2021 Winter Readiness Plan

May 2021

Gas Transmission Winter Operating Strategy for Victoria

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 2021. 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 5 May 2021 to present the 2021 Victorian Gas Winter Operations Outlook to stakeholders for discussion and comment. This document supplements the session and provides further technical information on the 2021 Winter Readiness Plan.

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VERSION CONTROL

Version	Release date	Changes
1.0	13/5/2021	

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 Victorian gas transmission system 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 Victoria's 1 May to 30 September peak demand period[1].

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

Key messages

- Victorian peak day supply capacity is expected to be sufficient to meet a forecast 1-in-20 peak system demand day of 1,263 terajoules (TJ), and to support forecast DTS-connected gas-powered generation (GPG) demand.
- The total available supply to the Victorian DTS this winter, allowing for pipeline capacity constraints, is forecast to be 1,544 TJ a day (TJ/d). The total supply includes the Gippsland zone (1,012 TJ/d), the Port Campbell zone (445 TJ/d), and the Dandenong liquefied natural gas (LNG) facility (87 TJ/d).
- Peak day Gippsland zone production capacity is forecast to decrease from 1,059 TJ/d in winter 2020 to 1,012 TJ/d in 2021. Some Gippsland zone production also supplies Tasmania Gas Pipeline and the Eastern Gas Pipeline (EGP). The EGP supplies parts of eastern Victoria outside of the DTS (including Bairnsdale), New South Wales, and the Australian Capital Territory.
- Peak day Port Campbell zone production capacity is forecast to remain steady in 2021, while there will be some increase in the Iona underground gas storage (UGS) capacity. Supply from Port Campbell into the DTS will continue to be limited to 445 TJ/d due to the South West Pipeline (SWP) capacity constraint
- Peak day supply capacity from New South Wales via Culcairn into the Victorian Northern Interconnect (VNI) is forecast to increase to 195 TJ/d. Available supply via Culcairn is expected to be impacted by New South Wales demand and supply to New South Wales via the EGP.
- AEMO expects that the system demand profile for winter 2021 will have similar but reduced characteristics to winter 2020, due to the ongoing impacts of COVID-19. AEMO therefore expects that high system demand days could again result in threat to system security events.
- Forecast GPG consumption during the 2021 peak demand period (May to September) has reduced to 1.9 petajoules (PJ), compared to the 3.6 PJ during the same period in 2020. There remains a greater likelihood of GPG demand occurring on high system demand days.
- System modelling indicates that the DTS is capable of supporting a 1-in-2 system demand day and maximum forecast GPG demand of 317 TJ, provided that sufficient gas supply is available.
- There will be continued reliance on the Iona UGS facility to balance daily and monthly supply and demand. The Dandenong LNG storage facility will continue to be used to supply peak shaving gas during periods of unforecast or very high hourly gas demands or in response to unplanned gas supply disruptions. AEMO will monitor storage inventory throughout winter to identify and manage any supply concerns.
- Low injections from the Iona Close Proximity Point (CPP) into the SWP at Port Campbell due to market outcomes will result in a greater reliance on Brooklyn Compressor Station (BCS) to support peak demand in the Geelong and Western Transmission System (WTS) withdrawal zones.

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

- The contracted capacity of the Dandenong LNG facility is substantially less than for previous winters, resulting in the LNG tank being less than half full. This may limit AEMO's ability to manage the DTS during the peak winter demand period, increasing the possibility of gas curtailment. AEMO identified the low Dandenong LNG inventory as a threat to system security and sought a market response following the publication of the 2021 Victorian Gas Planning Report (VGPR). AEMO is continuing to engage with APA[2], market participants, and the Victorian Government resolve this issue prior to the start of June 2021.
- Based on current forecasts of demand and supply, including LNG, AEMO expects that its gas transmission and market operational strategies will be sufficient to manage any potential threats to system security.

[2] APA Group, owns and maintains the DTS assets.

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1. Winter 2021 outlook

1.1 Demand for winter 2021

Table 1 shows the forecast peak day demand from the 2021 *Victorian Gas Planning Report* (VGPR)[3] estimates.

Table 1 Forecast peak system demands for winter 2021

	Peak 1-in-2	Peak 1-in-20
Daily demand (terajoules [TJ]/day)	1,155	1,263
Peak hourly demand (TJ/hr)	75	84

As detailed in the 2021 VGPR, changes in customer behaviour due to the COVID-19 pandemic impacted the daily gas demand and demand profile shape during winter 2020. Although the impacts on daily total demand that were observed in 2020 are expected to be less prevalent in 2021, the demand profile is still expected to be materially impacted on high demand days by ongoing work from home arrangements. The impact of COVID-19 on daily demand and the demand profile is discussed in more detail in Section 2.1.

Monthly peak day demand for 2021

Table 2 shows the forecast peak day system demand for each month during 2021. 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, with some impact due to seasonal commercial industrial consumption changes.

