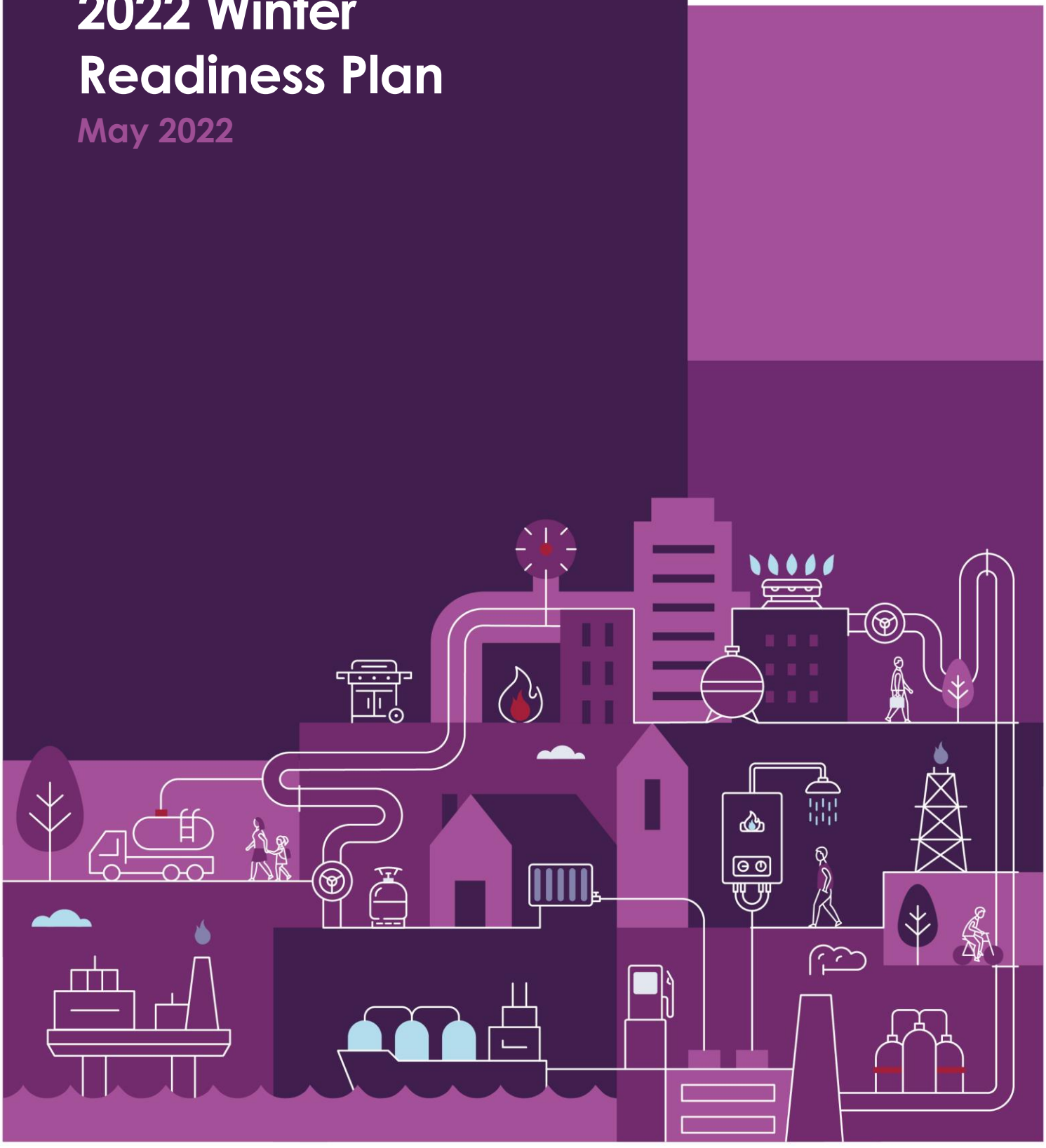
AEMO

AUSTRALIAN ENERGY MARKET OPERATOR

# 2022 Winter Readiness Plan

May 2022



# Important notice

## Purpose

AEMO has prepared this document to provide information about the operation of the Victorian gas transmission system and the market operational strategies for winter 2022. The strategies are designed to support the secure operation of the Victorian Gas Declared Transmission System (DTS) and the Declared Wholesale Gas Market (DWGM). The annual winter stakeholder information session was held on 4 May 2022 to present the 2022 Victorian Gas Winter Operations Outlook to stakeholders for discussion and comment. This document supplements the session and provides further technical information on the 2022 Winter Readiness Plan.

This publication is based on information available to AEMO at 4 May 2022 unless otherwise indicated.

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### Version control

| Version | Release date | Changes |
|---|---|---|
| 1.0 | 19/05/2022 | Initial release |

AEMO acknowledges the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture. We pay respect to Elders past, present and emerging.

# Executive summary

AEMO is the operator of the Victorian Gas Declared Transmission System (DTS) and the Declared Wholesale Gas Market (DWGM). As operator, AEMO is responsible for operating the DTS in a safe and secure manner, and for minimising threats to system security. This document, reviewed and published annually, details AEMO's operational and market strategies for operating the DTS and DWGM during the 1 May to 30 September peak demand period[1].

All times in this report are Australian Eastern Standard Time (AEST).

- Victorian peak day supply capacity is expected to be sufficient to meet a forecast 1-in-20 year peak system demand day of 1,255 terajoules (TJ), and to support forecast DTS-connected gas generation demand.
- The total available supply to the Victorian DTS this winter, allowing for pipeline capacity constraints, is forecast to be 1,552 terajoules per day (TJ/d). The total supply includes the Gippsland zone (972 TJ/d), the Port Campbell zone (447 TJ/d), New South Wales Zone (47 TJ/d), and the Dandenong liquefied natural gas (LNG) facility (87 TJ/d).
- Peak day Gippsland zone production capacity is forecast to decrease from 1,072 TJ/d in winter 2021 to 1,018 TJ/d in winter 2022. The expected Gippsland zone supply into the DTS is 972 TJ/d; this is less than the Gippsland zone production capacity because some gas is also supplied from the Gippsland zone into the Tasmanian Gas Pipeline and the Eastern Gas Pipeline (EGP).
- Peak day Port Campbell production and storage capacity is forecast to remain steady in 2022 at 719 TJ/d, however supply into the DTS will continue to be constrained by the South West Pipeline (SWP) transportation capacity of 447 TJ/d.
- The peak day supply from New South Wales via Culcairn into the Victorian Northern Interconnect (VNI) is forecast to be limited to 47 TJ/d by the capacity of the Moomba to Sydney Pipeline and New South Wales demand. Higher EGP flows to New South Wales may enable higher flows into the VNI via Culcairn.
- AEMO expects that the system demand profile for winter 2022 will have similar characteristics to winter 2020 and winter 2021 due to the ongoing impacts of COVID-19, particularly the continuing working from home trend. AEMO therefore expects that high system demand days could again result in threat to system security events.
- Forecast gas generation consumption during the 2022 peak demand period is forecast to be between 2.1 petajoules (PJ) and 5.4 PJ, based on a range of plausible weather conditions. This range bounds the observed gas generation consumption during the 2021 peak demand period, which was 5 PJ. The average gas generation consumption increases with system demand and is likely to be highest on high system demand days, during coal generation outages, or during periods of low wind and solar generation output.
- System modelling indicates that the DTS is capable of supporting a 1-in-2 year system demand day and maximum forecast gas generation demand of 317 TJ, provided that sufficient gas supply is available.
- There will be continued reliance on the Iona underground gas storage (UGS) facility to balance daily and monthly supply and demand. The Dandenong LNG storage facility will continue to be used to supply peak

[1] The Peak Demand Period is defined in this document as 1 May until 30 September. Winter is 1 June to 31 August.

shaving gas during periods of unforecast or very high hourly gas demands or in response to unplanned gas supply disruptions. AEMO will monitor storage inventories throughout winter to identify and manage any supply concerns.

