Zincara

From strategy to action

Capital Expenditure Review
Western Outer Ring Main
South West Pipeline

Public

Prepared for

AUSTRALIAN ENERGY REGULATOR

Date 2022/06/08

Zincara P/L

11 Alexandra Street

St Kilda East 3183

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Report prepared by:	Brian Fitzgerald
Reviewed by:	Ed Teoh

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1. EXECUTIVE SUMMARY

In December 2021, APA submitted its revised Access Arrangement (AA) for its Victorian Transmission System (VTS) for the period from 1 January 2023 to 31 December 2027 to the Australian Energy Regulator (AER). To assist in the capital expenditure review, the AER engaged Zincara P/L (Zincara) to advise on the augmentation projects related to the South West Pipeline (SWP), Western Outer Ring Main (WORM) and APA's Rule 80 applications.

The focus of Zincara's assessment is to advise the AER on whether the projects meet the requirement of the National Gas Rules (NGR) and in particular Rule 79. We have based our assessment on APA's submission and related documents and Australian Energy Market Operator's (AEMO) Gas Statement of Opportunities (GSOO) and the Victorian Gas Planning Report Update (VGPR). We have also taken into consideration, submissions from other stakeholders such noted in section 4.3.1 of this paper.

The results of our assessment consist of the following sections:

- AEMO Forecasts
- South West Pipeline
- Western Outer Ring Main
- Rule 80 Submissions

Summary of AEMO Forecast

AEMO's 2022 GSOO and VGPR supply-demand forecasts show that with the declining production from Longford, there will be an increasing reliance on "committed" and "anticipated" supply projects. With the difficulty in determining how the market will move to a net zero emission by 2050, AEMO has put forward two consumption forecasting scenarios:

- Step Change to reflect a rapid move away from gas utilisation.
- Progressive Change to reflect a more business as usual decline in consumption.

On the supply side, there is also uncertainty on the number of gas supply projects. As such, AEMO forecasts the risk of peak day shortfalls from 2023. This is compounded by the likelihood of production facility maintenance shutdowns and unforeseen infrastructure outages, with little or no resilience in the VTS to enable AEMO to effectively manage the system during these events.

While the 2022 GSOO and VGPR show an improved supply forecast from its 2021 forecasts, the reports also identify increasing peakiness in peak day demand, requiring flexible supply such as that available from Iona Underground Storage (UGS). The current SWP injection capacity constraints limit the ability of AEMO to effectively manage the peak demand events.

Analysis of peak day supply adequacy using "existing" and "committed" supply along with "Progressive Change" demand scenario, shows that the supply-demand balance is tight throughout planning period with the risk of supply shortfalls towards the later years with the forecast showing 2025 (6 TJ shortfall) and 2026 (130 TJ shortfall). Under the "Step Change" scenario, there is no shortfall in the forecast period.

There are a number of "anticipated" and "potential" supply projects identified in the reports that can be expected to provide adequate annual supply to meet the declining demand. However, significant peaks due to gas generation, infrastructure outages or weather related will require flexible and rapid supply response that can be provided by Iona UGS/SWP, linepack and Dandenong LNG.

Given the level of uncertainty in the supply situation, we have adopted the Progressive Change scenario in our analysis. Based on our analysis of the currently available supply-

demand forecast information we consider it prudent to address the injection capacity of the SWP to ensure increased gas supply can be injected into the VTS to meet these periods of high gas demand thereby preventing or minimising the potential shortfalls and restore a level of resilience to the VTS.

South West Pipeline (SWP)

The SWP runs from Port Campbell, in western Victoria to the Brooklyn City Gate in Melbourne's west. At the western end it takes supply from gas fields in the offshore Otway Basin, connects to the SEAGas pipeline to send gas west to Adelaide and also connects to the Iona underground gas storage (UGS) facility.

Iona UGS' core operation involves injecting natural gas into storage during low demand periods and withdrawing the gas to meet high demand periods, including gas powered generation and especially during the winter months in Victoria (and South Australia). Iona's role helps the underpin energy security and likely to help smooth out extreme price events.

The SWP is a bi-directional pipeline, with one compressor located at Winchelsea, midway along the pipeline. It transports gas from the Victorian Transmission System (VTS) to Port Campbell to refill Iona UGS and to flow to South Australia via the SEA Gas Pipeline. During the winter months and peak demand periods the stored gas is injected into the VTS via the SWP.

