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VTS Demand Management

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Contents

1. Introduction 3

2. What is demand management? 3

3. System planning 4

4. Scope of demand management requirement 5

5. APA VTS engagement with retailers 6

6. Scope for Victorian GPG participation 8

7. Scope for non-Victorian GPG participation 11

8. Scope for large customer participation 12

9. Conclusion 13

1. Introduction

During stakeholder engagement and discussions with the Australian Energy Regulator (AER) on the VTS 2023-27 access arrangement proposal, there was a request for APA VTS to investigate the feasibility of using demand management as an alternative to investing capital in projects.

This document discusses investigations undertaken by APA VTS into the scope to undertake demand management as a possible option to avoid expansion related capital expenditure in the face of projected Victorian gas supply shortfalls.

2. What is demand management?

Demand management refers to implementing an activity that influences energy consumption by customers as an alternative to capital investment. The objective is often to curtail or smooth consumption during peak periods.

Demand management can take two forms:

- Management or curtailment by the system operator to address system security needs. In the National Electricity Market, AEMO has responsibility for system security and has a number of levers including: Lack of Reserve market notices; Reliability and Emergency Reserve Trader (RERT) contracts; and load shedding (this is the last resort).

  This is often referred to as “Command and control” demand management.

- Non-network solutions to meet capacity requirements (Economic- based measures). Non-network solutions include:
  - using price signals during peak periods to reduce demand during those times
  - paying connected customers to reduce energy consumption at a particular time.

  This is often referred to as voluntary, or “Economic” demand management.

In the context of an infrastructure network, demand management is the process of incentivising consumers to voluntarily reduce demand during peak periods as a mechanism to avoid or defer network augmentation expenditure. This reduction in demand may be achieved through informed consumer choice or direct contracting. The greater the success of voluntarily demand reduction, the less the need for involuntarily curtailment.

Efficient demand management occurs when, without compromising service standards and security of supply, the cost of incentivising users to reduce demand is lower than system costs arising from the avoided augmentation expenditure to meet the higher levels of demand.

3. System planning

APA VTS considers that demand management is best undertaken at a system planning level rather than an economic regulation price review.

The approach to VTS system planning is outlined in AEMO's April 2015 *Victorian Gas Planning Approach* document, and in the accompanying *Guidelines for the Determination of The Victorian Gas Declared Transmission System Capacity* (Document Ref: 312075).

The *Victorian Gas Planning Report* makes it clear that AEMO considers investigations of economic curtailment to be its responsibility. The planning methodology section of the Planning Approach document identifies the following steps:

- Establishing supply demand forecasts (step 1) ...
- Establishing planning criteria (step 2) ...
- Existing (and committed) transmission system (step 3) ...
- System adequacy assessment (step 4) ...
- Augmentation options and possible solutions (step 5)

  Where appropriate, AEMO evaluates potential solutions. This involves considering a number of options available to restore the system to a secure state, including:

  - Augmentations or upgrades to the gas transmission system.
  - Additional or new supply capacity and storage.
  - Economic curtailment.
- System modelling for detailed planning studies (step 6) ...

  Based on screening study recommendations, AEMO will select the key constraints identified over the next five years, and prepare a more detailed evaluation. The aim is to identify the economically efficient solution, and facilitate the required investment(s).

There is no further discussion of economic curtailment or demand management in the *Planning Approach* document.

While AEMO appears to assume responsibility for investigating economic curtailment opportunities in its *Victorian Gas Planning Approach*, there does not appear to be any empowerment for such activity in either Part 6 Division 2 (s91B *et seq*) of the *National Gas Law* nor in Part 19 (Rule 199 *et seq*) of the *National Gas Rules*.

In AEMO's September 2021 *Guidelines for the Determination of The Victorian Gas Declared Transmission System Capacity,* section 5.4.3 makes it clear that AEMO is responsible for preparing the CTM (Custody Transfer Meter) demand and profiles for the next ten years:

5.4.3 CTM Demand and Profiles

- The CTM Load Forecast file, produced by AEMO as part of the Annual Planning Review Process, shall specify the load and profile at each CTM point in the Common Model.
- The CTM Load Forecast file must specify the seasonal loads (summer, shoulder), 1 in 2 and 1 in 20 winter peak loads, including profiles at each CTM point for each proposed seasonal load, for each year of the next 10 years.

