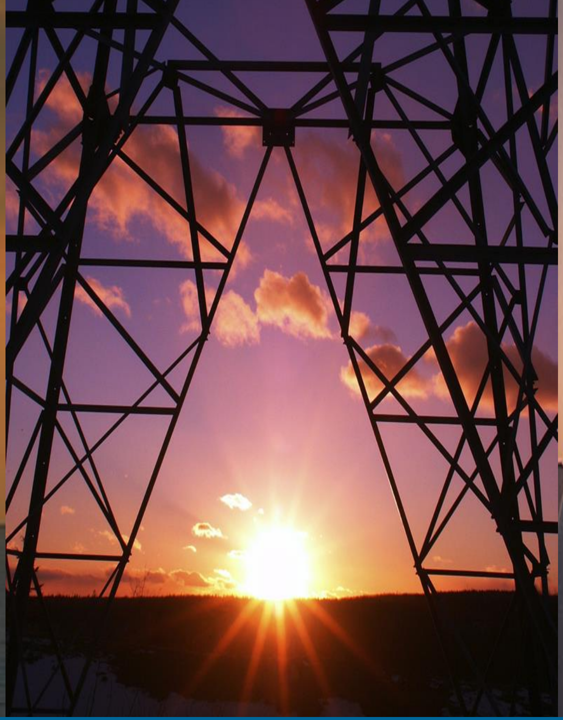




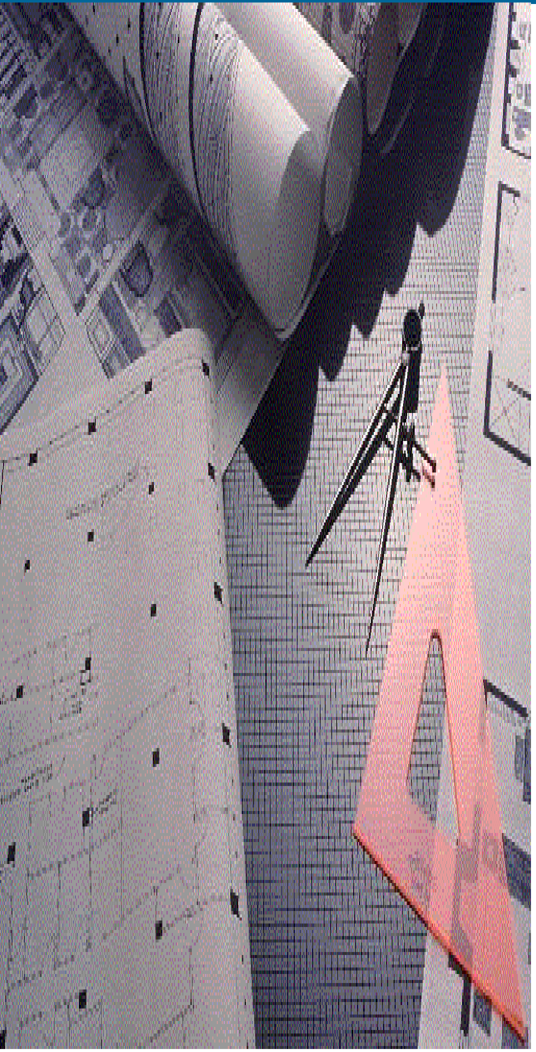

MARKET REFORM

Gas Market Parameters Review 2022

Market Reform

8 September 2022

Outline



- Background
- Markets and Trends
- Our Proposed Approach
- Modelling
  - Inputs
  - Market Simulation
  - Processing
- Data Sources
- Next Steps

Introduction

- AEMO has engaged Market Reform to perform the Gas Market Parameter Review.
- This is part of a mandatory review required to be performed for the Short Term Trading Market (STTM) within 6 months of a NEM parameter review.
- No similar mandate exists for the Declared Wholesale Gas Market (DWGM) but AEMO is combining this with the STTM review.
- Any change in the current parameters will normally apply from July 2025. The study period extends through to June 2028, as the next NEM parameter review will apply from then.
- If an urgent requirement for change is found, then the new parameters could apply from July 2024.
- In response to the events of winter 2022, we are also exploring the performance of parameters for the year from July 2023. While not part of the formal review, the information will be available if there is seen to be any need for earlier change.

