AEMC

REVIEW

Australian Energy Market Commission

DRAFT REPORT

REVIEW OF THE GAS SUPPLY GUARANTEE

29 JULY 2021

INQUIRIES

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ABOUT THE AEMC

The AEMC reports to the Council of Australian Governments (COAG) through the COAG Energy Council. We have two functions. We make and amend the national electricity, gas and energy retail rules and conduct independent reviews for the COAG Energy Council.

SUMMARY

1 The purpose of this review is to advise Energy Ministers on whether there continues to be value in retaining the Gas Supply Guarantee or a similar mechanism and, if there is, in what form it should be incorporated in the national energy framework.[1]

2 This review has been carried out in the context of a changing energy sector.

3 As noted by the Australian Energy Market Operator (AEMO) in its *2021 Gas Statement of Opportunities*, the long-term operation of gas-powered generators in the NEM is uncertain and highly dependent on the evolution of the NEM's retirements, generation technology mix, particularly variable renewable energy developments, coal-fired generation and the timing, location, and scale of new transmission infrastructure or augmentations in the NEM.[2]

4 This suggests that, for the foreseeable future, there are uncertainties in the electricity sector that will impact on the operation of gas-powered generators and, consequently, on their need for natural gas. Therefore, the supply of gas is expected to continue to play a critical role in the electricity sector for some time, particularly during periods of low variable renewable energy generation or prolonged coal-fired generation outages.

Extending the term of the Gas Supply Guarantee

5 The Commission's draft recommendation is:

- for the Australian Government to extend the term of the Gas Supply Guarantee another three years to March 2026
- that an assessment on the long term need of the Gas Supply Guarantee be carried out prior to the conclusion of this extended period.

6 This draft recommendation has been made on balance following consideration of a number of alternative views from stakeholders as well as the short to medium term outlook for the east coast energy market.

7 In particular, the Commission recognises the current uncertainties in the east coast energy sector, particularly the transition in the NEM to a greater use of variable renewable generation. It is prudent, under the current changing circumstances, that AEMO and market participants be able to access a tool such as the Gas Supply Guarantee that could assist them in managing potential gas supply shortfalls faced by gas-powered generators.

8 Reflecting the low cost nature of the current Gas Supply Guarantee, the flexibility of the mechanism in dealing with issues as they arise and the role AEMO can play in bringing industry together to share information when it is needed most, the Commission does not recommend any fundamental change to the mechanism such as including it in the national energy rules at this time. It is satisfied that continuation of the current arrangements for another three years will be consistent with the long term interests of electricity and gas consumers.

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1 Energy Ministers, *Review of the Gas Supply Guarantee*, terms of reference, 9 September 2020, p. 1.

2 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 30.

9 The Commission anticipates that the outcome of a review of the Gas Supply Guarantee in three years' time will indicate whether the transformation of the energy sector still requires a mechanism of this nature or if the risks to supplying gas-powered generators have changed such that the Gas Supply Guarantee is no longer needed.

How the Gas Supply Guarantee operates

10 In March 2017, east coast gas producers and pipeline operators made commitments to the Australian Government to make gas available to meet peak demand periods in the NEM (such as during heat waves).

- Producers proposed to meet this commitment by making additional gas supply available to gas-powered generators through AEMO's facilitated markets or contractual arrangements during peak NEM demand periods.
- Pipeline operators proposed to meet this commitment through new interruptible agreements for shipping additional gas supply, and where possible, by coordinating additional transfer and delivery of gas between pipelines and/or by transporting and making available additional delivery of gas to gas-powered generators.

11 AEMO developed the Gas Supply Guarantee Guidelines to facilitate the delivery of these commitments, with them coming into effect on 1 December 2017.[3]

12 The Gas Supply Guarantee Guidelines are a non-binding instrument and set out the process for AEMO to call conferences with market participants to facilitate determining what action can be taken to address a potential forthcoming gas supply shortage that would impact the operation of gas-powered generators in the NEM. The Gas Supply Guarantee Guidelines are currently scheduled to expire on 31 March 2023.

13 To carry out its commitment to the Gas Supply Guarantee, AEMO:

- Monitors the relevant east coast gas markets and the Gas Bulletin Board to determine whether a potential shortfall in the next three to four days exists that could lead to not enough gas being available for gas-powered generation during an upcoming electricity peak demand period.
- Facilitates a forum (the South East Australia Gas Maintenance Co-ordination Workshop) for gas market participants to share information on planned maintenance activities across the east coast gas market. The outcomes from the facilitated workshops, held periodically, are reflected in the information provided by participants to the Gas Bulletin Board.
- Holds conferences with market participants as set out in the Gas Supply Guarantee Guidelines. The first of these is an assessment conference which is used to facilitate AEMO's assessment of whether a gas supply shortfall exists or is likely to occur. If the shortfall remains unresolved, AEMO can then schedule additional industry conferences and notify jurisdictional representatives. This second conference is used to confirm

3 AEMO, *Gas Supply Guarantee Guidelines*, March 2020, p. 2.

whether a possible shortfall exists, determine whether there has been an industry response to the potential shortfall and allow AEMO to call for an industry response.

Context for the draft recommendation

14 In making its draft recommendation, the Commission has had regard to the outlook for gas-powered generators in the NEM and the outlook for the east coast gas market. It has also considered the various tools that support managing reliability in the NEM as well as the tools that enable gas market participants to actively manage their gas usage.

Market outlook

15 In summary, the overall outlook for the supply of gas to the east coast gas market and its availability for gas-powered generators in the NEM in the near term appears sufficient. However, this outlook relies on the actions of gas market participants. The east coast based liquified natural gas (LNG) exporters have undertaken to provide gas into the domestic east coast market. In addition, as discussed in chapter 3, the Australian Government's National Gas Infrastructure Plan has identified certain new projects that will support gas supply adequacy. These are:

- a new gas storage facility at Golden Beach in Victoria
- an expansion of the existing Iona storage facility in Victoria
- an expansion (in addition to the expansion already underway) of the South West Pipeline in Victoria
- a new import terminal, with the Port Kembla Gas Terminal (that is expected to inject up to 500 TJ per day into the domestic gas market) considered the most advanced.

16 As noted by the Australian Government, it will be important that these particular projects meet their target commissioning deadlines to enable adequate gas supply for gas-powered generation to meet the needs of the NEM.

17 In addition, the *2021 Gas Statement of Opportunities* has indicated that there are number of uncertainties in the electricity sector that may impact gas demand by gas-powered generators and therefore gas supply adequacy for these generators. Specifically, weather variability, extreme weather events, and generation or transmission outages are forecast to drive continued volatility in gas-powered generator demand for gas.

18 Other events in the NEM may also temporarily increase gas demand from gas-powered generators. These events include: delays or deferral in developing new generation and transmission capacity; prolonged unforced outages or mothballing of coal-fired generation or maintenance of coal generation units coincident with weather variability.

19 As a result, there is an underlying risk that the need for gas-powered generation in the NEM will become more volatile and unpredictable as the use of variable renewable generation increases. This volatility may become a growing feature of the transition that the energy sector is moving through. As such, it has the potential to place an additional strain on energy market participants and AEMO's ability to operate the NEM. The Commission notes that the ESB 2025 work program will help address some of these uncertainties.

20 The Commission also acknowledges that while many market participants do not see significant gas supply shortages arising, there is some risk that the east coast gas market will not always be able to provide enough gas in time to adequately supply gas-powered generators during electricity peak demand periods.

Managing potential gas supply shortages

21 One of the reasons the majority of stakeholders have suggested to the Commission that gas-powered generators have no problems obtaining adequate gas supply to support peak demand periods in the NEM is that there are market-based solutions in place.

22 Stakeholders have observed there have been a number of changes in both the NEM and east coast gas market since 2017, when the Gas Supply Guarantee was introduced, that aid in enabling short-term gas supplies to reach gas-powered generators.

23 Chapter 4 of this draft report sets out a number of tools already operational in the NEM that aid in managing the reliability of the market. These range from information provision requirements such as the reliability and emergency reserve trader mechanism to more active requirements such as the retailer reliability obligation. In addition, the Energy Security Board's post-2025 process may also result in other options being developed in the future.

24 There are also a number of tools available in the east coast gas market to support managing potential gas supply shortages that may arise. In addition to information reporting obligations, gas market participants are able to utilise the facilitated markets to obtain short term gas supplies. The introduction of the day ahead auction and the capacity trading platform for pipeline capacity has increased the tools available to market participants such as gas-powered generators.

25 As a result, the Commission considers that the electricity and gas facilitated markets include tools that enable market participants and AEMO to respond to alleviate a situation where a gas supply shortfall could otherwise lead to load shedding during an electricity peak demand period.

26 Nevertheless, while the emergency management options available to AEMO and the jurisdictions decrease the chance of electricity market load shedding being required if gas-powered generators are unavailable when needed, these tools might not completely remove the chance of load shedding occurring.

Potential improvements to consider

27 The draft recommendation is that the Gas Supply Guarantee be retained for another three years and its contribution to the energy sector be reassessed in the future. In coming to this draft recommendation, the Commission has also considered potential improvements for the NEM and east coast gas market that have been identified by AEMO.

28 As discussed in chapter 5 of this draft report, two of these potential improvements should be assessed more closely and in light of stakeholder feedback.

Defining a gas supply shortfall

29 A gas supply shortfall is currently defined in the Gas Supply Guarantee Guidelines as "a shortfall in gas supply available to meet the fuel requirements for gas generators to operate at the capacity required during a peak NEM demand period".[4]

30 AEMO has suggested that the gas supply shortfall could instead be linked to a broader definition of electricity demand in the NEM. Specifically, whether there is sufficient gas to enable gas-powered generators to operate at the capacity required during forecast low reserve condition, forecast or actual lack of reserve condition occurring in the NEM, or to meet electricity demand in a part of a NEM region. The Commission notes that such a change has the potential to alter the purpose of the Gas Supply Guarantee and impact on when it could be called upon by AEMO.

Coordinating planned maintenance across east coast gas infrastructure

31 During the review, AEMO advised that it established the South East Australia Gas Maintenance Coordination Workshop (SEAGMCW) in August 2017 to provide a forum for maintenance planning. AEMO considers this critical to minimising threats to gas supply from overlapping or adjacent maintenance activities of gas infrastructure across the east coast gas market.

32 AEMO has stated that this forum is primarily run to meet AEMO's obligation to coordinate all planned maintenance by Victorian declared wholesales gas market facility operators under the National Gas Rules and that participation in the workshop has been expanded on a voluntary basis to include facility operators in other locations.

33 The Commission considers that the forum complements the aims and outcomes of the Gas Supply Guarantee by preemptively reducing the risks of a gas supply shortfall emerging that AEMO may otherwise need the Gas Supply Guarantee to help address. The voluntary participation of some facility owners in the forum suggests that some market participants value AEMO's facilitation of coordinated planned maintenance of gas infrastructure.

Next steps

34 Stakeholders are invited to provide written submissions to this draft report by close of business 9 September 2021.

35 Following consideration of written submissions and other relevant information provided by stakeholders, the Commission will publish a final report. The Commission is required to report back to the Energy Ministers with its final recommendations in quarter 1, 2022.

4 AEMO, *Gas Supply Guarantee Guidelines,* March 2020, p. 4.

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APPENDICES

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1 INTRODUCTION

On 9 September 2020, the Energy Ministers provided the Australian Energy Market Commission (AEMC or Commission) with terms of reference to conduct a review of the Gas Supply Guarantee (Guarantee).

The terms of reference provided by Energy Ministers require the AEMC to consider the following:[5]

- the scope of the Gas Supply Guarantee guidelines (the guidelines) as developed and amended by the Australian Energy Market Operator (AEMO)[6]
- the manner in which the guidelines have been utilised by AEMO, including in relation to industry engagement
- any overlap between the guidelines and other existing reliability or security mechanisms in the national energy framework
- the potential for the guidelines, or another similar mechanism as identified by the AEMC, to support reliability in the national electricity market (NEM), or to otherwise provide value to consumers
- the form any such mechanism should take (for example, through changes to the national electricity and gas laws, or associated rules)
- the impact of any such mechanism on AEMO, the market and market participants (including the costs and benefits of any recommended approach) — such consideration should also take into account any current and enduring issues arising from the COVID-19 pandemic.

On 11 March 2021, the Commission published a consultation paper identifying specific issues for consultation.

In this draft report, the Commission discusses its considerations of the gas supply adequacy problem that the Gas Supply Guarantee could help resolve, the impacts of that problem and potential amendments that could be made so that the Gas Supply Guarantee provides as much assistance as it can to resolve any gas supply problems that it is designed to address.

1.1 This review process

On 11 March 2021, the Commission published a consultation paper identifying specific issues for stakeholder consideration and feedback. Submissions closed on 15 April 2021. The Commission received 11 submissions. In addition, AEMC staff held 25 meetings with stakeholders.

As noted in the consultation paper, the AEMC has adopted a two-stage approach to carry out this review. The findings of stage one will determine if stage two is required:

5 Energy Ministers, *Review of the Gas Supply Guarantee*, terms of reference, pp. 2-3.

6 In March 2017, AEMO, at the request of the COAG Energy Council, developed the guidelines to facilitate the delivery of these commitments, with the guidelines being effective since 1 December 2017.

- Stage one will identify if there is a problem and how material the problem is. If the Commission concludes that there is no longer a problem, or the problem is solved by other mechanisms in place in either the electricity or gas markets, then stage two will not be required and will not go ahead.
- Stage two will identify potential solutions and recommend an implementation and transition plan to help resolve the problem established through stage one of the review.

In undertaking the review, the AEMC must consult with AEMO, the Australian Energy Regulator (AER), the Australian Competition and Consumer Commission (ACCC), industry as well as state and territory governments.

The AEMC is requested to report back to Energy Ministers by quarter 1, 2022.[7]

1.2 Responding to this paper

Written submissions to this draft report must be lodged with AEMC by **9 September 2021** online via its website, www.aemc.gov.au, using the "lodge a submission" function and selecting the project reference code **EMO0041**.

The submission must be on letterhead (if submitted on behalf of an organisation), signed and dated.

Where practicable, submissions should be prepared in accordance with the Commission's guidelines for making written submissions.[8] All submissions are published on the AEMC website, subject to a claim of confidentiality.

All enquiries on this project should be addressed to Daniela Moraes at (02) 8296 0607 or daniela.moraes@aemc.gov.au.

7 Energy Ministers, *Review of the Gas Supply Guarantee*, terms of reference, pp. 2-3.

8 This guideline is available on the Commission's website www.aemc.gov.au.

2 BACKGROUND

In March 2017, east coast gas producers and pipeline operators made commitments to the Australian Government to make gas available to meet peak demand periods in the NEM (such as during heat waves):[9]

- Producers proposed to meet this commitment by making additional gas supply available to gas-powered generators through AEMO's facilitated markets[10] or contractual arrangements during peak NEM demand periods.
- Pipeline operators proposed to meet this commitment through new interruptible agreements for shipping additional gas supply, and where possible, by coordinating additional transfer and delivery of gas between pipelines and/or by transporting and making available additional delivery of gas to gas-powered generators.

AEMO, at the request of COAG Energy Council (now Energy Ministers), developed the guidelines to facilitate the delivery of these commitments, with the guidelines being effective since 1 December 2017.[11] AEMO and industry worked together to develop guidelines in order to support the commitments made to the Australian Government in March 2017.

The guidelines are a non-binding instrument and set out the process for calling meetings with market participants in relation to potential gas supply shortfalls, the purposes of those conferences and how the conferences will be conducted.

Box 1 below provides a description of the load shedding event that preceded the introduction of the Gas Supply Guarantee.

BOX 1: FEBRUARY 2017 LOAD-SHEDDING EVENT IN SOUTH AUSTRALIA

On 8 February 2017, South Australia suffered load shedding and associated blackouts during an afternoon heatwave, which left 90,000 users without power. Load shedding was necessary to return the state's power system to a secure state and reduce flows on the Murraylink interconnector to within limits.

Despite the weather conditions, forecasts prepared by AEMO did not anticipate the level of demand for electricity in South Australia that day. Throughout the day, AEMO's forecasts predicted materially lower levels of demand and a greater contribution from wind generation than occurred, which resulted in reduced price forecasts.

On 9 February, the temperature in Adelaide also exceeded 40 degrees, which resulted in high levels of electricity demand. AEMO published notices throughout the day to encourage local market participants to make additional generating capacity ready before 3 pm. As it received

9 The Hon. Malcolm Turnbull MP, Prime Minister, *Measures agreed for cheaper, more reliable gas,* 15 March 2017. See https://www.malcolmturnbull.com.au/media/measures-agreed-for-cheaper-more-reliable-gas. See also AEMO, *Gas Supply Guarantee Guidelines*, March 2020, pp. 2-3.

10 AEMO operates a number of facilitated wholesale markets. These are the Victorian declared wholesale gas market, the short term trading markets, the gas supply hubs and other markets supporting the secondary trading of gas and pipeline capacity.

11 AEMO, *Gas Supply Guarantee Guidelines*, March 2020, p. 2.

little response, at 3.05 pm, AEMO directed Engie to run an additional generator at Pelican Point.

The AEMO intervention event commenced at 3.10 pm and a market notice was issued. AEMO issued a further market notice declaring intervention pricing would commence from the 3.50 pm dispatch interval. Engie made the increased capacity at Pelican Point available to the market via a rebid effective at 3.30 pm and was issued an increased target at 4.15 pm. Pelican Point continued to operate at 320 megawatt (MW) until 7 pm when the direction was cancelled, and the Intervention pricing event ceased.

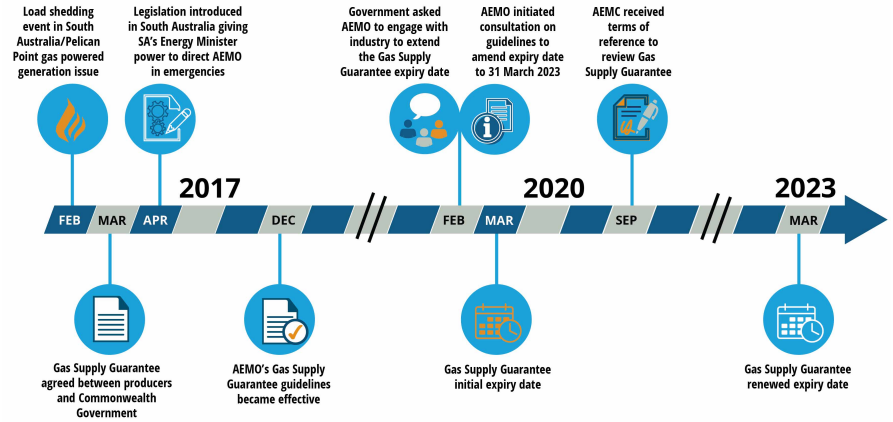
Soon after the February 2017 load shedding event, on 28 March 2017, the South Australian Government introduced into Parliament the Emergency Management (*Electricity Supply Emergency*) Amendment Bill to give the Minister for Energy and Mining the power to direct AEMO to direct market participants in the NEM to restrict, suspend or generate electricity in an electricity supply emergency, giving ultimate control for the state's energy security to the South Australian Minister rather than relying on AEMO to act. The legislation was passed on 26 April 2017. The Commission understands that this mechanism has not been utilised.

Source: AEMC, *Review of the Gas Supply Guarantee*, consultation paper, 11 March 2021, pp. 5-7.

The guidelines were due to expire in March 2020. However, in February 2020 the Minister for Energy and Emissions Reduction requested AEMO to engage with industry to extend the Gas Supply Guarantee expiry date.[12] AEMO initiated a consultation process and subsequently amended the expiry date of the guidelines to 31 March 2023.[13]

A timeline of events is illustrated in Figure 2.1 below.

Figure 2.1: Gas Supply Guarantee timeline



Source: AEMC.

12 AEMO, *Notice of guideline consultation*, 19 February 2020, p. 1.

13 AEMO, *Gas Supply Guarantee Guidelines Consultation*, final determination, March 2020, p. 2.

It is worth noting that the mechanism has not been triggered since its inception in December 2017.[14]

While AEMO has not found a gas supply shortfall or communicated with the industry to resolve a potential shortfall, it has used some steps within the process under the Gas Supply Guarantee to preemptively reduce the risk of a supply shortfall emerging.[15]

14 This was noted in the submissions to the consultation on AEMO's *Gas Supply Guarantee Guidelines* by the Australian Petroleum Production and Exploration Association, Australia Pacific LNG and Shell Australia. See AEMO's website: https://aemo.com.au/en/consultations/current-and-closed-consultations/gas-supply-guarantee-guidelines-consultation.