It is clear from the *Guidelines for the Determination of The Victorian Gas Declared Transmission System Capacity* that AEMO is responsible for investigating economic curtailment (demand management) in the context of the system planning approach, which then feeds into its CTM Load Forecast file. This information then forms the basis for any requirements to expand VTS capacity.

Our conclusion is that AEMO will consider demand management options in its approach to planning on the VTS, but that to date, demand management has not been a credible option.

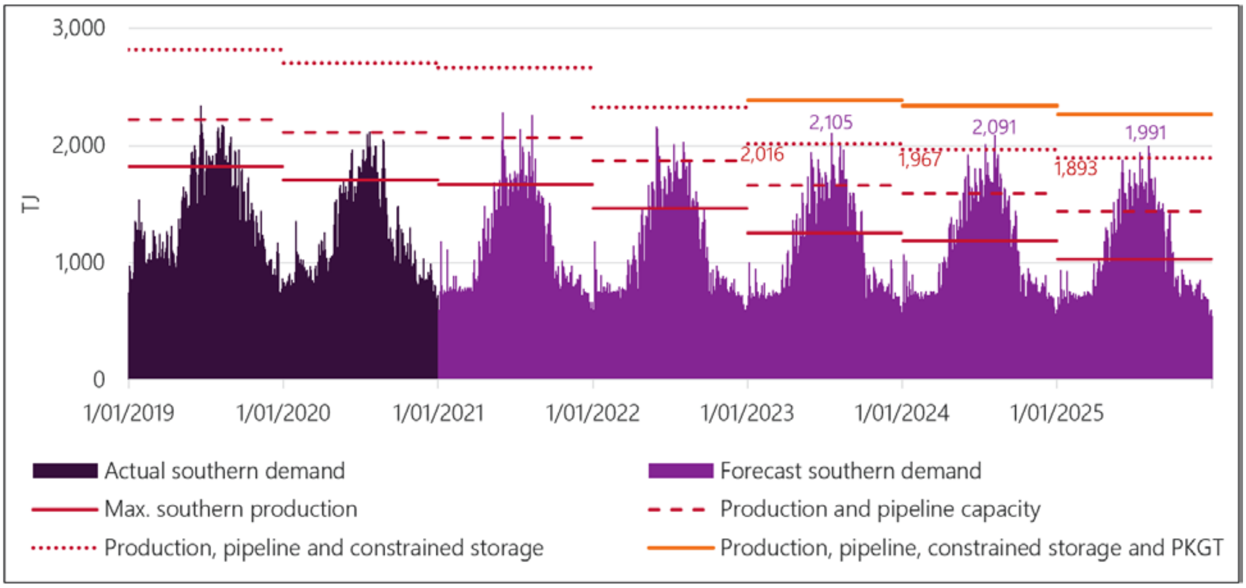
4. Scope of demand management requirement

Notwithstanding that investigation into economic curtailment is an AEMO responsibility, APA VTS sought to respond to stakeholder requests to consider demand management,

The first step was to work out how much gas demand would need to be voluntarily reduced using demand management. That is, what is the level of required participation for voluntary demand management to avoid involuntary curtailment.

Figure 1 of AEMO's 2021 *Gas Statement of Opportunities* (GSOO) indicates that, absent the Port Kembla Gas Import Terminal (PKGT), the forecast shortfall of southern production and pipeline capacity against peak demand is in the order of approximately 90-120 TJ/day:[1]

[1] We acknowledge that this analysis should be updated once the 2022 GSOO information is available.



Source: AEMO 2021 Gas Statement of Opportunities, Figure 1.

We have adopted the 'sans PKGT' forecast given that we are not aware of this project reaching Final Investment Decision.

In order for a demand management initiative to be useful in deferring or replacing the need for system augmentation, it will be necessary to be able to reliably achieve a demand response in the order of 100 TJ/day when called upon.

We then investigated how feasible it was to achieve a reduction in gas consumption of 100 TJ/day

5. APA VTS engagement with retailers

Notwithstanding that investigations into economic curtailment are clearly an AEMO responsibility, APA VTS engaged with the key retailers serving the Victorian Market. The purpose of this contact was to ascertain whether the retailers had any contracts with customers that featured scope for curtailment, so that APA VTS could "piggyback" on those contracts.