- AEMO has observed ongoing low levels of market participant contracting at the Dandenong LNG facility. AEMO's ability to manage the DTS during the peak winter demand period could be impacted, increasing the possibility of gas curtailment, particularly gas generation. AEMO identified the low Dandenong LNG inventory as a threat to system security and sought a market response following the publication of the 2022 Victorian Gas Planning Report (VGPR) Update. AEMO intends to respond to ensure there is sufficient capacity to provide an emergency reserve if market participants do not contract capacity.
- AEMO expects that its gas transmission and market operational strategies will be sufficient to manage any potential threats to system security during the peak demand period.

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# 1 Winter 2022 outlook

## 1.1 Demand for winter 2022

Table 1 shows the forecast peak daily demands[2] for the Declared Transmission System (DTS) from the 2022 Victorian Gas Planning Report (VGPR) Update[3], and forecast peak hourly demands for winter 2022. The forecast peak daily demands align with the *Progressive Change* scenario, noting that there is little difference between the *Progressive Change* and *Step Change* forecasts for winter 2022.

**Table 1 Forecast peak system daily and hourly demand for winter 2022**

| | Peak 1-in-2 | Peak 1-in-20 |
|---|---|---|
| **Peak daily demand (terajoules a day [TJ/d])** | 1,147 | 1,255 |
| **Peak hourly demand (terajoules an hour [TJ/h])*** | 75 | 84 |

* Peak hourly demand was not forecast as part of the 2022 VGPR Update. Peak hourly demand forecasts reported in the 2021 VGPR remain valid.

### Monthly forecast peak day demand

Table 2 shows the forecast peak day system demand for each month during 2022. The highest system demands are forecast to occur during the three coldest months: June, July, and August. Monthly peak day system demands are primarily influenced by weather conditions and with some impact due to seasonal commercial and industrial customer consumption changes.

**Table 2 Forecast monthly peak day demand for 2022, *Progressive Change* scenario (TJ/d)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1-in-2** | 392 | 409 | 473 | 670 | 917 | 1,082 | 1,108 | 1,080 | 903 | 749 | 596 | 437 |
| **1-in-20** | 440 | 478 | 614 | 832 | 1,047 | 1,186 | 1,221 | 1,231 | 1,028 | 871 | 738 | 575 |

## 1.2 Gas generation

### 1.2.1 Gas generation forecast

There are five gas-fired power stations directly connected to the DTS:

- Jeeralang.
- Laverton North.
- Newport.
- Somerton.
- Valley Power.

[2] Forecasts with a 1-in-20 probability of exceedance (POE) are statistically expected to be met or exceeded one in every 20 years. This represents more extreme weather than the average weather conditions assumed in a 1-in-2 forecast, which is expected to be met or exceeded one in every two years

[3] At https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/vgpr/2022/2022-victorian-gas-planning-report-update.pdf?la=en.

DTS-connected gas generators have a considerable impact on the operation of the DTS, due to their location and the large hourly quantities of gas these power stations consume when operating simultaneously (up to approximately 23 terajoules an hour [TJ/h]). The Mortlake Power Station is not connected to the DTS and is supplied directly by gas facilities at Port Campbell via a dedicated pipeline. While not connected to the DTS, gas supply from Port Campbell to the Mortlake Power Station and to South Australia (which has several gas-fired power stations) can reduce the available gas supply into the DTS and may increase the rate of Iona underground gas storage (UGS) inventory depletion.

The gas generation consumption forecasts are subject to a range of uncertainties, including:

- Weather variability**.**
- Reliability of coal-fired generators.
- Major transmission outages.
- Gas prices.
- Timing of the installation and commissioning of renewable energy projects.
- Electricity transmission investments.
- Early closure of coal-fired generators.

The gas generation forecasts presented in the 2022 VGPR Update and 2022 Gas Statement of Opportunities[4] (GSOO) explore the impact of some of these uncertainties and presents a range of expected demands. It is important to note that major outages of generators in the National Electricity Market (NEM) or extreme weather could increase actual gas generation consumption above is the VGPR and GSOO forecasts.

The Victorian gas generation winter consumption forecast presented in the 2022 VGPR Update is lower than the actual consumption during the same period in 2021. The forecast reduction is due to:

- New committed grid-scale variable renewable energy (VRE) generation projects and distributed solar photovoltaics (PV) which reduce the need for gas generation.
- An outage of the Yallourn coal-fired power station during winter 2021 that substantially increased gas generation consumption.

DTS-connected gas generation consumption during the 2022 peak demand period (1 May to 30 September) is forecast to be between 2.1 petajoules (PJ) and 5.4 PJ, based on a range of plausible weather conditions. This range bounds the observed gas generation consumption in the 2021 peak demand period, which was 5 PJ. The annual forecast gas generation for 2022 is between 5.4 PJ and 10.6 PJ, which bounds the actual gas consumption in 2021 of 6.2 PJ. These forecasts were developed before the announcement of an unplanned outage of unit 2 at the Loy Yang A Power Station[5], which is likely to increase gas generation consumption during winter 2022.

Figure 1 shows the monthly DTS gas generation consumption for 2020 and 2021, and the forecast monthly consumption for 2022. Monthly gas generation consumption can be significant during the winter and shoulder periods, and is higher than other times during the year.

[4] At https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/gsoo/2022/2022-gas-statement-of-opportunities.pdf?la=en.

[5] See https://www.agl.com.au/about-agl/media-centre/asx-and-media-releases/2022/may/updated-fy22-guidance.