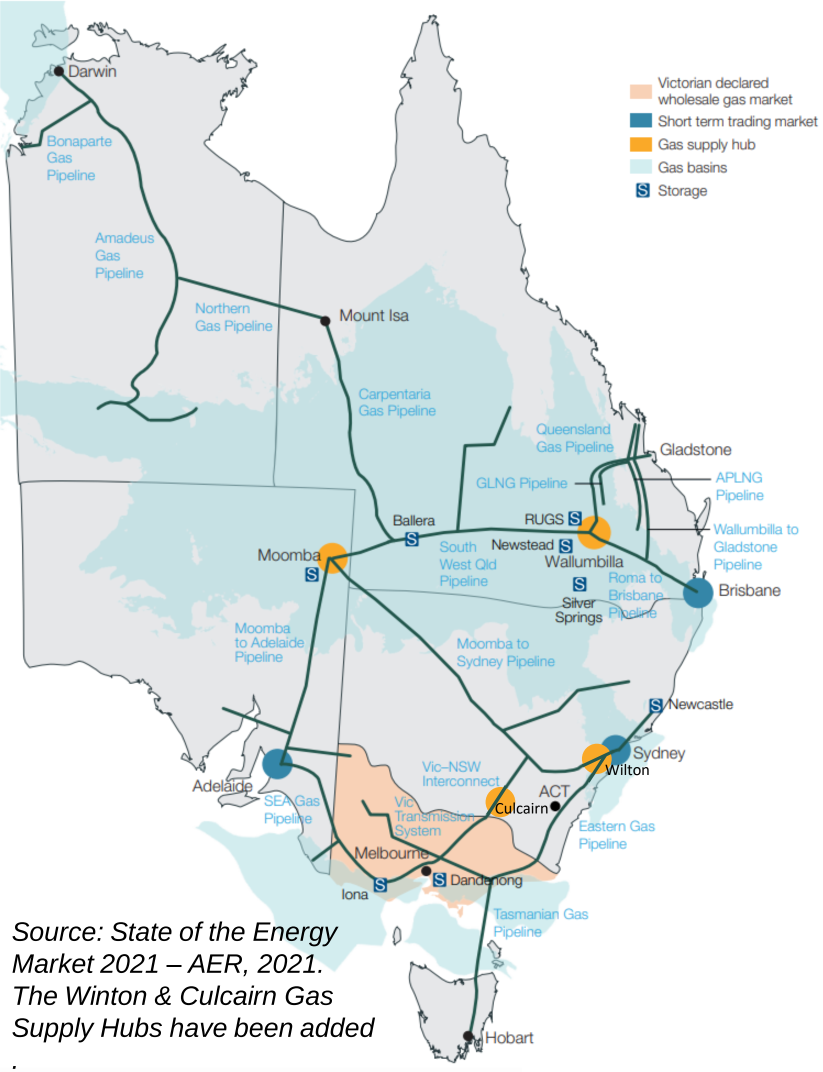
The Current Parameter Settings

STTM		
Parameter	**Documented in**	**Current Setting***
Market Price Cap (MPC)	National Gas Rules	$400/GJ
Administered Price Cap (APC)	National Gas Rules	$40/GJ
Cumulative Price Threshold (CPT)	National Gas Rules	$440/GJ over 7 days (110% of MPC)

DWGM		
Parameter	**Documented in**	**Current Setting**
Value of Lost Load (VoLL)	National Gas Rules	$800/GJ
Administered Price Cap (APC)	Wholesale Market Administered Pricing Procedures (Vic)	$40/GJ
Cumulative Price Threshold (CPT)	Wholesale Market Administered Pricing Procedures (Vic)	$1,400/GJ over 35 periods

** The appropriateness of different level of price caps in the STTM and DWGM was raised in the previous reviews Feedback then was that the different natures and context of the markets makes this appropriate.*

The Advice AEMO Has Sought



Source: State of the Energy Market 2021 – AER, 2021. The Winton & Culcairn Gas Supply Hubs have been added

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Review is to:

- Consider links between markets.
  - STTM Hubs (ADL, SYD, BRI) & Victoria’s DWGM.
  - Linkage with NEM.
  - Gas contracts and international gas markets.
  - Participants operating across markets.
- Reflect industry structure and future development.
  - Current and foreseeable future structure.
  - Should not focus on real participants but should look at range of participant sizes types and their contract / spot positions.
- Use public data or reasonable estimates.
- The four Gas Supply Hubs are not in scope.

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Role of Parameters

- Role of MPC/VoLL.
  - Set maximum market price.
  - Provide economic price signalling by allowing the market maximum opportunity to clear.
  - Not a risk management tool, although does influence participant risk.

- Bounds on MPC and VoLL.
  - Greater than the maximum short-term price expected to arise.
  - High enough to support an investment response to shortages.
  - Common across all schedules (STTM and separately DWGM) and hubs (STTM).

- Role of APC/CPT.
  - APC/CPT limit unmanageable market risks.

- Bounds on APC/CPT.
  - APC should not undermine participant incentive to manage risk or distort investment decisions.
  - CPT should be set to allow for normal market clearing while limiting exposure to unmanageable risks.

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DWGM 2022

- Market carriage with bids and offers used in a market run on the day of delivery.
- Network funded separately.
- Gas supply contracts used to hedge market exposure.
- Demand dominated by heating load.
- GPG's participate as price takers and can be curtailed.
- Interconnected with SA, NSW and Tasmania.
- Winter peak consumption typically exceeds 1100 TJ/day with 1-in-20 year-peak of around 1250 TJ/day.
- During summer 1-in-20-year peak consumption can be as low as 440 TJ/day.
- Available supply within and for Victoria is split between Gippsland (~972 TJ/day), Port Campbell (~719 TJ/day) and LNG (87 TJ/day).

Data based on 2022 forecast in Victorian Gas Planning Report

STTM 2022

- Three hubs – Adelaide, Sydney, and Brisbane.
- Participants trade gas in a day-ahead market then nominate on a relevant facility
- Pipeline shipping costs must be built into price.
- On the day schedules can be adjusted bilaterally, or a contingency gas market can run.
- Market operator service used to balance markets.
- Deviation pricing to settle deviations from modified market schedule.
- Indicative Demand.
  - Adelaide Typically 35-80 TJ/day, Extremes 25-90 TJ/day.
  - Brisbane Typically 60-100 TJ/day, Extremes 40-140TJ/day.
  - Sydney Typically 210-350 TJ/Day Extremes 185-490 TJ/day.