15 AEMO, *Summer 2020-21 Readiness Plan*, November 2020, p. 16.

3 ASSESSING THE PROBLEM

This chapter aims to identify and consider the issue that the Gas Supply Guarantee is seeking to address. It provides:

- an overview of the changes that have occurred in both the national electricity market and the east coast gas market since 2017
- a summary of stakeholders' views on whether there is currently an issue in the electricity and gas markets that the Guarantee addresses
- a detailed analysis of the present and future role of gas-powered generators in the NEM
- the Commission's draft conclusions.

3.1 Introduction

As noted in the consultation paper, the gas and electricity markets and underlying supply chains are complex.

As a result, it is difficult to quantify the impact of specific factors and reforms on market outcomes, including that of the Gas Supply Guarantee. This is particularly the case when a reform has not yet been utilised in the relatively short time that it has been in operation.

The first step in this review is to consider the issues, or perceived problems, that led to the introduction of the Guarantee. This context will aid in an assessment of the current market scenarios that may benefit from the Guarantee, or a similar mechanism.

To answer this key question, the Commission has looked at the context and circumstances in which the Australian Government introduced the Gas Supply Guarantee. It has also considered the current market environment, noting that a number of changes have occurred since 2017. These include:[16]

- Since 2017, the east coast gas market has:
  - experienced improved liquidity with new suppliers emerging and exploration and production restrictions being eased
  - had investment in pipelines to improve transportation capacity between regions, and a number of LNG import terminal proposals are under different stages of development
  - had greater flows and trading of gas (such as swaps) to enable increased gas supply into southern regions of the east coast market from other regions.
- Regulatory reforms in the east coast gas market have been undertaken since 2017 to:
  - enable secondary trading of pipeline capacity to occur more readily
  - improve the transparency of the market for all market participants.
- The NEM has also experienced a number of changes since 2017, including:

16 See Chapters 2 and 3 and Appendices A, B and C. Further details on many of the factors discussed below are available in AEMC, *Review of the Gas Supply Guarantee,* consultation paper, 11 March 2021.

- the increased penetration of renewable-based generation while some large coal-fired generators have recently retired, changing the generation mix in the NEM
- the introduction of large scale energy storage systems that can respond quickly to market conditions
- changing demand patterns with declining consumption overall with relatively little change in peak demand
- the introduction of reforms such as five-minute settlement[17] and the wholesale demand response mechanism[18] in the NEM, a requirement for generators to provide notice of planned closures, changes to wind farm settings and the introduction of the retailer reliability obligation.

- The Australian Government's National Gas Infrastructure Plan, which includes a commitment to support the east coast gas market across its entire supply chain.

It is worth noting that the Australian Domestic Gas Supply Mechanism (ADGSM) was also introduced in 2017,[19] resulting in east coast LNG exporters undertaking to make more supply available to the east coast gas market in general.[20]

Stakeholder views on the South Australian load-shedding event that occurred in the market in 2017, and whether there is currently an issue in the electricity and gas markets that the Guarantee helps to address are set out below. This is followed by the Commission's assessment of these views as well as consideration of the market environment.

3.2 Stakeholder views

The majority of stakeholders did not consider that there is a problem associated with gas-powered generators having an adequate gas supply to support peak demand periods in the NEM.

Many of the stakeholders that held this view suggested that no problem existed that warranted a regulatory mechanism because the gas could be made available to gas-powered generators when needed.[21]

In particular, some stakeholders pointed to gas market dynamics involving contractual or AEMO facilitated gas market options to suggest that gas-powered generators have many options available to them to secure an adequate gas supply (such as Short Term Trading Market (STTM) contingency gas, the day-ahead auction, the LNG heads of agreement, linepack, flexible gas supply and transportation arrangements).[22]

17 Implementation is scheduled for 1 October 2021.

18 Implementation is scheduled for 24 October 2021.

19 The ADGSM has been designed as a measure of last resort in the event of a forecast domestic gas shortage and provides the Australian Government with the ability to restrict LNG exports to secure domestic supply.

20 In January 2021, the Australian Government announced a new heads of agreement with the east coast LNG exporters, replacing the initial agreement.

21 Submissions to consultation paper: APA, p. 2; APGA, p. 3; APLNG, p. 2; APPEA, p. 4; GLNG, p. 5; Origin, p. 1; Shell, p. 2. Alinta Energy, Beach Energy and Central Petroleum expressed similar views in discussions with the AEMC.

22 Submissions to consultation paper: GLNG, pp. 5-6; Origin, p. 1; Shell, p. 2. Macquarie Bank and Jemena expressed similar views in discussions with the AEMC.

Additionally, APA suggested that, usually in instances of supply disruptions, the market will correct itself through shippers and gas-powered generators holding interruptible and as available commercial agreements with alternative suppliers and/or transporters.[23] If this is not the case, APA noted that it is not unusual for third party shippers and transporters to assist through bilateral arrangements to address shortfalls.[24]

In APA's view, in addition to market responses, enhanced planning and forecasting of east coast supply and demand in recent years and a more stringent focus on predicting supply shortfalls, has meant many issues have been averted before the start of the gas day.[25]

GLNG expressed similar views. It suggested that supply portfolios and contracts have been structured to supply gas to the domestic market generally and in particular during peak demand times.[26]

In addition, GLNG stated that east coast gas producers will generally have sufficient portfolio flexibility to cover additional demand, including demand from gas-powered generators, and market forces should help to meet additional demand without the need to trigger the Guarantee.[27]

Stakeholders also indicated that improvements to planning and forecasting supply and demand trends should support market participants in acting to meet any potential supply shortfalls. In addition, numerous regulatory reforms and government initiatives in the gas market, mean that there should be adequate supply to gas-powered generators for electricity peak demand periods.[28]

GLNG and APA also suggested that market-based solutions have previously responded to and corrected gas shortfalls within the NEM. In their view, past events have shown that the markets can operate effectively to support the NEM without government and regulatory intervention. These stakeholders have also suggested that the supply of gas for gas-powered generation is a capacity issue rather than purely being a commodity issue.[29]

Stakeholders also considered how AEMO's operation of the NEM is able to manage supply risks to gas-powered generators. GLNG and PIAC did not consider that there was a problem associated with making sure that gas-powered generators had adequate gas supply to support peak demand periods in the NEM.[30]

They considered that the electricity market is able to manage the risks associated with gas-powered generators not having adequate gas supplies during these periods through alternative fuels and sources of capacity, such as batteries and pumped storage.[31]

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23 Beach Energy and Macquarie Bank expressed similar views in discussions with the AEMC.

24 APA, submission to consultation paper, p. 1.

25 APA, submission to consultation paper, p. 2.

26 GLNG, submission to consultation paper, p. 8.

27 GLNG, submission to consultation paper, p. 8.

28 Submissions to consultation paper: APA, p. 2; GLNG, pp. 5-7; APLNG, p. 2.

29 Submissions to consultation paper: APA, pp. 1-2; GLNG, p. 10. Jemena expressed similar views in discussions with the AEMC.

30 Submissions to consultation paper: GLNG, pp. 8-9, PIAC, p. 2.

31 Submissions to consultation paper: GLNG, pp. 8-9, PIAC, p. 2.

Additionally, both PIAC and Shell mentioned established mechanisms that also function to manage reliability risks in the NEM and therefore reduce the reliability risk of a gas supply shortfall. These mechanisms include the retailer reliability obligation and the Reliability and Emergency Reserve Trader (RERT).[32]

On the other hand, AEMO and AGL consider that while there is currently no problem associated with that gas-powered generators having adequate gas supply to support peak demand periods in the NEM, a problem could emerge in the near future.[33]

In addition, AEMO stated its medium- to long-term forecasts indicate that various factors in the NEM and east coast gas market may increase the risk of gas supply to gas-powered generators.[34]

These factors include the demand for electricity from gas-powered generators becoming more volatile with the increase in variable renewable energy, the retirement of coal generators and the fact that gas-powered generators' peak demand may shift from a summer peak to a winter peak.[35]

Similarly, Lochard Energy considered that, although the Guarantee has not been triggered since its inception, the rapid changes currently taking place in both the NEM and the east coast gas market are making both the unexpected need for gas-powered generation and unforeseen tightness of gas supply more likely to occur simultaneously than in the past.[36]

In its view, these factors could increase the likelihood that the Guarantee could be triggered during this transition period. In its view, the Guarantee should be retained until the pressures that gave rise to it have significantly abated.[37]

3.3 Commission analysis

To determine whether there is a problem that the Gas Supply Guarantee needs to address, it is important to note that the Guarantee's implicit aim when it was introduced was to help avoid electricity load shedding during electricity peak demand periods. Therefore, the problem to consider is whether gas-powered generators are able to obtain gas when they need it to enable the electricity market to avoid load shedding during electricity peak demand periods.

Given gas-powered generators represent both a source of demand in the gas market and a source of supply in the electricity market, there are three underlying questions to explore:

1. Will gas-powered generators be needed to help avoid load shedding in the NEM? Or will the electricity market have adequate alternative solutions to meet electricity peak demand periods?

32 Submissions to consultation paper: PIAC, p. 2; Shell, p. 1. Alinta Energy expressed a similar view in discussions with the AEMC.
33 Submissions to consultation paper: AEMO, p. 1; AGL, p. 1.
34 AEMO, submission to consultation paper, p. 1.
35 AEMO, submission to consultation paper, p. 1.
36 Lochard Energy, submission to consultation paper, pp. 1; 3.
37 Lochard Energy, submission to consultation paper, pp. 1; 3.

2. If gas-powered generators will be needed to help meet electricity peak demand in the future, is the gas market able to provide adequate gas supplies to gas-powered generators through its operations and processes, including during peak gas demand periods?
3. If the answer to the second question is no, then can preexisting gas market emergency mechanisms like the STTM contingency gas framework or gas market interventions facilitate in providing gas-powered generators with sufficient gas during periods of gas supply scarcity?

These questions are examined in this chapter and chapter 4.

3.3.1 Gas-powered generators' role in the electricity market

Understanding the present and future role of gas-powered generators in the NEM, as well as its dynamics, is important to determine whether a present or future gas supply adequacy risk exists during NEM peak demand periods.

The Commission, therefore, assessed AEMO's recently published expectations involving the present and future role of gas-powered generators and the impacts they have on peak gas and electricity demand. It has also considered relevant comments made by other stakeholders.

As a result, the Commission has concluded that the need for gas-powered generation in the NEM has become more volatile and unpredictable as the use of variable renewable generation has increased. This has the potential to place an additional strain on energy market participants and AEMO's ability to operate the NEM at times.

Gas-powered generators' role in the NEM

AEMO has indicated that the long-term operation of gas-powered generators in the NEM is uncertain and highly dependent on the evolution of the NEM's generator retirements as well as the generation technology mix.

In particular, variable renewable energy developments will impact on the market's need for gas-powered generation as well as the operation of coal-fired generators and the timing, location, and scale of new transmission infrastructure and augmentations in the NEM.[38]

The strategic bidding behaviour of generators is also a key driver of the use of gas-powered generation. Gas-powered generation dispatch volumes will depend on participants' actual bidding strategies, and how they change over time as the portfolio of generation changes to incorporate more variable renewable energy.[39]

In AEMO's view, gas-powered generators will retain a critical role in meeting electricity demand during high temperatures in summer and low variable renewable energy periods in winter.[40]

38 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 30.
39 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 30.
40 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 20.

AEMO noted that the development of energy storage may be able to help cover low variable renewable energy operation periods. However, storage would be unable to replace gas-powered generators entirely because it is unable to cover all conditions, such as extended high electricity demand periods, extended periods of low wind speed (wind droughts) or to cover generator and/or transmission outages.[41]

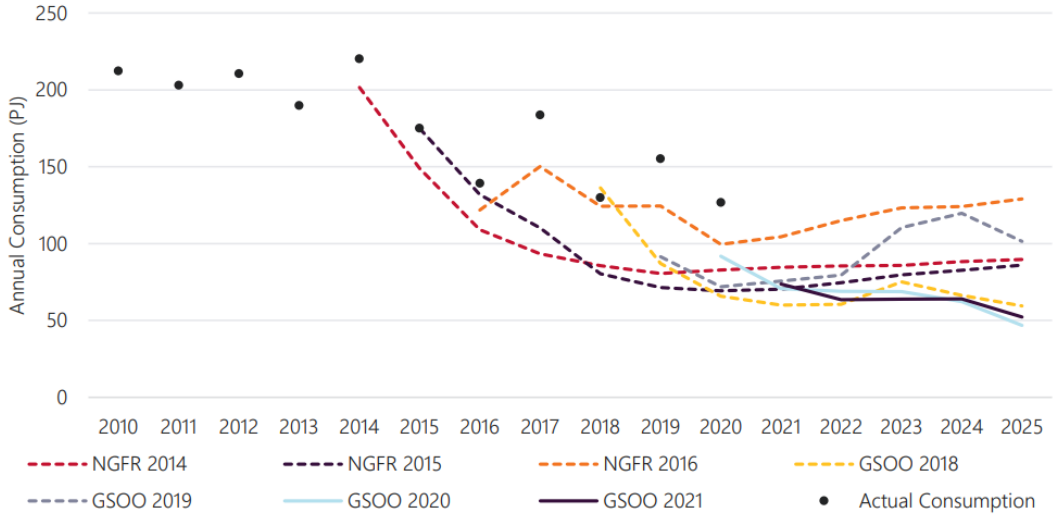
For these reasons, AEMO forecasts that there will be a few hours in most years in which almost all gas-powered generation units in a region will be needed to meet peak electricity demand.[42]

Forecasting gas demand for gas-powered generators

Forecasting gas demand for gas-powered generators is challenging because it is driven by events, such as extreme weather or generation outages, that are difficult to predict. This can lead to significant variations in forecasts and significant differences between forecast and actual demand.

As demonstrated in Figure 3.1, which compares AEMO's gas-powered generators forecast accuracy against actual demand, all recent forecasts have underestimated demand. This is due to a number of events that have resulted in higher gas-powered generator consumption of gas than that initially forecast.[43]

Figure 3.1: NEM gas annual demand forecast comparison, gas-powered generators



Source: AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 73.

These events have negated the forecast reductions in gas-powered generators' volumes due to the increasing penetration of renewable energy at large and small scale. The events include:

41 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 36.
42 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 36.
43 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 72.

- The Basslink interconnector outage in 2015.
- The early closure of Northern Power Station in South Australia, in May 2016.
- The extended outage at Eraring Power Station in 2016.
- The short notice closure of the Hazelwood Power Station and extended outage at Yallourn in 2017.
- The Loy Yang A and Mortlake unit outages and coal shortages at Mount Piper Power Station in 2019.
- Extended hot weather across December and January 2019, which led to a slightly higher electricity consumption than forecast.
- Long duration coal-fired generation outages at both Tarong and Tarong North power stations in early 2020.
- The failure of the Heywood interconnector connecting South Australia with Victoria in early 2020.

In 2020, higher than forecast gas-powered generator consumption of gas was most notable in Queensland. The 2020 calendar year also experienced the lowest gas spot prices since 2016. This resulted in the lower-priced market offers from Queensland gas-powered generators such as Darling Downs and Swanbank E, which displaced black coal-fired generation.[44]

Forecast accuracy in 2020 was generally better in the other NEM regions. However, lower than anticipated wind availability in the southern states over the winter months resulted in actual gas demand being higher than forecast for gas-powered generators.[45]

Figure 3.2 provides an overview of the forecast accuracy since 2016 of the calendar year immediately following the forecast. The gas-powered generation forecast accuracy ranges from a -41.1 per cent (an under-forecast) for the 2019 calendar year up to a five per cent over-forecast for the 2018 calendar year. The average forecast error in the past five years was -17.3 per cent.

Figure 3.2: Gas-powered generation – year ahead historical forecast accuracy

	2016	2017	2018	2019	2020
Year ahead forecast	132	150	136	91	91.9
Actual consumption	139	184	130[81]	155	127
Forecast accuracy	-5%	-18%	5%	-41%	-27%
Source	2015 NGFR	2016 NGFR	2018 GSOO[82]	2019 GSOO	2020 GSOO

Source: AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 73.

44 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 73.
45 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 73.

According to AEMO, annual demand for gas from gas-powered generators is likely to fall materially as more variable renewable energy connects and operates in the NEM.[46] This expected change in the generation mix has been a factor that has influenced the forecast demand of gas for gas-powered generators.

Over time, as more energy storage is developed and coal-fired generators retire, daily gas-powered generator gas demand is forecast to switch from summer to winter peaking. This is expected to further exaggerate the existing seasonal variations in daily gas demand.[47]

While the demand for gas for gas-powered generators is influenced by the noted structural changes in the NEM, higher gas-powered generation demand is frequently event-driven. This is discussed in the next section.

Analysing the variability in gas demand for gas-powered generation

A number of uncertainties in the electricity sector may impact gas consumption by gas-powered generators and therefore gas supply adequacy. Weather variability, extreme weather events, and generation or transmission outages are forecast to drive continued volatility in gas-powered generator demand for gas.[48]

In addition, other events in the NEM may temporarily increase future gas demand from gas-powered generators. These events include: delays or deferral in developing new generation and transmission capacity; earlier than expected closure of coal-fired generation or maintenance of coal generation units coincident with weather variability.[49]

As a result, AEMO forecasts continued volatility in gas-powered generation demand, with large variances driven by the NEM's operation of coal, hydro, and renewable energy generators.[50] This volatility is already experienced in South Australia where, on any given day, gas-powered generation can comprise between zero and 95 per cent of the electricity supply.[51]

This uncertain volatility in the demand for gas by gas-powered generators increases the value of flexible supply and infrastructure options in the gas market to meet projected seasonal supply gaps as well as unexpected changes in the markets.[52]

As a result, AEMO has assessed two key risks — the impact of electricity market events, that are distinguishable and unexpected, and natural weather variability that is expected, but predictable only at short notice.[53]

- **Event-driven variability** such as outages of major coal generators, or transmission outages that affect key electricity flow paths:

46 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 8.
47 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 8.
48 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 32.
49 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 32.
50 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 8.
51 AEMO, submission to consultation paper, p. 4.
52 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 9.
53 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 32.

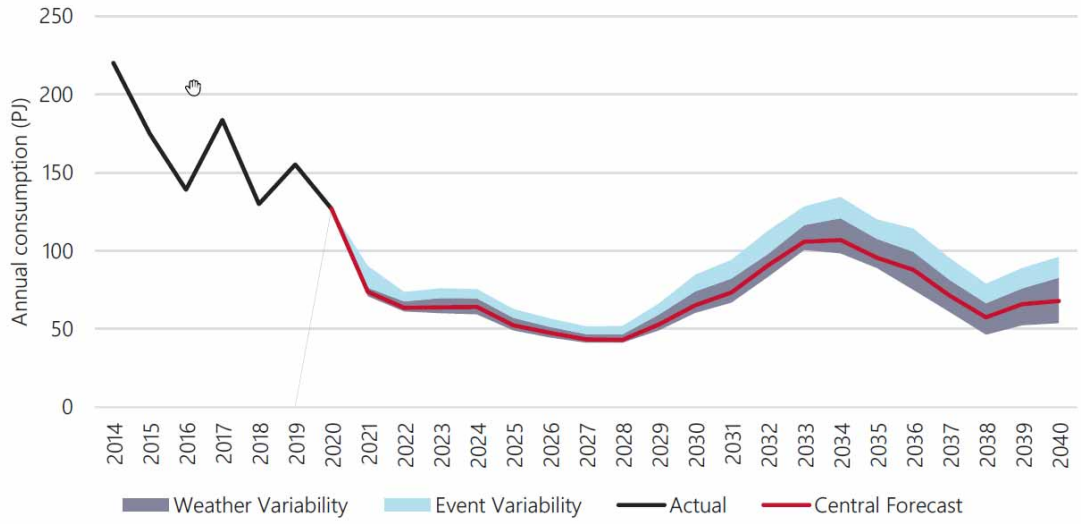
- Extended coal outages — gas-powered generator's demand is highly sensitive to coal-fired generation availability. In recent years, a number of prolonged outages have resulted in an increase in gas-powered generation volumes. Unplanned outages at Loy Yang A in 2019, Tarong North in 2020, Callide C and Yallourn in 2021 are recent examples.
- Major transmission outage — outages on key transmission flow paths can result in elevated gas-powered generation consumption. For example, higher volumes of gas-powered generation might be required in the southern regions should South Australia separate from the rest of the NEM due to an interconnector outage.[54]

- **Weather variability**, including extreme weather events, can impact the output from wind, solar and hydro generators, and commensurately impact thermal dispatch from coal and gas-powered generators.[55]

In summary, weather variability and power system events, such as electricity infrastructure outages, will continue to be key drivers of uncertainty in the long-term forecast of gas demand for gas-powered generation.