**Figure 1 Monthly DTS-connected gas generation consumption, actual 2020-21 and forecast 2022 (TJ/m)**

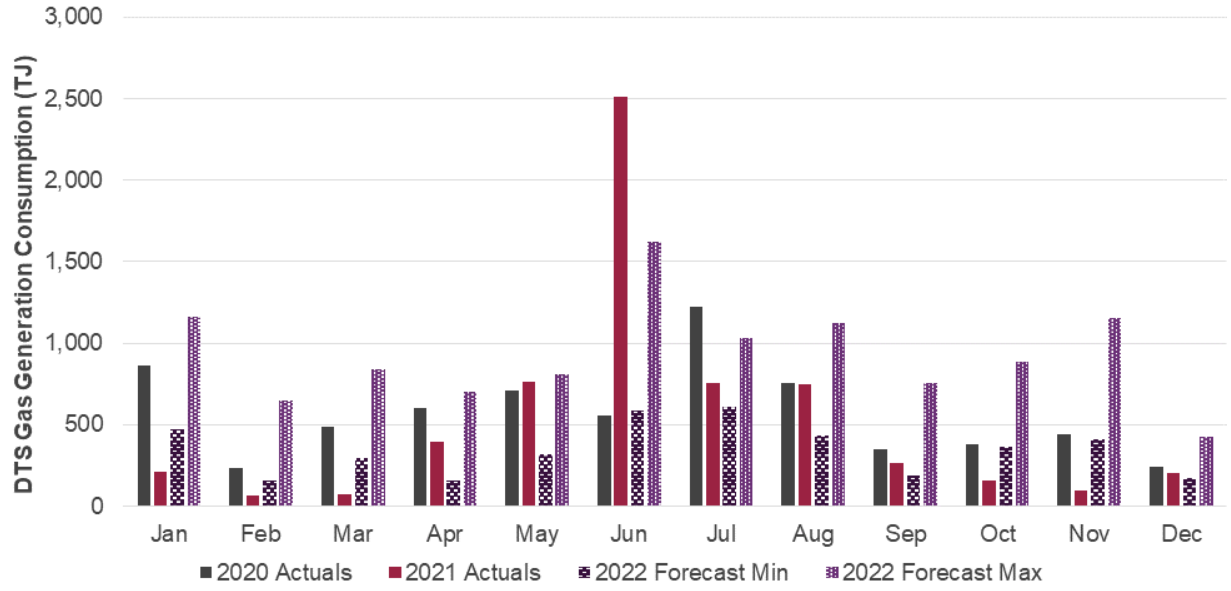
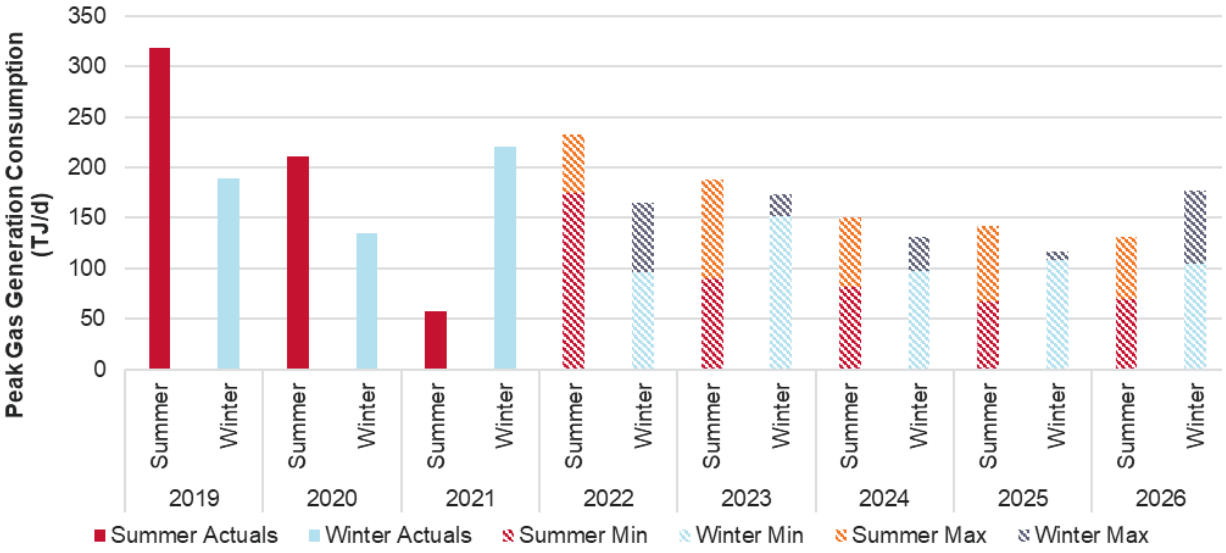


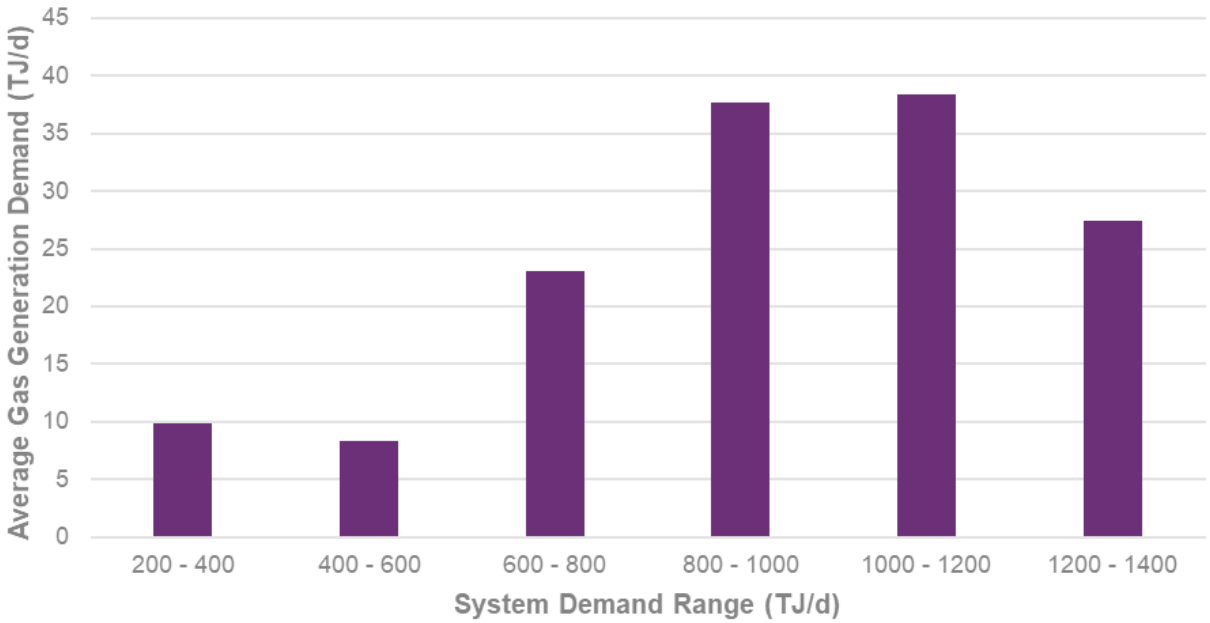

Figure 2 shows the maximum forecast daily gas generation demand for each season from 2022-26. The forecast maximum winter seasonal gas generation demand for winter 2022 is between 96 terajoules a day (TJ/d) and 165 TJ/d, which is less than the maximum gas generation demand observed during winter 2021 of 220 TJ/d. The forecast seasonal peak gas generation demand has the potential to align with peak system demand conditions.

**Figure 2 Historical and forecast seasonal maximum DTS gas generation demand in summer and winter, 2019-26 (TJ/d)**




This is supported by 0, which shows that average gas generation demand generally increases with system demand, based on historical data from 2020 and 2021. This can be interpreted to mean that the expected gas generation increases with system demand and it is higher on high system demand days.

**Figure 3 Average gas generation demand for various system demand levels, 2020-21 (TJ/d)**




### 1.2.2 Gas generation supportability

Hydraulic modelling completed for the 2021 VGPR indicated that up to 317 TJ/d of gas generation can be supported on a 1-in-2 peak system demand day if the gas generation demand is forecast from the start of the gas day.

The ability of the DTS to support gas generation demand is significantly reduced if this demand is not forecast, because the DTS has a low level of usable linepack, especially in winter, compared to the large gas transmission pipelines that supply Sydney and Adelaide. Other factors that also influence the ability of the DTS to support gas generation demand include increased system demand due to colder than forecast weather, unplanned DTS asset outages, and gas supply disruptions.

