weekly report shows the total metered daily injections by each of the Victorian system injection points (SIP) listed below for each of the five daily scheduling intervals:

- Longford
- VicHub (adjacent to Longford)
- BassGas
- Culcairn
- Iona (Underground Storage facility)
- SEAGas (adjacent to Iona)
- Otway (adjacent to Iona)
- Mortlake (adjacent to Iona)

Figure 1.5 shows the source of gas injections across the market and across the gas day between scheduling intervals. It indicates at different stages of the day where gas is sourced from for injection into the market. LNG injections (which occur infrequently) are not shown. However, significant LNG injections are discussed in the summary section.⁹

An example of a figure 1.5 chart is provided below.

Figure 1.5: Metered Injections by System Injection Point¹⁰



AEMO Victorian Gas Market data: INT150 report

⁹ This decision recognises that at present there is no public report available on the amount of LNG allocated into the Victorian Gas Market. Current allocations reported in INT150 typically include amounts associated with the movement of gas around the facility—rather than gas scheduled or injected into the gas market as a response to scheduling.

¹⁰ The last scheduling interval from 10pm to 6am is twice as long as the others and has been broken into two 4 hour blocks.

2. The detailed STTM section of the gas weekly report

Having covered the Victorian gas market in detail, each gas weekly report then provides detailed data on each of the STTM hubs in turn. The data provided is the same for each hub, as the same STTM market rules apply to the Sydney (section 2), Adelaide (section 3) and Brisbane (section 4).

In each STTM hub, gas is priced once before each gas day (the ex ante price for the gas day) and once after the gas day (the ex post price). The main price drivers are demand forecasts¹¹ and participant offers to deliver and withdraw gas.

The hubs are supplied as follows:

- Sydney—the Moomba Sydney Pipeline (**MSP**), the Eastern Gas Pipeline (**EGP**), the Rosalind gas pipeline (**ROS**, a dedicated pipeline delivering gas to the hub from an embedded gas plant at Camden), and the Newcastle Gas Storage facility (**NGS**)¹²
- Adelaide—the Moomba Adelaide Pipeline (**MAP**) and the SEAGas Pipeline (**SEAGas**)
- Brisbane—the Roma Brisbane Pipeline (**RBP**)

Figures 2.1 in each gas weekly report compare daily ex ante with ex post prices and daily ex ante with ex post quantities at the Sydney hub. An equivalent chart is provided for Adelaide (figure 3.1) and Brisbane (figure 4.1). An example of the charts is provided below.

Figure 2.1: SYD STTM daily ex ante and ex post prices and quantities

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Ex ante price (\$/GJ)	6.40	7.45	6.45	7.00	9.80	8.45	7.45
Ex ante quantity (TJ)	255	276	276	272	277	271	234
Ex post price (\$/GJ)	6.40	8.90	7.00	7.41	8.92	7.45	7.45
Ex post quantity (TJ)	257	287	290	281	274	259	235

AEMO STTM data: INT651, INT652, INT657 reports

Prices may vary across the week due to changes in demand. Differences between the ex ante and ex post price may arise where scheduled gas demand and actual demand differ. The ex ante price applies to all scheduled gas before the gas day, whilst the ex post price is used in calculating deviation payments e.g. where a participant takes more gas from the market than what they were scheduled to take.

Prices can also be affected by transmission constraints that limit how much gas can be delivered through a pipeline over a gas day, in which case capacity prices apply.¹³

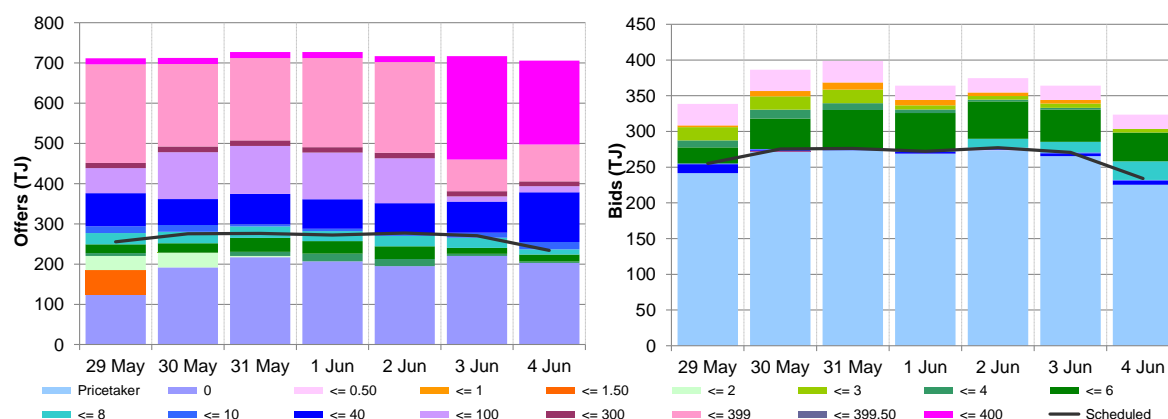
¹¹ The main demand forecast is the 'price-taker' bid, i.e. forecast hub demand that is not responsive to price (uncontrollable demand).