Table 2 Forecast monthly peak day demand for 2021 (petajoules [PJ]/month)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1-in-2	392	411	482	662	918	1,088	1,113	1,089	904	752	598	440
1-in-20	443	479	626	832	1,043	1,192	1,228	1,241	1,030	863	755	579

Hourly demand

The 2021 forecast hourly system demand profiles for 1-in-2 year and 1-in-20 year peak winter days are shown as dashed lines in Figure 1, along with the average hourly demand for winter 2020.

This illustrates the substantial increase in hourly demand that is forecast to occur on peak days compared to average demand days, particularly prior to 22:00. The forecast hourly peak day system demand (shown in Table 3) reflects changes to the demand profile due to the COVID-19 pandemic, discussed in Section 2.1.

[3] At https://aemo.com.au/energy-systems/gas/gas-forecasting-and-planning/victorian-gas-planning-report.

Figure 1 Average hourly winter profile for 2020 and forecast peak day system demand profile for 2021

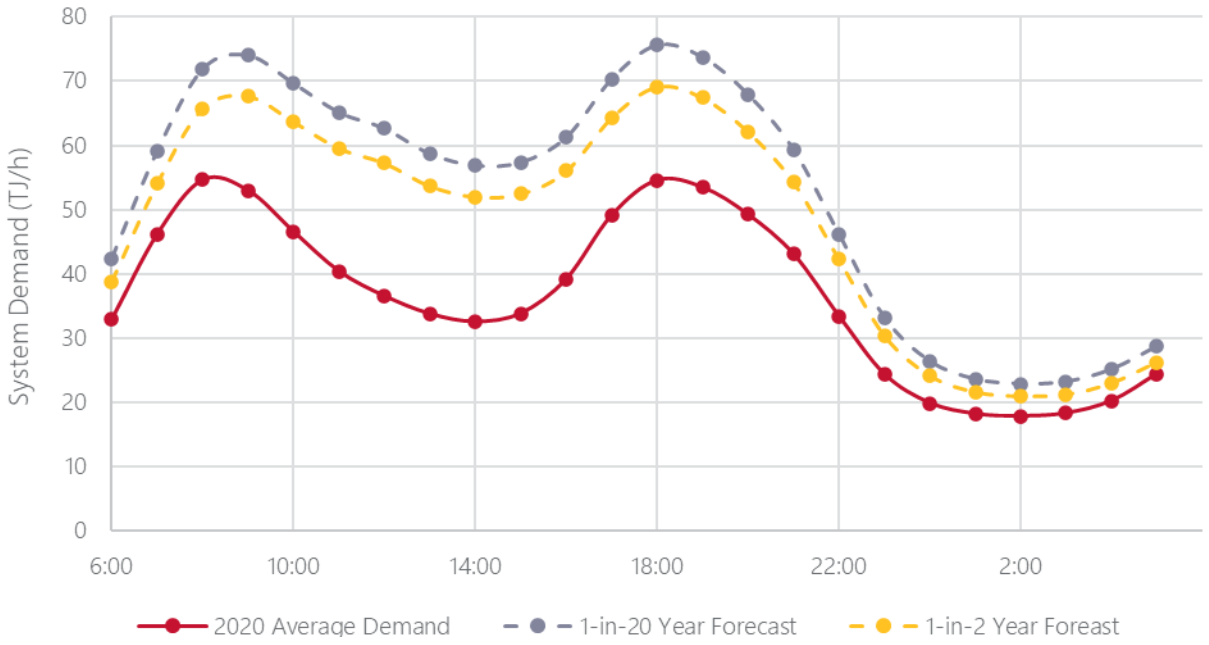


Table 3 Forecast hourly peak day demand for 2021 (TJ/hour)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1-in-2	25	31	36	47	65	73	75	73	64	53	45	33
1-in-20	34	36	44	59	70	80	83	84	69	61	54	44

1.2 Gas-powered generation supportability for winter 2021

There are five gas-powered generation (GPG) power stations directly connected to the Victorian Declared Transmission System (DTS):

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

DTS-connected GPG units have a considerable impact on the operation of the DTS, due to their location and the large hourly demand of these units when operating simultaneously (up to approximately 23 terajoules an hour [TJ/h]).