Depending on the location and magnitude of the gas generation demand that is unforecast, it is possible for AEMO to either:

- Schedule operational response gas injections, which may include peak shaving Dandenong liquefied natural gas (LNG) injections above firm rates; or
- Issue curtailment instructions to gas generators in accordance with the *Gas Load Curtailment and Rationing and Recovery Guidelines*[6] to prevent minimum DTS supply pressures being breached, which would threaten supply to customers within the gas distribution networks. This may result in electrical load shedding in the NEM if the gas generators do not hold sufficient alternate fuel, or if there was otherwise insufficient alternative generation sources available.

It is critical to the operation of the DTS and the Declared Wholesale Gas Market (DWGM) that participants accurately forecast gas generation demand to reduce the likelihood of a threat to system security event.

[6] AEMO, *Gas Load Curtailment and Gas Rationing and Recovery Guidelines*, at http://www.aemo.com.au/Gas/Emergency-management/Victorian-role.

## 1.3 Supply for winter 2022

The total available supply to the Victorian DTS this winter, allowing for pipeline capacity constraints, is forecast to be 1,552 TJ/d. The total supply includes the Gippsland zone (972 TJ/d), the Port Campbell zone (447 TJ/d), the New South Wales Zone (47 TJ/d), and the Dandenong LNG facility (87 TJ/d).

The 2022 VGPR Update advised that there is sufficient available supply to support a 1-in-20 year system demand day for 2022.

### Gippsland supply capacity

Peak day Gippsland zone production capacity is forecast to decrease from 1,072 TJ/d in winter 2021 to 1,018 TJ/d in winter 2022. The expected Gippsland zone supply into the DTS is 972 TJ/d; this is less than the Gippsland zone production capacity because some of this gas is also supplied into the Tasmanian Gas Pipeline and the Eastern Gas Pipeline (EGP). The EGP is the only source of supply for non-DTS Victorian demand in Bairnsdale, as well as the south coast of New South Wales, with some gas also supplied to the Australian Capital Territory.

### Port Campbell supply capacity

Peak day Port Campbell production and Iona UGS supply capacity is forecast to remain steady in 2022 at 719 TJ/d, however this supply will continue to be constrained by South West Pipeline (SWP) transportation capacity of 447 TJ/d. As noted in the 2022 VGPR Update, the SWP transportation capacity is expected to be increased for winter 2023 through the construction of the Western Outer Ring Main (WORM) pipeline.

### New South Wales supply capacity

The maximum Culcairn supply capacity from the Moomba to Sydney Pipeline (MSP) in New South Wales will decrease to from 195 TJ/d to 180 TJ/d for winter 2022. Gas from Culcairn is supplied into the Victorian Northern Interconnect (VNI). As detailed in the 2022 VGPR Update, the expected peak day supply from New South Wales into Victoria via Culcairn is expected to be limited to 47 TJ/d as flows along the MSP must also support Sydney and regional New South Wales demand. Increased flows into the DTS via Culcairn are possible, but it is expected that this would be offset by increased flows up the EGP to supply New South Wales. Expected New South Wales supply on peak demand days was informed by east coast mass balance modelling in the 2022 GSOO.

## 1.4 Peak day supply and demand sensitivity analysis

AEMO has considered three scenarios to demonstrate a potential supply and demand balance within the DTS for a 1-in-20 system demand day:

- Scenario 1 – base case.
- Scenario 2 – reduced Longford injections.
- Scenario 3 – reduced Longford injections with significant gas generation.

Each scenario considers available supply as reported in the 2022 VGPR Update.

DTS peak demand can be satisfied in all scenarios, although supply from Dandenong LNG and VNI imports is required for the highest demand scenarios.

These scenarios do not consider pipeline dynamics and assume an accurate beginning-of-day demand forecast, no facility deviations, and optimum DTS linepack distribution. The supply-demand balance does not account for intraday DTS congestion and does not consider the supply-demand balance in other states.

## Scenario 1 – base case

The base case scenario assumes that all production facilities and transmission equipment are available at maximum capacity and represents a potential supply demand balance on a 1-in-20 year system demand day (Table 3). A range of flows from the Longford and Port Campbell supply hubs are possible, and these are expected to be influenced by gas demand in New South Wales (including the Uranquinty Power Station), Port Campbell (including the Mortlake Power Station), and South Australia.

**Table 3 Scenario 1 – peak day supply and demand (TJ/d)**

| | Supply (TJ/d) | | Demand (TJ/d) |
|---|---|---|---|
| **Gippsland** | 761 - 994 | **1-in-20 system demand** | 1,255 |
| **Port Campbell** | 214 - 447 | **Gas generation** | 0 |
| **Culcairn** | 47 | | |
| **Dandenong LNG** | 0 | | |
| **Total supply** | 1,255 | **Total demand** | 1,255 |

## Scenario 2 – reduced Longford injection

This scenario assumes that the Longford Gas Plant has reduced production capacity, limiting the Gippsland supply to 670 TJ/d. Following the retirement of the Gas Plant 1 inlet system in late 2021, this capacity reduction is consistent with the loss of one of the two remaining inlet systems (see Section 2.4 for further detail). East coast mass balance modelling indicates that 610 TJ/d of Longford's reduced capacity would be supplied into the DTS. It is expected that flows from Port Campbell will increase to the capacity of the SWP. Flows via Culcairn may vary based on required MSP deliveries to Sydney. If Sydney demand is less, Culcairn flows may increase, which in turn decreases the amount of Dandenong LNG required.

**Table 4 Scenario 1 – peak day supply and demand (TJ/d)**

| | Supply (TJ/d) | | Demand (TJ/d) |
|---|---|---|---|
| **Gippsland** | 610 | **1-in-20 system demand** | 1,255 |
| **Port Campbell** | 447 | **Gas generation** | 0 |
| **Culcairn** | 80 | | |
| **Dandenong LNG** | 119 | | |
| **Total supply** | 1,255 | **Total demand** | 1,255 |

## Scenario 3 – reduced Longford injections with gas generation demand

This scenario assumes reduced Longford Gas Plant production as in Scenario 2, but with an additional 100 TJ of gas generation demand. The scenario results show that with supplies maximised from all remaining production

facilities (considering likely demand in other jurisdictions), 219 TJ of Dandenong LNG is required to satisfy demand. It is important to note the following regarding this scenario:

- Dandenong supply is well above the firm supply capacity of 87 TJ/d and near the maximum non-firm supply capacity of 237 TJ/d. Dandenong injections of this magnitude greatly increase the risk of storage depletion prior to the end of winter, and this supply may not be available depending on the inventory level at the time.
- Profiling of Port Campbell injections may increase available supply from Port Campbell
- It may be possible to utilise linepack from non-DTS pipelines, increasing supply to the DTS and reducing the required LNG.
- If injections from any source were not available at or near maximum capacity, gas load curtailment would occur in line with the Gas Load Curtailment, Rationing and Recovery Guidelines.

**Table 5 Scenario 1 – peak day supply and demand (TJ/d)**

| Supply (TJ/d) | | Demand (TJ/d) | |
|---|---|---|---|
| **Gippsland** | 610 | **1-in-20 system demand** | 1,255 |
| **Port Campbell** | 447 | **Gas generation** | 100 |
| **Culcairn** | 80 | | |
| **Dandenong LNG** | 219 | | |
| **Total supply** | 1,355 | **Total demand** | 1,355 |

# 2 Operational challenges for winter 2022

## 2.1 Peak demand profiled and linepack management

Victorian residents and businesses were subject to various levels of movement restrictions due to the COVID-19 pandemic during winter 2021. This resulted in a continuation of the behaviour observed in winter 2020, including:

- Reduced commercial and industrial activity.
- Reduced social activity including restaurant dining and sporting matches.
- A large proportion of the population working from home.