¹² The LNG storage facility at Newcastle began operation on 15 June 2015.

¹³ The capacity price on a capacity-constrained pipeline is the difference between the price of the last offer cleared on that pipeline and the ex ante market price. The capacity price on an unconstrained pipeline is zero. An example of this mechanism is provided in [significant price variation](#) reports for Brisbane in 2014. Pipeline Flow Direction Constraints (PFDCs) may also be applied to facilitate additional back haul deliveries. A description of the PFDC mechanism is provided in the [gas weekly report for the week of 31 August 2014](#).

Figure 2.2 in each gas weekly report compares the price bands of injection offers and withdrawal bids for the hub. An equivalent chart is provided for Adelaide (figure 3.2) and Brisbane (figure 4.2). An example of the charts is provided below.

Figure 2.2: SYD daily hub offers and daily hub bids in price bands (\$/GJ)



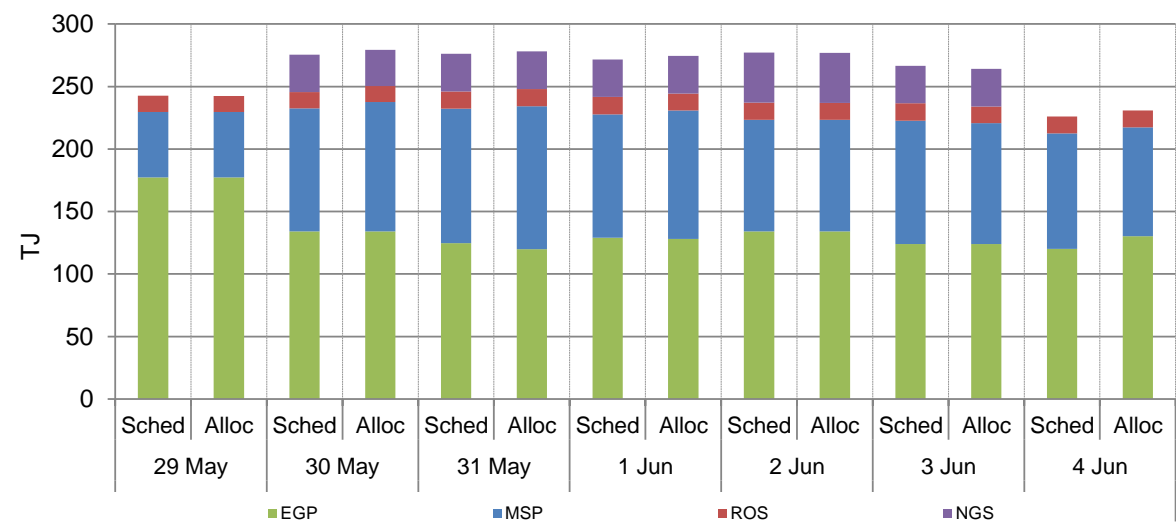
AEMO STTM data: INT652 and INT659 reports

Each offer/bid involves up to ten price-quantity bid steps. Offers and bids range from \$0/GJ to the market cap of \$400/GJ. Trading participants make offers to supply gas to the hub based on contractual rights on pipelines connected to the hub. Along with price taker demand forecasts, participants may submit withdrawal bids to backhaul gas from the hubs (e.g. into gas powered generators outside the hub) or for gas connections located in the hub (e.g. a cement manufacturing facility). These bids form part of the demand curve and so also affect the market price (see figure 1).

Given there are many participants, and hundreds of offer/bid steps for every schedule, the injection bid steps and withdrawal bid steps for each schedule are grouped for analysis purposes into price bands, as shown above.

Figure 2.3 in each gas weekly report shows the daily scheduled and allocated flows at the Sydney hub by pipeline. The amount shown as scheduled for each pipeline is a net amount which accounts for what was scheduled to the hub minus what was scheduled from the hub. This scheduled amount is then compared to allocated gas amounts on the pipeline for that gas day excluding any MOS amounts. An equivalent chart is provided for Adelaide (figure 3.3) and Brisbane (figure 4.3). An example of the charts is provided below.

Figure 2.3: SYD net scheduled and allocated gas hub supply (excluding MOS)