The response from the retailers was universally negative. The response is best summarised by the comments of a major retailer:

> *We are aware of the conflicting pressures facing the Victorian gas system, from declining production from Longford and, the Victorian Government's Net Zero 2050 program and the Gas Substitution Road Map, and the challenges these*

conflicting pressures create in the context of managing supply, demand, and investment.

[retailer] is unable to assist for the following reasons:

- *[retailer]'s current portfolio has very limited large C& I customers (our focus is at the lower end of C & I and in MM [mass market] which traditionally has less appetite and less ability to decrease demand); and*
- *Any contracts with large C&I customers are unable to be used to curtail supply in the way the AER has suggested.*

We would note that a retailer, who had this flexibility would be seeking to use this flexibility to manage its risk in the market and it is incentivised by the pricing in the market to do so. A fee is unlikely to be sufficient incentive or risk mitigation for a retailer to relinquish this flexibility.

Additionally, the relative size of the Gippsland Basin supply decline dwarfs the theoretical customer ability for demand reduction. Expansion of the SWP supports delivery of replacement gas and stored gas on a scale that is more consistent with the challenge presented by decline of supply from the Gippsland Basin.

Whilst it is [retailer]'s view that any mechanism to contract or incentivise demand reduction is unable to relieve the market need for expansion of the SWP for the reasons above, there is an opportunity to investigate:

- *a market mechanism, managed by AEMO and that participants access directly;*
- *customer/participant appetite for such mechanism; and*
- *the associated benefits to the market.*

In [retailer]'s view these type of mechanisms have been successful in other markets (RERT in the NEM) and warrant preliminary investigation. Further, this investigation should be undertaken by AEMO as the market operator.

As many of Victoria's retailers are also electricity gentailers, omitting retailers from the list of curtailment candidates also removes the scope to interrupt Victorian GPG loads.[2]

[2] This is analysed further in the next section.

6. Scope for Victorian GPG participation

The VTS serves six gas-powered electricity generation (GPG) units in Victoria:

- Loy Yang (LaTrobe zone);
- Laverton North (Metro NW zone);
- Somerton (Metro NW zone);
- Valley Power (LaTrobe zone);
- Jeeralang; (Tyers zone); and
- Newport (Metro NW zone).

The Mort Lake Power Station is also in Victoria, but is not served from the VTS.[3]

GPG units can be large gas consumers, and at first glance may be seen as good candidates for demand management activity.

However, GPG demand can be quite variable, as it is driven by conditions in the electricity market rather than conditions in the gas market. Curtailment of a GPG unit may have a significant impact on the electricity market, and would clearly need to be coordinated by AEMO as operator of both the electricity and gas markets.

In 2021, GPG demand on the top ten peak gas days was as follows (this data is public):

	1	2	3	4	5	6	7	8	9	10
Vic GPG	22/07/2021	23/07/2021	17/06/2021	21/06/2021	22/06/2021	8/07/2021	16/06/2021	9/07/2021	20/07/2021	15/06/2021
M071 MORWELL (LOY YANG)	0.01	0.01	0.02	0.02	0.02	-	0.02	-	0.00	0.02
M102 JEERELANG	-	2.69	41.21	36.26	24.66	-	25.28	3.05	3.03	36.24
M103 NEWPORT	43.75	49.48	95.29	74.53	58.35	31.42	74.25	53.13	2.49	86.91
M134 LOY YANG	-	0.01	15.74	18.59	-	-	22.01	-	0.06	-
M135 AGL SOMERTON	9.61	25.21	18.65	12.85	12.19	12.89	10.83	10.32	-	7.32
M143 SNOWY HYDRO	0.03	29.48	49.00	40.29	0.13	0.00	35.63	0.00	0.00	63.28
Total	**53.40**	**106.88**	**219.90**	**182.53**	**95.35**	**44.31**	**168.01**	**66.50**	**5.59**	**193.76**