Higher reliance on variable renewable energy will increasingly expose the NEM to weather variability, which drives a larger forecast range in gas-powered generator's demand for gas over time.[56] This is illustrated by Figure 3.3 below.

Figure 3.3: Forecast variance in gas-powered generation consumption due to NEM events and weather variability, 2014-2040 (PJ)



Source: AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 33.

54 AEMO has modelled this risk by assuming the month-long February 2020 outage of the Heywood interconnector (joining Victoria and South Australia) was repeated in June 2021. This timing was chosen to test the impact of the outage during the peak season for gas consumption in Victoria.

55 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 33.

56 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 33.

3.3.2 Is there enough gas to meet NEM peak demand periods?

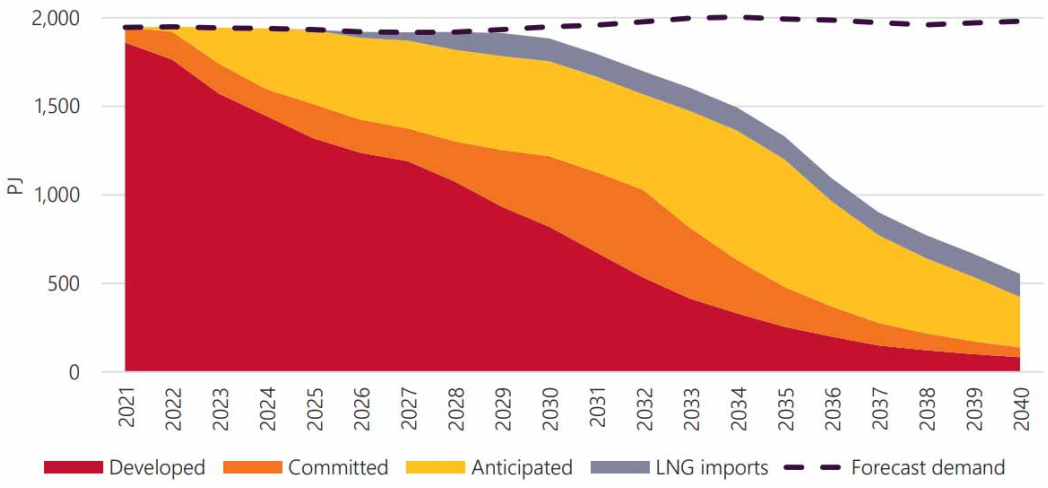
The Commission examined AEMO's gas supply adequacy forecasts to assess the risks of gas supply being inadequate to cover future gas and electricity peak demand periods. Information from AEMO and the National Gas Infrastructure Plan (NGIP) indicate that, with the development of certain key projects, supply of gas is likely to meet the needs of the NEM at peak electricity demand periods. This is explored further in this section.

Expectations in the Gas statement of opportunities

AEMO's most recent forecasts suggest that gas supply is likely to be adequate to meet gas peak demand during the near-term and long-term future.

Figure 3.4 below shows the expected production forecast if existing, committed, and anticipated projects are developed and all associated reserves and resources are commercially recoverable to meet demand in the long term. It shows that new supply options will be required across eastern and south-eastern Australia towards the end of the decade to ensure domestic and LNG export demand is met to the end of the outlook period.

Figure 3.4: Projected eastern and south-eastern Australia gas production (including export LNG), central scenario, 2021-40 (PJ)



Source: AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 55.

Note: The figure displays the supply from developed, committed and anticipated developments, showing the utilisation of anticipated production as early as 2022. Without this anticipated production, developed and committed production can service 2022 and 2023 consumption and maximum daily demand but these fields would then be depleted earlier than shown in this figure.

However, these forecasts are dependent on several factors, including:

- The commencement of operations for the Port Kembla Gas Terminal, which is a committed LNG import terminal that is expected to inject up to 500 terajoules (TJ) per day into the domestic gas market, before winter 2023.
- The development of all committed field developments and anticipated projects, including Golden Beach and new fields in the Gippsland Basin Joint Venture, on schedule.

- Pipeline expansions, such as those scheduled for the South West Pipeline.
- Additional demand management initiatives that could assist in mitigating supply scarcity risks associated with any potential Port Kembla Gas Terminal commissioning schedule slippage, or LNG cargo delays.

If all of these domestic production projects are developed on time, then AEMO does not anticipate peak demand gas supply gaps to emerge until 2029. The timely operation of Port Kembla Gas Terminal alone is expected to enable supply to meet all peak gas demand periods until at least winter 2026.[57]

However, if the above projects do not occur as currently expected, then AEMO considers that a risk of peak-day gas supply shortfalls begins to emerge in Victoria for the 2023 winter season under 1-in-20 peak demand conditions.[58] If these shortfalls occur, then AEMO (as market operator of the Victorian Declared Wholesale Gas Market (DWGM)) would need to take short-term operational measures to attempt to reduce this threat to system security in Victoria, including controlled interruption of demand.[59]

Possible gas supply shortfall scenarios

Based on AEMO's scenario analysis, there is currently one set of credible contingencies for the short-term that would lead to a gas supply shortfall for a gas-powered generator. This scenario involves:

1. the Longford gas plant is operating with reduced capacity due to maintenance
2. a peak demand period has arisen in the NEM due to extreme temperatures and there is no concurrent wind generation available
3. one or two coal-fired plants have tripped and are not operational.

The likelihood of this scenario eventuating is low because all three events, while individually credible, would need to occur concurrently.

In any event, under normal operations planned maintenance is not scheduled for Longford during peak NEM periods.

Instead, it is usually scheduled for shoulder periods. In addition, as gas demand is winter peaking, there is sufficient gas supply available during summer to generators at short notice, meaning that they should be able to operate during a NEM event if directed.[60]

The recently committed Port Kembla Gas Terminal will improve the near-term gas supply outlook for the domestic market, injecting up to 500 TJ per day. It is expected to replace declining supplies such as from the Longford gas plant.

57 AEMO, *2021 Gas Statement of Opportunities*, March 2021, pp. 54; 58.
58 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 56.
59 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 56.
60 AEMO, submission to consultation paper, p. 3.

Further to improving overall gas supply in the short term, the Port Kembla Gas Terminal will somewhat reduce the longer-term risk of gas-powered generators facing a gas supply shortfall by providing a new, additional fuel source.[61]

However, AEMO noted that due to logistical issues, the terminal may not completely mitigate shortfall risks to gas-powered generators. It commented that if LNG cargoes to the new terminal are unavailable during a shortfall event or if the LNG import facility empties its inventories without a new supply vessel having arrived then there would be no more supply until another vessel arrives.

Such an event would result in a large decrease in supply capacity. AEMO commented that cargo issues for floating LNG terminals occur significantly more frequently than complete gas plant failures.[62]

Expectations in the National gas infrastructure plan

The Commission also examined the Australian Government's NGIP. The NGIP is one component of the Australian Government's gas-fired recovery plan.[63]

Through the NGIP, the government aims to identify the high priority infrastructure projects that could address an anticipated future shortfall in gas supply in the southeast of Australia in the near term. The Australian Government released an interim report on 7 May 2021.[64]

Despite the improved gas supply outcomes in AEMO's *2021 Gas Statement of Opportunities* (GSOO), the Australian Government perceives some risk of a shortfall in eastern Australia by 2024. Specifically, a 10 petajoules (PJ) shortfall in 2024 that could grow to 53 PJ in 2025 and 167 PJ in 2026.[65]

A key assumption used in the NGIP is that it assumes gas supplies must be sufficient to enable gas-powered generators to operate at the average of the levels observed over 2018 to 2020.[66]

Similar to the GSOO, the interim NGIP has identified four critical infrastructure projects that need to progress to avoid a shortfall. These projects are:

- a new gas storage facility at Golden Beach in Victoria
- an expansion of the existing Iona storage facility in Victoria
- an expansion (in addition to the expansion already underway) of the South West Pipeline in Victoria

61 AEMO, submission to consultation paper, p. 4.

62 AEMO, submission to consultation paper, p. 4.

63 Australian Government Department of Industry, Science, Energy and Resources, *Advancing Australia's gas-fired recovery*, media release, accessed via https://www.energy.gov.au/news-media/news/advancing-australias-gas-fired-recovery.

64 Australian Government Department of Industry, Science, Energy and Resources, *National Gas Infrastructure Plan*, interim report, May 2021.

65 Australian Government Department of Industry, Science, Energy and Resources, *National Gas Infrastructure Plan,* interim report, May 2021, p. 9.

66 Australian Government Department of Industry, Science, Energy and Resources, *National Gas Infrastructure Plan,* interim report, May 2021, p. 9.

- a new import terminal, with the Port Kembla project considered the most advanced.[67]

Following from this, the Australian Government announced it will allocate $38.7 million to accelerate these projects to final investment decisions and mitigate the risk of commencement delays.[68]

3.3.3 Increased flexibility in gas supply and transportation contracts

Some stakeholders have also suggested that the increasing volatility of gas-powered generation is being accommodated by increased gas market flexibility. For example, GLNG stated that gas sellers and buyers have in many cases contracted flexibility into gas supply arrangements to enable short term or seasonal diversion of gas back to the domestic markets when required.[69] Pipeline operators can also provide short-term support for gas shortages to balance demand through line pack and pipeline trading capacity.[70]

GLNG and APA also indicated that market-based solutions have previously responded to and corrected gas shortfalls impacted on the NEM. In their view, past events have shown that the markets can operate effectively to support the NEM without government and regulatory intervention. These stakeholders have also suggested that the supply of gas for gas-powered generation is a capacity issue rather than purely being a commodity issue.[71]

AEMO also noted in its submission that there are various mechanisms available to access gas at short notice. For example, from a capacity perspective, the capacity trading platform provides as-available and interruptible contracts. From a commodity perspective, there are mechanisms such as the gas supply hub, direct contracting with suppliers for as-available gas, and gas swaps. In addition, brokers are increasingly playing a role in enabling short term gas demand to be met.[72]

AEMO also indicated that some gas-powered generators are dual fuel and can also operate on diesel, although this is a significantly expensive and short-term measure and is likely to be a last resort.[73]

These views are consistent with the Commission's opinion that there are a number of alternatives to managing a need for flexible supply and transportation of gas across the east coast gas market.

As noted above in section 3.1, a number of relevant changes have occurred in the gas market since 2017 that have improved the adaptability of the gas market to the changing needs of market participants. There is no indication that flexibility will decline. In fact, reforms in gas market transparency and pipeline regulation are likely to further support flexibility in the east coast gas market over the longer term.

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67 Australian Government Department of Industry, Science, Energy and Resources, *National Gas Infrastructure Plan,* interim report, May 2021, pp. 6-7.

68 Australian Government Department of Industry, Science, Energy and Resources, "Advancing Australia's gas-fired recovery", accessed via https://www.energy.gov.au/news-media/news/advancing-australias-gas-fired-recovery

69 GLNG, submission to consultation paper, p. 2.

70 GLNG, submission to consultation paper, p. 9.

71 Submissions to consultation paper: APA, pp. 1-2; GLNG, p. 10.

72 AEMO, submission to consultation paper, p. 4.

73 AEMO, submission to consultation paper, p. 4.

3.3.4 Gas market emergency measures

AEMO and jurisdictions have access to several types of regulatory or intervention-based emergency management tools to respond to a supply issue in the east coast gas market.

This includes responding to events that result in the gas market being unable to provide adequate gas supplies to gas-powered generators through regular operations.

These tools enable emergency reallocation of gas to gas-powered generators although they may entail costs for other gas market participants who face their gas supplies being reallocated. These measures are explored further in chapter 4.

3.4 Draft conclusion

As noted earlier, the majority of stakeholders suggested that gas-powered generators have no problems obtaining adequate gas supply to support peak demand periods in the NEM through market-based solutions. As stakeholders have observed, there have been a number of changes in both the NEM and east coast gas market since 2017, when the Gas Supply Guarantee was introduced, that aid in enabling short-term gas supplies to reach gas-powered generators.

Having regard to these views, the Commission considers that a gas supply adequacy risk does not seem to be significant for electricity peak demand periods at present due to market mechanisms already in place that support flexible and short-term gas supply arrangements.

However, AEMO and the Australian Government both consider that gas-powered generators may, under certain conditions, face challenges obtaining gas when needed to supply the NEM into the future. These concerns arise from uncertainty regarding the timing in the development of new gas projects in the near term that will support the availability of gas where and when it is needed and counteract declining supply from existing sources.

The Commission acknowledges these concerns. At present, the gas projects identified by AEMO and the interim NGIP as necessary for the market are not sufficiently progressed to provide a degree of certainty about their commissioning dates. As a result, there is some risk that the east coast gas market will not always be able to provide enough gas in time to adequately supply gas-powered generators during future electricity peak demand periods.

In addition, there is an underlying risk that the need for gas-powered generation in the NEM has become more volatile and unpredictable as the use of variable renewable generation increases. This volatility may become a growing feature of the transition that the energy sector is moving through. As such, it has the potential to place an additional strain on energy market participants and AEMO's ability to operate the NEM.

This volatility is unlikely to be predictable or uniform from one year to the next. For example, gas market volatility seen in 2016 and 2017, driven by a combination of supply and demand side factors, has not been repeated to the same extent since. Until such a combination of factors is repeated and similar levels of volatility are seen in the gas market, it could be considered premature to make an assessment as to the usefulness of the Gas Supply

Guarantee in all market circumstances, and in all scenarios, as they might occur through the continued transition of the NEM.

Noting market participant views and those of AEMO and the Australian Government, the Commission recommends that, on balance:

- the Gas Supply Guarantee in its current form be extended for another three years to March 2026
- a review to assess the long term need for the mechanism be carried out prior to the conclusion of the extended period.

The Commission has made this draft recommendation in recognition of the current uncertainties in the east coast energy sector, particularly the transition in the NEM to a greater use of variable renewable generation. It is prudent under the current changing circumstances that AEMO and market participants be able to access a tool such as the Gas Supply Guarantee that could assist them in managing potential gas supply shortfalls faced by gas-powered generators.

Reflecting the low cost nature of the current Gas Supply Guarantee, the flexibility of the guidelines in dealing with issues as they arise and the role the guidelines play in bringing industry together to share information when it is needed most, the Commission does not recommend any fundamental change to the mechanism such as including it in the national energy rules at this time. It is satisfied that continuation of the current, low cost, light handed arrangements for another three years is likely to be consistent with the long term interests of electricity and gas consumers.

The Commission anticipates that a review of the Gas Supply Guarantee in three years' time will indicate whether the transformation of the energy sector still requires a mechanism of this nature or if the risks to supplying gas-powered generators have changed such that the Guarantee is no longer needed.

4 IMPACT OF THE PROBLEM

This chapter seeks to identify the impact of the Gas Supply Guarantee on operating the energy markets and on market participants. It provides:

- a summary of stakeholders' views on what could be the impact of not having the Guarantee in place, how material the impact could be and who in the NEM and the east coast gas market may be impacted
- a detailed analysis of the electricity and gas facilitated markets tools available to market participants, AEMO and jurisdictions to respond to alleviate a situation where a gas supply shortfall could otherwise lead to load shedding during an electricity peak demand period
- the Commission's draft conclusions.

4.1 Stakeholder views

Most stakeholders responded to the consultation paper's question on the potential impact on the NEM and the east coast gas market of not continuing with the Guarantee.

Overall, stakeholders did not identify any significant impact on the operation of the electricity and gas markets if the Guarantee did not continue beyond its expiry date in 2023. In forming this view, stakeholders noted the markets have other mechanisms that are in place to manage potential and actual demand-supply gaps.

For example, some stakeholders noted the potential costs of relying on alternative emergency reliability measures to avoid load shedding compared to the costs of using the Guarantee. While noting these mechanisms, AEMO and PIAC both considered the Guarantee to be less costly than these measures, such as RERT or interventions in the gas market.[74]

AEMO and Lochard Energy also considered the impacts of load shedding on consumers and stated that the Guarantee is more cost-effective by comparison.[75]

APGA and GLNG considered that while gas supply shortfalls could occur that would leave gas-powered generators unable to adequately support the NEM, the Guarantee would not help to avoid these shortfalls or their impacts.[76]

APGA commented that the Guarantee would not be relevant for a small number of shortfall incidents where gas cannot be physically made available. However, for most events, APGA stated "the goodwill and swift actions of gas market participants and pipeline operators ensures that if the gas can be made available, it will be made available".[77]

Other stakeholders suggested that the impact of any possible shortfall would be minimal at best. They considered that the gas and/or electricity markets are currently equipped to

74 Submissions to consultation paper: AEMO, pp. 1; 7-8; PIAC, p. 1.
75 Submissions to consultation paper: AEMO, pp. 1; 7-8; Lochard Energy, p. 4.
76 Submissions to consultation paper: APGA, p. 3; GLNG, p. 9.
77 APGA, submission to consultation paper, p. 3.

resolve these situations through other arrangements and regulatory mechanisms.[78] GLNG reaffirmed its expectation that the impact of a possible gas supply shortfall would be minimal at best and commented that the Guarantee acts as a safeguard rather than a market necessity.[79]

Lochard Energy considered the economic value of curtailment could be an indication of how material the impact could be in case the Guarantee is removed. This value could be measured by the 'value of customer reliability', which is taken into account in setting market price caps. It calculated that using current Victorian DWGM and NEM price caps, a 100 TJ gas curtailment would have an implied value of $80 million to gas customers and $100 million to electricity customers. Under such situations, the parties most impacted would be the customers who are curtailed and retailers affected by high market prices.[80]

4.2 Commission analysis

As noted in the consultation paper, the Gas Supply Guarantee was designed to assist gas market participants in supplying gas to one or more gas-powered generators in a short time frame to enable those generators to assist in meeting unexpectedly high demand for electricity in the NEM.

The result of using the Guarantee could be a decline in supply for some gas users to enable the demand from a gas-powered generator to be met. However, without adequate gas being made available to a gas-powered generator, it is possible that electricity demand would not be met without intervention by AEMO to reduce demand in the NEM or increase supply in the east coast gas market. This, as suggested by Lochard Energy, could be costly for market participants.

The Commission assessed the electricity and gas facilitated markets tools that enable market participants, AEMO and jurisdictions to respond to alleviate a situation where a gas supply shortfall could otherwise lead to load shedding during an electricity peak demand period. These are discussed in detail below.

4.2.1 Electricity market tools

AEMO and market participants currently have various tools to manage electricity peak demand periods. There are also mechanisms under consideration as part of the NEM 2025 reforms.

AEMO obtains and, in turn, provides large amounts of information to NEM market participants to enable and encourage the market to provide adequate supply to safely meet demand at all times. These are broadly referred to as reliability measures.[81] Alternative market options to quickly provide supply or reduce demand during peak demand periods are increasingly

78 Submissions to consultation paper: APA, p. 1; APLNG, p. 4; APPEA, p. 4; GLNG, pp. 10-11; Shell, p. 2.

79 GLNG, submission to consultation paper, p. 10.

80 Lochard Energy, submission to consultation paper, p. 5.

81 The NEM also has system security measures aimed at maintaining a secure and stable system. These measures include parameter settings for voltage and frequency.

becoming available alongside gas-powered generators. These include batteries and wholesale demand response.

AEMO has various emergency management options, including using RERT and directing market participants, which it can use to intervene in the market and avoid load shedding when a market solution may not be available.

In addition, the Retailer Reliability Obligation (RRO) requires retailers and larger generators to enter contractual arrangements to cover forecast reliability shortfall periods, providing strong incentives for contracted generators to be available for dispatch during peak demand periods.[82] Other mechanisms being considered through the ESB post-2025 process may strengthen some of these existing options for addressing peak demand.

Table 4.1 below covers the existing options for addressing peak demand reliability concerns in the NEM.