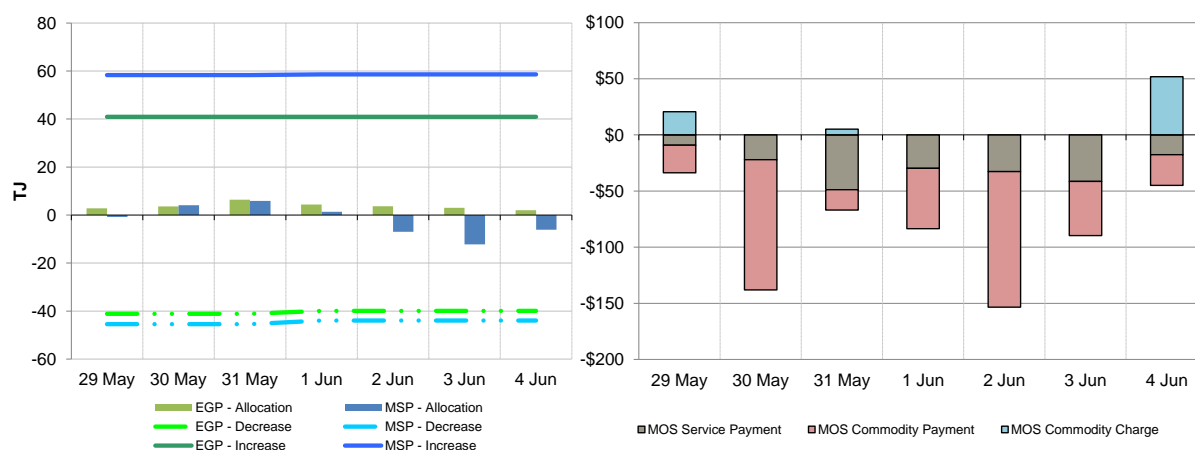


AEMO STTM data: INT652, INT658 and INT664 reports

Where gas scheduled on a pipeline differs from what is allocated, it may indicate that nominations on the pipeline for the gas day differed from schedule. This may occur if participants seek to reduce nominations on a pipeline in response to a material change in circumstances, such as a reduction in forecast demand at the hub or when a major gas customer alters its gas usage.

Figure 2.4 in each gas weekly report shows MOS allocations and various MOS payments and charges. Equivalent charts are provided for Adelaide (figure 3.4) and Brisbane (figure 4.4). An example of the charts is provided below.

Figure 2.4: SYD MOS allocations (TJ), service payments and commodity payments/charges (\$000)



AEMO STTM data: INT663, INT664, INT665 reports

The Market Operator Service (**MOS**) is a mechanism for allocating balancing gas provided by pipelines to maintain pressures at receipt points. This balancing gas is the difference between what was scheduled by a pipeline operator (the pipeline schedule) and the actual quantities of gas that flowed on a pipeline on the day.

MOS offers are made by participants that have contracts with pipeline facilities to “park” gas (on the pipeline) or “loan” gas (from the pipeline)¹⁴. Based on these contracts, two types of MOS are offered: increase offers that increase flows on a pipeline to a hub; and decrease offers that reduce pipeline flows to a hub.

MOS providers are paid according to their offer price (the **MOS service payment**)¹⁵, and are paid (or pay)¹⁶ for the commodity on the gas day at the ex ante market price two days after the gas day (**MOS commodity payment or charge**). This covers the cost of restoring its inventory of MOS gas. The provider can then choose to submit bids or offers to achieve its MOS gas allocation on the gas day.

MOS service payments and commodity payments or charges are shown for each day of the gas week on each MOS enabled STTM pipeline connected to the hub. Payments are shown below the horizontal axis and charges are shown above the axis for days when the payments are generated.¹⁷

¹⁴ It is expected that MOS providers will utilise "park-and-loan" pipeline services or over-run facilities on forward haulage contracts to provide MOS. The offer price for MOS gas reflects the cost of this park-and-loan-type service and associated haulage, which is in addition to the cost of replacing the gas supplied. MOS offers are pay-as-bid.

¹⁵ Where a pipeline deviation occurs on gas day and is allocated to a MOS provider, the MOS provider is paid according to their MOS offer price. Any resulting deviations incurred by the MOS provider are exempt from deviation payments and charges. MOS offers were collected by AEMO on a quarterly (seasonal) tendering basis up to mid-2014, changing to monthly MOS stacks from June 2014.

¹⁶ MOS providers of increase services are paid for the physical gas flowing from the pipeline to meet the higher than scheduled demand requirements. For decrease services, providers are paid for the service of providing pipeline capacity, but pay for the commodity of the additional gas (linepack) parked on the pipeline.

¹⁷ Service payments for a gas day relate to the MOS requirement on the gas day (determined by the gas allocation after the day), based on the MOS offer prices (pay-as-bid). Commodity payments/charges relate to the ex ante price for the gas day, applied to the physical MOS commodity two days prior.

NOTE: When gas allocations are published, participants can determine their MOS allocation for the previous day, compare this with their available linepack balance, and adjust their pipeline bids/offers for the following gas day (which determines the price of the MOS commodity of the previous day). e.g. If a participant has provided increase MOS the previous day, they might reduce their supply offers for the following day, making less cheaper gas available in the stack and increasing the D+2 ex ante price for the commodity provided. Alternatively, additional offers of cheap gas could reduce the amount paid for decrease MOS purchased, and make it more likely their gas will be scheduled and reduce their linepack balance.

5. The National Gas Bulletin Board section of the weekly report

Background

Information on forecast and actual flows and facility capacities is provided electronically to the Bulletin Board (**BB**) by facility operators (pipelines, storage and production facilities) on a daily basis, as required under Part 18 of the National Gas Rules and in accordance with the BB Procedures published by AEMO. The information is published by AEMO without alteration in a set of standard reports available on the BB website: www.gasbb.com.au

Data shown with the BB map

Figure 5.1 in each gas weekly report depicts the main transmission pipelines, production zones and demand zones in eastern Australia. Instead of showing daily data, the AER's map captures the average daily flows for the current week as reported on the Bulletin Board with changes from the previous week in brackets.