Data derived from daily STTM reports from Jan 2019 to July 2022.

Events of Winter 2022

Drivers:

- Extreme international coal & gas prices.
- Domestic gas prices reached (and exceeded). international LNG netback gas prices.
- Reduced coal generation availability in the NEM.
- Particularly cold weather increasing gas consumption.

Impacts:

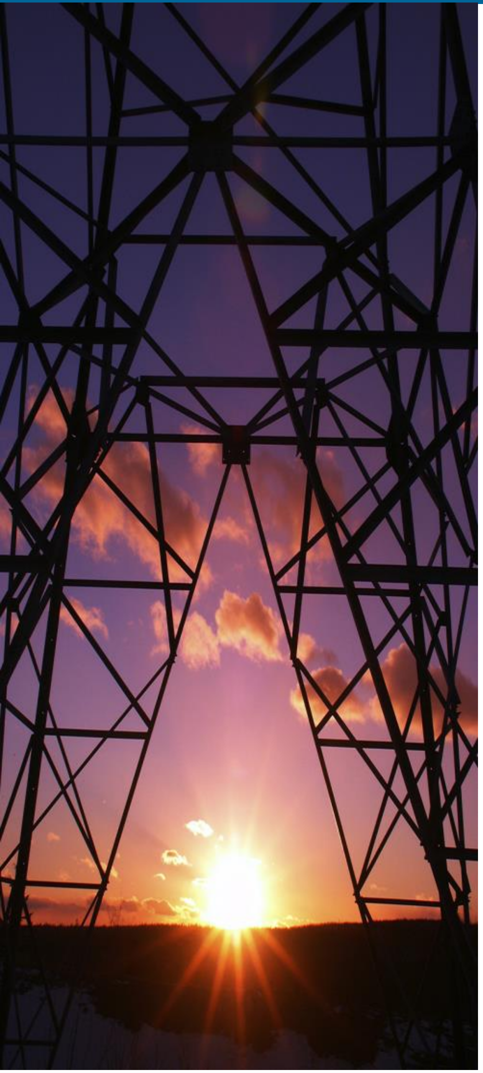
- High gas and electricity prices.
    - Retail failure and ROLR events.
- Price caps created issues across markets.
    - APC in STTM and DWGM at $40/GJ.
    - APC in NEM applied at $300/MWh .
    - Challenging ratio given GPG heat rates.
    - APC applied at different times in different gas markets, impacting flows between them.
- AEMO invoked Gas Supply Guarantee.
- AEMO suspended NEM.

Observations

- Gas and NEM price caps may have been appropriate for short term supply interruptions at otherwise historic levels of gas prices, but in the context of gas prices aligning with world gas prices they were challenging.
- Gas sold outside of the STTM and DWGM is not at a capped price, meaning there can be incentives to sell out of these markets.   Overtime this can reduce the supply certainty for consumers in markets with price caps.
- Price caps are suited for short events which the market cannot mitigate but are not the solution when high prices reflect long term supply and demand. Prices need to rise to allow supply and demand to re-equilibrate.

These highlight trade-offs between risks to consumers, system security, and the operability of markets.

NEM Reliability Panel Review 2022



- The Reliability Panel published its final report on the 2022 Review of the Reliability Standard and Settings on September 1st.
- Recommended that the NEM's administered price cap be increased from $300/MWh to $500/MWh for the period 1 July 2025 – 30 June 2028.
  - Also proposed a review to consider, among other things, linking NEM APC to gas a reference price or gas APC value.
- The Reliability Panel noted that the value of $500/MWh:
  - Would provide for more robust outcomes under possible future periods of high fuel prices and would better cover the resulting short-run marginal costs of most generators in such events.
  - Is more appropriate given that domestic gas and coal prices have stronger links to international markets since the $300/MWh value was set.
- The NEM's administered price cap is relevant to some credible scenarios in the gas parameter review, and this updated value will be used in our study.
- There is also a separate Alinta Energy rule change seeking a temporary 12 month increase of the NEM APC to $600/MWh, though the temporary nature of this limits its relevance to this review.