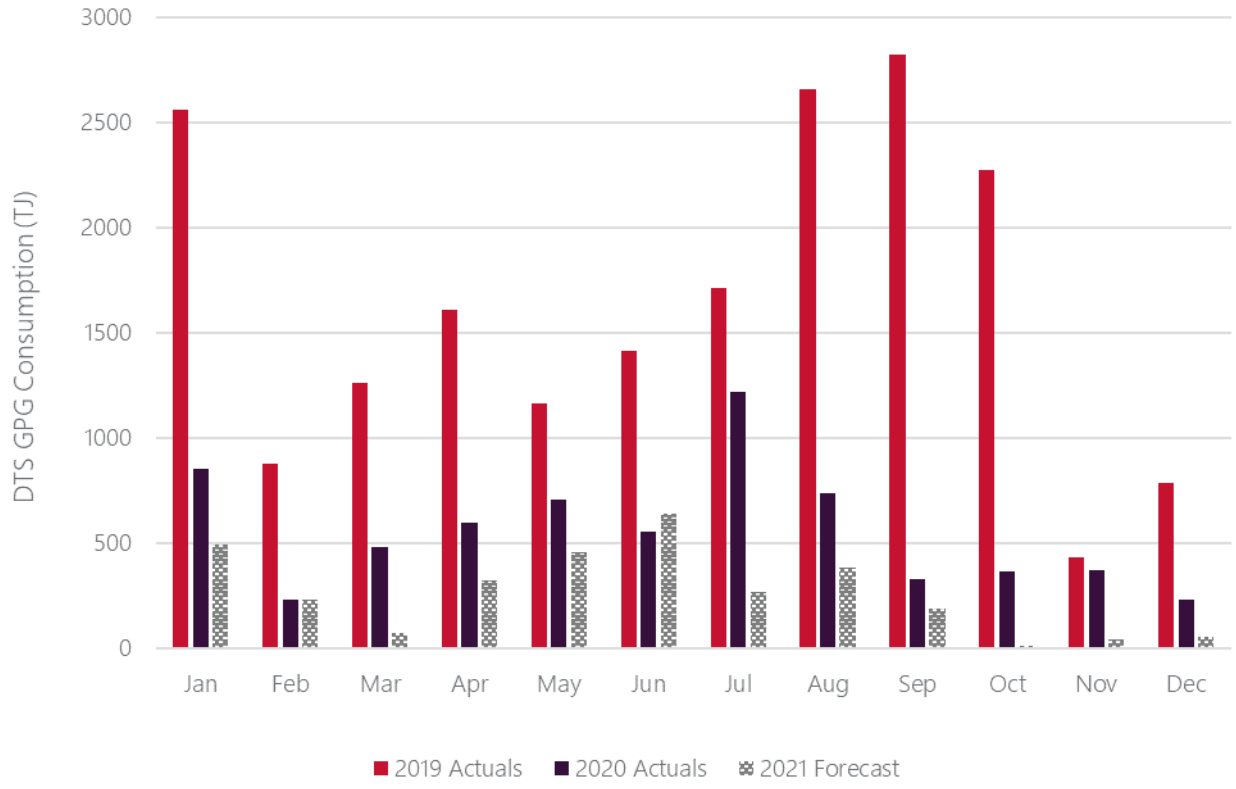
The Mortlake Power Station is not connected to the DTS, and is supplied directly by gas facilities at Port Campbell via a dedicated pipeline. While it is not connected to the DTS, gas supply from Port Campbell to the Mortlake Power Station and to South Australia, including multiple GPG units, can reduce the available gas supply into Victoria and deplete the Iona underground storage (UGS) storage inventory.

The forecast winter period Victorian GPG consumption presented in the 2021 VGPR is lower than the actual consumption during the same period in 2020. The forecast reduction is primarily due to new committed grid-scale variable renewable energy (VRE) generation projects and distributed solar photovoltaics (PV).

DTS-connected GPG consumption during the 2021 peak demand period (May to September) is forecast to be 1.9 petajoules (PJ), which is 1.6 PJ less than the same period during 2020. Annual GPG consumption is also forecast to reduce, from 6.7 PJ in 2020 to 3.2 PJ in 2021.

Figure 2 shows monthly DTS GPG consumption for 2019 and 2020, and the forecast monthly consumption for 2021. Monthly GPG consumption can be significant during the winter and shoulder periods, with the potential for high daily GPG demand to coincide with a 1-in-2 or 1-in-20 peak winter demand day.

Figure 2 Monthly DTS-connected GPG consumption, actual 2019-20 and forecast 2021 (TJ/month)



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

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

The 2021 *Gas Statement of Opportunities* (GSOO)[4] explores the impact of a variety of these events on forecast GPG consumption. Depending on the event and its magnitude, GSOO modelling projects annual Victorian GPG consumption being up to 70% higher than the forecasts provided in Figure 2. In response to these uncertainties, AEMO has prepared operating strategies to manage a moderate increase in GPG demand beyond the VGPR forecast.

[4] At https://aemo.com.au/en/energy-systems/gas/gas-forecasting-and-planning/gas-statement-of-opportunities-gsoo.

DTS capacity modelling indicates that up to 317 TJ/d of forecast GPG can be supported on a 1-in-2 peak system demand day.

The ability of the DTS to support GPG load is significantly reduced if the load is not forecast, because the DTS has a low level of usable linepack compared to other gas transmission systems, especially in winter. Other factors also influence the ability of the DTS to support GPG demand, including increased system demand due to unforecast colder weather and unplanned DTS asset outages or gas supply disruptions.