Figure 4 shows that the average percentage demand profile[7] on winter weekdays in 2021 was almost identical to that observed in 2020. The figure also highlights the differences between 2021 and 2020 (pandemic profile) and 2019 (typical profile).

As highlighted in the 2022 VGPR Update and shown in Figure 5, the pandemic profile has the following impacts in comparison to a typical profile:

- A greater proportion of daily system demand occurs before 10:00 pm, which reduces the usable system linepack at 10:00 pm[8].

[7] Note that the average percentage demand profile is shown to *normalise* for weather effects.

[8] This is a critical time operationally, as it corresponds to the time of minimum system linepack, and minimum system pressure.

- There is limited opportunity to build system linepack during the middle of the day. This reduces system resilience leading into the evening peak, increasing the likelihood of Dandenong LNG being required to manage system pressures.

**Figure 4 Average percentage of weekday winter system demand profile in 2019, 2020 and 2021**

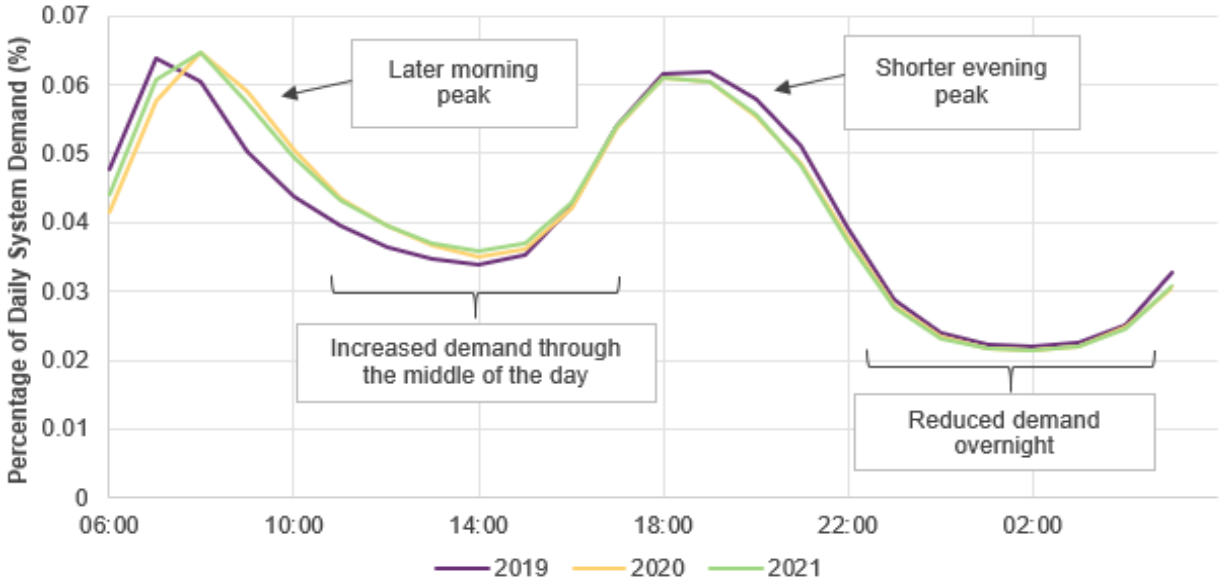
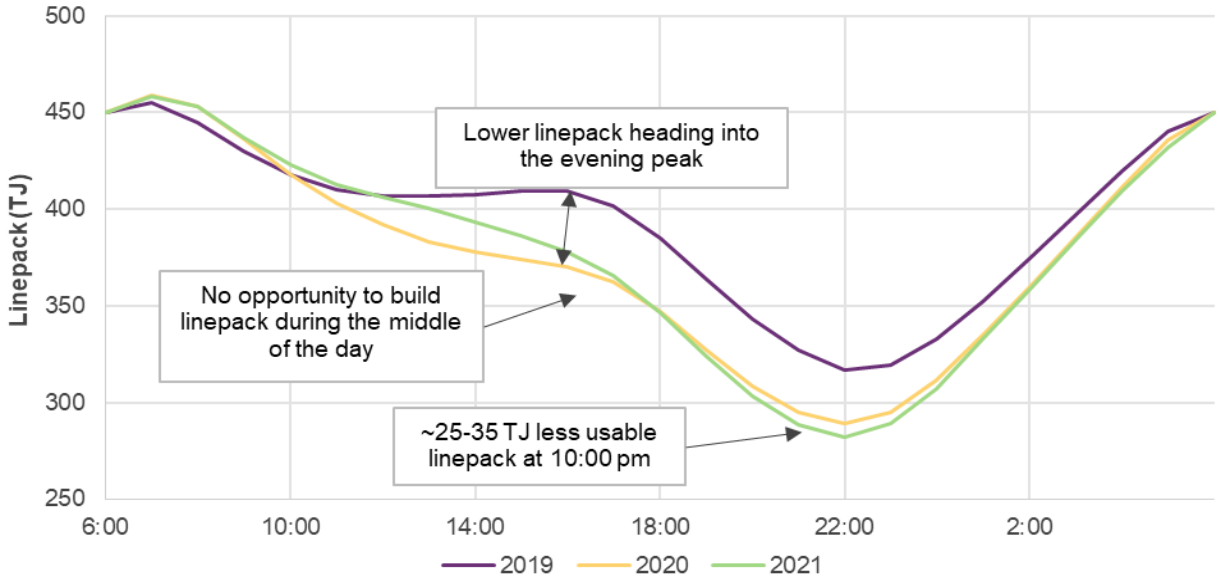



**Figure 5 Impact demand profile on system linepack for a perfectly forecast, 1,100 TJ day in 2019, 2020 and 2021**




There were no threat to system security events during winter 2021 due to generally mild conditions and improvements to AEMO's demand forecasting processes to manage the pandemic profile.

AEMO anticipates 'working from home' arrangements are likely to be maintained throughout the recovery from the COVID-19 pandemic, and that the system demand profile during winter 2022 will be similar to those observed in 2020 and 2021. AEMO therefore expects the demand profile on high system demand days to continue to pose an increased risk to system security.

AEMO will continue to monitor the demand profile on high demand days, and act in accordance with the Demand Override Methodology[9] to minimise interventions by AEMO.

## 2.2 Iona UGS inventory

Iona UGS is a critical source of gas supply to meet winter demand, which is three to four times higher than summer demand. There were significant concerns about Iona UGS inventory during winter 2021, despite storage levels reaching a record high of 24.5 PJ on 10 May. Iona UGS was heavily utilised during winter 2021 (see Figure 6) with inventory falling to its lowest level of 9.6 PJ on 25 July.