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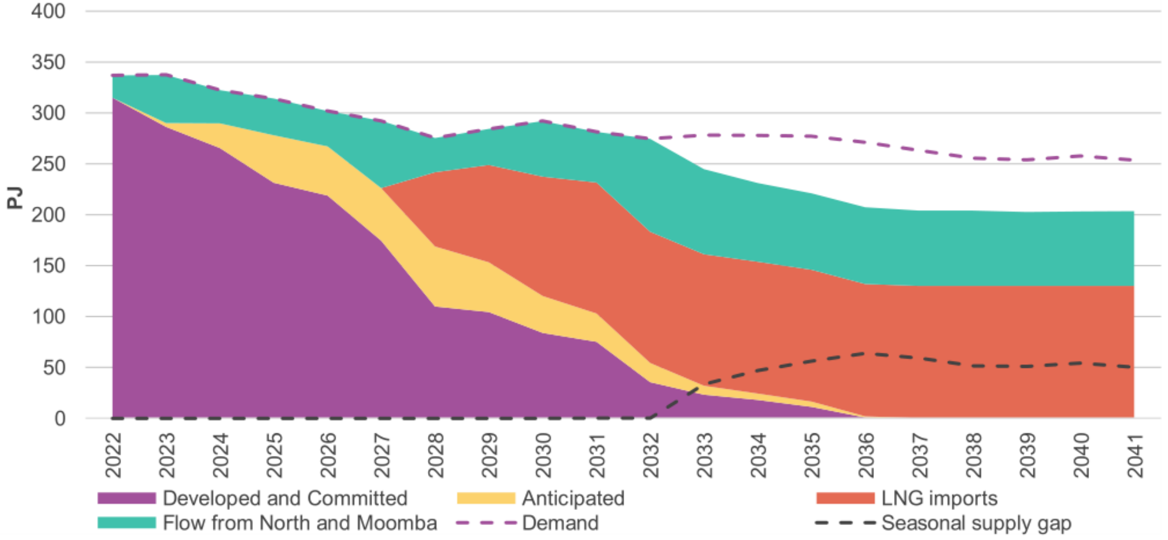
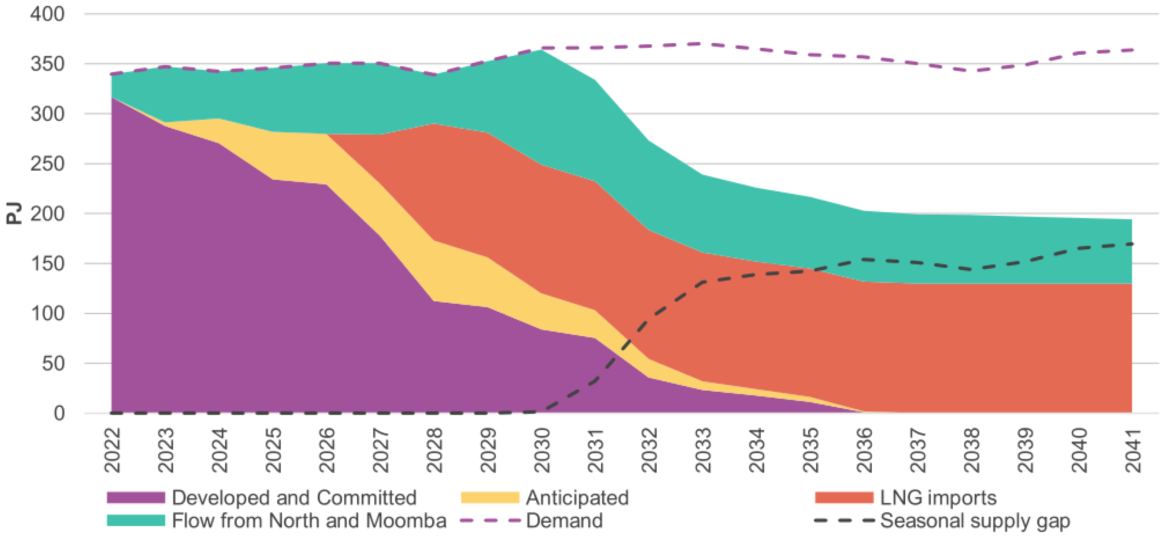
For the Eastern States Supply Adequacy Depends on Anticipated New Projects

2022 GSOO, Step Change Scenario (A rapid move away from gas)



2022 GSOO, Progressive Change Scenario (a slower move away from gas)



2022 GSOO, Table 10: Maximum magnitude and timing of forecast daily shortfalls, Step Change and Progressive Change, 2023-26 (TJ/d).

Scenario	2023	2024	2025	2026
Step Change, existing and committed supply	0 - 0	0 - 0	0 - 0	0 - 0
Step Change, existing, committed and anticipated supply	0 - 0	0 - 0	0 - 0	0 - 0
Progressive Change, existing and committed supply	0 - 36	0 - 50	0 - 35	157 - 614
Progressive Change, existing, committed and anticipated supply	0 - 36	0 - 0	0 - 0	0 - 0

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Summary of Trends

DWGM

Predicted increase in commercial & industrial gas demand, due to uptake in steam methane reforming used in hydrogen production

Demand uncertainty is being reflected in a relative hesitancy of the market to contract for future supply.

Victorian gas production declining, with existing and committed supply forecast to decline from 360 PJ (2022) to 243 PJ (2026)

Risk of shortfalls

- No peak shortfalls forecast prior to 2026 though risk of issues on high demand days due to tight supply and demand balance.
- For 2026 unless anticipated (but not yet confirmed) projects eventuate peak day shortfalls could range from 23 TJ (1-in-2-year peak) to 130 TJ (1-in-20-year peak).

Note: A current proposed rule change by the Victorian government would, if adopted, have AEMO managing a reserve of gas in the Dandenong LNG storage facility with gas priced at VoLL.

STTM

Adelaide and Sydney share in the potential overall shortfalls for south-eastern region.

- Under higher progressive change demand, infrequent gas shortages are forecast from 2023, but these become more severe by 2026 with the reduction in south-eastern production.
- The delivery of anticipated projects would alleviate all forecast supply gaps, except in 2023.

The ACCC’s Gas Enquiry 2017-2025 indicates that Queensland could face a small shortfall of 2 PJ in 2023 if LNG exporters decide to export all of their excess gas.