The SWP eastbound injection capacity (ie into the VTS) is currently limited to 445 TJ/d. After completion of the WORM (expected 2023), injection will increase to 468 TJ/d. The Iona UGS has a standing injection capacity of 530 TJ/d which is shared between the VTS and SEAGas pipeline.

Iona UGS along with the SWP provide AEMO with a flexible management of the gas balance. It also enables AEMO to manage supply during events such as planned and unplanned outages, and production facility maintenance.

APA has submitted a Business Case[1] to upgrade the SWP facilities to increase injection capacity to 570 TJ/d, matching Iona UGS capacity. This is a 102 TJ/d increase (post WORM) project of additional supply to the VTS predominantly during the winter peak. It should be noted that APA has prepared its business case on the basis of Lochard Energy achieving FID to increase injection capacity of Iona UGS to 570 TJ/d. This capacity having been developed by a consortium of east coast gas market participants.

APA has submitted this proposal under the criteria of Rule 79(2)(c)(ii) and (iv), that is, the South West Pipeline investment is required for integrity of services, and to maintain the capacity to meet existing levels of demand for services.

APA had considered a range of options and its preferred solution is to install two compressors on the SWP, at Stonehaven (in 2024) and Pirron (in 2025 due to time required to acquire land). Works will also be required to the existing Winchelsea compressor to de-bottleneck high pressure drops across the suction and discharge headers due to higher flows. Also, an upgrade of Brooklyn City Gate to enable increased flowrates into the Melbourne transmission network. The capital expenditure is shown in the following table:

Table 1-1: SWP 570 project – capital expenditure ($millions)

Preferred Option	Estimate	2023	2024	2025
Brooklyn CG and Winchelsea Aftercooler bypass	3.6	-	3.6	
Stonehaven CS	42.0	24.0	18.0	
Pirron CS	45.2	10.5	27.9	6.8
Total	**90.9**	**34.5**	**49.6**	**6.8**

(Source: IR001: Q5.3 – SWP cost breakdown – preferred option)

[1] Business Case 601: South West Pipeline expansion – Iona 570 TJ/d injection

A recurring theme during our analysis is the uncertainty for both supply ("existing/committed" and "anticipated"/"potential") and demand ("progressive change"/"step change"). While the current supply situation is deteriorating, largely due to the declining production from Longford, there are a range of "anticipated" and "potential" supply projects that could restore resilience to the VTS. The uncertainty of supply lies in which projects may progress to production, when that might occur and, in particular, what level of flexibility they provide to AEMO in managing peak day demand events.

Notwithstanding the uncertainty in the supply-demand balance, we concluded that it is prudent to increase the injection capacity of the SWP to provide additional resilience to the VTS. However, the uncertainty of the supply-demand balance means that we could not determine exactly the level of capacity necessary. We do believe that the driver for APA's option of two compressors is to match the Iona UGS supply capacity which is not necessarily to maintain the level of service (Rule 79) which its submission is based on.

After investigating the range of options including an additional compressor at Winchelsea (favoured by AEMO) and with the supply-demand balance uncertainty, we can only recommend the acceptance of one compressor option at this time. In addition, given the range of options for the single compressor, we do not propose to recommend one single option but to recommend that the AER make capital investment provision in the order of $45million for one compressor in its Draft Decision. This recommendation allows for future staged expansion as supply-demand uncertainties become clearer.

Western Outer Ring Main (WORM)

The Melbourne inner ring between Dandenong, to Melbourne's east, and Brooklyn, to Melbourne's west, operates at 2.760 MPa, for safety reasons, as it goes through the Melbourne CBD high consequence area. As a result, it is constrained as to the capacity to move large volumes of gas between the east and west. The proposed WORM is to provide a higher pressure link main around Melbourne (up to 10.2 MPa), hence removing the bottleneck.

In its 2017 submission APA proposed[2] a 49 km (500 mm diameter) pipeline interconnection between Plumpton and Wollert (noting that a short 8.3 km section of the WORM had been laid between Rockbank and Plumpton in 2012)[3]. The WORM is a bi-directional pipeline. The WORM project also included:

(i) installation of an additional compressor (WCS6 – Centaur 50) at Wollert Compressor Station B and
(ii) new interconnecting Pressure Reduction Station at Wollert, connecting the Brooklyn Lara Pipeline (BLP) to the Pakenham-Wollert Pipeline.

The WORM was accepted in AER's 2017 Final Decision of the 2018-22 Access Arrangement for APA, with capital expenditure of $127 million ($2017) and planned completion by Q1 2021. The project was justified based on the need to maintain system security.