Also shown are estimates of gas demand from gas-fired generation derived from AEMO's NEM data and heating capacity rates for plant from an ACIL Tasman study on the long and short run marginal costs of NEM generators.

This includes estimated gas usage for the following generators:

- Queensland—Barcaldine, Braemar, Braemar 2, Condamine, Darling Downs, Oakey, Roma GT, Swanbank E, Yabulu, Yarwun
- New South Wales— Colongra, Hunter Valley GT, Smithfield, Tallawarra, Uranquinty
- Victoria—Bairnsdale, Jeeralang A, Jeeralang B, Laverton North, Mortlake, Newport, Somerton, Valley Power
- South Australia—Dry Creek GT, Hallett, Ladbroke Grove, Mintaro GT, Osborne, Pelican Point, Quarantine, Torrens Island A, Torrens Island B
- Tasmania—Bell Bay Three, Tamar Valley CCGT, Tamar Valley OCGT

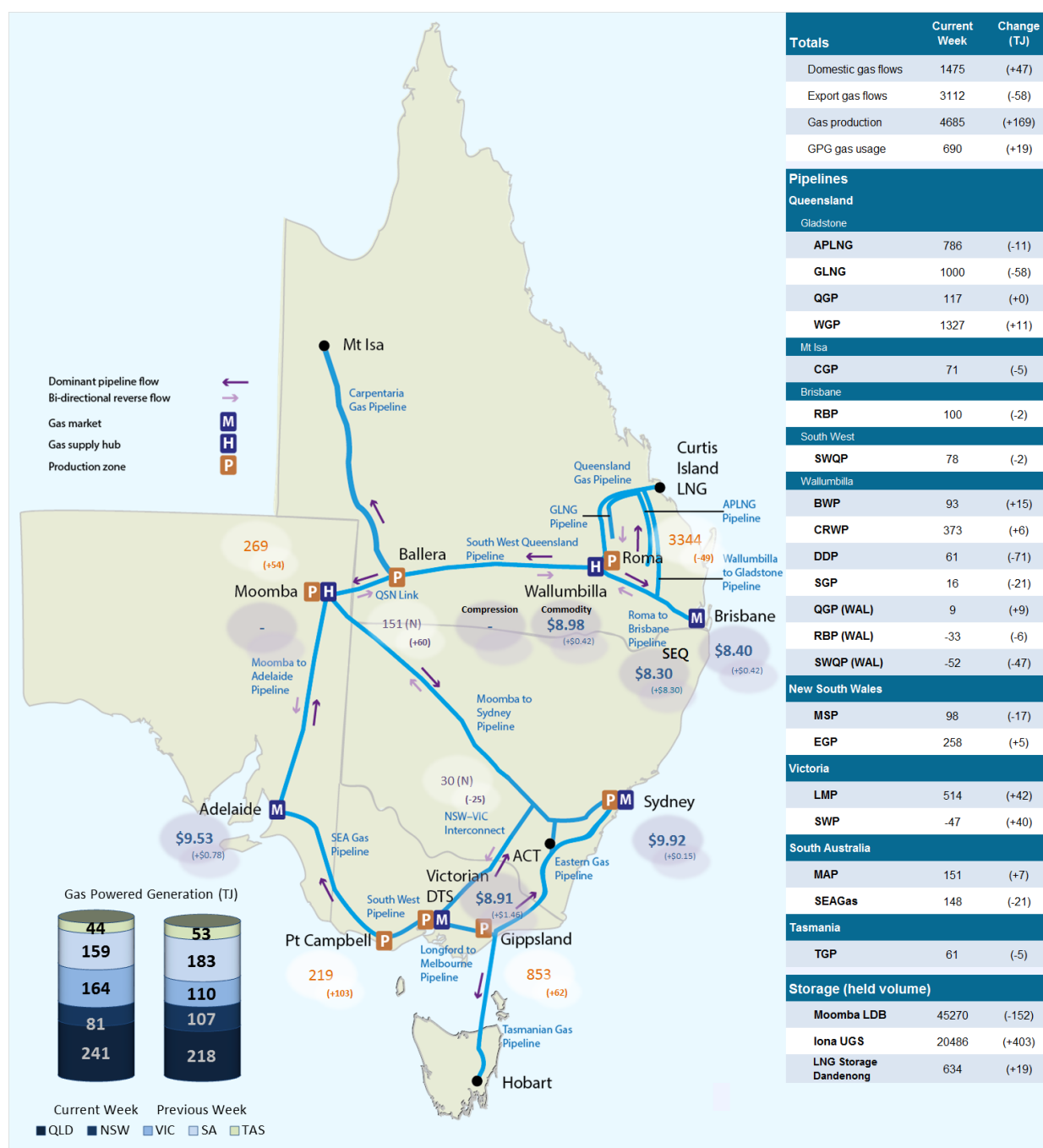
Figure 5.1 shows average daily prices¹⁸ for each wholesale gas market and gas supply hub (the blue numbers encircled on the map). Average daily production quantities are shown for the main production areas (the orange numbers encircled on the map). Average daily actual flows (from the Bulletin Board) for the current week are shown in a table to the right of the map¹⁹. Changes from the previous week's averages are shown in brackets. Gas powered generation (GPG) gas usage is also shown for each region in stacks located at the bottom right corner of the figure.