Market Linkages

- Links between DWGM and STTM and broader gas market
  - Markets are sharing the same pool of gas.
  - Long delivery times limit inter-market responses to short term issues.
  - Multiple day issues are possible given market tightness.
  - Gas supply disruptions in one market increase demand for gas in other markets.
  - Different market price caps may impact willingness to trade (but only when prices are very high).
  - Market price caps are triggered independently between the DWMG and each STTM hub, even if an event is common to the DWGM and some STTM hubs.
  - Links to the LNG export market. LNG net back prices forecast to be $70/GJ+ during the coming European winter.

- Links between gas markets and the NEM
  - Gas powered generation links the gas and electricity markets.
  - If there is an urgent need for GPG in the electricity market but gas is limited, then an electricity issues becomes a gas issues.
  - Sustained high electricity prices incentivise long-term running of gas powered generation.
  - Coincident and cascading linked events across markets are possible (and happened this year).

Potential Unmanageable Risk Events

DWGM

- Production failure on high demand day.
- Pipeline compressor failure limiting ability to move gas.
- Very high demand, e.g. due to:
  - Extreme cold weather.
  - High rate of gas export to support other markets.
  - High GPG demand (e.g. surprise event during day).
  - Context of different events may impact administered outcomes and market risks for participants differently.
- Low reserves of stored gas (e.g. LNG to support Melbourne).
- VoLL triggered by price taker bidding behaviour at a system withdrawal point (e.g. failure to schedule supply to hedge that position which drives price to VoLL).

STTM

- Production failure limits supply to the hub.
- Pipeline compressor failure limits ability to move gas to the hub.
- High GPG demand outside the hub reducing capacity to deliver to the hub.
- Very high demand (including in broader gas market).
- Contingency gas scenarios resulting from the above risks.