Table 4.1: Electricity market tools

TOOL / MARKET	CATEGORY	NER	TIMEFRAME
National Electricity Market Emergency Management Forum (NEMEMF)	Emergency management	N/A	meet twice a year / called if there is an emergency
Directions	Emergency management	4.8.9	generally within a day
Load shedding (Instructions)	Emergency management	4.8.9	within day
Lack of Reserve (LOR) operational assessment horizon	Information	4.8.4A	within day
Pre-dispatch (PD PASA)	Information	3.8.20	within day to day-ahead / voluntary up to a week ahead
Lack of Reserve (LOR) forecast assessment horizon	Information	4.8.4A	within day to 7 days ahead
Gas Supply Guarantee (GSG)	Emergency management	N/A	only effective 3 to 4 days ahead
Short-notice RERT	Emergency management	3.20.3	3 hours to 7 days ahead
Short Term PASA (ST PASA)	Information	3.7.3	2 to 7 days ahead
Extended pre-dispatch report	Information	N/A	7 days ahead

82 AEMC, *Review of the Gas Supply Guarantee*, consultation paper, 11 March 2021, p. 27.

TOOL / MARKET	CATEGORY	NER	TIMEFRAME
Medium-notice RERT	Emergency management	3.20.3	7 days to 10 weeks ahead
Summer readiness report	Information	N/A — Finkel recommendation	1 month before summer starts
Long-notice RERT	Emergency management	3.20.3	10 weeks to 1 year ahead
Energy Adequacy Assessment Projection	Information	3.7C	2 years ahead, but repeated at least annually
Interim Reliability Reserve	Emergency management	Part ZZZZD — 11.128.4	1 to 3 years ahead
Medium Term PASA (MT PASA)	Information	3.7.2	2 to 3 years ahead
Retailer Reliability Obligation (RRO)	Facilitated market	4A.C.1	3 years and 3 months ahead
Generator notice of closure	Information	2.10.1	3.5 years ahead
Electricity Statement of Opportunities (ESOO)	Information	3.13.3A	Annual, with an outlook of 20 years in practice, 10 years as the obligation

Source: AEMC
Note: The lack of reserves framework is discussed more extensively in Appendix B. More details on the RRO, RERT and the Summer readiness report are available in AEMC, *Review of the Gas Supply Guarantee,* consultation paper, 11 March 2021.

Information

The provision of accurate information to AEMO by market participants is essential for managing system security and reliability.

The market information reporting requirements in chapter three of the National Electricity Rules (NER) cover MT PASA, ST PASA and the pre-dispatch process. These information requirements obligate market participants to provide information on the availability of generation and scheduled network services up to two-three years ahead of the relevant dispatch period. They are discussed further in appendix A.

Specifically, participants must regularly review and update the information they provide to AEMO as part of the MT PASA, ST PASA and pre-dispatch processes. Participants must also regularly review their daily bids to ensure that they can comply with offers and dispatch instructions at all times and must immediately notify AEMO of any situation that may alter their availability.[83]

AEMO also provides information to market participants to inform them of emerging electricity supply shortfalls to encourage them to fill the supply gap. This occurs through the lack of reserves process, which is discussed further in appendix B.

83 See rules 3.7 and 3.8 of the NER.

Emergency management

AEMO also has several emergency options available to it in circumstances where the market response to information has been inadequate to maintain a reliable and secure power system or where it needs to respond to unexpected events. For example, AEMO can procure electricity reserves or demand response through RERT or the interim reliability reserve.[84] It could also direct market participants to increase supply to overcome the shortfall or trigger load shedding through instructions.

4.2.2 East coast gas market tools

AEMO and market participants also have a wide range of information, emergency management tools and facilitated markets to respond to a gas supply shortfall on the east coast, as illustrated in Table 4.2 below.

Table 4.2: Gas market tools

TOOL / MARKET	CATEGORY	NGR	TIMEFRAME
National Gas Emergency Response Advisory Committee (NGERAC)	Emergency management	N/A	meet twice a year / called if there is an emergency
Gas emergency protocol — Victoria	Emergency management	definition in rule 333	within day
STTM contingency gas	Emergency management	Part 20 – 444	within day
Victoria Declared Wholesale Gas Market (DWGM)	Facilitated market	Part 19	within day to day-ahead
Short-Term Trading Market (STTM)	Facilitated market	Part 20	within day to day-ahead
Gas Supply Hub (GSH)	Facilitated market	Part 22	within day to up to a month ahead
Day-ahead auction (DAA)	Facilitated market	Part 25	day-ahead
Bulletin Board (BB)	Information	Part 18	from day-ahead up to 36 months outlook
Capacity trading platform (CTP)	Facilitated market	Part 24	bespoke
Victorian gas operations winter outlook	Information	N/A	1 month before winter starts
Gas Statement of	Information	Part 19 — rule	Annual with a 5-year

84 The RERT is a last resort mechanism that allows AEMO to pay for additional capacity to be on standby in case of emergencies when the supply and demand balance is tight.

TOOL / MARKET	CATEGORY	NGR	TIMEFRAME
Opportunities (GSOO)		323	outlook
Victorian Gas Planning Report (VGPR)	Information	Part 15D	Annual, with an outlook of 20 years in practice, 10 years as the obligation

Source: AEMC.
Note: The timeframe for the Gas Supply Guarantee was provided to the AEMC by AEMO staff.
The STTM contingency gas processes are discussed further in Appendix C.

Information

In relation to information, the Gas Statement of Opportunities, the Victorian Gas Planning Report, the Victorian winter outlook and the Gas Bulletin Board provide a wide range of information about gas market dynamics and forecasts.[85]

The upcoming reforms on gas transparency measures are also expected to materially increase the range of information available including greater information on production and reserves of natural gas, information to support secondary trading of storage, details on the capacity and demand of large gas users, and changing the GSOO from a voluntary information reporting process to mandatory.[86]

Emergency management

There is also a comprehensive emergency management protocol that covers the risk of gas supply shortages.[87] For example, in Victoria the Gas Emergency Protocol consists of a high-level set of documents that outline the actions AEMO (as the market operator) may take in an emergency for the Victorian DWGM and include:

1. Emergency Procedures (Gas)
2. Wholesale System Security Procedures
3. Gas Curtailment and Gas Rationing and Recovery Guidelines.

AEMO also operates the STTM hubs and has contingency gas processes to address a supply shortfall in these markets which are discussed further in appendix C.

In addition, while there is no overarching national legal framework for coordinating the energy supplies in the case of an emergency, jurisdictions do have localised options. Legislation in each jurisdiction provides for the emergency management of the supply of electricity and gas within those jurisdictions (but not beyond them).

In some jurisdictions, emergency management for the energy sector includes granting the relevant minister the power to give directions to market participants in order to respond to an energy supply emergency (this occurs in South Australia).

85 AEMC, *Review of the Gas Supply Guarantee*, consultation paper, 11 March 2021, p. 27.

86 AEMC, *Review of the Gas Supply Guarantee*, consultation paper, 11 March 2021, pp. 42-43; Energy Ministers, *Measures to improve transparency in the gas market*, consultation paper, November 2020, pp. 7-9.

87 AEMC, *Review of the Gas Supply Guarantee*, consultation paper, 11 March 2021, pp. 52-54.

These powers are only available where an emergency has been 'declared or proclaimed' in writing and published. The declaration or proclamation remains in force for a limited period (for example, 14 days) and may be revoked at any time.[88] Box 2 below provides details on two forums that act as joint coordination groups between the different jurisdictions for electricity and gas.

BOX 2: NATIONAL FORUMS FOR COLLABORATION IN SUPPLY EMERGENCY SITUATIONS

There are two national forums that act as joint coordination groups between the different jurisdictions. Neither are enforceable nor legislatively mandated, as they were formed under memoranda of understanding.

National Gas Emergency Response Advisory Committee (NGERAC)

The NGERAC was established in 2005 as part of a memorandum of understanding on the National Gas Emergency Response Protocol, with a revised memorandum finalised in 2017. The NGERAC comprises officials from Commonwealth, state and territory governments, and representatives from AEMO, gas industry sectors and gas users. It meets as often as required to assist with managing the emergency. The committee is responsible for:

- ensuring natural gas supply disruptions are managed consistently across all jurisdictions
- advising jurisdictions on efficient and effective management responses (including use of emergency powers by jurisdictions) in the event of multi-jurisdictional natural gas supply shortages
- assessing the risks and impacts of multi-jurisdictional natural gas supply shortages.

While the NGERAC has an important role to play in advising jurisdictions during an emergency, the affected jurisdictions will ultimately decide whether their emergency powers will be exercised and the end-users that should be curtailed if there is a shortage of available gas.

National Electricity Market Emergency Management Forum (NEMEMF)

The NEMEMF was established in 1998 and is convened by AEMO and includes representatives from industry, state and federal governments and is charged with reviewing and improving the emergency plans and procedures that apply during power system emergencies. It meets twice a year, but can be convened as often as required to assist with managing the emergency. It also runs annual exercises that test these emergency arrangements.

The NEMEMF was also formed under a non-binding memorandum of understanding but responses to energy incidents are based on AEMO operating procedures and jurisdictional plans which are in turn, based on the NER, the National Electricity Law (NEL) and relevant state legislation.

88 AEMC, *Review of the Gas Supply Guarantee,* consultation paper, 11 March 2021, Appendix C.

Source: https://www.energy.gov.au/government-priorities/energy-security/energy-emergency-management-forums; https://aemo.com.au/en/energy-systems/electricity/emergency-management/national-role; https://www.energyministers.gov.au/current-projects/gas-emergency-response

Facilitated markets

Despite the fact that most wholesale gas is sold through bilateral contracts, the east coast gas market has three wholesale gas markets that are facilitated by AEMO:[89]

- the Victorian Declared Wholesale Gas Market
- the Short Term Trading Markets (STTMs) located at key demand centres (Adelaide, Sydney and Brisbane)
- the Gas Supply Hubs (located in Moomba and Wallumbilla).[90]

AEMO also runs the day-ahead auction of contracted but unnominated capacity and the capacity trading platform.[91]

Origin noted in its submission that the day-ahead auction provides gas-powered generators with another avenue to access gas transport.[92] This is supported by evidence set out in a recent AER report.

In March 2021, the AER published a review of the pipeline capacity trading reforms introduced in March 2019. Its key findings, and particularly those in relation to gas-powered generators, are provided in Box 3 below.

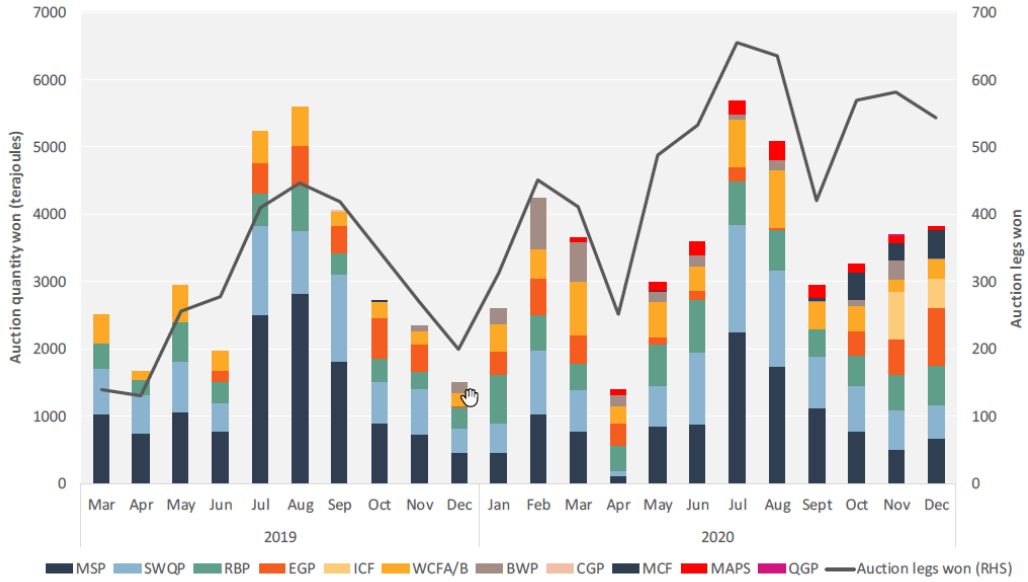
89 AEMC, *Biennial review into liquidity in wholesale gas and pipeline trading markets*, final report, July 2020, p. 107.
90 AEMC, *Biennial review into liquidity in wholesale gas and pipeline trading markets*, final report, July 2020, p. 2.
91 AEMC, *Biennial review into liquidity in wholesale gas and pipeline trading markets*, final report, July 2020, pp. 8; 78.
92 Origin, submission to consultation paper, p. 1.

BOX 3: AER REVIEW OF THE PIPELINE CAPACITY TRADING REFORMS

For those relevantly registered participants, the DAA provides a readily accessible source of short term pipeline capacity across the east coast gas market.

Since its introduction, the DAA has provided access to nearly 73.5 PJ of contracted but unnominated pipeline capacity. This has been achieved through 8,750 individual auctions won by various parties (see Figure 4.1 below). Participants won this capacity over 12 different auction facilities and, to date, 79 per cent of auctions were won at the reserve price of $0/GJ.

Figure 4.1: Capacity won on the day-ahead auction, by facility



Source: AER analysis using DAA auction results data.
Source: AER, *Source: Pipeline capacity trading — two-year review*Source: , April 2021, p. 8.
Note: Quantities shown are the monthly sum of auction products allocated on each pipeline and do not necessarily represent the physical volumes of gas that actually flowed for each gas day.

The majority of the pipeline capacity gained through the DAA has been on the key routes connecting the northern and southern markets. Specifically, the Moomba Sydney Pipeline (MSP) and the South West Queensland Pipeline (SWQP).

According to the AER, this inexpensive pipeline capacity has allowed participants to respond flexibly to changing market conditions and energy needs. Participants have also been able to arbitrage between markets, typically between cheaper northern markets and more expensive southern markets. The DAA is seen as usually being a cheaper alternative than other contract-based short term transportation services, which are often priced at a premium.

Most capacity is sold in winter

To date, the value of the DAA is greatest in winter when southern demand is highest. Reflecting this, the most activity on the DAA was during July and August in both 2019 and 2020 on routes to deliver gas south from Queensland. However, during these cooler months,

available auction quantities can be low and participants are more likely to need to pay a price above the reserve of $0/GJ to secure capacity.

In July and August 2020, 39 per cent of capacity was won at prices greater than $0/GJ across all auction facilities. However, results varied by facility; 81 per cent of the capacity won on the MSP and 39 per cent of capacity won on the Roma Brisbane Pipeline (RBP) were at prices greater than $0/GJ. It was also in August 2020 that participants paid the record price on the DAA of $1.49/GJ for capacity on the MSP.

According to the AER, these outcomes indicate that so far, participants place a greater value on auction capacity at times of higher seasonal gas demand, as the winter months are typically when demand is highest in the southern spot markets.

However, capacity is increasingly sold in non-winter months

The AER report also indicates that participants' willingness to pay more for auction capacity in non-winter months has grown over 2020. For example, in Q4 2019, 38 per cent of all bids were priced at less than $0.01/GJ, compared to 16 per cent in Q4 2020. The quantity of the capacity auctioned has also increased over this time.

The AER also noted that participants winning increased volumes of auction capacity in February 2020 partly reflected increased requirements for gas-powered generation in South Australia as the region was electrically separated for 18 days in the first half of the month.

The DAA enhances flexibility between northern and southern markets

Participants have taken advantage of the flexibility provided by the DAA to deliver gas in response to fluctuating demand and prices across the different markets, typically from north to south. These markets are connected by some key bi-directional pipelines: the RBP, SWQP, and MSP. Together, these pipelines can deliver gas from the Brisbane STTM to the Sydney or Victorian markets. As a result, the AER observed that it has been these pipelines where there has been the greatest amount of DAA activity.

Being bi-directional, participants can win capacity on these pipelines to send gas in any available direction. Generally, since the introduction of the DAA, participants have been winning capacity on routes from north to south, reflecting the prevailing gas price difference between northern and southern markets. However, towards the end of 2020 most gas was won on routes from south to north as participants responded flexibly to seize new arbitrage opportunities.

Demand for auction capacity has also increased at times of high prices in the NEM

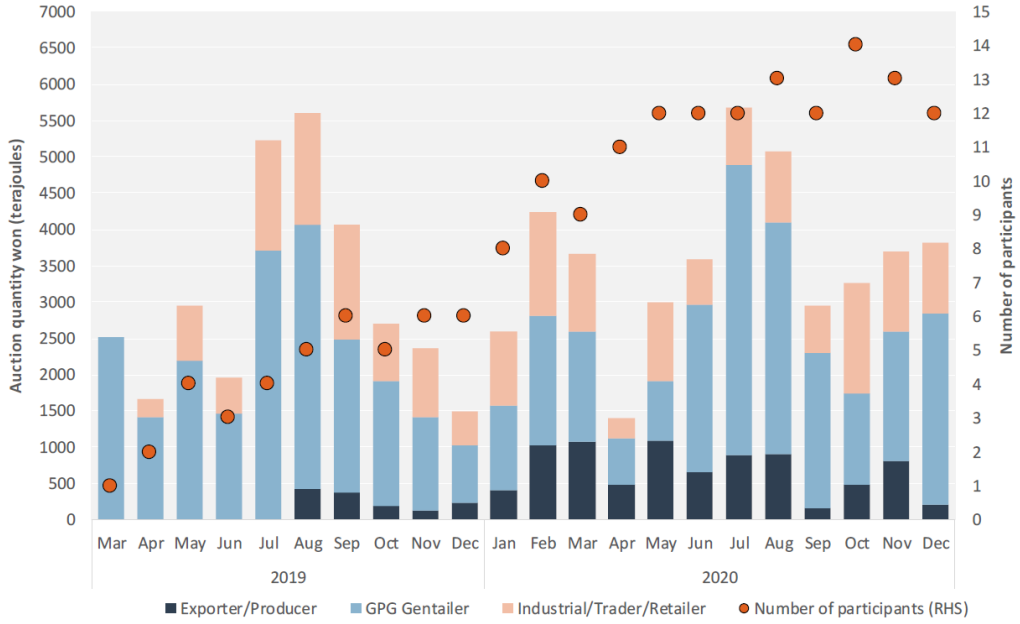
The AER report also shows that use of the DAA is higher when prices in the NEM are higher. For example, on 31 January 2020 wholesale electricity prices were high when South Australia electrically separated from the rest of the NEM. In response, DAA participants won a record amount of capacity (317 TJ), of which almost a third was on routes delivering gas from Wallumbilla to Moomba through the SWQP. This auction capacity helped facilitate gas supplies to the "peaking" gas-powered generation required in South Australia at the time.

Gas-powered generators the key buyers of DAA capacity

The AER also noted that, of the participants actively using the auction, gas-powered generators and gentailers (retailers with gas-powered generators in their portfolio) are consistently winning the most capacity.

This reflects the interrelationship between the NEM and the DAA. These parties can use low-cost auction pipeline capacity to ship additional gas to fuel generation and manage fluctuations in prevailing conditions and is illustrated in Figure 4.2.

Figure 4.2: Auction quantities won by participant group, all facilities



Source: AER analysis using DAA auction results data.
Source: AER, *Source: Pipeline capacity trading — two-year review*Source: , April 2021, p. 19.
Note: Participant groups determined by core business operations. GPG gentailers include vertically integrated NEM participants. These participants are distinct from retailer participants, who primarily retail gas.

Source: AER, *Pipeline capacity trading — two-year review*, April 2021.

4.3 Draft conclusion

The NEM's various existing tools, information and the operation of the facilitated markets mean there are numerous mechanisms to enable and encourage gas-powered generators, other electricity market participants and AEMO to maintain reliability in the NEM and work towards avoiding load shedding of consumers during electricity peak demand periods.

Other electricity market mechanisms being considered under the Energy Security Board (ESB) post-2025 process may increase these options further, such as through changes to the Retailer Reliability Obligation mechanism.[93]

93 ESB, *Post-2025 Market Design Options — A paper for consultation Part A*, April 2021, pp. 31-39.

The east coast gas market also increasingly provides comprehensive information, market tools and emergency management options that enable gas-powered generators to make informed decisions to obtain gas supply when needed to meet electricity demand.

As a result, the Commission considers that the electricity and gas facilitated markets include tools that enable market participants, AEMO and jurisdictions to respond to alleviate a situation where a gas supply shortfall could otherwise lead to load shedding during an electricity peak demand period. Some of these tools have been introduced since the commencement of the Guarantee in early 2017, placing participants in a better place to manage short term supply-demand issues than they were previously.

This suggests that if the Guarantee was to expire in 2023 as currently scheduled, then parties would be in a position to respond to potential gas supply shortages that may limit the operation of the gas-powered generators.

However, as set out previously in chapter 3, the Commission is of the view that in the current transitional stage of the energy market, a risk still remains that market participants would not always be able to respond on their own to avoid load shedding when a gas supply shortfall emerges.

This risk may be low but remains despite the information that AEMO and market participants make available to inform electricity dispatch and gas supply decisions made by both the electricity and gas markets, as well through the facilitated markets.

In addition, while the emergency management options available to AEMO and the jurisdictions decrease the chance of electricity market load shedding being required if gas-powered generators are unavailable when needed, these tools might not completely remove the chance of load shedding occurring.

Therefore, if the Guarantee was to expire in 2023 as currently scheduled, the Commission considers that there is a small risk under current market conditions that market tools may not be sufficient for market participants and AEMO to manage a potential gas supply shortfall that could impact the operation of the gas-powered generators.