Depending on the location and magnitude of the GPG load that is unforecast, it is possible that either:

- Operational response liquefied natural gas (LNG) injections, with peak shaving LNG injections above firm rates, would be required; or
- AEMO would issue curtailment instructions to GPG sites in accordance with the *Gas Load Curtailment and Rationing and Recovery Guidelines*[5] to prevent minimum DTS supply pressures being breached, which would threaten supply within the distribution networks.

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

1.3 Supply for winter 2021

The total available supply to the Victorian DTS this winter, allowing for pipeline capacity constraints, is forecast to be 1,544 TJ a day (TJ/d). The total supply includes the Gippsland zone (1,012 TJ/d), the Port Campbell zone (445 TJ/d), and the Dandenong LNG facility (87 TJ/d).

The 2021 VGPR outlines that there is sufficient available supply to support a 1-in-20 system demand day for 2021.

Gippsland supply capacity

Peak day Gippsland zone production capacity is forecast to decrease from 1,059 TJ/d in winter 2020 to 1,012 TJ/d in 2021. The Gippsland zone supply into the DTS is expected to be less than this quantity, because the gas is also supplied into the Tasmanian Gas Pipeline and the Eastern Gas Pipeline (EGP). The EGP supplies non-DTS Victorian demand (such as Bairnsdale), New South Wales, and the Australian Capital Territory.

Port Campbell supply capacity

Peak day Port Campbell production capacity is forecast to remain steady in 2021, however will continue to be constrained by South West Pipeline (SWP) transportation capacity of 445 TJ/d per the 2021 VGPR. The Iona UGS storage inventory is at its highest ever level, peaking at over 24.5 PJ.

Victorian Northern Interconnect (VNI) supply capacity

The Culcairn supply capacity from the Moomba to Sydney Pipeline (MSP) in New South Wales will increase to 195 TJ/d for winter 2021. Gas from Culcairn is supplied into the VNI.

Throughout winter 2020, increasing VNI imports were observed. This was due to increased gas supply from Queensland, due to the COVID-19 pandemic reducing LNG exports and prices. This increased gas supply via the VNI also resulted in lower supply into the DTS from Iona compared to previous winters.

Increased VNI imports may also occur during winter 2021, enabled by forecast capacity and compression availability increases on the South West Queensland Pipeline (SWQP) and the MSP.

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

2. Operational challenges for winter 2021

2.1 Peak demand profiles and linepack management

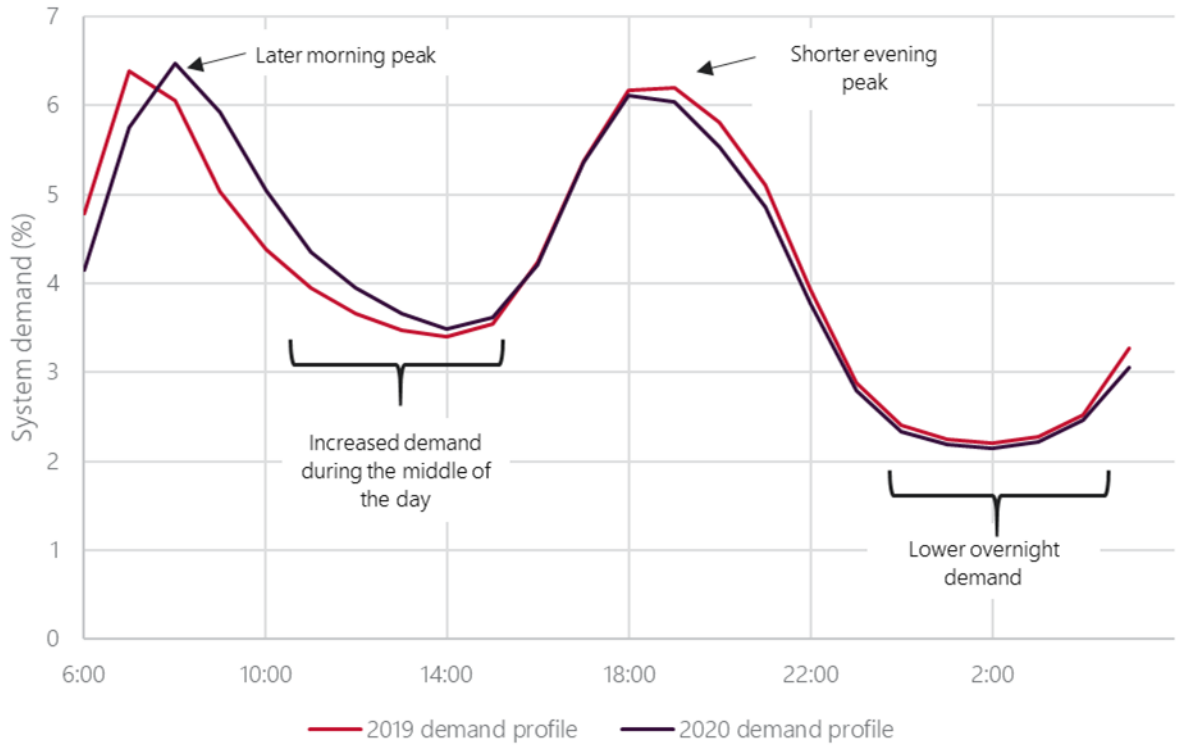
Victorian residents and businesses were subject to varying levels of movement restrictions due to the COVID-19 pandemic for the entirety of winter 2020. This resulted in:

- Reduced commercial and industrial activity.
- Reduced social activity including restaurant dining and sporting matches.
- Delayed morning demand peaks and increased heating demand during weekdays due to a large proportion of the population working from home.