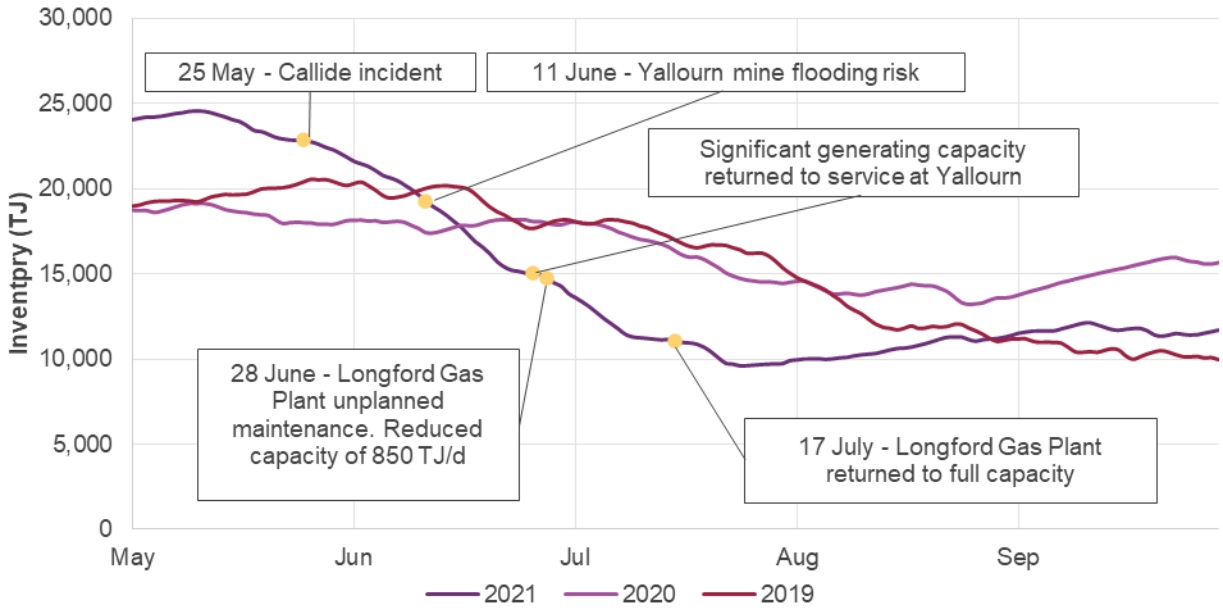
Lochard Energy highlighted an increased risk of supply restrictions from the facility due to the rate of storage reservoir depletion. AEMO requested market participants to consider sourcing increased gas supply from Queensland and formally requested updated gas supply and demand forecasts as well as Iona UGS storage balance projections from market participants.

The high Iona UGS inventory drawdown was to:

- High gas generation demand in Queensland due to the 25 May 2021 Callide incident.
- An outage at Yallourn Power Station due to coal mine flooding risks.
- Reduced Longford Gas Plant capacity for almost three weeks to repair a gas leak on one of its three gas processing trains.

Iona UGS inventory was able to increase during August 2021 due to unusually mild conditions. System demand did not exceed 1,000 TJ/d after 25 July 2021 compared to both August 2019 and August 2020 when system demand peaked at approx. 1,200 TJ/d.

**Figure 6 Comparison of Iona UGS storage levels, 2019, 2020 and 2021**




[9] See https://www.aemo.com.au/-/media/files/pdf/demand-override-methodology.pdf.

The 2022 VGPR Update forecast that there is expected to be sufficient available supply from Victorian production facilities, Iona UGS, and interstate flows to meet winter demand in 2022. Unplanned outages of production facilities, increased demand from gas generation, or reduced supply from Queensland may increase the Iona UGS depletion risk.

AEMO will closely monitor the Iona UGS inventory levels over the winter period and respond accordingly.

## 2.3 Dandenong LNG inventory

The Dandenong LNG facility has historically been used to provide an operational response to alleviate threats to system security and for responding to emergency events including the implementation of customer curtailment. The facility is used as a flexible supply source to quickly respond to incidents including supply disruptions, equipment outages or failures, unforecast increases in demand, and high gas generation demand.

AEMO reported a reduction in contracted Dandenong LNG services in the 2021 VGPR[10], and issued a Notice of a Threat to System Security[11] due to there being insufficient inventory to respond to operational and emergency scenarios. AEMO's modelling indicated that 140 TJ of Dandenong LNG was required as an emergency reserve, and an additional 110 TJ was required to minimise the likelihood of curtailment during threat to system security events. Following the publication of this threat notice, market participants contracted some additional capacity, although this remained below the quantity specified by AEMO.

During winter 2021 while AEMO considered options for increasing Dandenong LNG inventory, the LNG stock level remained above the level specified in the Notice of a Threat to System Security. After a thorough assessment of the available options, AEMO contracted 60 TJ of capacity at the Dandenong LNG facility in January 2022 on the basis that the threat would be ongoing and impact into winter 2022 due to the expected contracted capacity remaining relatively low. AEMO notified the market on 8 March 2022 that this threat to system security had ended and published an Intervention Report[12].

AEMO's modelling indicates that for winter 2022, 140 TJ of Dandenong LNG is required for an emergency reserve, and 128 TJ is required to minimise the level of curtailment during threats to system security to a 1-in-20 year or 5% probability of exceedance (POE). This increased operational quantity is due to the reduction in Gippsland supply capacity and reduced Longford Gas Plant production system resilience, which is discussed in the 2021 VGPR and the 2022 VGPR Update.

This risk of a gas supply disruption has increased compared to the 2021 VGPR, due to the increased possibility of reduced Longford Gas Plant capacity following the retirement of the Gas Plant 1 inlet section in December 2021.

The 2022 VGPR Update identified that there is forecast to be insufficient Dandenong LNG inventory available from 2022 (including currently contracted AEMO volumes) to manage operational and emergency responses during periods of high unforecast demand or a supply disruption, which increases the risk of AEMO curtailing supply to customers.

[10] See page 50, AEMO 2021 VGPR, at https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/vgpr/2021/2021-victorian-gas-planning-report.pdf?la=en.

[11] See https://aemo.com.au/-/media/files/gas/dwgm/2021/threat-to-system-security-notice-dwgm-dandenong-lng-contracted-capacity.pdf?la=en.

[12] See https://aemo.com.au/-/media/files/gas/dwgm/2022/dwgm-er-21-004-winter-2021.pdf?la=en.

Consistent with the criteria above, AEMO has identified this low Dandenong LNG inventory as a threat to system security and sought a market response[13]. AEMO intends to respond to ensure there is sufficient capacity to provide an emergency reserve if market participants do not contract capacity.

## 2.4 Longford gas plant resilience risks

The 2022 VGPR Update reported on supply resilience risks relating to the Longford Gas Plant. Those pertinent to winter 2022 are presented below.

### Gas Plant 1 inlet section retirement

As noted above, Esso retired the inlet section of Longford Gas Plant 1 (one of three Longford processing trains) in December 2021 to:

- Align Longford's operating footprint with system capacity.
- Manage risks associated with Gas Plant 1 inlets equipment.
- Increase focus on Gas Plants 2 and 3 inlets systems.

Esso has advised that the capacity of Gas Plants 2 and 3 inlets is sufficient to accommodate Longford gas capacity.

While an Esso review of Gas Plant 2 and 3 inlet systems showed high historical uptime performance, if one of the two remaining inlet sections was unavailable (for example, due to unplanned downtime), the Longford Gas Plant capacity would reduce to 500-650 TJ/d, depending on the gas system conditions at the time.

An outage on a peak demand day is likely to result in a threat to system security, which is likely to require operational response LNG to manage and may result in curtailment in the event of very high gas demands. AEMO is continuing to work with Esso on this issue.

### Ethane constraint

The Longford production system produces an ethane by-product stream that is used by a downstream customer. Periods of reduced customer ethane offtake may constrain Longford production during winter 2022. AEMO is working collaboratively with Esso to minimise the impact on Longford operations and gas supply into the DTS.