Accordingly, there is likely to be some value in a mechanism such as the Guarantee to enable AEMO to proactively facilitate a market-based solution and prevent the need for potentially more expensive emergency measures in the face of a potential gas supply shortfall. In particular, the existing Guarantee is a relatively low cost, light handed mechanism that provides this support to AEMO. In addition, the Guarantee could easily, and with little cost, be continued in its current form during the transition of the east coast energy market.

However, the Commission also notes that several stakeholders have questioned whether the Guarantee would be effective if it was ever used. This is discussed further in the next chapter.

5 ASSESSING POTENTIAL SOLUTIONS

This chapter aims to identify and consider a range of potential improvements to the Gas Supply Guarantee mechanism. It provides:

- an overview of how the Gas Supply Guarantee mechanism works, potential improvements to the mechanism and alternative measures.
- a summary of stakeholders' views on whether the Guarantee mechanism is fit for purpose, including if there are rules in place or under development that provide a better solution, and whether other approaches or mechanisms (that are not rules-based) provide a better solution
- a detailed analysis of the present and future role of gas-powered generators in the NEM and the associated gas market dynamics
- the Commission's conclusions.

5.1 Introduction

Under the terms of reference for this review, the Commission is to consider whether there are issues in the NEM and/or east coast gas market that need to be addressed, and whether the Gas Supply Guarantee is the appropriate mechanism to address these issues.

In doing so, a range of potential improvements and alternative measures should be considered. These may range from mechanisms that might operate outside the energy framework, such as a memorandum of understanding or an undertaking, to mechanisms that are incorporated into the existing energy framework.

The terms of reference request that the AEMC considers incorporating any required mechanism in the national energy framework. This could consist of utilising existing mechanisms and functions, amending existing provisions, or creating new provisions altogether.

In the consultation paper, stakeholders were asked to comment on whether the Gas Supply Guarantee mechanism is fit for purpose; if there are rules in place or under development that could provide a better solution; and whether other approaches or mechanisms (that are not rules-based) may provide a better solution.

5.2 Stakeholder views

The majority of stakeholders expressed support for not renewing the Guarantee mechanism or replacing it with a different mechanism designed to achieve the same outcome.[94]

Most of these stakeholders suggested that the mechanism does not need to be renewed because it is not necessary. However, Shell and GLNG also argued that the Guarantee imposes negative outcomes while it is in place, particularly in encouraging gas-powered

94 Submissions to consultation paper: APA, p. 2; APLNG, p. 4; APPEA, p. 4; GLNG, p. 13; Origin, p. 1; Shell, p. 2.

generators to be less proactive in managing their gas positions than they would otherwise be.[95]

APA stated that the continuation of the mechanism is not warranted in the current market. However, it noted that should the AEMC determine its continuation is warranted, then it should remain a non-binding commitment similar to the current mechanism.[96]

PIAC, despite considering that the Guarantee was not likely to be critically needed to avoid load shedding, did suggest that the mechanism could still provide benefits for consumers through improved planning and forecasting and avoided reliability costs. PIAC supported retaining the Guarantee as long as these potential benefits outweigh the costs.[97]

AGL and APGA recommended preserving the Guarantee without making any changes.[98] AGL supported leaving the mechanism in place in the absence of better operational and cost-effective options to deal with the electricity reliability risks of a gas supply shortfall. AGL considered the Guarantee to be a potentially useful mechanism for industry collaboration to address a potential gas supply shortfall.[99]

APGA noted that the ESB electricity market design process is expected to deliver electricity market reform resulting in superior solutions to the issues addressed through the Guarantee. In its view, no amendments should be made to the current mechanism until the ESB process is implemented.[100]

APGA and GLNG also opposed any additional obligations to the Guarantee or its formalisation in the energy rules. APA expressed a similar view if the mechanism would be retained.[101]

Origin and GLNG did not think there would be any certainty that the Guarantee would be effective if AEMO sought to use it to address a gas supply shortfall that emerged.[102] GLNG suggested that should NEM reliability issues occur, these would most likely occur in the southern states where various gas development moratoriums have restricted new supply.[103]

AEMO proposed considering possible improvements to the Guarantee. These included improving the certainty of data used to inform the mechanism, automating the mechanism and making the Guarantee mandatory and enshrining both the mechanism and AEMO's role in the rules.[104] These suggestions are discussed in greater detail below in this chapter.

95 Submissions to consultation paper: GLNG, p. 4; Shell, p. 2. Central Petroleum expressed a similar view in discussions with the AEMC.

96 APA, submission to consultation paper, p. 2. Alinta Energy expressed a similar view in discussions with the AEMC.

97 PIAC, submission to consultation paper, p. 2.

98 Hydro Tasmania expressed a similar view in discussions with the AEMC.

99 AGL, submission to consultation paper, p. 1.

100 APGA, submission to consultation paper, pp. 4-5.

101 Submissions to consultation paper: APA, p. 2; APGA, p. 1; GLNG, p. 13.

102 Submissions to consultation paper: Origin, p. 1; GLNG, pp. 8-9.

103 GLNG, submission to consultation paper, p. 9.

104 AEMO, submission to consultation paper, p. 9.

5.3 Commission analysis

The Commission recognises that there is no certainty that the Guarantee would be effective if it were ever called on to address a gas supply shortfall and avoid a NEM reliability issue, as noted by Origin and GLNG.[105]

The Commission considered ways to address this potential issue by assessing how the Guarantee operates, the mechanism's value and scope and its operating costs.

The Commission's assessment of some potential improvements and supporting measures to the Guarantee are set out in the next section of this chapter.

5.3.1 How the Gas Supply Guarantee operates

Before assessing whether the Gas Supply Guarantee would address gas supply shortfall issues that may impact on electricity peak demand periods, it is important to briefly outline how the mechanism operates.

Monitoring

AEMO monitors the relevant gas markets and the Gas Bulletin Board to determine whether a potential shortfall in the next three to four days exists that could lead to not enough gas being available for gas-powered generation during an upcoming electricity peak demand period.[106]

The AEMC notes the monitoring is carried out at regular intervals by AEMO's Gas operations team and that this team liaises with AEMO's NEM operations team if it appears there is a potential issue arising.

In addition, the Commission understands that the Guarantee could potentially also be useful in shorter time frames.

Coordinating a market-based gas supply solution

If AEMO considers that there is a risk of a relevant gas supply shortfall, it can convene two types of conferences involving market participants that have voluntarily registered with AEMO for this process to help facilitate a solution.

The first of these is an assessment conference which is used to facilitate AEMO's assessment of whether a gas supply shortfall exists or is likely to occur. Participating parties in assessment conferences can include pipeline service providers, storage facility providers and gas producers across the east coast gas market, while industry conferences can also include gas-powered generators, other relevant large users and jurisdictional representatives.

If the shortfall remains unresolved, AEMO can then schedule additional industry conferences and notify jurisdictional representatives. This second conference is used to confirm whether a

105 Submissions to consultation paper: Origin, p. 1; GLNG, pp. 8-9. Macquarie Bank expressed a similar view in discussions with the AEMC.

106 AEMO, *Gas Supply Guarantee Guidelines,* April 2020.

possible shortfall exists, determine whether there has been an industry response to the potential shortfall and allow AEMO to call for an industry response.

Regardless of the location(s) of the gas-powered generator(s) that may be impacted by a shortfall in gas supply, all of these registered parties can be included in the relevant conference.[107]

Planning and maintenance coordination

The risk that a gas supply shortfall may emerge and potentially impact on the ability of gas-powered generators to increase output to address NEM reliability concerns can be greater if multiple gas infrastructure is unable to perform at full capacity at the critical time. To reduce this risk, AEMO facilitates a forum for relevant gas market participants to share information on planned maintenance activities across the east coast gas market.[108]

The AEMC understands from AEMO that coordinated maintenance outcomes from these discussions are subsequently reflected in the information provided by participants to the Gas Bulletin Board.[109]

This forum, the South East Australia Gas Maintenance Co-ordination Workshop (SEAGMCW), is not acknowledged in the Gas Supply Guarantee Guidelines. However, AEMO's *Summer 2020-21 readiness plan* notes the operation of the forum in the context of the Gas Supply Guarantee.[110]

AEMO has subsequently clarified that the forum is an extension of its obligations for the DWGM "to coordinate all maintenance planned by DWGM facility operators" under rule 326 of the National Gas Rules (NGR).[111] It noted that some non-DWGM facility operators see value in coordinating maintenance activities with the DWGM facility operators although they are not under any obligation to do so.

5.3.2 Value of the mechanism

AEMO has indicated that it considers the Guarantee has some beneficial features which could make it a useful risk management tool.[112] For example:

- It contributes to AEMO's overall NEM risk management approach, even if not targeting a credible contingency. The mechanism is one tool of many available to AEMO when faced with a reliability issue in the NEM. Effective risk management requires a wide spectrum of strategic and tactical tools for high to low probability events. This enables AEMO to select which mechanism(s) to use in a particular circumstance, noting that different situations may require different responses. In addition to risk controls for credible contingencies,

107 AEMO, *Gas Supply Guarantee Guidelines*, April 2020.

108 AEMO, supplementary submission to consultation paper, p. 3.

109 A number of east coast gas market participants have obligations under the NGR to inform AEMO of planned outages of facilities for publication on the Gas Bulletin Board.

110 AEMO, *Summer 2020-21 readiness plan*, November 2020, p. 16.

111 AEMO, supplementary submission to consultation paper, p. 3.

112 AEMO, submissions to consultation paper, p. 7.

AEMO also requires controls for non-credible and, where justified, low-probability high-impact events.[113]

- It could be valuable in specific circumstances. An example where the Guarantee could be relevant is where a potential NEM supply shortfall is identified for a certain period with reasonable certainty three to four days ahead. In this circumstance, AEMO may be able to identify that gas-powered generators are required to increase generation but surety of gas supplies to these facilities are critical in enabling this to occur. Under the Guarantee, AEMO can then initiate an assessment conference, followed by an industry conference (if required), where industry participants are brought together to identify a solution to meet the needs of the NEM.
- It operates across regions outside of the DWGM. While there is a robust regulatory framework in the DWGM establishing AEMO as the market operator, with the ability to facilitate emergency response, there is no such role outside of the DWGM. As a result, the Guarantee is the only gas market safety net available for AEMO to use in areas where STTM contingency gas is not an option. It therefore provides support to the emergency management procedures available to jurisdictional governments in those areas.

The Commission acknowledges these potential benefits of the Guarantee that have been identified by AEMO but cautions against over-stating the Guarantee's attributes. While there are some positive features of the Guarantee, not all market participants appear to agree with AEMO. In addition, the benefits should be considered in light of the mechanism's scope.

5.3.3 Scope of the mechanism

AEMO has noted that, as a NEM reliability risk mitigation tool, the Guarantee is untested and its fitness for purpose is limited.[114] It identified a number of reasons for this view:

- Participation in the Guarantee process is voluntary and the mechanism is non-binding. This means that there is no requirement to register or to comply with any aspect of the Guidelines once market participants have committed to involvement. While the mechanism places additional obligations on AEMO outside the scope of its formal DWGM, STTM and Gas Bulletin Board roles, it lacks firmness and presents a risk to AEMO if AEMO is unable to use the Guarantee to develop an industry solution to a gas shortfall because market participants that would be instrumental to a supply solution decide not to participate in the Guarantee process.
- It operates within a limited timeframe due to the fact that gas is not transported instantaneously and, under current and expected market conditions, it is commonly transported southwards from Queensland. This means that certainty regarding NEM bids and dispatch, responses to market notices and the need for directions would typically become certain too late to leverage the Guarantee. By contrast, the RERT provides more certain outcomes and can be triggered as late as three hours before a NEM reliability gap.

113 Credible contingency events are significant power system events expected by AEMO that could involve the failure or sudden and removal of a generator or transmission line. Non-credible contingency events are generally events that are rare in occurrence, such as the combination of a number of credible contingency events occurring at the same time. For more information, see the AEMC's website: https://www.aemc.gov.au/energy-system/electricity/electricity-system/security

114 AEMO, submission to consultation paper, p. 8.

While the Guarantee has not been triggered since its establishment, the RERT was activated on four days over the 2019-2020 summer.

- It presents a risk to gas-powered generators in sourcing alternative gas supply. That is, gas-powered generators may source an alternative gas supply at a higher price in anticipation of addressing a reliability need in the NEM. However, even though these commitments on sourcing gas are made, there remains a risk for the generators that NEM operations may result in those generators not being dispatched (even though it may have been initially anticipated that dispatch would occur). This is because NEM dispatch depends on factors such as how the market responds to AEMO notices, the ultimate availability of renewable resources and other matters beyond the control of the gas-powered generators.
- The Guarantee is reliant on data sets that are not firm more than seven days ahead. The data underpinning AEMO's determination of a gas supply shortfall is reliant on interpolating data from the NEM seven day Short Term Projected Assessment of System Adequacy (ST PASA). However, this data is of low quality beyond four days out and lacks granularity in terms of fuel requirements. Other data relevant to determining a potential gas supply shortage is publicly available Gas Bulletin Board data; and Victorian market information about gas flows, supply availability and gas-powered generators scheduling obtained through AEMO's role as the DWGM market operator.
- As previously noted, the Gas Supply Guarantee is in place through a memorandum of understanding. However, it does place some operational burden on AEMO which is not within its official duties within the east coast gas market. For example, the process to determine a gas supply shortfall is largely manual, being run through spreadsheets that aggregate the information gathered from the various sources. It also requires AEMO to monitor east coast gas flows, east coast gas-powered generators' nominations and east coast gas operations. These tasks involve significant reliance on contacts maintained by AEMO's Gas Real-Time Operations team with non-DTS pipeline operators.

These issues identified by AEMO highlight the operational limitations of the Guarantee. The key issues appear to be the voluntary nature of the mechanism and its limited window of opportunity to support actions by market participants to address potential gas supply shortages. While these features enable the mechanism to be flexible and relatively low-cost, they do limit its potential impact.

In addition to considering the points above, the Commission has also considered the scope of the Gas Supply Guarantee in the context of the recent explosion at the Callide C power station.

This unexpected event had an immediate and significant impact on the NEM. Nevertheless, the nature of the issue meant that the Guarantee could not aid AEMO in supporting the market response to the event.

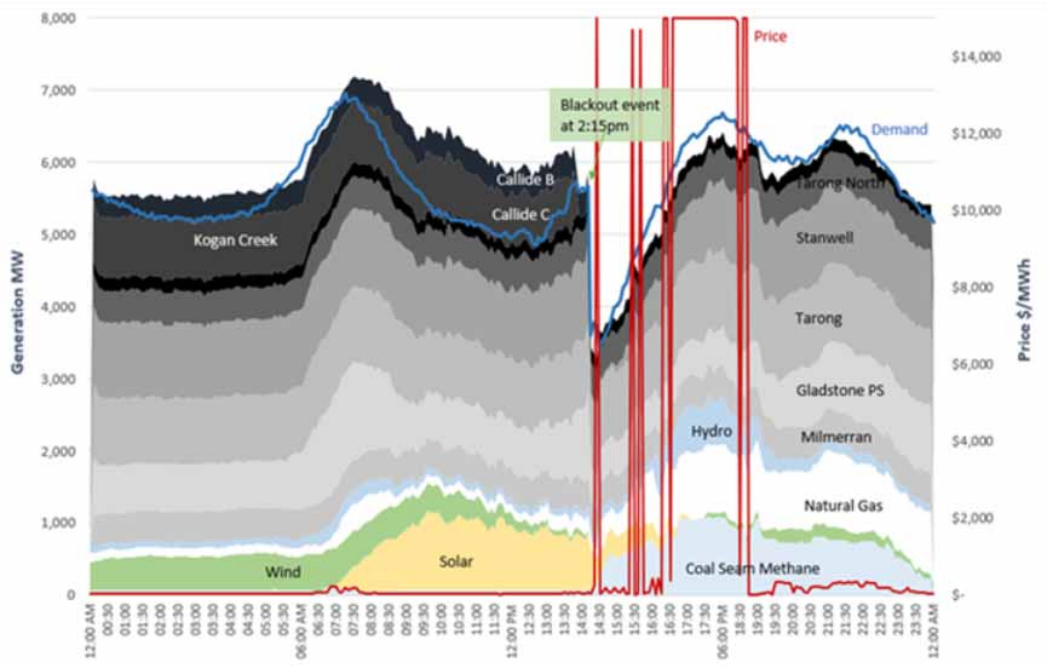
BOX 4: CALLIDE C POWER STATION EXPLOSION

A recent coal generator power outage in Queensland provides an example of the role gas-powered generators can play in helping the NEM to manage and recover from outages.

A fire and subsequent explosion in unit 4 at the Callide C Power Station quickly sent it offline on 25 May 2021, disrupting multiple transmission lines and other generators. This, in turn, resulted in the loss of around 3,000 MW of generation and interrupted supply to more than 470,000 consumers.

Gas-powered generators were instrumental in making up for the lost supply as quickly as possible. This can be seen in the increases in Queensland large-scale generation using natural gas and coal seam methane from a combined total of less than 500 MW to a peak of approximately 2,000 MW after 2:15 pm in the figure below.

Figure 5.1: Queensland's generation before and after Callide C explosion



Source: AEC, 'Queensland blackout: Should we let the market run?', accessed via https://www.energycouncil.com.au/analysis/queensland-blackout-should-we-let-the-market-run/
Note: Callide Power Station alone can supply up to 1,586 MW.

AEMO also tendered for and activated nearly 15 MW of RERT capacity in response to this event after announcing the lack of reserves conditions. Approximately 250,000 consumers had their electricity supply restored less than two hours after Callide C went offline.

Three of Callide C's generating units have already resumed operations. However, unit 4 may not resume operations until June 2022. Since that unit has a nameplate capacity of 420 MW, this will likely mean that Queensland will need to rely more on gas-powered generators in the near term.

Because this event occurred without prior notice, AEMO made use of the following emergency tools in response:

- Lack of reserves notices: AEMO used this tool to alert the market that additional electricity supplies were needed and facilitate the use of RERT.
- RERT: AEMO procured RERT electricity supplies.

AEMO did not make use of the Guarantee. However, it is worth noting that there was no gas supply shortfall at the time the incident occurred.

It is also important to note that the Guarantee was not designed to address the risk of a gas supply shortfall during events like this where gas supplies could suddenly be required with very little or no previous notice.

However, AEMO may find the Guarantee useful if, in the period until Callide's unit 4 resumes service, a gas supply shortfall emerges.

Source: AEMO, *Preliminary Report: Trip of multiple generators and lines in Queensland and associated under-frequency load shedding on 25 May 2021*, June 2021, pp. 11-12; ABC, *What happened at Queensland's Callide Power Station and will we lose power again?*, accessed via https://www.abc.net.au/news/2021-05-26/queensland-blackout-callide-power-station-failure-explained/100164976; Australian Financial Review, *Queensland power station unit to be offline for a year*, accessed via https://www.afr.com/companies/energy/queensland-power-station-unit-could-be-offline-for-a-year-20210526-p57v7o

5.3.4 Operating costs

AEMO has indicated that the costs it incurs operationalising the Guarantee are relatively minimal. No specific information on the costs of operating the guarantee was available from AEMO. In addition, no cost information has been provided to the AEMC by industry participants.

In the Commission's view, it could be argued that some monitoring and oversight of the supply of gas to gas-powered generators would already be undertaken by AEMO in operating the NEM, as doing so would be prudent. In that case, any costs that could be identified by AEMO for monitoring the markets should not be considered as part of the cost of the Guarantee but part of the usual NEM operating costs.

However, there may be costs associated with facilitating the conferences with market participants under the Guarantee for AEMO. The facilitation of the SEAGMCW may also generate some costs. Without the Guarantee's inclusion in the energy rules, any of these costs (and their recovery) are not transparent to market participants.

5.4 Potential improvements and alternative measures

AEMO noted in its first submission to this review that, in the longer term, measures to address gas-powered generation shortfalls may become more important and therefore reliance on the Guarantee, particularly in its current form, will become riskier as a sole measure. It noted that both strengthening of the Guarantee and the development of

alternative measures to address the risks as these become clearer will need to be carefully considered.[115]

Given the initial focus of the Commission's review is on problem identification and materiality, AEMO did not propose any specific amendments or alternative options in this first submission.

However, the Commission specifically requested AEMO provide a supplementary submission identifying some potential areas for improvements or alternative measures. AEMO responded on the 17 June 2021 with a submission that identified three supporting measures and three potential changes to the Guidelines, which are discussed below.