This impacted the DTS system demand profile and was a contributing factor in all threat to system security events during winter 2020.

Figure 3 shows the impacts of the COVID-19 restrictions on the average weekday winter system demand profile. The chart compares system demand in winter 2020 with system demand during winter 2019, which had typical system demand behaviour.

Figure 3 Average weekday winter system demand profile in 2019 and 2020



The operational impact of the change in system demand profile on high demand days is demonstrated in Figure 4, which shows:

- The aggregate market participant forecast (typically used to schedule the market) was regularly under-forecast during the middle of the day. Consequently, injections scheduled into the market were

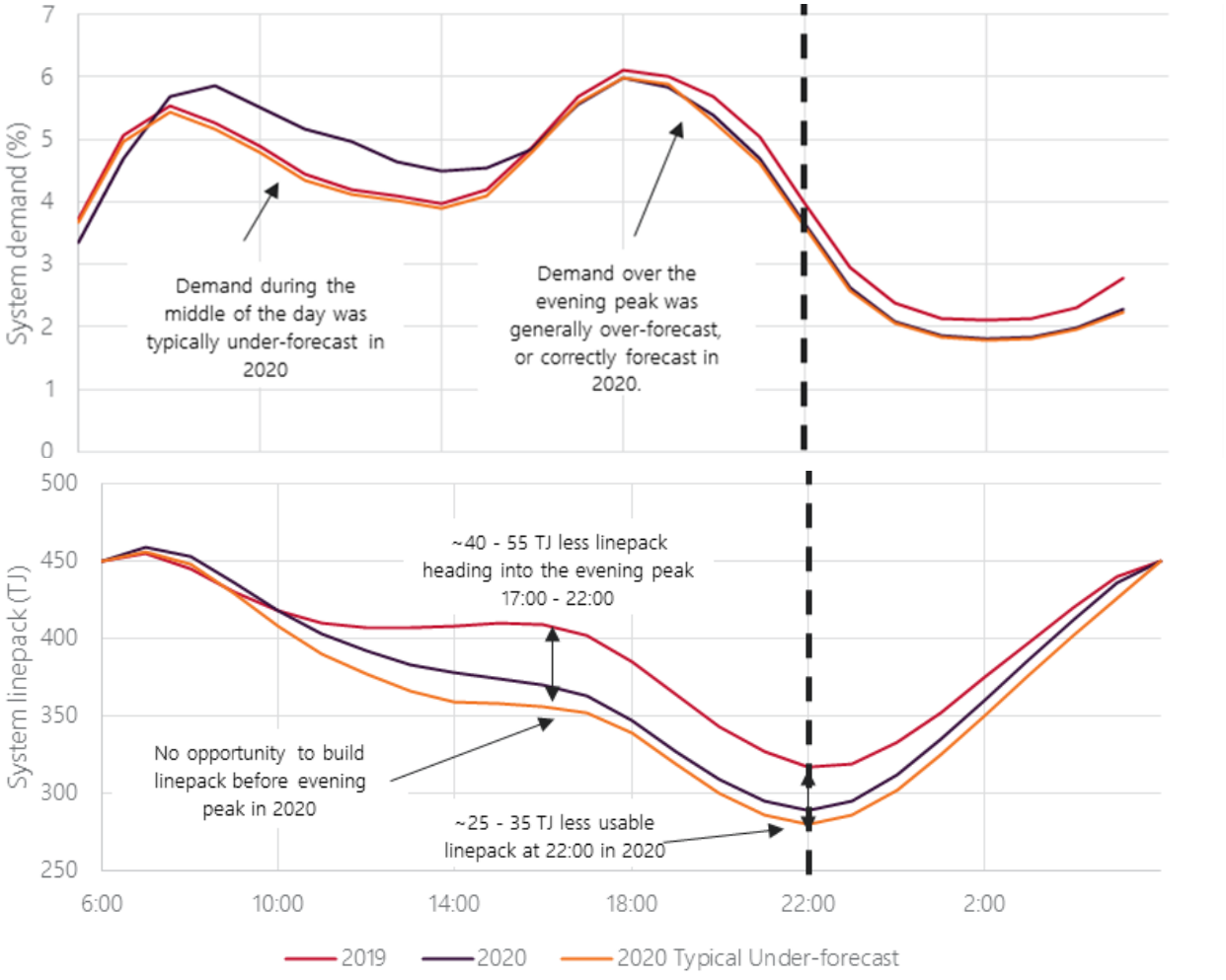
often lower than if the demand profile had been correctly forecast. This reduced usable system linepack heading into the evening peak demand period.