AEMO understands that this ethane constraint is unlikely to impact Longford production from winter 2023 due to the forecast reduction in Longford capacity.

[13] See http://vicgas.prod.marketnet.net.au/Public_Dir/SWN_Attachments/20220329092551%20-%2020220329%20-%20DLNG%20TTSS%20Notice%20-%20Market%20Response.pdf.

# 3 Resources to manage peak demand

## 3.1 Profiled injections

On peak demand days, conserving or increasing usable DTS linepack before the evening peak is an effective way to reduce the likelihood and severity of a threat to system security. When a peak demand day is forecast, AEMO can improve system security margins by scheduling more Longford Gas Plant injections into the DTS early in the gas day and balancing this with less gas later in the day (referred to as injection profiling).

The total quantity injected for the day is the same, so the market is not impacted by this process[14].

The profiling process is triggered when the day ahead, Day+1, total demand forecast exceeds 1,150 TJ. AEMO seeks approval from the Longford and VicHub facility operators before scheduling profiled injections[15].

Profiling may also be considered at lower demand levels or at other facilities depending on the risk profile for the day including gas supply restrictions, transmission equipment outages or restrictions, or abnormal gas demand profiles (such as COVID-19 impacts). During the 2007 drought conditions, Iona UGS injections were profiled to overcome the SWP capacity constraint and to conserve Dandenong LNG inventory.

Accurate forecasting of gas generation demand for the day ahead schedule assists AEMO in determining whether or not to initiate injection profiling.

Injection profiling was not used in winter 2021 because the forecast total demand prior to the gas day did not exceed the threshold over the winter period.

## 3.2 Demand forecast override methodology

In addition to the requirement for market participants to submit a demand forecast, AEMO prepares its own independent forecast of daily system demand and the profile of this demand. If the aggregate of the market participants' demand forecasts is too low (or too high) relative to AEMO's demand forecast, an override quantity may be added to (or subtracted from) the market participants' aggregate demand forecast. This ensures that an appropriate amount of gas is scheduled to maintain an appropriate level of linepack and to maintain system security.

The override quantity is calculated based on the *Victorian Wholesale Gas Demand Override Methodology*[16]. It considers variables such as:

- Beginning-of-day linepack level (high, on target or low).
- Profile type (light, average or heavy).
- Demand override adjustment factors.
- Time of day.

[14] Profiling injections does not impact either imbalance or deviation payments.

[15] Injection profiling is available at the Longford injection point.

[16] See https://aemo.com.au/-/media/files/gas/dwgm/2009-15/demand-override-methodology.pdf.

These variables are then used to calculate upper or lower threshold limits at each scheduling interval. The difference between AEMO's and the market participants' total demand forecasts is compared to this calculated threshold limit. If necessary, an adjustment is then made to the market participants' aggregate demand forecast so it is within the upper or lower threshold limit.

## 3.3 Gas generation demand monitoring

### 3.3.1 Monitoring DTS-connected gas generation

Gas consumption by DTS-connected gas-fired generation units is monitored in real time through AEMO's Gas System Control and Data Acquisition (SCADA) system. Gas generation forecasts are obtained from site-specific forecasts submitted by market participants as well via the NEM Pre-Dispatch scheduling system. AEMO monitors these forecasts to ensure they are consistent and that any known increase in the gas generation forecast can be supported by the DTS.

The NEM operates on five-minute scheduling intervals, while the DWGM operates with schedules issued at 06:00, 10:00, 14:00, 18:00, and 22:00 for the current gas day. It is therefore possible for a generator's dispatch instructions to change within a DWGM scheduling interval, with additional gas not scheduled for up to four hours (unless AEMO intervenes in the DWGM by publishing an ad hoc schedule).

AEMO maintains awareness of intended gas generation operation by:

- Monitoring NEM Pre-Dispatch and current gas generation demand through its Gas SCADA system.
- Modelling pipeline pressures to determine whether sufficient gas is available to maintain DTS pressures.
- Having the AEMO NEM Control Room inform the AEMO Gas Control Room of likely unforecast increases in gas generation demand. The Gas Control Room will also notify the NEM Control Room of any issues within the gas system that may lead to DTS-connected gas generation units having insufficient gas supply.
- Contacting participants to clarify the intended operation of their gas generation units.

### 3.3.2 Operational response to unforecast gas generation

AEMO may implement the following operational responses to manage unforecast gas generation demand:

- Updating the total demand forecast in accordance with the demand override methodology to account for the forecast increase in gas generation demand. Total demand includes system demand and gas generation demand.
- Issuing a Notice of a Threat to System Security if modelling indicates that an unforecast increase in gas generation demand will result in a threat to system security. AEMO's range of responses to a threat to system security includes publishing an ad hoc schedule, which is a market intervention (detailed in Section 3.4).
- Issuing a direction to facility operators to inject additional gas into the DTS including non-firm gas, or issuing DTS-connected gas generation units with a Direction to Curtail Load in accordance with the *Gas Load Curtailment and Rationing and Recovery Guidelines*[17].

[17] At http://www.aemo.com.au/Gas/Emergency-management/Victorian-role.

The four largest DTS-connected gas power stations can switch to liquid fuel in the event of insufficient gas supply. If AEMO needs to curtail gas supply to these units, they are expected to have the option of continuing to operate using liquid fuel.

The AEMO Gas Control Room will consult with the NEM Control Room prior to curtailing DTS-connected gas generation units. The NEM Control Room may direct gas generation units with alternative fuel supply to generate to maintain power system security.

### 3.3.3 Monitoring non-DTS-connected gas generation

AEMO does not have real-time monitoring of non-DTS gas pipeline flows and linepack conditions (that is, the AEMO Gas SCADA only monitors and controls the DTS). AEMO monitors non-DTS connected gas generation demand via the NEM Pre-Dispatch and non-DTS pipeline flows via the Natural Gas Services Bulletin Board.

By monitoring these flows along with the DWGM bid stacks, AEMO has some indication of whether DTS injections or withdrawals are more or less likely to occur. Examples include:

- Exports from Victoria via Culcairn to support Uranquinty Power Station operation.
- Imports into Victoria via Culcairn being impacted by the operation of the Uranquinty Power Station.
- Supply into the SWP at Port Campbell when the Mortlake Power Station is or is not operating, as well as SEA Gas Pipeline flows and South Australian gas generation demand.
- VicHub and TasHub supply into the Longford to Melbourne Pipeline when the Tallawarra (as well as Bairnsdale) and Tamar Valley power stations (respectively) are operating.

Monitoring demand at these gas generation units enables AEMO to anticipate gas flows into and out of the DTS.

### 3.3.4 Gas Supply Guarantee

The Gas Supply Guarantee[18] was instituted in response to commitments by production facility operators and pipeline operators to the Commonwealth Government to make gas available for gas generation during peak demand periods in the NEM.

The Gas Supply Guarantee mechanism is a process to identify, assess, and confirm a potential supply shortfall. AEMO will then communicate with industry and call for a response to the shortfall. The Gas Supply Guarantee process will be available for use if required during winter 2022.

## 3.4 Threat to System Security

AEMO must monitor operational conditions to identify any material schedule deviation or forecast that may cause a threat to system security. This includes:

- Rapidly increasing demand due to deteriorating weather conditions.
- Unforecast increases in gas generation demand.
- Unscheduled DTS asset outage.
- A transmission pipeline incident and/or a gas supply incident.