An example of the figure 5.1 chart is shown below.

¹⁸ Wallumbilla supply is the average daily volume of gas 'traded', while price is a volume weighted average.

¹⁹ Regional Gas Flows: **SA** = MAP + SEAGAS, **VIC** = SWP + LMP – negative(NSW-VIC)*, **NSW/ACT** = EGP + MSP, **TAS** = TGP, **QLD (Brisbane)** = RBP, **QLD (Mt Isa)** = CGP, **QLD (Gladstone)** = QGP
* from 27 June 2017, 'NSW-Vic interconnector' default flow nominations changed to match Victorian market data. For actual flow data from this date, positive values represent daily flows towards Victoria (added to SWP and LMP flows). Gas Powered Generation volumes include gas usage that may not show up on Bulletin Board pipeline flows. From October 2014, production flows reported for the Roma region include quantities of gas for LNG export trains. From 1 June 2016, South West Queensland Pipeline flows (reported against the SWQ zone) were altered to no longer include deliveries to (or from) the Queensland Gas Pipeline, Roma to Brisbane Pipeline, Comet Ridge to Wallumbilla Pipeline and Berwyndale to Wallumbilla Pipeline. From October 2016, facility reporting requirements split flows between receipts and deliveries, affecting production reported in figure 5.1 (at Iona underground storage in the Otway basin/Port Campbell, and at Dandenong LNG in Eastern Victoria/Gippsland), and flows shown for the QSN Link.

Figure 5.1: Gas market data (\$/GJ, TJ/day); Production, Storage, Consumption and Pipeline flows (TJ)²⁰



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Numbers for QSN Link, Port Campbell (Otway basin) and Gippsland (Eastern Victoria) have been adjusted to account for changes to Bulletin Board flows which came into effect from 6 October (see [gas report 2-8 October 2016](#)). Individual facilities are now required to report 'receipts' separate to 'deliveries', rather than net flows. Adjustments have been made to the calculation of Iona production quantities from 2-8 February 2020 weekly report, representing offshore supply (previous Iona calculations showed net flows in the Otway basin production numbers).

Net flows are displayed for Bulletin Board pipelines and storage facilities. Flow calculations are dependent on default pipeline flow directions: flows into a zone calculated as delivery minus receipt; flows from a zone are calculated as receipt minus delivery. CRWP flows are calculated using a combination of Wallumbilla (receipt – delivery) and Roma (delivery – receipt) zone flows.

6. Gas Supply Hub

The Gas Supply Hub (**GSH**) was introduced for the trading of gas at Wallumbilla because it is located in close proximity to significant gas supply sources and demand locations and is a major transit point between Queensland and the gas markets on Australia's east coast.

The GSH was established from 20 March 2014 for the trading of gas at Wallumbilla. The GSH is a voluntary market²¹ for the supply of gas traded²² between separate participants, with products listed for sale and purchase at delivery points on three major connecting pipelines at Wallumbilla – the Queensland Gas Pipeline (**QGP**), the South West Queensland Pipeline (**SWQP**) and the Roma to Brisbane Pipeline (**RBP**).

There are separate products for each pipeline (each pipeline is considered a trading location, and each has a number of delivery points) and delivery period (daily, day-ahead, balance-of-day, weekly and monthly²³ products).

From 1 June 2016, a new supply hub at Moomba was created to facilitate trade on the Moomba to Adelaide Pipeline (**MAP**) and Moomba to Sydney Pipeline (**MSP**), and also allow for trading between the Wallumbilla and Moomba markets on the SWQP through a spread product (representing the price differential between the two hubs).

Non-netted products (available in the Wallumbilla hub only) were also introduced to allow participants to register off-market trades between agreed delivery points in the region.²⁴ In these cases, trades proceed under off-market agreements (trades are not pursuant to bids and offers on the exchange). Some of these off-market trades are specifically excluded from AEMO's netting and matching process, and are denoted in AEMO's system as 'non-netted'.²⁵

From 26 October 2016, the addition of a Wallumbilla Compression Product was introduced to facilitate the supply hub's transition from three different trading locations into one. The optional hub services for compression and redirection of gas between buyers and sellers (and facility operators) on different pipelines provides a secondary trading mechanism for the delivery of commodity gas.

From 28 March 2017, Wallumbilla was transitioned to a single product, grouping together delivery points at, and connecting to, the Wallumbilla gas hub. Trades at QGP, SWQP and RBP trading locations now fall under a new Wallumbilla product (**WAL**). A new South East Queensland (**SEQ**) product was introduced to cover transactions for delivery at the RBP in-pipe trade point, and a spread product was implemented for trading between the two locations.