- A greater proportion of daily system demand occurred before 22:00 during winter 2020 compared to winter 2019. This reduced the usable system linepack by 25-35 TJ at 22:00[6] (injections are scheduled flat across the day).
- There was limited ability to build linepack during the middle of the day, even if the demand profile had been perfectly forecast, due to the increased weekday demands. Typical system linepack levels leading into the evening peak period were 40-55 TJ lower than in 2019, increasing the likelihood of peak shaving LNG being required.

AEMO anticipates that ongoing work from home arrangements during winter 2021 could result in system demand profiles that are similar to those encountered during winter 2020, particularly on high system demand days. AEMO therefore expects that high system demand days will have an increased risk of a threat to system security event occurring.

AEMO will continue to monitor the demand profile on high demand days and take appropriate actions to reduce operating risks, including increasing gas supply in accordance with the *Demand Override Methodology*[7] when necessary.

Figure 4 Top: Average 2020 demand profile where system demand was greater than 1,075 TJ Bottom: Impact on system linepack impact for a perfectly forecast, 1,100 TJ day for 2019 and 2020 demand profiles – the '2020 under-forecast' represents a 60 TJ forecast error at 06:00



[6] 22:00 is a critical time operationally, as it corresponds to the time of minimum system linepack, and therefore also minimum system pressure.

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

2.2 Low Iona Close Proximity Point (CPP)[8] injections and Brooklyn compressor reliability

Winter 2020 had lower levels of injections into the DTS than usual, due to increased supply from Queensland. Low injections on days with a system demand greater than 800 TJ resulted in an increased reliance on the Brooklyn compressors to support the total demand supplied from the SWP, Brooklyn – Lara Pipeline (BLP), and Brooklyn – Corio Pipeline (BCP). These pipelines mainly supply the Geelong and Western Transmission System (WTS) withdrawal zones, which is up to 20% of DTS system demand during winter.

Linepack management was also challenging due to lower useable linepack being available in the BLP and SWP, as these pipelines operate at lower pressures when Iona UGS is withdrawing gas due to the 7,400 kilopascals gauge (kPag) discharge pressure limit on the large compressors at the Brooklyn Compressor Station (BCS).

The Western Outer Ring Main (WORM), when constructed and commissioned, will enable the WORM, BLP, and SWP to operate at up to 10,200 kPag while Iona UGS is withdrawing from the DTS, which will increase available linepack and reduce this operating risk. This higher operating pressure will also increase the DTS' ability to support GPG operation, including the Newport and Laverton North power stations, during winter.

The conservation of linepack in the SWP prior to the morning and evening peaks will continue to be an essential aspect of AEMO's operations during winter 2021, particularly if similar conditions to winter 2020 arise. AEMO has procedures in place to ensure continued gas supply to Geelong and WTS withdrawal zones in the event of a Brooklyn compression outage. These procedures maintain the supply by reducing Iona UGS withdrawals then scheduling out of merit order injections at the Iona CPP to maintain system security.

In the event of reduced Brooklyn compression capacity during high system demand days (at least 1,110 TJ/d), compression to supply Ballarat is prioritised. At this level of system demand, there is expected to be sufficient net injections at Iona CPP into the SWP to reduce or negate the need for Brooklyn compression into the BLP and SWP.

2.3 Iona UGS inventory

Iona UGS inventory reached over 24.5 PJ during May 2021. This is a high storage level held at Iona and it is significantly more than the quantity held at the same time in 2020 (18.6 PJ).

AEMO will continue to monitor Iona UGS levels to ensure gas will be available through the May to September winter period. If storage is projected to empty before the end of winter, AEMO will communicate with industry and the Victorian Government to examine alternate supply options or gas usage restrictions. If storage was to empty before the end of winter and a peak system demand day then occurred, it could result in a gas supply shortfall.

It is expected that the Iona UGS inventory will be sufficient to meet participants' forecast supply requirements during winter 2021, provided that there are no major unplanned gas supply outages or extended periods of very high GPG demand.

2.4 Dandenong LNG inventory

Gas from the Dandenong LNG facility is injected in the DTS for three main purposes:

- Market response LNG, where market participants use LNG to manage imbalance positions or in response to high DWGM gas prices, as they would any other injection facility, to manage their gas supply portfolio.
- Operational response LNG, otherwise known as peak shaving gas, where AEMO schedules out of merit order gas (gas that is above the market price) to prevent breaches of critical system pressures, which would disruption supply to customers in distribution networks. Without operational response LNG there

[8] Iona CPP consists of Iona UGS, SEAGas, Otway, and Mortlake.

would be an increased need for gas curtailment, particularly GPG demand, in response to a threat to system security.