5.4.1 Mandatory extended pre-dispatch

Current arrangements

In order to determine if a gas supply shortfall exists for the purpose of the Guarantee, AEMO utilises the extended pre-dispatch report for the NEM, in conjunction with existing Gas Bulletin Board data, to provide visibility of gas supply and demand up to seven days ahead

This report provides information about upcoming electricity market conditions. It is based on information voluntarily provided by market participants and contains indicative electricity regional reference prices, interconnector flows, binding constraint information as well as a projection of aggregate daily fuel use by gas-powered generation in the NEM.

The report also provides information to market participants to support their short-term operations. The extended pre-dispatch report complements the information that AEMO obtains and publishes through the ST PASA process.

AEMO's view

AEMO suggested that the current arrangements on the extended pre-dispatch should be changed from voluntary to mandatory. It stated in its supplementary submission that this option could provide AEMO and gas-powered generators with enhanced information with which to make decisions where a potential NEM need is identified.[116]

Under this suggested change, AEMO could trigger a mandatory extended pre-dispatch process that would then require generators and market participants to provide dispatch offers and bids in advance of the existing schedule.[117]

AEMO has suggested that bids and offers made under the mandatory extended pre-dispatch period would be subject to a less onerous level of commitment and less limitations on changes than currently required through the existing process (such as the good faith bidding requirements).[118]

115 AEMO, submission to consultation paper, p. 9.
116 AEMO, supplementary submission to consultation paper, p. 1.
117 AEMO, supplementary submission to consultation paper, p. 1.
118 AEMO, supplementary submission to consultation paper, p. 1.

AEMO indicated that one of the possible benefits of implementing this option is that it would provide information that is more accurate than ST PASA, which only needs to be based on a market participant's "current intentions and best estimates". It would also improve on the current extended pre-dispatch data that is currently provided by generators voluntarily up to seven days out.[119] AEMO stated that:[120]

> It is not recommending or advocating for mandatory extended pre-dispatch to support the [Gas Supply Guarantee]. Rather, this [Gas Supply Guarantee] supporting option is presented for consideration by the AEMC, taking into account market impacts and the relevant costs and benefits.

Commission's response

The Commission acknowledges that AEMO is not recommending the introduction of mandatory extended pre-dispatch to support the Guarantee and that it has not investigated this issue in depth. The Commission notes AEMO's subsequent comments provided in meetings that an appropriate next step to take is for AEMO to carry out further internal work on this concept. It also notes the suggestion to loosen the requirements under which the information is provided would need more analysis in light of how this would fit into the context of other mechanisms and the broader context of competition in the NEM.

AEMO has presented this mandatory pre-dispatch suggestion as a way to improve the information that it receives compared to the current ST PASA process. The Commission considers that assessing this option would require investigation of both the current ST PASA process and possible changes to it in addition to the pre-dispatch process. The accuracy of information from market participants over different time frames is also likely to be an important consideration.

For these reasons, the Commission does not propose to assess the concept of mandatory extended pre-dispatch in the NEM in this review. It is more appropriate that any further work on its potential feasibility and design be carried out by AEMO.

5.4.2 ST PASA rule change request

Current arrangements

The existing ST PASA process requires two inputs from NEM market participants on availability: technical availability (PASA) and market availability. Specifically, clause 3.7.3(e) of the NER requires relevant scheduled generators and market participants to submit the following ST PASA inputs to AEMO:

- the availability of each scheduled generating unit, load or network service for each trading interval under expected market conditions

119 AEMO, supplementary submission to consultation paper, p. 1. Market participants are only obliged to provide this information one day ahead of dispatch.

120 AEMO, supplementary submission to consultation paper, p. 1.

- the PASA availability of each scheduled generating unit, load or network service for each trading interval (being the physical capability, including any capability that can be made available within 24 hours)
- the scheduled generating unit synchronisation and de-synchronisation times for slow start generating units
- the projected daily energy availability for energy-constrained scheduled generating units and energy-constrained scheduled loads.

The inputs must represent the scheduled generator's or market participant's current intentions and best estimates. This information should be based on the most recent local weather forecasts, reflecting the effect that ambient temperature has on plant, and should indicate any scheduled maintenance.

These inputs allow market participants to identify cost-effective periods during which to take short-term maintenance outages and to facilitate plant commitment decisions. Participants also provide a power system reserve capacity adequacy forecast that covers each trading interval for the coming week to AEMO.

The ST PASA is updated every two hours to reflect AEMO forecasts of demand and information provided to AEMO by market participants. The capacity adequacy process is designed to enable AEMO to determine if intervention in the market is required to maintain system security and reliability. Such an intervention may include calling on capacity contracted through the RERT process or issuing directions to market participants.

AEMO's view

AEMO does not foresee any material impacts on the Guarantee arising out of its recent ST PASA rule change request.[121] The rule change request primarily seeks to provide AEMO and market participants with the flexibility to respond to future ST PASA modelling changes faster and with a reduced burden by shifting some prescription from the NER to AEMO's procedures, subject to a formal rules consultation process.[122]

The rule change request proposes that AEMO would publish available capacity and PASA availability by individual unit, as opposed to the current aggregation form, to improve the transparency of information available to market participants. AEMO suggests this would enable market participants to make operational and market decisions about the capacity they can provide at certain times and may assist with gas supply planning.[123]

Commission's response

The Commission acknowledges that, since receiving the supplementary submission from AEMO on 17 June, a rule change request was lodged by AEMO on 28 June 2021. The Commission expects to commence consideration of the ST PASA rule change request soon. It will focus on the particular issues raised in the request.

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121 See AEMC's website for a copy of the rule change request: https://www.aemc.gov.au/rule-changes/updating-short-term-pasa

122 AEMO, supplementary submission to consultation paper, pp. 1-2.

123 AEMO, supplementary submission to consultation paper, p. 2.

5.4.3 Improve Gas Bulletin Board data

Current arrangements

In November 2020, the Energy Ministers (formerly the COAG Energy Council) initiated consultation on the changes required to the National Gas Law and associated regulations and rules to implement the gas transparency measures reform, following the recommendations of the ACCC-GMRG joint report and the AEMC's Stage 2 Bulletin Board improvements.

The transparency reform measures package seeks to enhance transparency in the eastern and northern Australian gas markets, addressing information gaps and asymmetries relating to gas and infrastructure prices, supply and availability of gas, gas demand, and infrastructure used to supply gas to end-markets.

AEMO's view

While the *Measures to Improve Transparency in the Gas Market* reform is a supporting measure that will already be implemented in the near-future, AEMO stated that improvements to data quality will be achieved through this reform, which is expected to commence in mid-2022.[124]

Gas Bulletin Board pipeline operators will be required to provide seven-day forecasts of withdrawals from a BB pipeline on a daily basis. Importantly, for the Guarantee, while this information is currently provided on a voluntary basis, it will become mandatory for each delivery point, including gas-powered generators' delivery points.[125]

AEMO stated that this information may be based on the pipeline operator's forecasts, or based on forecast nominations from shippers (such as gas-powered generators) where they have provided forecast delivery point nominations.[126]

AEMO suggested that the benefit of this reform, as a supporting measure to the Guarantee, is that it can be used to assess the east coast supply-demand balance based on the latest information. For example, following the reform's implementation a gas-power generator should update its nominations to pipeline operators and to the extent that its nominations result in a material change on the facility, then information about this change must be shared with the Gas Bulletin Board.

AEMO additionally suggested that the implementation of this reform may also provide a mechanism for AEMO to request additional information from gas market participants (albeit on a voluntary basis) if a need for intraday information is identified on the basis of a potential NEM need.[127]

Commission's response

The increased information that will be provided and available through the *Measures to Improve Transparency in the Gas Market* reform should help both AEMO and market

124 AEMO, supplementary submission to consultation paper, p. 2.
125 AEMO, supplementary submission to consultation paper, p. 2.
126 AEMO, supplementary submission to consultation paper, p. 2.
127 AEMO, supplementary submission to consultation paper, p. 2.

participants to assess the east coast supply-demand balance with improved information. As a result, the Commission considers that the information provided through these transparency measures should assist with determining whether a gas supply shortfall may exist and provide more time and reveal more options to resolve it.

5.4.4 Application to broader system security NEM requirements

Current arrangements

Under the Gas Supply Guarantee Guidelines, AEMO first determines that a 'gas supply shortfall' exists to then be able to call conferences with industry participants to address a gas supply issue. Conferences under the Guarantee can be initiated to deal with a potential shortage of gas supplies needed for gas-powered generators to operate at the capacity required during a NEM peak demand period. This is consistent with how the Guarantee was conceived — to address NEM reliability issues.

AEMO's view

In its supplementary submission, AEMO stated that it considered that it would be appropriate for the Guarantee to be used to address broader NEM power system security requirements such as system strength and voltage requirements, in addition to reliability needs. It stated that under the Guarantee's Guidelines, broader NEM requirements could be covered by the trigger event under the clauses:[128]

- 3(b)(i) "prevailing market conditions" or
- 3(b)(ii) where the Guarantee process is triggered by gas-powered generators' advice that it is not available for dispatch for system security purposes.

AEMO also stated that the Guarantee would be less likely to be used for power system security requirements than for supply reliability requirements. This would be because gas-powered generators that need to operate for system strength purposes can be run at minimum or lower loading levels to provide the required system security services. Under these circumstances, the total gas supply required would likely be less than that required for a reliability event.[129]

Commission's response

The Commission notes AEMO's interpretation of certain clauses of its Guarantee Guidelines and that this expands the original intent of the Guarantee to focus on NEM reliability issues and the definition of gas supply shortfall used in the Guidelines. It also notes that amending the purpose of the Guarantee may impact on the frequency upon which it is called. This may impact on market participants.

The Commission has not carried out a full assessment of the Guarantee's relevance to system security issues for this draft report as it has in relation to the use of the Guarantee for reliability purposes. However, the ESB and the AEMC have a comprehensive and well-

128 AEMO, supplementary submission to consultation paper, p. 2.
129 AEMO, supplementary submission to consultation paper, p. 2.

consulted-on system security work program underway which is working on various improvements to managing system security.[130]

The Commission will continue progressing the various components of the system security plan as this is the most appropriate forum to consider those interconnected issues. As a result, it will not incorporate an analysis of system security issues in this review.

5.4.5 References to NEM peak demand

Current arrangements

A gas supply shortfall is currently defined in the Guidelines as "a shortfall in gas supply available to meet the fuel requirements for gas generators to operate at the capacity required during a peak NEM demand period".[131]

AEMO's view

As noted in AEMO's supplementary submission, the AEMC had suggested to AEMO that a peak NEM demand period was an unlikely driver for a gas supply shortfall event, and that a definition based on some other peak demand, such as a regional peak, might be more appropriate.[132]

AEMO agreed that a definition based on peak NEM demand period should not be used to define a gas supply shortfall in the Guidelines. To address this issue, AEMO recommended broadening the gas supply shortfall definition to be based on broader NEM objectives.[133]

One option suggested by AEMO to achieve this would be to amend the gas supply shortfall definition to "a shortfall in gas supply available to meet the fuel requirements for gas-powered generators to operate at the capacity required to operate the NEM".[134] Alternatively, AEMO suggested the definition could reference the trigger events set out at 3(b) of the Guidelines, which cover various conditions under which AEMO may consider that a gas supply shortfall may occur.[135]

In subsequent discussions between the AEMC and AEMO it was agreed that an alternative gas supply shortfall definition should be explored that would remain focused on reliability issues but not rely on NEM peak demand alone. AEMO subsequently provided the following suggested definition:[136]

> A shortfall in gas supply available to meet the fuel requirements for Gas Generators to operate at the capacity required during forecast low reserve condition (LRC), forecast or actual lack of reserve condition (LOR) occurring in the NEM, or to meet electricity

130 AEMC, *System security and reliability action plan*, 19 February 2021 at https://www.aemc.gov.au/sites/default/files/2021-02/System%20security%20and%20reliability%20action%20plan.pdf
131 AEMO, *Gas Supply Guarantee Guidelines,* March 2020, p. 4.
132 AEMO, supplementary submission to consultation paper, p. 3.
133 AEMO, supplementary submission to consultation paper, p. 3.
134 AEMO, supplementary submission to consultation paper, p. 3.
135 AEMO, supplementary submission to consultation paper, p. 3.
136 AEMO email to AEMC, 5 July 2021.

demand in a part of a NEM region.

Commission's response

The Commission considers that AEMO's proposed revised definition would enable it to utilise the mechanism in an increased number of electricity peak demand reliability situations to help secure adequate gas supplies. This could be beneficial for AEMO in managing reliability across the NEM. The proposed definition may also enable the Guarantee to be used in other scenarios at AEMO's discretion. The Commission seeks feedback on whether the definition suggested by AEMO, or another, is more appropriate than the current definition included in the Guidelines.

5.4.6 References to east coast gas coordination role

Current arrangements

During the review, AEMO advised that it established the South East Australia Gas Maintenance Coordination Workshop (SEAGMCW) in August 2017 to provide a forum for maintenance planning. AEMO considers this critical to minimising threats to gas supply from overlapping or adjacent maintenance activities of gas infrastructure across the east coast gas market.

The SEAGMCW is chaired by AEMO and attendees include producers, storage providers and transmission pipeline operators that have voluntarily elected to participate in the forum.[137] Meetings are held three times a year or if requested due to a material change to maintenance activities or a projected gas supply shortfall. Participants update their relevant Gas Bulletin Board details following the meeting as required by rule 181 of the NGR.[138] However, there is no reference to such a forum in the Guidelines nor is there any reference to it on the AEMO website.

AEMO's view

AEMO facilitates the SEAGMCW for producers, storage providers and transmission pipeline operators that supply gas to southeast Australia.

AEMO has stated that the SEAGMCW is primarily run to meet AEMO's obligation to coordinate all maintenance planned by DWGM facility operators under rule 326 of the NGR and that participation in the workshop has been expanded on a voluntary basis to non-DWGM facility operators that see the value in coordinating maintenance activities with DWGM facility operators.[139]

AEMO indicated that, even though there are opportunities to enhance publicly available information on the Guarantee and its interactions with other measures such as the SEAGMCW, it does not see the Guarantee Guidelines as the optimal place to provide 'contextual information'. Instead, AEMO suggested that enhancements could be made to its

137 Except for DWGM facility operators. AEMO supplementary submission to the consultation paper, p. 3.
138 AEMO email to AEMC, 29 June 2021.
139 AEMO, supplementary submission to consultation paper, p. 3.

website so that participants could better understand the linkages between various formal and informal obligations and AEMO roles.[140]

Commission's response

To reduce the risk of gas supply shortfalls emerging that could affect electricity peak demand periods, AEMO takes steps through the SEAGMCW to coordinate different gas market participants' planning and maintenance activities. This activity is not included in the Guidelines although it is relevant to how AEMO manages gas supply shortfalls that may impact on the operation of gas-powered generators.

The Commission considers that the SEAGMCW meetings complement the aims and outcomes of the Guarantee by preemptively reducing the risks of a gas supply shortfall emerging that AEMO may otherwise need the Guarantee to help address. The voluntary participation of some facility owners in the forum suggests that some market participants value AEMO's facilitation of coordinated planned maintenance of gas infrastructure.

In light of this, and that the SEAGMCW is not currently acknowledged or documented, the Commission seeks feedback on:

- the value of this forum to NEM and east coast gas market participants
- how the work of this forum and its relevance to other AEMO functions can be best acknowledged
- if the forum should be extended to include other market participants
- whether the forum impacts on competition, in particular with respect to the provision of maintenance services.

5.5 Draft conclusion

The Commission has considered views expressed about the Gas Supply Guarantee's value to market participants and AEMO, noting the scope of its operations.

As discussed in chapter 3, the Commission's draft recommendation is that the Australian Government retains the Guarantee for another three years. This reflects the balance between the potential for the Guarantee as one of the tools available to AEMO to manage the NEM, the limited scope of the Guarantee and its relatively low cost, light handed form.

The Commission has made this recommendation in recognition of the current uncertainties in the east coast energy sector, particularly the transition in the NEM to a greater use of variable renewable generation.

It has considered the low cost nature of the current Gas Supply Guarantee, the flexibility of the guidelines in dealing with issues as they arise and the role the guidelines play in bringing industry together to share information when it is needed most.

As a result, the Commission does not recommend any fundamental change to the mechanism such as including it in the national energy rules at this time. It considers that the current

140 AEMO, supplementary submission to consultation paper, p. 3.

form of the Gas Supply Guarantee is suitable in the context of extending its term for three years.

The Commission anticipates that a review of the Gas Supply Guarantee in three years' time will indicate whether the transformation of the energy sector still requires a mechanism of this nature or if the risks to supplying gas-powered generators have changed such that the Guarantee is no longer needed.

As noted throughout this chapter, the Commission will consider potential changes to the current arrangements as summarised below.

Table 5.1: AEMO's suggested potential areas for improvement

SUGGESTION	DESCRIPTION	AEMC DRAFT RESPONSE
SUPPORTING MEASURES		
1. Mandatory extended pre-dispatch	AEMO suggests that gaps in ST PASA could be resolved by a new mandatory extended pre-dispatch mechanism (by providing bids and prices 7 days ahead). This would provide AEMO and gas-powered generators with enhanced information where a potential NEM need is identified.	Given the very high level nature of this suggestion and the fact that AEMO has recently lodged a rule change request proposing changes to ST PASA, the AEMC will not look into this issue further as part of this review.
2. ST PASA rule change request	AEMO lodged a rule change request that seeks to provide AEMO and market participants with flexibility to respond to future ST PASA modelling changes faster and with less burden by shifting prescription from the NER to procedures.	The AEMC will assess AEMO's proposed changes through a rule change process.
3. Gas transparency measure reform	AEMO noted that improvements to data quality will be realised through the Gas transparency measures reform, which is expected to commence mid-2022.	The AEMC considers that these improvements should assist AEMO and market participants with detecting and resolving potential gas supply shortfalls.
POTENTIAL CHANGES TO GAS SUPPLY GUARANTEE GUIDELINES		
4. Application to broader NEM system security requirements	AEMO has stated that the Guarantee should be and already can be used to address broader NEM power system security requirements such as system strength and voltage requirements, in addition to reliability needs as originally	Since the ESB and AEMC already have a comprehensive system security work program, the Commission will not assess system security issues in

SUGGESTION	DESCRIPTION	AEMC DRAFT RESPONSE
	intended.	this review.
5. References to NEM peak demand	AEMO considers that the Guarantee should be linked to a broader definition of peak demand that incorporates regional peak demand periods through definitional changes in the Guidelines.	The Commission seeks feedback on AEMO's suggested new definition.
6. References to east coast gas coordination role	The SEAGMCW provides a forum to coordinate planned maintenance. This forum operates to meet AEMO's obligations for the DWGM although some market participants outside of the DWGM participate voluntarily. AEMO does not propose incorporating the SEAGMCW into the Guidelines.	The Commission seeks feedback on the value of the SEAGMCW and how it can be appropriately recognised.

Source: AEMO, supplementary submission to consultation paper, 17 June 2021.

ABBREVIATIONS

ACCC	Australian Competition and Consumer Commission
ADGSM	Australian Domestic Gas Security Mechanism
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
CCGT	Combined-cycled gas turbine
Commission	See AEMC
CTP	Capacity Trading Platform
DAA	Day-Ahead Auction
DWGM	Declared Wholesale Gas Market
ESB	Energy Security Board
ESOO	Electricity Statement of Opportunities
GSH	Gas Supply Hub
GSOO	Gas Statement of Opportunities
LNG	Liquified natural gas
LOR	Lack of reserves
MW	Megawatt
NEL	National Electricity Law
NEM	National electricity market
NEMEMF	National Electricity Market Emergency Management Forum
NER	National Electricity Rules
NGERAC	National Gas Emergency Response Advisory Committee
NGIP	National Gas Infrastructure Plan
NGR	National Gas Rules
OCGT	Open-cycle gas turbine
PJ	Petajoules
RERT	Reliability and Emergency Reserve Trader
RRO	Retailer Reliability Obligation
STTM	Short Term Trading Market
TJ	Terajoules

A PROVIDING AND UPDATING MARKET PARTICIPANT AVAILABILITY IN THE NEM

In February 2010, the AER published a compliance bulletin that clarifies the AER's interpretation of the provisions of the NER that govern communication of the availability of market generators and scheduled network service providers.[141]

This appendix provides a summary of the main reporting requirements contained in chapters three and four of the NER that are somewhat related to the Gas Supply Guarantee, which were extracted from the AER's bulletin.

Overview

NEM participants must regularly review and update the information they provide to AEMO as part of the MT PASA, ST PASA and pre-dispatch processes.[142]

Participants must also regularly review their daily bids to ensure that they can comply with offers and dispatch instructions at all times and must immediately notify AEMO of any situation that may alter their availability.

The provision of accurate information to AEMO by market participants is essential for managing NEM system security and reliability.