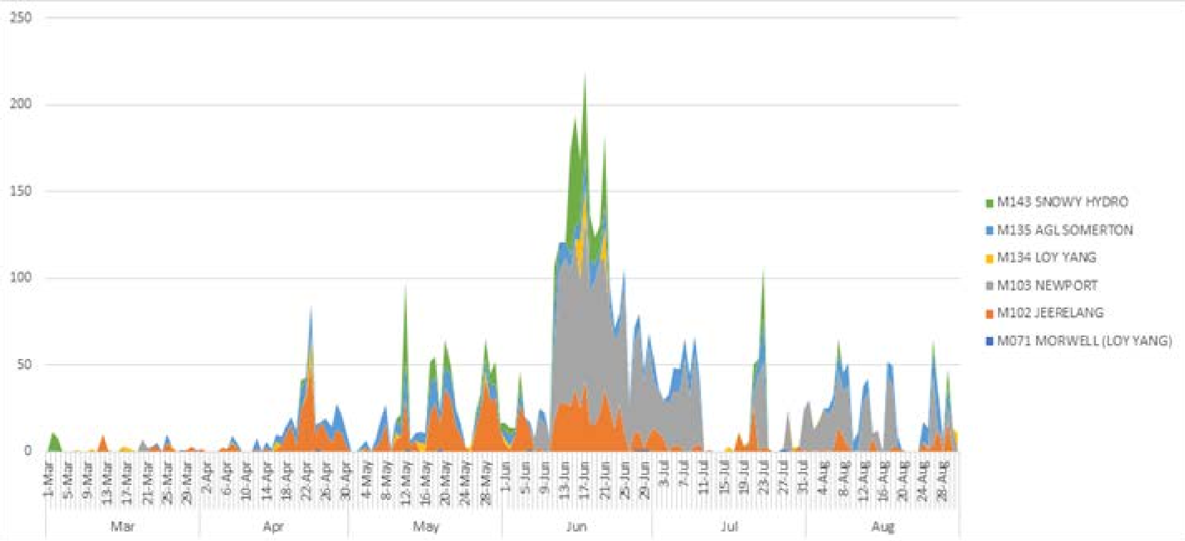
A review of this data reveals:

1. System-wide GPG demand is quite variable. Had the entire Victorian GPG fleet been curtailed on 20 July 2021, only 5.6TJ of gas would have been able to be diverted to the gas market.

2. Different power stations contribute to total GPG consumption to different extents on different days. While Newport Power Station is generally the largest contributor, the top GPG gas consumer on 20 July 2021 was Jeeralang Power Station. Jeeralang's contribution ranged from 2.69TJ on 23 July 2021 to 41.2TJ on 17 June 2021.

[3] It should be noted that any gas supply made available by curtailment of the Mort Lake Power Station would also face the constrained capacity of the South West Pipeline.

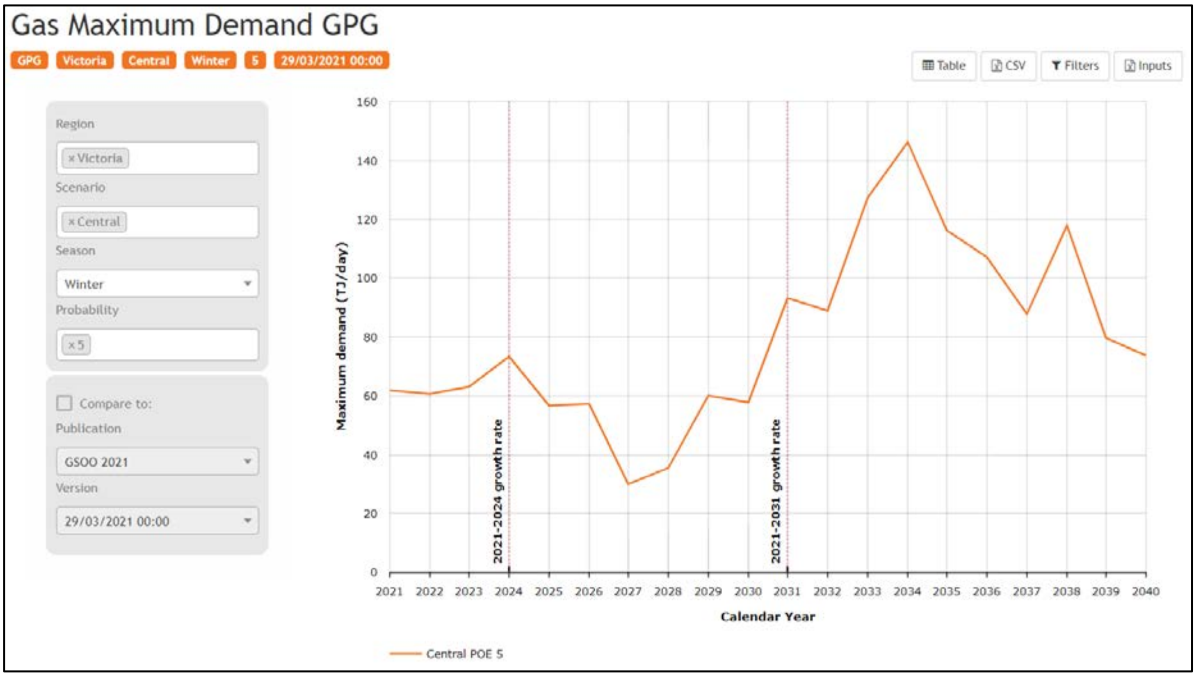
This data should be interpreted with caution. APA VTS understands that GPG demand was relatively high in winter 2021 due to a number of coal-fired electricity generation plant closures.[4]