Changes to other market arrangements also include new delivery matching concepts and different cut-off times for netting trades, re-naming the balance-of-day product and establishing daily netted and non-netted products.²⁶

²¹ Market trade is facilitated through an electronic trading platform, with standardised terms and conditions and a market settlement facility for the short-term trading of physical gas and related products. The market is designed to complement existing bilateral gas supply arrangements and gas transportation agreements, through the placement of anonymous offers (to sell) or bids (to buy) at specified quantity and price increments, which are automatically matched on the exchange to form transactions.

²² Volume weighted average prices and traded quantities provided in this report may include off-market trades, which are not included in AEMO's reference price calculations.

²³ Effective from 28 May 2015.

²⁴ Alternate delivery points which are not registered with AEMO may also be nominated through non-netted trades.

²⁵ These 'non-netted' trades are registered as a separate product and are not included in AEMO's reference price calculations for the Wallumbilla GSH (as is the case for all off market trades). They proceed under bilateral agreements and can apply to delivery points at the hub or to alternate delivery points. The delivery points can be physical or virtual.

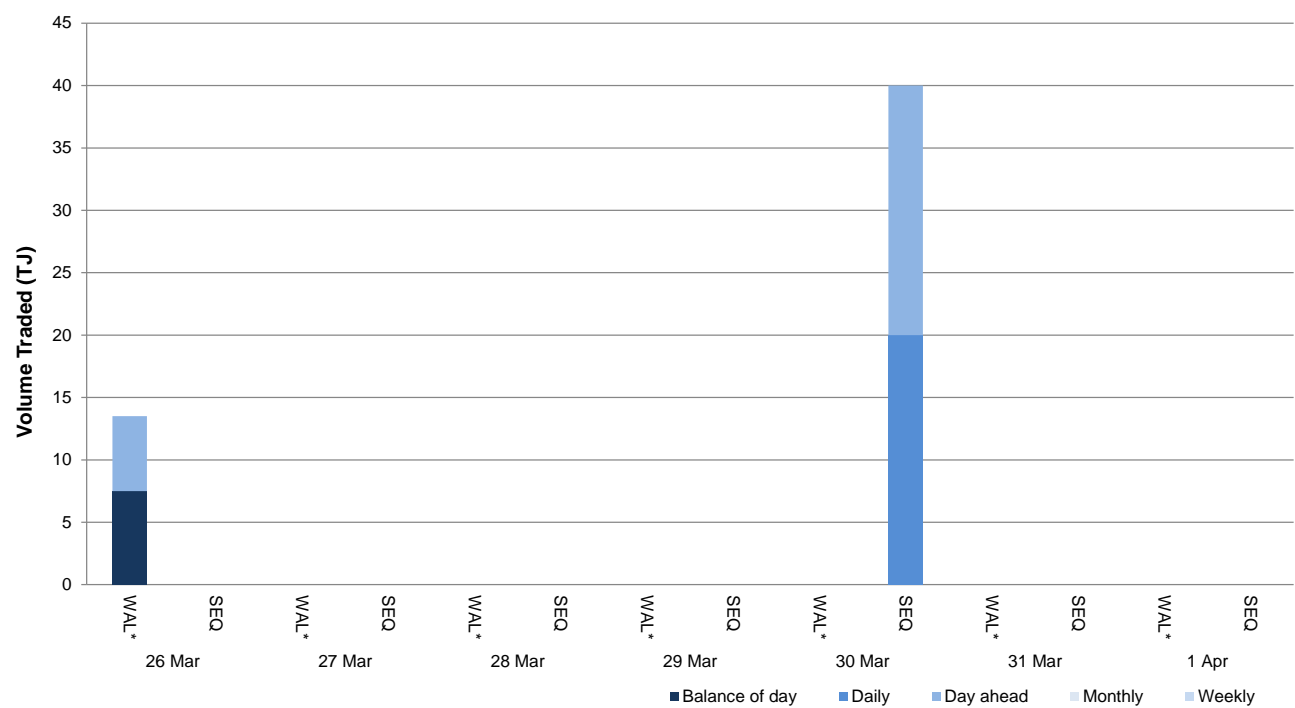
²⁶ The delivery netting run time was changed from 5 pm two days ahead (D-2) to 1 pm D-1. Daily (netted) trading window runs from D-7 to D-1 (until 2 pm), Daily (non-netted) is D-1 (from 2 pm) to D (5 pm).

The trading window for monthly products traded through pre-matched deals was extended from 3 months to 12-months ahead of delivery from late-August 2018. Strips were introduced for off-market daily product trades on 22 September 2020, offering the ability to nominate multiple delivery days in a single trade. On 28 January 2021, trading locations at Wilton (Sydney) and Culcairn (Victoria) were introduced.