The market information reporting requirements in chapter three of the NER cover MT PASA and ST PASA and the pre-dispatch process. These information requirements obligate market participants to provide information on the availability of generation and scheduled network services up to two years ahead of the relevant dispatch period.

Clauses 3.7.2 (d) and (e) and 3.7.3(e) and (g) of the NER set out the information required from market participants for MT PASA and ST PASA, while clauses 3.8.6 and 3.8.20 of the NER describe the information that must be provided for daily bids and pre-dispatch.

Chapter four of the NER complements chapter three by establishing the framework for the dispatch process and system security.[143] It requires market participants to report to AEMO when there is a change in their plant that prevents them from following dispatch instructions. This requirement supports AEMO in managing system security, specifically:

- Clauses 4.9.9 and 4.9.9A of the NER require scheduled generators and scheduled network service providers to inform AEMO of any event that will change or is likely to change the availability of the scheduled generating units or network services.
- Clause 4.9.9B of the NER places the same obligation on all market participants that provide frequency control ancillary services.
- Clause 4.9.8 of the NER requires market participants to comply with dispatch instructions from AEMO and ensure that they can comply with their latest dispatch offer.

141 AER, *Providing and updating market participant availability in the NEM*, compliance bulletin No 2, February 2010.
142 See rules 3.7 and 3.8 of the NER.
143 AER, *Providing and updating market participant availability in the NEM*, compliance bulletin No 2, February 2010, p. 6.

MT PASA

The MT PASA forecasts demand and reserves (that is, the excess of available supply from generators/imports above demand) for each region of the NEM on a daily basis over a two-year period. The availability figures for participants in MT PASA should reflect the physical capability of scheduled generating units, loads and network service providers, including any capability that can be made available within 24 hours.

AEMO monitors the MT PASA to identify periods where reserves are projected to be less than the specified minimum reserve level for a region. It then uses this information to communicate medium-term reliability in the NEM and, in the absence of a sufficient market response, determines whether to contract for additional reserves under the RERT mechanism.

The provision of accurate availability information is essential to enable AEMO and market participants to effectively schedule maintenance outages and other events that may impact system security. Over the medium to longer-term, accurate MT PASA forecasts are essential to provide AEMO with the opportunity to procure appropriate reserve options to maintain system security and minimise the cost of interventions in the market.

ST PASA

The ST PASA process requires two inputs from market participants on availability: PASA or technical availability and market availability.

Specifically, clause 3.7.3(e) of the NER requires relevant scheduled generators and market participants to submit the following ST PASA inputs to AEMO:

- the availability of each scheduled generating unit, load or network service for each trading interval under expected market conditions
- the PASA availability of each scheduled generating unit, load or network service for each trading interval (being the physical capability, including any capability that can be made available within 24 hours)
- the scheduled generating unit synchronisation and de-synchronisation times for slow start generating units
- the projected daily energy availability for energy-constrained scheduled generating units and energy-constrained scheduled loads.

The inputs must represent the scheduled generator's or market participant's current intentions and best estimates. This information should be based on the most recent local weather forecasts, reflecting the effect that ambient temperature has on plant, and should indicate any scheduled maintenance.

These inputs allow market participants to identify cost-effective periods during which to take short term maintenance outages and to facilitate plant commitment decisions. Participants also provide a power system reserve capacity adequacy forecast that covers each trading interval for the coming week to AEMO.

The ST PASA is updated every two hours to reflect AEMO forecasts of demand and information provided to AEMO by market participants.

The capacity adequacy process is designed to enable AEMO to determine if intervention in the market is required to maintain system security and reliability. Such intervention may include calling on capacity contracted through the RERT process or issuing directions to market participants.

Daily bids and pre-dispatch

Clause 3.8.6 of the NER sets out the framework for bidding in the NEM. Under this clause, the scheduled generator's dispatch bid must contain an energy offer for each price band specified in the dispatch bid. The maximum available capacity offered by a generator should reflect the expected weather conditions and should not exceed the relevant PASA availability.

Clause 3.8.20 of the NER requires each scheduled generator, scheduled network service provider, market customer with a scheduled load or market participant to ensure that it is able to comply with the pre-dispatch schedule.

The pre-dispatch schedule is derived from the pre-dispatch bids and offers, forecast load and unconstrained intermittent generation forecast. This information is used by AEMO to produce scheduling data for the trading day.

Should market participants become aware of circumstances that may require them to deviate from this schedule, they must inform AEMO through the central dispatch process — generally through a rebid. The requirements for rebidding are set out in clause 3.8.22 of the NER.

The obligations described above are closely linked to the obligations in chapter four of the NER, particularly the obligations to comply with dispatch offers and to follow dispatch instructions. These obligations are discussed further below.

Ability to comply with offer

Clause 4.9.8(b) of the NER requires scheduled generators to ensure that each generating unit is able to comply with the latest dispatch offer made to AEMO under chapter three of the NER. A generator should, therefore, inform AEMO if it cannot comply with its most recent offer without delay. This is a requirement of clause 4.9.9 of the NER which is discussed further below.

A generator could breach clause 4.9.8(b) of the NER if the information that it provides to AEMO does not reflect the capabilities of its plant— for example, if an offer is submitted that the participant can not physically honour. The obligation to comply with dispatch instructions under clause 4.9.8(b) of the NER is closely linked to the obligation to be able to comply with an offer, contained in clause 4.9.8(a) of the NER.

Other market participants, including ancillary service providers, registered participants, scheduled network service providers and semi scheduled generators are also required to ensure that they can comply with their latest dispatch offer. For example, if a market participant has an ancillary service load that is temporarily unavailable to the market, the participant must rebid the available load to zero.

Changes in generation unit availability

Clause 4.9.9 of the NER requires scheduled generators to inform AEMO as soon as they become aware of an event that has affected, or is likely to affect, their availability. Where this information is provided through a rebid, generators should ensure that it is consistent with the AER's *Rebidding and technical parameters' guideline*. For issues that require urgent attention by AEMO, market participants should verbally advise the AEMO control centre as well as submitting a rebid.[144]

Scheduled generators must notify AEMO immediately when there is an event that has or is likely to change the availability of its plant. This includes any impact on plant availability resulting from changes in actual or forecast ambient temperature.

Generators are also required to inform AEMO where they make a decision that is likely to change plant availability. The requirement to inform AEMO applies even when the generator is unsure that the plant will successfully return to service.

Changes in scheduled network availability

Clause 4.9.9A of the NER requires scheduled network service providers to inform AEMO when there is an event that has or is likely to change the capacity of the network. This obligation is equivalent to the obligation on generators under clause 4.9.9 of the NER discussed above.

A scheduled network service provider is required to inform AEMO immediately following an event that may change the availability of its network. Relevant events may include a change in the weather forecast. In some instances this will mean contacting AEMO the day prior to the anticipated impact on network availability. This will allow AEMO time to make arrangements to ensure the security and reliability of the power system.

144 AER, *Providing and updating market participant availability in the NEM*, compliance bulletin No 2, February 2010, p. 9.

B THE LACK OF RESERVES FRAMEWORK

Pre-determined reserves in the NEM refer to the spare capacity of electricity available to provide a reliability buffer, over and above the level of electricity demand forecast at any given time.[145] AEMO has several processes and arrangements in place to mitigate risk to energy supply when the system is affected by lack of reserves (LOR) conditions.

Unplanned events can impact available resources. This might include a combination of extreme weather, natural disasters, high demand, generation or transmission outages, or critical infrastructure maintenance. These conditions may cause a depletion of electricity reserves.

AEMO assesses the probability of a shortfall in capacity reserves leading to LOR load shedding in each region on a continuous basis from the current time to the end of the period covered by the most recently published ST PASA (two to seven days prior to dispatch). Within this period, AEMO publishes 30-minute update reports on expected capacity reserves.[146]

A forecast LOR occurs when AEMO's forecasts show a reduced amount of electricity reserves. When there is an expected or actual supply and demand imbalance, AEMO takes proactive steps to manage reserve shortfalls by issuing LOR notices to the market to encourage more generation. Market participants are expected to respond to the forecast so an actual LOR situation does not occur.

However, when the market response to the forecast LOR has not been adequate to clear the LOR thresholds, AEMO declares an actual LOR, which indicates that the LOR has become an operational reality.[147]

LORs are categorised over three tiers:

- **LOR 1**: this condition exists when reserve levels are lower than the two largest supply resources in a state. LOR 1 signals a reduction in pre-determined electricity reserve levels, encouraging generators to offer more supply, or large industrial or commercial consumers to reduce their demand. At this stage, there is no impact on power system security or reliability and AEMO continues to monitor reserve levels to maintain an adequate supply.
- **LOR 2**: this signals a tightening of electricity supply reserves. This condition exists when reserve levels are lower than the single largest supply resource in a state. There is no impact on the power system at this level, but supply could be disrupted if a large incident occurred (likely the loss of the largest generator in that state). Once a forecast LOR 2 is declared, AEMO has the power to direct generators or use the Reliability & Emergency Reserve Trader (RERT) mechanism to call on off-market supply and demand management reserves to improve the supply-demand balance.

145 See rules 4.8.4 and 4.8.4A of the NER. See also AEMO, *Explaining electricity reserve levels*, fact sheet, accessed via https://aemo.com.au/en/learn/energy-explained/energy-101/electricity-reserves-explained, viewed 13 May 2021.

146 AEMO, *Reserve level declaration guidelines*, December 2018, p. 6.

147 AEMO, *Reserve level declaration guidelines*, December 2018, pp. 10-11. See also AEMO, *Explaining electricity reserve levels*, fact sheet, accessed via https://aemo.com.au/en/learn/energy-explained/energy-101/electricity-reserves-explained, viewed 13 May 2021.

- **LOR 3**: this signals a deficit in the supply/demand balance. This condition exists when the available electricity supply is equal to or less than the operational demand. This means there are no reserve supplies available. Controlled load shedding may be required as a last resort to protect system security and avoid long-term damage to system infrastructure. Actual LOR 3 is declared when LOR load shedding is occurring due to this shortfall of reserves in real-time.

NEM lack of reserve framework quarterly reports

AEMO also publishes a report on the operation of the Lack of Reserve Framework every quarter.[148] This publication reports on the number of forecast and actual LOR conditions declared for a particular quarter.

148 Rule 4.8.4B of the NER.

C SHORT TERM TRADING MARKET EMERGENCY MECHANISMS

The STTM is a market-based wholesale gas balancing mechanism established at defined gas hubs in Adelaide, Brisbane and Sydney. Each hub is scheduled and settled separately, but all three hubs operate under the same rules. The market runs once a day on a day-ahead basis for each hub. AEMO operates the STTM hubs but does not operate the relevant pipelines.

This appendix briefly sets out the emergency mechanisms that are available to AEMO as the operator of this market.

STTM contingency gas

Contingency gas is an emergency mechanism that AEMO can use to call on market participants to balance supply and demand based on voluntary day-ahead market participant offers if the normal mechanisms in the STTM hubs are unlikely to achieve this balance. The NGR defines STTM contingency gas as a quantity of natural gas by which supply to or withdrawal from a hub by a trading participant is decreased or increased to address a contingency gas requirement.[149]

The use of contingency gas provides pipeline operators and distributors with a means of avoiding or at least minimising the need to involuntarily curtail shippers supplying the hub or users withdrawing at the hub.[150] STTM pipeline operators and distributors can involuntarily curtail shippers or users regardless of whether contingency gas is called for or not. Contingency gas cannot be used to address events on pipelines that do not impact a hub.[151]

At every STTM hub, either STTM shippers or STTM users can choose to submit contingency gas offers:[152]

- An STTM offer from a shipper could be the shipper offering to supply additional gas to an STTM hub on that gas day or it could involve the shipper reducing the gas it withdraws from the hub into an STTM pipeline.
- STTM users can also submit contingency gas offers to provide additional gas at a hub on a gas day by reducing the quantity of natural gas they would withdraw from that hub into an STTM distribution system.

Contingency gas offers for a hub and a gas day must be submitted to AEMO before 6 pm on the preceding gas day (D-1).[153]

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149 See rule 364 of the NGR.

150 An STTM Pipeline Operator is the operator of a gas transmission pipeline that delivers gas to a distribution system or transmission customer at a hub, or away from the hub. An STTM distributor is the operator of a gas distribution pipeline that delivers gas from the hub to end users. An STTM shipper has a contractual right to have gas supplied from or withdrawn into an STTM facility such as a transmission pipeline at a hub transfer point. STTM users are typically retailers or large consumers who have a contractual right to use pipeline services provided by an STTM distribution system. Transmission customers who withdraw gas directly from a transmission pipeline at a defined hub transfer point are also STTM users. For more information, see AEMO, 'Gas market participant types', accessed via https://aemo.com.au/en/learn/market-participants/gas-market-participants

151 AEMO, *Technical Guide to the STTM*, October 2019, pp. 55-56.

152 See rule 435 of the NGR.

153 See rule 435(6) of the NGR. STTM users and shippers can also make contingency gas bids, which work in the opposite way to contingency gas offers by addressing oversupply rather than a supply shortage.

The trigger events for contingency gas are:[154]

- Pressure conditions are forecast to be under or over acceptable operating levels at a hub or a custody transfer point. Notably, intraday pressure issues can arise even when supply and withdrawal are balanced over the day.
- An STTM facility is forecast to be unable to meet the normal seasonal levels of daily delivery capacity to the hub.
- An event upstream of an STTM distribution system could reasonably be expected to adversely affect the supply of natural gas to that STTM distribution system.
- Price taker bids in an ex-ante market schedule or an outlook schedule issued by AEMO are not fully scheduled due to an inadequate supply of natural gas to that hub on that gas day.

STTM trading participants, STTM distributors and STTM facility operators need to inform AEMO if one of these trigger events has occurred. They must also provide relevant information to AEMO about these events and responses to them upon request.[155]

AEMO does not automatically need to schedule contingency gas when a trigger event occurs. Instead, AEMO must first commence a consultation process to determine whether to call for contingency gas at that hub on a gas day.

AEMO would typically call for contingency gas ahead of the relevant gas day. This gives distributors time to plan curtailment measures if these measures are needed. However, AEMO can also call for contingency gas on an intraday basis.[156] Calling for contingency gas involves AEMO scheduling the contingency gas offers that were previously provided by STTM users or shippers.

The contingent gas process steps have been set out by AEMO as:[157]

1. Trading participants electronically submit contingency gas offers for each gas day. Only trading participants who have completed this step can provide confirmation at step 7.
2. STTM facility operators, STTM distributors, STTM shippers or STTM users must notify AEMO as soon as they become aware of a contingency gas trigger event.
3. AEMO issues a notice to STTM participants describing the nature of the trigger event, who called it and when.
4. AEMO convenes a contingency gas assessment conference with the relevant STTM facility operators, STTM distributor and any other party which AEMO believes could assist in resolving the issue. At this conference:
    - Information about the trigger event is exchanged, and an assessment is made of the operational requirements for the STTM distribution network and STTM facilities for the affected gas days.

154 See rule 440(1) of the NGR.
155 See rule 440(2) of the NGR. AEMO's website states that its contingency gas phone is manned 24 hours a day, 7 days a week.
156 AEMO, *Technical Guide to the STTM*, October 2019, p. 54.
157 AEMO, *Technical Guide to the STTM*, October 2019, pp. 55-56.

- An assessment is made as to whether contingency gas is required; if so, what quantity of contingency gas is required, the location and timing for delivery of that contingency gas.

5. AEMO convenes a wider industry conference with participants at the affected hub to discuss the outcome of the contingency gas assessment conference. Trading participants may discuss whether an industry response to the trigger event without scheduling contingency gas is possible. However, if AEMO considers that contingency gas is urgently required if, at the assessment conference, it may not have time to convene the industry conference before needing to call for contingency gas. In this case, AEMO may skip the industry conference and go straight to step 6.
6. Following the conference(s), AEMO determines whether contingency gas is required or not, based on the information provided to it. This will include the quantity, location and timing for when contingency gas will be required.
7. AEMO carries out a confirmation process with trading participants who submitted contingency gas offers by 6:00 pm on gas day D-1 to electronically confirm the quantity of contingency gas they expect to be able to provide within the required time. Note that participants must have an offer already in place to confirm on the day an event occurs.
   - The available quantity confirmed may be more or less than the quantity in the contingency gas offer. The available quantity can be changed, but the offer price steps cannot be changed. If the available quantity is reduced, price steps in order of highest to lowest will be marked as unavailable, or the last price step will be extended if the available quantity is increased.
   - A trading participant may confirm the availability of contingency gas for individual price steps, provided it has registered facilities related to those price steps with AEMO.
8. Subject to the information determined in step 7, AEMO then proceeds to schedule contingency gas. To rectify a supply shortfall, AEMO calls contingency gas offers in order of increasing price.[158] Quantities called will not exceed the quantities confirmed in step 7. All contingency gas offers called are recorded by AEMO for settlement purposes.
9. AEMO continues to monitor the situation and liaise with participants until the situation is rectified. This response does not preclude the need for involuntary curtailment. AEMO may also request participants to reduce their response; however, this will be voluntary because responses may already be committed. If a provider can reduce its response and agrees to do so, then AEMO will reduce the quantity of contingency gas called for settlement purposes.

After the contingency gas event, the contingency gas provider needs to demonstrate that it has delivered the contingency gas scheduled by the time and at the location required. The participant will be exposed to ad hoc charges where it has not delivered contingency gas according to the contingency gas requirements.

158 To rectify a supply surplus, AEMO calls contingency gas bids in order of decreasing price.

AEMO provides records of contingency gas trigger notices and contingency gas determinations on its website.[159] AEMO has never progressed past step 6 of the contingency gas process and therefore has not ever called for contingency gas to be provided by participants.

STTM technical and operational constraints

AEMO also has emergency procedures on STTM technical or operational conditions.

There are two types of conditions under which AEMO considers that technical or operational conditions could materially affect the ability of shippers or users to supply or withdraw gas involving an STTM hub:

- a material involuntary commitment. This is any involuntary curtailment to either end-users implemented by an STTM distributor, or to deemed STTM distributors by the STTM pipeline operator.
- a significant constraint. This occurs if a shipper or user is unable to flow gas to meet their scheduled position due to a technical issue in the supply chain.

If AEMO becomes aware that a material involuntary curtailment has occurred, it must prepare and consider whether to apply an administered price cap state for a hub for that gas day.[160]

When a significant constraint occurs, the relevant shippers or users need to take all measures within their reasonable control to mitigate the effects of the operational constraint.[161] Shippers and users can also notify AEMO if they consider that an operational constraint is affecting a hub or will affect a hub.

159 See: http://www.nemweb.com.au/Reports/CURRENT/STTM/Contingency_Gas/

160 See rules 428(1)(c) and 364 of the NGR; AEMO, *STTM Procedures*, January 2021, Chapters 8.1 and 8.2.

161 AEMO, *STTM Procedures*, January 2021, Chapters 8.1 and 8.2, particularly 8.2.4(b)(ii).

D GAS SUPPLY AND DEMAND FORECASTS

AEMO prepares the GSOO annually. It reports on the adequacy of eastern and south-eastern Australian gas markets to supply forecast maximum demand and annual consumption over a 20-year outlook period.

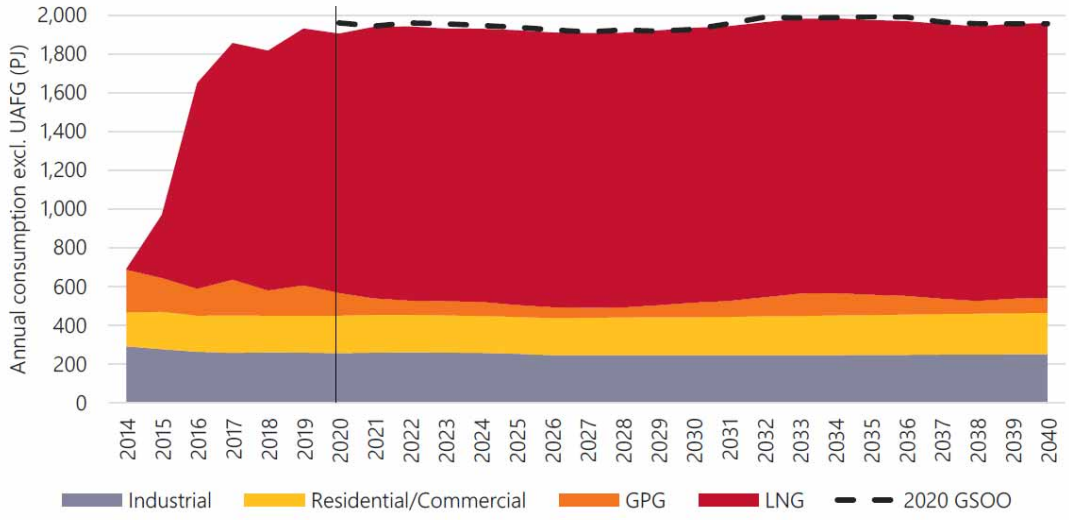
The GSOO analyses transmission, production, and reserves adequacy to highlight locations where new gas processing or transmission infrastructure, or field developments may be required. This appendix provides an overview of the GSOO published by AEMO in March 2021.