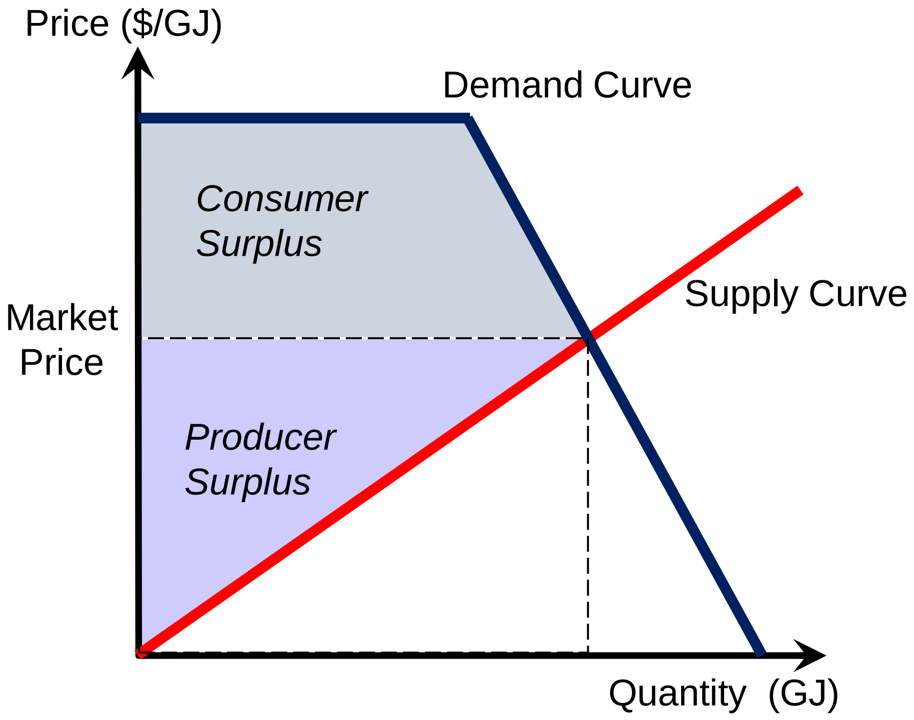
Our Approach for Measuring Performance

Maximising Market Efficiency

while

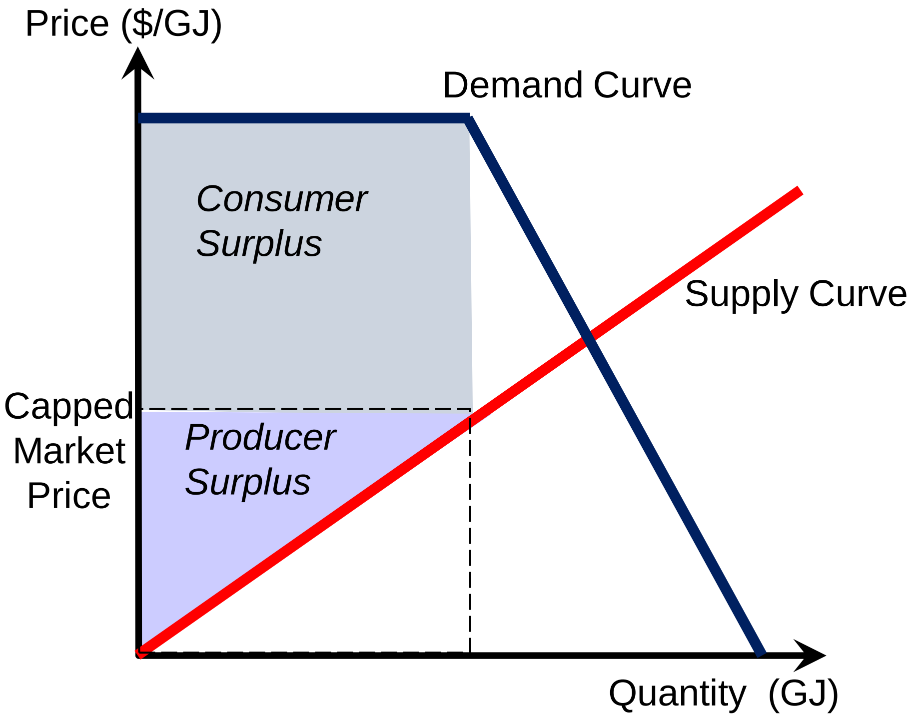
Keeping Participant Risk Acceptable

Market Efficiency



- Consumer Surplus is the difference between the value of a product and the price paid for it.
- Producer surplus is the difference between the price paid for a product and its cost of production.
- We can measure Market Efficiency as the sum of Consumer Surplus and Producer Surplus.
- If the market clears where the supply and demand curves cross then market efficiency is maximised.
- But if this implies high prices then this creates risk for the market.

Administered Price Caps Can Reduce Market Efficiency



- If we impose price caps to limit prices, we can also limit trade.
- With a lower price cap supply is truncated and less quantity clears in the market.
- The sum of the Consumer Surplus and Producer Surplus is reduced.
- Suppliers who would willingly sell to willing consumers at prices above the price cap cannot do so.
- The market outcome is less efficient.

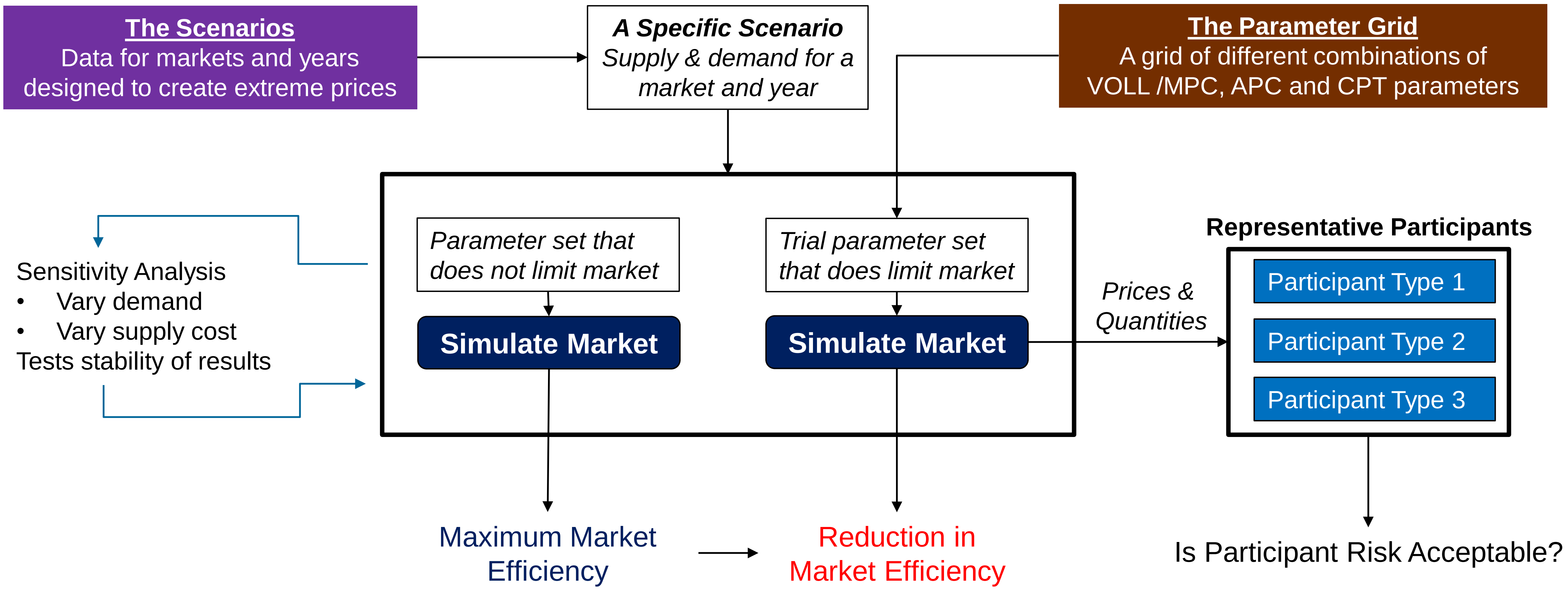
Keeping Participant Risk Acceptable

- On a high-priced day, participants can be forced to buy gas at a loss if they are to operate.
- Based on annual profits, a participant will have a typical average daily profit.
- The ratio of these is the Days of Lost Profit due to an event.