[18] See https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Emergency-Management/Gas-Supply-Guarantee.

If AEMO identifies a threat to system security, the following actions will be taken as described in full in the *Wholesale Market System Security Procedures*[19]:

- Notify market participants of the threat. AEMO may also request for a market response to the threat to system security.
- Take appropriate action to resolve the threat to system security which includes, but is not limited to, publishing an ad hoc schedule, injecting out of merit order gas at the next operating schedule, directing participants to inject or withdraw gas, and curtailment.
- Notify market participants that the threat to system security has ended.

## 3.5 Gas Operations Engineers skills refreshing and training

AEMO has continued to develop and deliver training for Gas Operations Engineers who staff its gas control room as well as for operational support staff. Training covers a range of areas such as linepack management, compressor operations, and refresher training on key operational procedures.

Scenario-based learning forms a central part of the training delivered to the Gas Operations Engineers as preparation for high demand days in the upcoming winter. Assessments conducted through the Competency Based Learning Framework and e-learning modules ensure that gas control room competency is appropriately developed and maintained.

# 4 Emergency management

## 4.1 Legislation and rules

The *National Gas (Victoria) Act 2008* is the legislation for the application of the National Gas Law (NGL) and rules in Victoria. The NGL defines an emergency as it applies in Victoria. It specifies what is required to prepare for gas emergencies, the requirements for the Gas Emergency Protocol, and that participants must comply with the Gas Emergency Protocol.

[19] At https://www.aemo.com.au/energy-systems/gas/emergency-management/victorian-role.

## 4.2 Emergencies

Emergencies are defined under the Section 333 of the National Gas Rules (NGR) as follows:

> *(1) An emergency occurs when:*
>
> *(a) AEMO reasonably believes there to be a situation which may threaten:*
>
> *(i) reliability of gas supply; or*
>
> *(ii) system security or the security of a declared distribution system; or*
>
> *(iii) public safety,*
>
> *and AEMO in its absolute discretion considers that the situation is an emergency and declares there to be an emergency; or*
>
> *(b) AEMO declares there to be an emergency at the direction of a government authority authorised to give such directions.*

AEMO will declare an emergency if it reasonably believes that an operational response cannot address the issue. It will implement the declaration by issuing an Emergency Declaration Notice to the Emergency Manager, Duty Manager, or General Manager of each participant.

AEMO is also responsible for maintaining the Gas Emergency Protocol[20]. This protocol consists of the:

- *Gas Load Curtailment and Gas Rationing and Recovery Guidelines* – define classes of gas customers within prioritised curtailment tables, from which curtailment lists are derived. These guidelines are based on system security criteria and can be modified by government direction.
- *Wholesale Market System Security Procedures* – set the thresholds for operation of the DTS, so threats to system security are averted or minimised.
- *Emergency Procedures (Gas)* – guide the management, preparation, response and recovery for gas emergencies in Victoria. The procedures are underpinned by the principles of maintaining gas supply reliability, maintaining DTS system security, and minimising risks to public safety.

The NGR outlines four key requirements for participants. Each participant must:

- Notify AEMO as soon as practicable of any emergency or situation that may threaten system security.
- Use best endeavours to ensure that its safety plan (if any) permits it to comply with emergency directions.
- Provide AEMO with emergency contacts (including an email address, telephone and fax number, name, and title) of an appropriate representative who has the authority and responsibility to act in the event of an emergency.
- Ensure all relevant officers, staff, and customers are familiar with the emergency protocol and the participant's safety plan or procedures.

[20] Gas Emergency Protocol documents can be found at http://www.aemo.com.au/Gas/Emergency-management/Victorian-role.

### 4.2.1 AEMO's powers during an emergency

AEMO may use section 91BC of the NGL to issue directions for managing:

- The operation or use of any equipment or installation.
- The control of natural gas flow.
- Any other matter that may affect the safety, security, or reliability of the declared transmission or declared distribution systems.

While AEMO's powers under NGL 91BC can be used without declaring an emergency or issuing a notice of a threat to system security, it is unlikely AEMO would invoke these powers without initiating one or both of these mechanisms.

### 4.2.2 Energy Safe Victoria's power to issue directions

During a gas emergency, the Director of Energy Safe Victoria (ESV) may also issue a direction that ESV believes is needed to avoid a situation occurring that is likely to impact public safety. The intent is to regulate the available gas supply (having regard to community needs) and facilitate the reliability of gas supply or the security of systems for transmitting or distributing gas.

### 4.2.3 The Governor and Minister for Energy

The Governor may also declare a proclamation under Part 9 of the *Gas Industry Act*, if it appears that the available supply of gas is (or is likely to become) insufficient for the community's essential needs. The proclamation remains in effect until the Governor revokes it. While the proclamation is in force, the Minister for Energy may give any direction necessary to ensure the safe and secure supply of gas.

## 4.3 Threat to system security procedure

A threat to system security[21] can be indicated by any one of the following:

- The annual planning reviews prepared by AEMO.
- An operating schedule.
- Any other fact or circumstance that AEMO becomes aware of.

A threat to system security may impact the DTS partially or as a whole. AEMO has the power to issue a notice of a threat to system security if it reasonably believes some level of operational response can address the issue, otherwise an "emergency" will be declared.

If a threat to system security occurs:

- AEMO will assess the threat and notify the market.
- If there is sufficient time, AEMO may request the market to respond to alleviate the threat.

[21] A threat to system security is defined in rule 341 of the NGR.

- If there is insufficient time, or the market response is inadequate to alleviate the threat, AEMO will take action in the priority order outlined in the *Wholesale Market System Security Procedures (Victoria)*[22]. This may include injecting gas that is above the market price at a location that can alleviate the threat, which is usually injections from the Dandenong LNG facility.

AEMO will regularly communicate relevant information to participants. If an emergency occurs, AEMO uses the *Emergency Procedures Gas*[23], which are designed to enhance AEMO's and industry's ability to manage the preparation for, response to, and recovery from gas emergencies in Victoria.

### Market response and intervention

AEMO may take the following measures to manage a threat to system security (under s.91BC of the NGL):

- Directing the injection of LNG.
- Increasing withdrawals.
- Using reasonable endeavours to inject gas that is available, including non-firm gas.
- Injecting off-specification gas.
- Curtailment[24] (in accordance with curtailment tables).
- Doing anything AEMO believes necessary in the circumstances.

## 4.4 Emergency communication

Participants must have registered with AEMO at least one emergency contact, that is, a person having appropriate authority and responsibility within their organisation to act as the primary contact for AEMO in the event of an emergency.

Participants must provide AEMO with a telephone number and facsimile number at which a representative(s) is contactable by AEMO, **24 hours a day, seven days a week**. This person will be contacted in the event of an emergency under the *Emergency Procedures Gas* and the *Victorian Gas Emergency Communications Protocol*.

[22] See https://aemo.com.au/-/media/files/gas/emergency_management/victorian/aemo-wholesale-market-system-security-procedures-ngr-11.pdf.

[23] At http://www.aemo.com.au/Gas/Emergency-management/Victorian-role.

[24] In the event of a threat to system security attributable to a transmission constraint, AEMO will curtail customers in accordance with sections 3 and 4 of the *Gas Load Curtailment and Gas Rationing and Recovery Guidelines*, at http://www.aemo.com.au/Gas/Emergency-management/Victorian-role.