- Emergency response LNG that is used during an emergency caused by a major loss of supply or major transmission pipeline or equipment failure to support critical system pressures while curtailment of customer load occurs.

The Dandenong LNG facility can inject gas into the DTS at either a:

- Firm rate of up to 5.5 TJ/hr (100 tonnes per hour), or
- Non-firm rate of up to 9.9 TJ/hr (180 tonnes per hour).

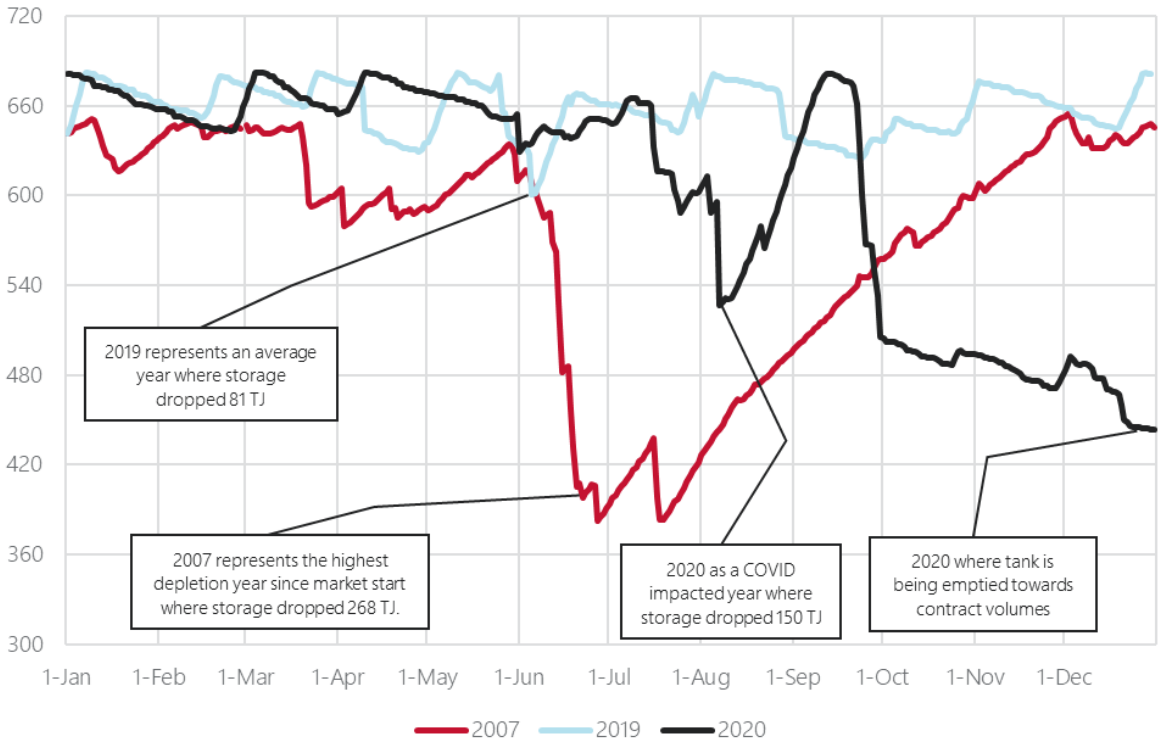
When used for operational response, LNG is not usually scheduled from the beginning-of-day, but is included in an intraday schedule for linepack management purposes (to prevent breaches of critical system pressures). LNG only effectively supports system pressures when injected before 22:00, which is when hourly system demand is greater than the rate of gas supply into the DTS (which causes linepack to be depleted).

At 22:00, the DTS linepack is at its lowest point and the hourly rate of supply is greater than demand (so linepack increases). Therefore, operational response LNG is not scheduled after 22:00. If operational response LNG was injected from the beginning of the gas day until 22:00, the maximum supply quantity during this 16-hour period is 87 TJ.

AEMO has observed[9] a decline in contracted Dandenong LNG levels to only 188 TJ of storage inventory and 4.5 TJ/hr of injection capacity. At these contracted levels, AEMO's ability to safely manage the DTS during the peak winter demand period and an emergency is adversely impacted. The reduced LNG quantity may limit the operational and market responses available, increasing the risk of gas curtailment.

Figure 5 shows several representative years for the utilisation of the Dandenong LNG facility. In 2020, the LNG inventory reduced by 150 TJ due to a combination of a few very cold, wet days and a high proportion of people working from home due to COVID-19 lockdown conditions (discussed in Section 2.1).

Figure 5 Historical Dandenong LNG storage utilisation



[9] See the AEMO Gas Bulletin Board for uncontracted capacity information, at https://www.aemo.com.au/energy-systems/gas/gas-bulletin-board-gbb.

The year during which inventories fell at the highest rate was 2007, when the tank level dropped by 268 TJ due to very high levels of GPG. This was due to drought conditions causing low hydro storage and coal-fired power station cooling water dam levels, and was exacerbated by a severe SWP capacity constraint (this was prior to the construction of the BLP).