$$Days\ Lost\ Profit = \frac{Profit\ Lost}{Average\ Daily\ Profit}$$

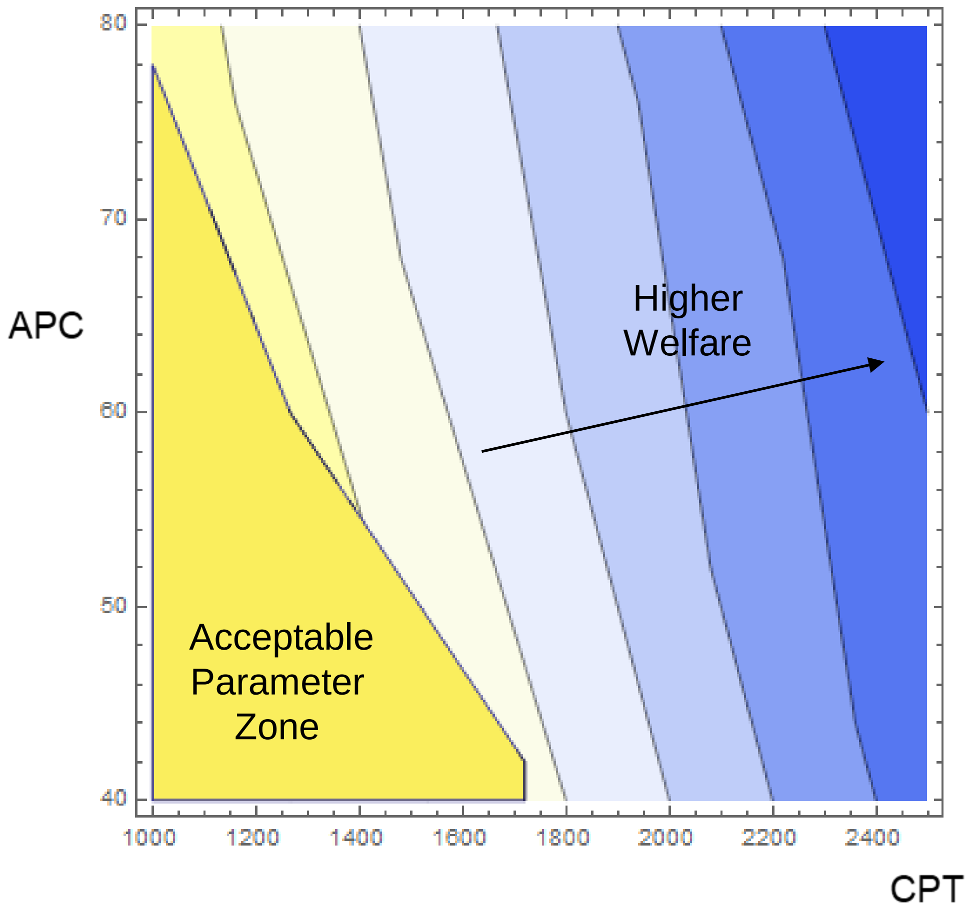
- The measure used in past reviews is that an Acceptable Participant Risk is no more than 500 days lost profit. This measure has been used since the 2013 review and was based on an analysis of different types of participants.
- Participants come in all shapes and sizes and with different degrees of hedge. Using a hypothetical example of each size and type of participant we can use simulation with different gas market parameters to determine which parameters maintain risk at acceptable levels across all of them.

Model Components



Goal: Across all scenarios, find the parameters that maximise market efficiency without participants facing unacceptable risk.

DWGM Welfare Loss & Acceptable Parameter Zone (VoLL = $800/GJ)



- Our 2018 review considered a range of scenarios and years for the DWGM and produced the graph shown.
- It can be seen that welfare increases (i.e. greater market efficiency) as APC and CPT increase.
- Prior to the last review the DWGM CPT value was $1800.
- The acceptable range shown does not violate the 500 days of lost profit limit.
- A CPT of $1800 was outside the acceptable range and as APC was $40/GJ a value of $1400 was recommended and adopted.

The Scenarios

The scenarios are described in more detail in the draft consultation report. They are a mix of scenarios used in our last review (with updated data) and new scenarios. PC and SC refer to the GSOO Progressive Change and Step Change supply and demand scenarios. The years shown are periods of 12 months from 1st July of that year.

DWGM Scenarios		**STTM Scenarios**		**Linked Market Scenarios**	
1	A full Longford outage during part of a high demand day in winter. 2024, 2026. *PC*	7	MSP capacity to supply SYD reduced by 5% for 3 days during winter. 2024 (without Port Kembla), 2026, 2027. *SC*	11	Extreme VIC winter demand and low storage links markets for 3 days. DWGM, SYD, ADL, 2026, SYD, ADL 2023. *PC*
2	A 2-day VNI compressor outage limiting supply from NSW, high demand days. 2026, 2027. *PC*	8	High GPG backhaul limiting supply to ADL ex ante market. 2025, 2027. *PG*	12	High NEM GPG demand for 3 days. APC in NEM. DWGM, SYD, ADL, 2026. *PC*
3	Moomba supply issue for 3 days has high exports from Victoria, NEM prices are high. 2026. *SC*	9	High GPG backhaul for BRI for 3 days. GPG demand triggers contingency gas during first gas day. 2025, 2027. *PG*	13	High world oil, gas and coal price scenario. NEM not capped. DWGM, SYD, ADL, 2026. *SC*
4	High GPG demand & coal outages during winter. Flow to SA. APC in NEM. 2023, 2025, 2026. *PC*	10	Supply interruption at SYD hub triggers contingency gas. 2024, 2026. *SC*		
5	Extreme winter demand (> 1-in-20-years) for 3 days. APC in NEM. 2023, 2025, 2026. *SC*				
6	High demand, 2-days of LNG but storage low. High NEM prices. 2026, 2027. *SC*				