Gas in the GSH is traded on a ‘trading day’ from 9 am – 7 pm on the exchange, while gas is physically delivered on ‘gas days’ in line with the Brisbane market from 8 am at Wallumbilla. The physical delivery timeframe for trades in the Moomba hub occurs from 6.30 am. For example, a day-ahead product traded on 27 May will be physically delivered on 28 May. When a weekly product is traded, the ‘Volume Traded by Trading Day’ represents the entire volume of gas to be delivered.

Figure 6.1 shows the quantity of gas traded by product type for each trading day on pipeline trading locations in the Wallumbilla and Moomba Gas Supply Hubs. Non-netted (off-market) trades, allowing the selection of specific delivery point at a trading location, are grouped with the new Wallumbilla product trades and denoted as WAL*. An example of this chart is provided below.

Figure 6.1: GSH traded quantities



7. Capacity Trading and Day Ahead Auction

The Day Ahead Auction (**DAA**) and Capacity Trading Platform (**CTP**) commenced on 1 March 2019 as part of capacity trading reforms to increase liquidity in the secondary gas transportation network. The DAA is a centralised auction platform providing the release of contracted but un-nominated transportation capacity on designated pipelines and compression facilities across eastern Australia. The auction, facilitated by the Australian Energy Market Operator (**AEMO**), enables transportation facility users to procure residual capacity for the right to transport gas through a transmission pipeline. This occurs on a day-ahead basis after nomination cut-off, with a zero reserve price and compressor fuel provided.

The CTP forms part of the Gas Supply Hub (**GSH**) exchange and allows shippers to procure gas and secondary transportation services across pipelines through one platform. AEMO operates both the DAA and CTP across the east coast.

Participants may bid in to the DAA in order to procure the following services:

- park services (pipeline storage);
- forward haul pipeline services with products offered in both directions on bi-directional pipelines;
- interruptible backhaul services; and
- stand-alone compression services (Moomba, Wallumbilla, Ballera, Iona).

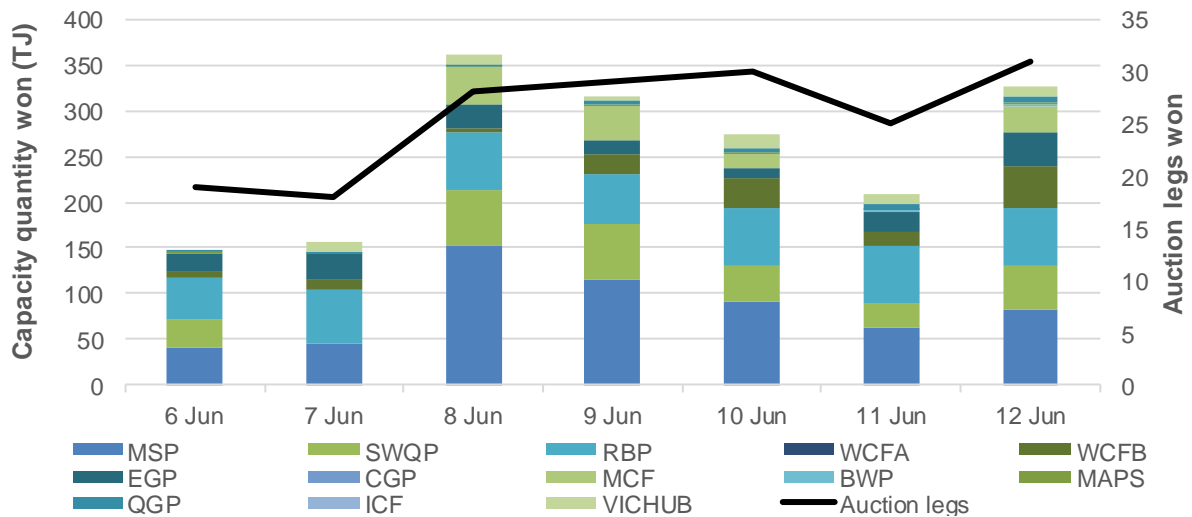
List of facilities

Acronym	Facility name
AGP	Amadeus Gas Pipeline
BCF	Ballera Compression Facility
BWP	Berwyndale to Wallumbilla Pipeline
CGP	Carpentaria Gas Pipeline
DDP	Darling Downs Pipeline
EGP	Eastern Gas Pipeline
ICF	Iona Compression Facility
MAPS	Moomba to Adelaide Pipeline
MCF	Moomba Compression Facility
MSP	Moomba to Sydney Pipeline
NGP	Northern Gas Pipeline
PCA	Port Campbell to Adelaide Pipeline
PCI	Port Campbell to Iona Pipeline
QGP	Queensland Gas Pipeline
RBP	Roma to Brisbane Pipeline
RP	Roma Pipeline
SEPS	South East Pipeline System
SESA	South East South Australia Pipeline
SWQP	South West Queensland Pipeline
TGP	Tasmanian Gas Pipeline
VICH	VicHub Pipeline
WCFA	Wallumbilla Compression Facility A
WCFB	Wallumbilla Compression Facility B
WGP	Wallumbilla to Gladstone Pipeline

Figure 7.1 shows the quantities of gas and auction legs won through the DAA by gas date, with gas deliverable up to the level of capacity procured. Auction quantities procured are the sum of auction products allocated on the facilities and do not necessarily represent the physical volumes of gas actually flowed for each gas day. Auction legs reflect each individual facility transaction.