D.1 Gas demand forecasts

A key source of forecast demand information for the east coast gas market is the GSOO, produced annually by AEMO.

In the most recent GSOO, published in March 2021, annual gas consumption in the next 20 years is uncertain.Figure D.1 below shows the 20-year total consumption forecast for eastern and south-eastern gas markets under AEMO's central scenario, broken down by consumer types.[162]

Figure D.1: Gas demand actual and forecast, all sectors, central scenario, 2014-2040 (PJ)



Source: AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 21.

The figure above indicates LNG, industrial and residential and commercial demand is forecast to remain stable through to 2040. Gas-powered generators, on the other hand, are a volatile consumer of gas. This is because it provides a firming function to fill periods of low variable

162 AEMO's modelling was conducted based on four futures scenarios: central, slow change, hydrogen and low gas price. The central scenario uses AEMO's best (central) view of future uncertainties.

renewable energy production, and can substitute for lost coal-fired generation during periods of outages (planned or unplanned).[163]

The downward trend for gas-powered generation gas demand that has occurred over recent years is projected to continue and accelerate in the next five years as more variable renewable energy projects come online to meet various state renewable energy targets.[164]

D.1.1 Maximum daily gas demand forecasts

Across Australia's east coast gas market, maximum daily demand has a strong seasonal influence driven by heating demand in winter. Much of this variation comes from residential and commercial consumers in the southern states, with a smaller influence due to industrial businesses.[165]

Victoria is the state with the highest seasonal maximum demand and therefore has the greatest reliance on flexible and reliable gas infrastructure.

Victorian winter maximum demand is projected to decline until 2025, due to improvements in energy efficiency. From the mid-2020s onwards, maximum gas demand is expected to increase as new gas connections are forecast to continue to grow (contributing to an approximate 0.5 per cent increase in daily peak demand each year). New investments in energy efficiency in gas-fuelled appliances are assumed to slow over the same period.[166]

Seasonal variance and extreme peaks

The most extreme southern daily gas demands observed each year typically only occur on a relatively small number of days when conditions compound to lead to very high utilisation of residential and commercial heating appliances.

Industrial loads such as aluminium and chemical production, as well as some household and commercial loads, such as cooking and hot water demand, operate consistently across the year.

Over the winter months (June to August in particular), additional gas is used for heating in households and business premises. On average, winter peaks in Victoria are two to three times higher than summer peaks due predominately to the heating load.[167]

The extreme peaks — for instance, the top five demand days — are on average 25 per cent higher than an average winter day. The peak winter days are typically defined by a combination of high system demand and high gas-powered generation demand, depending on the degree of extreme conditions prevailing in both the electricity and gas markets.[168]

163 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 21.
164 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 21.
165 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 33.
166 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 34.
167 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 35.
168 AEMO, *2021 Gas Statement of Opportunities*, March 2021, pp. 35-36.

Gas-powered generators retain a critical role despite falling consumption

Gas-powered generators' demand for gas at time of daily maximum winter gas demand is projected to decline in South Australia as new synchronous condensers are installed to alleviate the need to direct gas-powered generators on at times to maintain NEM system security.[169]

However, in New South Wales and Queensland, daily gas-powered generation demand at times of daily maximum winter gas demand is projected to increase significantly over the GSOO forecast horizon to cover periods of low variable renewable energy once coal-fired generation retires.[170]

Coincident daily gas-powered generation demand for gas has the potential to be even higher in the event of low wind or droughts, prolonged coal-fired generation outages, transmission outages, or extreme peak electricity demand.

This could significantly increase the risk and impact of shortfalls if the gas supply-demand balance is tight, as the market would lack resilience to cope with these high impact low probability events.[171]

Historically, gas-powered generators have operated with higher daily maximum gas consumption in summer than winter. From around 2030, as additional coal retires and more variable renewable energy is installed in the NEM, the maximum daily gas-powered generation demand is forecast to shift towards a higher winter daily maximum than in summer.[172]

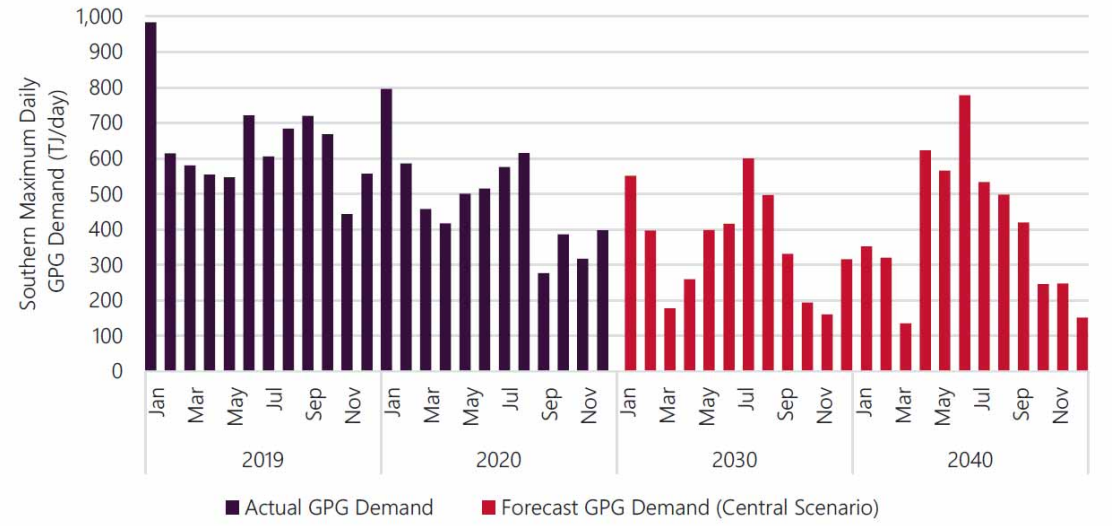
Coincident southern daily peak demand may pose risk to system security

Maximum regional daily gas demands tend not to occur across the entire east coast gas market at the same time, as the weather extremes in New South Wales and Victoria in particular tend not to coincide. The maximum daily demand is therefore measured and forecast at the regional level.[173]

Nevertheless, gas system security across the interconnected east coast gas market needs to be considered. To maintain gas system security, gas infrastructure needs to be able to manage high seasonal variations in daily gas demand while retaining the flexibility to cover high impact, low probability daily demand peaks that could foreseeably occur.[174]

169 AEMO, *2021 Gas Statement of Opportunities*, March 2021, pp. 36.
170 AEMO, *2021 Gas Statement of Opportunities*, March 2021, pp. 36-37.
171 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 37.
172 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 37.
173 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 38.
174 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 38.

Figure D.2: Actual and projected daily gas-powered generation demand for gas by month in the southern states



Source: AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 38.

D.1.2 Demand forecasts for gas-powered generation by jurisdiction

New South Wales

The most recent GSOO indicates that forecast gas-powered generation demand in New South Wales continues to trend down as new solar and wind generation continues to come online. New South Wales gas-powered generation has historically been highly volatile and appears to be sensitive to coal-powered generation availability.[175]

The New South Wales Electricity Strategy aims to deliver additional renewable energy and storage generation within the Electricity Infrastructure Roadmap. This strategy has not been captured in the 2021 GSOO forecasts and increases the uncertainty associated with long-term gas-powered generation forecasts in New South Wales.[176]

The potential development of gas-powered generation capacity in response to the Australian Government's request for a market-driven response of up to 1,000 MW of dispatchable capacity by 2023 also increases the potential volatility of gas demand.

However, the utilisation of this potential plant would depend on the technology and bidding approach of the generator. If operated as an extreme peaker to service extreme demands, a low impact on annual gas consumption is likely.[177]

175 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 75.
176 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 75.
177 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 75.

Since the publication of the GSOO, the Australian Government confirmed it will spend up to $600 million building a gas-fired power station in Kurri Kurri in the New South Wales Hunter Valley. The money to build the 660 MW plant has been allocated to the government-owned Snowy Hydro Limited in the 2021-2022 budget.[178]

Victoria

AEMO forecasts a decline in demand from gas-power generation in Victoria. This is driven by an energy surplus from Victorian Renewable Energy Target projects and the ongoing growth in rooftop solar. However, as reliability of the coal-powered generators deteriorates and capacity withdraws, gas-powered generators will remain vital in Victoria to be a capacity reserve in the event of weather events and power system shocks.[179]

The Victorian gas-powered generation fleet is dominated by open-cycle gas turbines (OCGTs) which are peaking in nature and mostly operate at the margin. This makes their dispatch patterns much more volatile and less predictable than that of combined- cycle gas turbines (CCGTs).[180]

However, since the flooding of the Yallourn coal-powered generator in June 2021, there has been greater reliance on Victorian gas-powered generators and these plants have all increased their output to cover for the generation that would usually be provided by Yallourn.

South Australia

Gas-powered generation consumption in South Australia is projected to continue to trend down as high-inertia synchronous condensers are brought online, reducing the need for gas-powered generators operation to maintain system security, and the growing share of renewable generation, particularly rooftop solar systems, continues to reduce operational demand.[181]

Consumption will also be contingent on the retirement of existing gas-powered generation assets such as Osborne Power Station (announced by 2023-24) and the development of Project Energy Connect (2024-25), a high voltage transmission line that is proposed to connect South Australia and New South Wales.[182]

Queensland

An overall decline in gas-powered generation was forecast for Queensland in the 2021 GSOO. This was driven by the increasing penetration of grid-scale renewables and ongoing growth in rooftop solar. Gas-powered generation is expected to become more peaking, with large solar generation during the middle of the day putting downward pressure on electricity prices.[183]

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178 ABC, *Federal government will spend $600 million on new Kurri Kurri gas plant in the NSW Hunter Valley*, 18 May 2021, at https://www.abc.net.au/news/2021-05-18/federal-government-commits-600m-for-kurri-kurri-gas-plant/100147956

179 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 78.

180 OCGT is an internal combustion engine consisting of a compressor, combustor and power turbine that compresses and ignites an air/fuel mixture to create rotary motion.CCGT uses both gas and steam turbine cycles in a single plant to produce electricity with high conversion efficiencies and low emissions.

181 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 77.

182 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 77.

183 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 76.

Since the explosion at the Callide C power station on 25 May 2021, the Queensland gas-powered generators were instrumental in making up for the lost supply as quickly as possible and have since increased generation, with average demand for gas generation having at least doubled since the incident.[184]

However, it is forecast that while Callide C unit 4 will not be operational until June 2022, Callide C unit 3 and Callide B units may be operating by early July, meaning that this additional gas demand should largely abate.[185]

Tasmania

As variable renewable energy increases both locally and on the mainland, gas-powered generation in Tasmania is likely to continue to play a marginal role. It is primarily a backup fuel when hydro reservoirs are low or when renewable generation is not available.[186]

As a result, the use of the gas-powered generators in Tasmania is largely influenced by longer term weather events. The last significant reliance on gas-powered generation occurred as a result of facing unprecedented dry conditions in spring 2015 and the major outage on Basslink from December 2015 to May 2016, which curtailed all trade between Tasmania and the mainland.

D.2 Gas supply and infrastructure forecasts

The 2021 GSOO also provides an overview of the reserves, resources and production forecasts for supplies connected to the east coast gas market. It also provides an overview of the market's midstream infrastructure (that is, pipelines, storage facilities, and LNG import terminals). Key points from the GSOO are provided below.

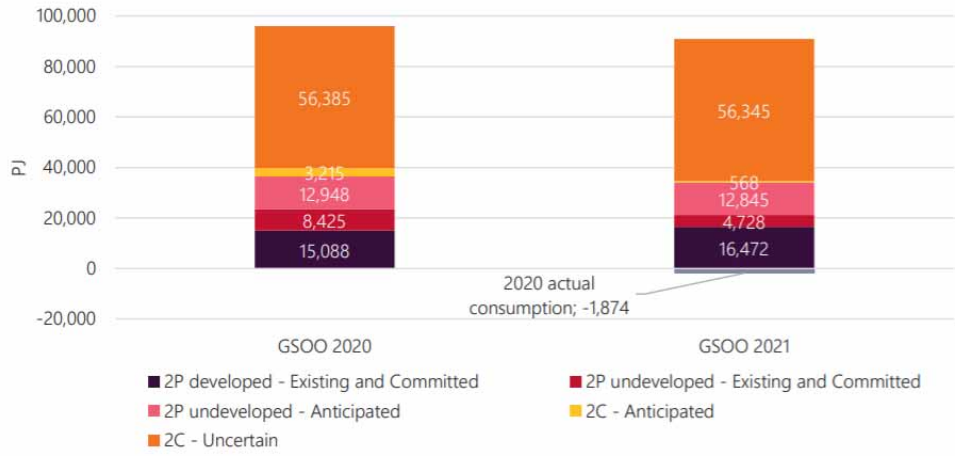
D.2.1 Reserves and resources

Gas supply to consumers relies on continued investment to identify and then exploit gas reserves and resources. The expected quantity of gas that is expected to be commercially recovered (gas reserves) and the quantity of less certain and potentially less commercially viable gas (gas resources) have both decreased since 2020.

The most certain "proven and probable" (2P) reserve forecasts have declined due to gas reserves consumption in 2020.[187] Both trends can be seen in Figure D.3.

184 AEMO, supplementary submission to consultation paper, p. 3.
185 AEMO, supplementary submission to consultation paper, p. 3.
186 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 77.
187 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 42.

Figure D.3: Reserves and resources reported in the 2020 and 2021 GSOOs



Source: AEMO, *2021 Gas Statement of Opportunities,* March 2021, p. 42.

D.2.2 Available annual production

Gas production involves gas being extracted and processed before being injected into gas pipelines.

AEMO's 2021 forecast annual production for 2021-2025 is lower than its 2020 forecast. Most of this reduction can be attributed to lower rates of drilling planned by northern gas producers.[188]

Figure D.4: AEMO's forecast of available production, 2021-2025 (PJ)

	Commitment criteria	2021	2022	2023	2024	2025
North (QLD / NT)	Existing and committed	1,599	1,586	1,554	1,462	1,371
	Anticipated	0	29	111	180	226
	Total	1,599	1,615	1,666	1,642	1,596
	Difference from 2020 GSOO*	**-19**	**-96**	**-72**	**-47**	**N/A**
South (VIC / NSW / SA^)	Existing and committed	467	445	406	377	321
	Anticipated	0	0	25	39	22
	Total	467	445	430	417	343
	Difference from 2020 GSOO	**4**	**-11**	**-16**	**43**	**N/A**
Total east coast gas production		2,066	2,060	2,096	2,059	1,939
Difference from 2020 GSOO		**-15**	**-107**	**-88**	**-3**	**N/A**

Source: AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 43.
Note: AEMO developed this table based on information provided by gas producers.

188 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 43.

AEMO noted that the commissioning of the Port Kembla Gas Terminal should provide an offset to field production declines, though a continued decline in southern field production will likely challenge long-term supply-demand adequacy.[189]

D.2.3 Maximum daily production capacity

The maximum daily production capacity defines the quantity of total gas that can be injected into the system each day and how much may need to be extracted from storage.

This maximum daily production capacity is a key influence on the operation of the gas markets to ensure sufficient gas is available to meet peak winter demands. Maximum daily production is strongly proportional to annual production forecasts in most cases.

AEMO and producers forecast for maximum daily production capacity to fall faster than annual available production in the southern regions, particularly in Victoria.[190]

Much of the Victorian production decrease is due to the decline of legacy fields in Longford that are heavily relied on to ramp production up and down to match southern seasonal demand. AEMO considers that the commissioning of the Port Kembla Gas Terminal will help address peak day capacity risks, particularly across winter.[191]

In the north, the demand is far less seasonal and production operates at near full capacity all year round. Any changes in production capacity would be proportional to changes in annual production.[192]

D.2.4 Midstream gas infrastructure

Midstream infrastructure provides the linkage between producers and consumers; and includes pipelines, storage facilities and LNG import terminals. As production and consumption patterns change, the requirements on the midstream infrastructure may also change.

In the 2021 GSOO, AEMO stated that the expected reduction in southern maximum daily production capacity means that during periods of high demand, there will be greater reliance on withdrawals from southern storage facilities such as Iona Underground Storage, and pipelines to deliver supplies from the north.[193]

AEMO also suggested that Victoria's own reduction in southern maximum daily production capacity would lead the state to rely more heavily on externally produced gas unless new local supply sources are secured.[194]

189 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 44.
190 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 45.
191 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 45.
192 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 45.
193 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 47.
194 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 47.

Under this scenario and without pipeline expansions, constraints on existing pipeline infrastructure could limit the delivery of gas from southern producers to southern customers during peak demand periods.[195]

D.3 Gas supply adequacy

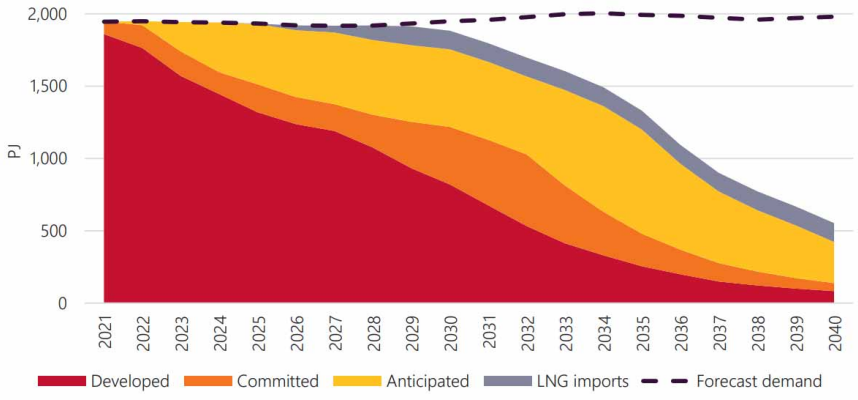
For GSOO purposes, an inability to supply gas to meet domestic (industrial, commercial, residential or gas-powered generation) demand is identified as a supply gap and becomes a shortfall if projected in the next five years. There are two classes of shortfall (or supply gap) identified:

- Peak day shortfall — a shortfall driven by insufficient capacity to meet demand on an extreme peak day.
- Seasonal shortfall — a shortfall driven by a broader lack of available gas rather than just capacity on a single day. Note that the seasonal shortfalls can also be caused by prolonged infrastructure constraints.

AEMO stated in its 2021 GSOO that production (particularly peak production) from existing and committed developments is projected to rapidly decline over the coming years.[196]

Despite this, AEMO expects the commissioning of the Port Kembla Gas Terminal to enable available supply to meet all consumer demand until 2026 in its central scenario, even without the development of anticipated projects. If these additional domestic production projects are developed, then AEMO does not anticipate peak day gas supply gaps or seasonal supply gaps to occur until 2029.[197]

Figure D.5: Projected eastern and south-eastern Australia gas production under the central scenario



Source: AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 43.
Note: This chart includes export LNG.

195 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 47.
196 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 54.
197 AEMO, *2021 Gas Statement of Opportunities*, March 2021, pp. 54; 58. AEMO expects similar supply gaps to emerge in 2029 under all of its other modelled scenarios.

D.3.1 Risk of peak and seasonal shortfalls

According to AEMO, without new supply options, and if Port Kembla Gas Terminal's commissioning and operation were delayed until after winter 2023, then peak day shortfalls of up to 100 TJ/d could occur in Victoria in the 2023 winter season under extreme peak demand conditions.[198]

This risk of peak shortfalls in the short term could be avoided if anticipated projects are also developed according to their respective best estimates on commissioning, increasing the resilience of the system to commissioning delays.[199]

If these shortfalls were to occur, AEMO would need to take short-term operational measures to attempt to reduce this threat to system security in Victoria, including controlled interruption of demand.[200]

Consideration of specific gas-powered generation sensitivities resulted in maximum daily demand projections that were as much as 100 TJ/d higher. An increase of 100 TJ/d would not be enough to risk supply shortfalls while LNG cargoes are available.[201]

Without the LNG cargoes, there is already a peak day risk for 2023, but higher than expected gas-powered generation demand for gas would further exacerbate this risk. If non-gas electricity generation alternatives are not available, this could lead to both electricity and gas supply shortfalls under these extreme conditions.[202]

198 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 55.
199 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 55.
200 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 56.
201 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 58.
202 AEMO, *2021 Gas Statement of Opportunities*, March 2021, p. 58.