It is essential that Dandenong LNG inventory is closely managed, as the refill rate is limited to approximately 6 TJ/d. This means it would take a week to recover the LNG inventory used during a moderate threat to system security event (around 40 TJ) or two smaller events (typically 20 TJ each).

If there was insufficient LNG inventory, gas load curtailment would be necessary to manage system pressures during periods of very high gas demand or following a gas supply disruption.

From the information provided by participants and modelling conducted for the 2021 VGPR, AEMO has identified that there is forecast to be insufficient Dandenong LNG inventory available for all operational and emergency scenarios, leading to an increased risk of curtailment during winter 2021 unless the LNG inventory was increased.

AEMO identified the low Dandenong LNG inventory as a threat to system security and sought a market response. AEMO is currently engaging with APA, market participants, and the Victorian Government to assess the options available to address this threat.

3. Resources for peak demand management

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 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[10]. 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[11].

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

Accurate forecasting of GPG demand for the day ahead schedules helps AEMO determine whether or not to initiate injection profiling. There were several days during winter 2020 where injection profiling was utilised. On 22 August 2021, operational response LNG still needed to be scheduled despite Longford injections being profiled, although the quantities of LNG required were lower than if there was no profiling.

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

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

If Longford injections had not been profiled, there was an increased risk that hourly LNG requirements would be above the availability of the LNG facility, increasing the possibility that curtailment of unforecast GPG could be required.

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 an appropriate amount of gas is scheduled to maintain a safe level of linepack reserve, and to maintain system security.

The override quantity is calculated based on the *Demand Override Methodology* and 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.

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 GPG demand monitoring

Monitoring DTS-connected GPG

Gas consumption by DTS-connected GPG units is monitored in real time through AEMO's Gas System Control and Data Acquisition (SCADA) system. GPG forecasts are obtained from site-specific forecasts submitted by market participants to AEMO and compared to the National Electricity Market (NEM) Pre-Dispatch scheduling system. AEMO monitors these forecasts to ensure they are consistent and that any known increase in GPG 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 GPG operation by:

- Monitoring NEM Pre-Dispatch and current GPG 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 GPG 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 GPG units having insufficient gas supply.
- Contacting participants to clarify the intended operation of their GPG units.

Operational response to unforecast GPG

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

- Update the total demand forecast in accordance with the demand override methodology to account for the forecast increase in GPG demand. Total demand includes system demand and GPG demand.
- Issue a *Notice of a Threat to System Security* if modelling indicates that an unforecast increase in GPG 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).
- Issue a direction to facility operators to inject additional gas into the DTS including non-firm gas, or issue DTS-connected GPG units with a *Direction to Curtail Load* In accordance with the *Gas Load Curtailment and Rationing and Recovery Guidelines*[12].

The four largest DTS-connected GPG power stations are able to 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 GPG units. The NEM Control Room may direct GPG units with alternative fuel supply to generate to maintain power system security.

Monitoring non-DTS-connected GPG

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 GPG demand through 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 SEAGas Pipeline flows and South Australian GPG demand.
- VicHub and TasHub supply into the LMP when the Tallawarra (as well as Bairnsdale) and Tamar Valley power stations (respectively) are operating.

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

Gas Supply Guarantee

The Gas Supply Guarantee[13] was instituted in response to commitments by production facility operators and pipeline operators to the Commonwealth Government to make gas available for GPG 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 2021.

The Australian Energy Market Commission (AEMC) is currently conducting a review to determine the future of the Gas Supply Guarantee.

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.

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

[13] More information available at https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Emergency-Management/Gas-Supply-Guarantee.

- Unforecast increases in GPG demand.
- Unscheduled DTS asset outage.
- A transmission pipeline incident and/or a gas supply incident.

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*[14]:

- Notify market participants of the threat. AEMO may also request 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 Engineer skills refreshing and training

AEMO has continued to develop and deliver training for the 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 CBL Framework and e-learning modules ensures 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, and 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.

4.2 Emergencies

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

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

(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[15]. 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 outline 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.

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.

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

Energy Safe Victoria power to issue directions

The Chairperson of Energy Safe Victoria (ESV) may also issue a direction that ESV considers is necessary for safety reasons. 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.

The Governor and the 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 reasonable requirements of the community. 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[16] 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.
- 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)*. 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*[17], 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.

Intervention

If AEMO reasonably considers that a threat to system security is unlikely to subside without intervention, AEMO must intervene by taking any measures it believes are reasonable and necessary to overcome the threat to system security, including making the following directions under s.91BC of the NGL:

- Injection of LNG.
- Increasing withdrawals.
- Using reasonable endeavours to inject gas which is available, including non-firm gas.
- Injecting off-specification gas.
- Curtailment[18] (in accordance with curtailment tables).
- Doing anything AEMO believes reasonably necessary in the circumstances.

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

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

[18] 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*, available at http://www.aemo.com.au/Gas/Emergency-management/Victorian-role.

4.4 Emergency communications

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*.