For example, if capacity is acquired to transport gas south from Wallumbilla to Sydney on a day this could involve two legs—SWQP and MSP—or possibly four legs if capacity on the RBP and Wallumbilla compressors has also been involved in the transaction. Reported quantities are for capacity won on the auction day, with gas deliverable to following day.

Figure 7.1: DAA traded quantities and auction legs won



Appendix: STTM and Victorian gas market – key differences

Key area of difference	Victorian gas market	STTM (Adelaide, Sydney, Brisbane)	GSH
AEMO role	<ul style="list-style-type: none"> Wholesale market operator. Retail market operator. Transmission pipeline system operator. 	<ul style="list-style-type: none"> Wholesale market operator. Retail market operator. 	<ul style="list-style-type: none"> Wholesale market operator.
Scheduling	<ul style="list-style-type: none"> Provisional day ahead schedules published based on forecast data as part of a price discovery process. Five ex-ante (6 am, 10 am, 2 pm, 6 pm and 10 pm) pricing and operating schedules across the gas day. Ad hoc schedules can be used if required i.e. for system security reasons. 	<ul style="list-style-type: none"> Provisional day ahead schedules published based on forecast data One ex-ante (before the gas day) market schedule. No ad hoc schedules but contingency gas offers and bids (to reduce demand) are submitted separately and can be called on if needed. 	<ul style="list-style-type: none"> Voluntary market trading, gas scheduled when bids/offers are matched.
Market Price	<ul style="list-style-type: none"> Five ex ante market prices over the gas day based on the cheapest offers to supply gas required by the market. These prices apply to scheduled differences between participants' gas supplies to the hub and their gas withdrawals (imbalances). Subsequent schedules (ex ante prices) apply to deviations from schedule in the previous scheduling interval. That is deviations between what was scheduled to and what gas actually flowed (wsa allocated). e.g. deviations from 6 am to 10 am are paid at the 10 am ex ante price. Market price is for commodity only. Transportation is charged separately by pipeline owner (withdrawal tariffs). 	<ul style="list-style-type: none"> One daily ex ante market price is set applying to imbalances. An ex post imbalance price is calculated after the gas day using allocated quantity which applies to participant deviations, or what was actually delivered/used by the participant in contrast to what was scheduled. Price takes account of delivery cost to the hub and represents purchase of gas at the hub. 	<ul style="list-style-type: none"> Prices are set for individual trades.
Bids and Offers	<p>By a cut-off time (5 am) prior to the start of each gas day (6 am), market participants submit:</p> <ul style="list-style-type: none"> any injection bids (offers to supply the market) at gas system injection points. any withdrawal bids at system withdrawal points i.e. offers to take gas into SA or NSW. Injection and Withdrawals bids can be priced up to \$800/GJ. <p>Market participants may on the gas day rebid up to one hour before, each reschedule (10 am, 2 pm, 6 pm & 10 pm).</p>	<p>By a cut-off time (the day before) prior to the start of each gas day (6:30 am, 8 am for Brisbane hub) trading participants submit:</p> <ul style="list-style-type: none"> any offers to supply the hub based on STTM pipeline contractual rights to deliver. any offers to withdraw gas from, or in, the hub based on STTM pipeline/distribution system contractual rights i.e. to backhaul gas to a generator outside the hub or by a major industrial customer in the hub. Bids and offers can be priced up to \$400/GJ <p>Trading participants may not re-offer on the gas day; but can renominate to the pipeline operator to avoid deviations.</p>	<ul style="list-style-type: none"> Priced up to \$999/GJ
Demand forecasts	<ul style="list-style-type: none"> Market participants submit demand forecast by the same cut-off time for offers. Market participants should update at each reschedule if forecasts changes AEMO aggregates demand forecasts to schedule gas but may use forecast override if required for system security 	<ul style="list-style-type: none"> Trading participants submit demand forecasts a day ahead which are used by the market operator to produce the schedule and set the ex ante price AEMO aggregates demand forecasts but has no function to override demand forecasts. 	<ul style="list-style-type: none"> No
Linepack management (pipeline balancing mechanism)	<ul style="list-style-type: none"> AEMO defines linepack target depending on operational conditions and this is generally set seasonally, not daily Linepack account covers costs that includes costs of day to day linepack variations and UAFG 	<ul style="list-style-type: none"> On the day pipeline imbalances are managed through a Market Operator Service (MOS), provided by MOS offers from shippers 	<ul style="list-style-type: none"> No
Transmission pipeline constraint management	<ul style="list-style-type: none"> Ancillary payments for higher priced gas scheduled to relieve transmission constraints Uplift payments allocated by cause to fund ancillary payments 	<ul style="list-style-type: none"> Capacity payments from shippers with non-firm contracts to shippers with firm contracts apply if a pipeline is constrained (based on the pipeline capacity price) 	<ul style="list-style-type: none"> No