Source: AEMO Gas Bulletin Board data.

The winter 2021 data may overstate the scope for GPG to contribute to gas system demand management, particularly in comparison to the AEMO 2021 GSOO forecast of 1-in-20 GPG peak demand over the 2023-27 access arrangement period:

4 See https://www.afr.com/companies/energy/flooding-hits-yallourn-coal-power-as-callide-unit-returns-20210616-p581o0 and https://www.afr.com/companies/energy/cs-energy-cautious-over-return-of-callide-station-as-power-price-spike-20210713-p5898o.



Source: AEMO Forecasting Portal

A key issue to consider is the relative size of the incentive to
1) reduce peak demand in the gas market vs
2) generate peak supply in the electricity market.

The incentive offered to encourage gas-fired power generators to curtail gas consumption would need to reflect the revenue they would forego by not generating into the electricity market.

With the gas market cap Value of Lost Load (VOLL) at $800/GJ and electricity VOLL at $15,300/MWh, and assuming an energy conversion rate of 11 GJ/MWh, the value of gas VOLL, in energy equivalent terms, is 57% of the value of electricity VOLL. If both markets were constrained to the market cap, a GPG user would choose to consume gas at VOLL and produce electricity at VOLL, rather than reduce its generation output to reduce its gas load.

On balance, we find that, due to:

- the variability of the GPG load;
- the inter-market complexity associated with curtailing GPG load; and
- the poor financial incentives for GPG to reduce gas usage rather than generate electricity,

curtailing GPG loads is not a viable demand management option.

7. Scope for non-Victorian GPG participation

We also discussed with the AER, prior to lodgement of our access arrangement proposal, the scope to engage in discussions with Origin Energy to curtail the Uranquinty power station on peak demand days.

When the Uranquinty power station is operating, the associated gas pipeline pressure drop restricts the amount of gas that can enter the VTS from Culcairn. Interrupting the Uranquinty power station would allow the Young-Culcairn section of the Moomba Sydney Pipeline to maintain pressure, which would allow more gas to enter the VTS from Culcairn (including the gas that Origin Energy would have consumed by running the power station).

While APA's commercial experts appreciated the nimble thinking, there were many barriers to such an arrangement, not the least of which being AEMO concerns on whether there is enough gas available to serve both NSW and Victoria peak days, despite any curtailment of the Uranquinty power station.

There were also significant uncertainties surrounding AEMO's powers to curtail an electricity generator to manage a gas shortfall; and moreover, AEMO's powers to curtail an electricity generator in NSW to manage a gas shortfall in Victoria.

From Origin Energy's perspective, the Uranquinty power station tends to operate when pool prices are very high. If the Uranquinty power station were to be curtailed, Origin Energy would then need to buy electricity from other producers, possibly at VOLL, in order to meet its supply obligations. It is difficult to understand how Origin Energy could be encouraged to curtail production under those circumstances.

APA's commercial team was not comfortable having a discussion with Origin Energy on this proposal, given the strategic importance of the Uranquinty power station to Origin Energy's electricity supply portfolio. APA provided contact information to enable the AER to engage with Origin Energy directly on this matter. We are not aware as to whether any such discussions occurred, or the outcome of any such discussions.

In terms of whether Uranquinty curtailment would be an economically superior option, a high-level calculation indicates that, if the plant were operating at its 640MW capacity, and we had to pay VOLL[5] to induce it to curtail (noting that Origin Energy may then need to purchase electricity at VOLL to meet its contractual obligations) the cost to curtail would be [640MW x $15,300/MWh] $9.792 million per hour. ***The cost of curtailing Uranquinty at VOLL for only 10 hours***[6] ***would***

5 We acknowledge that there is scope for sensitivity analysis on this assumption in the context of the high-level calculation.