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The Parameter Grid

Parameter	Current Value	Grid Points (2018 study)	Grid Points (this study)
Market Price Cap (MPC) **Value of Lost Load (VoLL)**	STTM $400/GJ DWGM $800/GJ	Both markets: $400/GJ, $600/GJ, $800/GJ, $1000/GJ	DWGM only: $600, $800, $1000 STTM only: $400, $600, $800
Administered Price Cap (APC)	STTM $40/GJ DWGM $40/GJ	Both markets: $40/GJ, $60/GJ, $80/GJ	Both markets: $35/GJ, $40/GJ, $60/GJ, $80/GJ
Cumulative Price Threshold (CPT)	STTM $440 DWGM $1400	Both markets: $1000, $1200, $1400 $1800, $2500 STTM only: $440, $600	DWGM only: $1200, $1400, $1600, $2000, $2500 STTM only: $440, $600, $800

Key reasons for changes

- We have revised the range of MPC/VoLL to recognise that a DWGM VoLL of $400/GJ and an STTM MPC of $1000/GJ seem very unlikely.
- For APC we have added $35/GJ. This is because current STTM parameter values would otherwise be at the minimum values in the grid. If the current values were found to be unacceptable then it gives an alternative option, though we think this is unlikely to be needed.
- For CPT we have refined the resolution of points above current values. This is because if normal gas prices are higher, then CPT values may need to be adjusted accordingly.
- We dropped the $1000/GJ MPC value for the STTM as was very far from acceptable in the prior review.

Participant Types

- For the participant risk assessment we focus on those predominantly buying from the market:
  - A small market customer (who may purchase directly from the wholesale market) with a less sophisticated approach to risk management than a retailer;
  - Gas retailers with varying contract positions, retail margins and customer portfolios;
  - Gas and electricity retailer who could be impacted by events in both the NEM and the gas industry;
  - Industrial users, covering a representative spectrum of gas intensity; and
  - Gas powered generators;
- We will have some variation in the contract levels, imbalances, deviations and risk behaviour of different participants.
- Base profitability will be based on a simple assessment of the normal profitability of each participant in a given market context.
- Given outcomes of each simulation for each participant type we can assess their risk exposure.

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Investment

- Investment decisions require consideration of at least:
  - Cost of constructing additional capacity.
  - Required rate of return (of similar investments).
  - Economies of scale in construction and operation mean that marginal cost measures are not appropriate.
  - Utilisation of peaking capacity will typically be partial when considering an economically sized investment.

- We do not propose to explicitly model the investment decision.
  - Too difficult to model in such a framework.
  - Influence of investment assumptions on outcomes is too great.

- We propose instead to:
  - Estimate investment costs for LNG facility.
    - We are proposing to assume a Port Kembla type LNG receipt facility (which can provide 115 PJ per year at a peak of 500 TJ/day) as the driver of investment costs.
  - Include investment cost recovery as a lower bound on MPC / VoLL values.

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Other Details of the Study Method

- Market Context
  - Describes underlying context of a market, based on GSOO and other forecasts.
  - Specific to a Market (DGWM, specific STTM hub) and year.
  - Intended to provide plausible scenarios for future supply and demand position .

- Supply and Demand Curves
  - Historic curves adjusted to the market context/scenario.
  - Specific curves for each supply source are constrained by injection / off-take limits.
  - Supply cost from storage vary with storage levels set by scenario.
  - Adjusted to reflect assumed contract levels relevant to context.

- Determining Market Surplus
  - Based on the supply and demand curves used in each simulation run.
  - We assume in all cases that uncontrollable demand is at the same invariant cost. The logic is that we are focusing on market clearing events that precede involuntary curtailment.
  - We only care about the change in market surplus – not the absolute position – so some systematic inaccuracy is tolerable.

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Data Sources - Processing

- Sources
  - AEMO Public Market History
    - Daily injection and withdrawal.
    - Daily Prices.
    - Daily total injections and withdrawals.
    - End-of-day linepack.
  - Gas Statement of Opportunities for Eastern and South-Eastern Australia, AEMO, March 2022.
    - Provides forecast of growth and shrinkage.
  - Victorian Gas Planning Report Update 2022.
  - State of the Energy Market 2021, Australian Energy Regulator, 2nd July 2021.
  - Australian Bureau of Statistics (ABS), Australian National Accounts .
    - Average Revenue at Risk.
  - Previous Reviews
    - Investment parameter estimates.
    - Participant profitability.

- Processing
  - Bid and offers curves to be modified to suit the context of future conditions.

Next Steps

Submissions on the Draft Consultation Report are to be made by email to GWCF_Correspondence@aemo.com.au

These are due by 7th October 2022. *Later than stated in the Draft Consultation Report.*

A presentation of the draft recommendations of this review will be made to the Gas Wholesale Consultative Forum (GWCF) in early December 2022.

The final report is due for publication by 16 February 2023.

Questions