6 Note that this would not need to be 10 *contiguous* hours – it could be 4 curtailments of 15 minutes each over each the next ten years to achieve the same result.

overwhelm the required capex to complete the WORM and would be greater than the cost of expanding the SWP.

Moreover, at an energy conversion rate of 11.15GJ/MWh (AEMO), this would only increase supply to the VTS by approximately 7.1 TJ/hour.

Therefore, the potential cost of implementing this form of demand management is likely to be greater than the cost of completing the WORM and investing in the proposed South West Pipeline expansion.

Finally, we note Uranquinty power station did not consume significant amounts of gas on many of the top ten peak days in 2021. APA interrogated its systems to ascertain the total Uranquinty Power Station deliveries on the top ten system peak days in 2021 (the AER has been provided this information, confidentially):

	22/07/2021	23/07/2021	17/06/2021	21/06/2021	22/06/2021	8/07/2021	16/06/2021	9/07/2021	20/07/2021	15/06/2021
Total Uranquinty Deliveries	(redacted)	(redacted)	(redacted)	(redacted)	(redacted)	(redacted)	(redacted)	(redacted)	(redacted)	(redacted)

On four of the top ten system peak days in 2021, Uranquinty Power Station consumed less than (redacted)TJ of gas. In a demand management context, the variability of GPG loads suggests that this may not be a reliable source of load reduction.

8. Scope for large customer participation

Apart from the GPGs, relying on large Tariff D customers to curtailment would not be practical in terms of volume requirements (there are not many Tariff D customers over 1 TJ/d) which means a large number of customers may have to participate, simultaneously, for any effective curtailment. Furthermore, depending upon their usage of gas, their ability to curtail at short notice may not be viable.

APA VTS conducted an analysis of the volumes consumed by VTS customers on the top ten system peak days of 2021, shown below.

(Note to readers – the confidential version of this document provides the AER with peak day consumption information by customer. As this is commercially confidential information, this public version includes a summarised form of that table, below.)

Omitting retailers and GPG as discussed above and omitting two glass manufacturers due to the requirement for 24/7 supply leaves a small number of large customers that could be considered to be candidates for demand management. From those remaining customers on the list, it is clear that:

1) there is no single large customer that could provide a sufficiently large demand response to avoid WORM augmentation or SWP expansion;

2) some of these customers are not necessarily taking gas on the peak days;

3) a significant number of VTS industrial customers would need to be engaged and willing to simultaneously reduce consumption on the peak days in order for demand management to be a viable option.

The transaction costs, complexity of execution, and risks of a sufficient number of large users being able or willing to simultaneously reduce consumption on the peak days, renders this possibility unworkable.

	1	2	3	4	5	6	7	8	9	10
company_name	22/07/2021	23/07/2021	17/06/2021	21/06/2021	22/06/2021	8/07/2021	16/06/2021	9/07/2021	20/07/2021	15/06/2021
Retailer (count = 30)	1,112.60	1,098.30	1,137.44	1,103.07	1,049.10	1,101.66	1,090.91	1,061.26	1,107.24	1,049.87
Industrial (count = 15)	83.29	84.46	87.70	92.41	85.35	98.95	87.30	103.66	88.42	88.79
Total	1,195.88	1,182.76	1,225.14	1,195.48	1,134.45	1,200.61	1,178.21	1,164.92	1,195.66	1,138.66

9. Conclusion

In summary, under current circumstances, demand management is not a viable option to avoid or defer the proposed security of supply-related expansion capital expenditure for the VTS.

Our investigations have found that demand management is not efficient under current market arrangements:

- the potential cost of implementing demand management is greater than the cost of investing in the WORM and proposed South West Pipeline expansion.

- the transaction costs, complexity of execution, and risks of an insufficient number of large users being able or willing to simultaneously curtail consumption on the peak days, renders this option unworkable and possibly ineffective.

APA VTS would support the AER/ AEMO undertaking a review into the potential for future demand management in the DWGM, taking into account:

- whether demand management is feasible under the market carriage framework and
- the role that AEMO and other parties can play in demand management.

However, until a framework for demand management is conceived, curtailment and demand management is not considered a viable option as an alternative to the WORM or the expansion of the South West Pipeline.