In its updated business plan, APA has indicated that the capital expenditure for the project has now increased to $184.8million as shown in the table below.

Table 1-2: WORM project: capital expenditure ($ millions)

	2018 - 2021	2022	2023	2024	Total
WORM	44.8	91.0	46.3	2.8	184.8

(Source: WORM business case update: Table 4: March 2022)

[2] Business Case 506: April 2017 supplement to initial AA proposal
[3] Note: updated business case shows WORM will now be 50.1 kilometres.

Largely due to a requirement to prepare an Environment Effects Statement the project has been significantly delayed with completion now expected in Q2 2023. Requirements arising from the environmental study, land approvals processes, along with procurement and construction tendering processes have all seen cost increases, with the current estimate of capital expenditure being $185 million.

At the AER's request, APA provided a revised business case which included an assessment to cancel the WORM project and also the potential to utilise demand management instead of the WORM. We have reviewed these scenarios and agree with APA that they are neither prudent nor efficient.

Our assessment of the WORM project shows that it will provide significant benefit in the operation of the VTS including:

- Unlocking capacity to and from Port Campbell;
- Security of supply in the event of temporary loss of supply from production facilities or infrastructure across the VTS;
- Improved operability of the VTS by increasing available system linepack and adding the ability to transfer linepack between pipelines that are currently disconnected;
- Reducing reliance on the aged and congested Brooklyn Compressor site;
- Providing increased capacity and gas flow flexibility to optimise any new sources of gas supply

In spite of the significant cost increase, we consider that the WORM project remains prudent and efficient as was the case when it was initially accepted as part of the 2018-22 access arrangement.

Rule 80 Business Case 602 SWP Expansion – Iona 670 TJ/D

Lochard Energy owns the Iona UGS at Port Campbell. This storage facility provides the flexibility to be filled during periods of lower demand and then provide capacity to inject this gas into the VTS during periods of high demand. In December 2020, Lochard Energy achieved FID to increase the Iona UGS injection capacity to 570 TJ/d by January 2023.

Lochard Energy is currently considering a proposal to increase the Iona UGS injection capacity to 670 TJ/d and increasing their storage to 30 PJ by Q4 2024, subject to achieving Financial Investment Decision (FID) in Q3 2022.

APA has prepared a Business Case 602 to further expand the SWP to allow more gas from Iona UGS to be injected into the VTS, matching the injection capacity being proposed for Iona UGS. As this proposal has not achieved FID, APA is submitting this business case under Rule 80.

APA considered three options with the preferred option to lay 74km of 20inch pipeline looping. Other works associated with the proposal include restaging of the Winchelsea compressor and further upgrade of the Brooklyn City Gate and Brooklyn Lara City Gate. The pipeline would be constructed to be hydrogen ready.

In our assessment of APA's proposal to increase injection capacity on the SWP to 570 TJ/d we noted that AEMO sees the flexibility, and rapid response capabilities of Iona UGS, in addressing peak demand events as becoming increasingly important in coming years. However, there are a number of anticipated and potential supply projects that may (or may not) proceed to production and therefore the level of Iona UGS injection capacity is very uncertain. It is made more complex given the fact that there are two potential LNG terminal supply options currently under consideration that would have a direct impact of Iona UGS' ability to injection freely into the VTS.

This project has been categorised as a "potential" supply in AEMO's 2022 GSOO and VGPR. While acknowledging that this project has an extended lead time of 4-5 years, we

consider that there is too much uncertainty regarding demand and supply at this time. We also note that the AER decision relating to APA's proposal to increase SWP injection capacity to 570 TJ/d would need to be fully resolved before consideration of this proposal. This project also requires extensive capital investment of $216 million. As such, at this stage, we are not able to recommend that this project is currently prudent and efficient.

Rule 80 Business Case 603 LNG Import Terminal Connection to SWP

There are currently two LNG import terminal projects undertaking investment (FEED) studies to connect to the SWP around the Geelong area. Viva Energy and Vopak are proposing to connect at Lara/Avalon and may achieve FID later in 2022 and targeting supply from 2024. Both projects propose injection capacity of up to 500-600 TJ/d from their facilities. Given the timing of these LNG projects, APA has prepared a business case and submitted to the AER for consideration under Rule 80.

APA's business case recommended option is to upgrade Brooklyn City Gate and Brooklyn Lara Pipeline City Gate, which would allow higher flows to be supplied to the VTS should either one of the projects connect to the VTS. The upgrade of the Brooklyn facilities is the minimum capital expenditure required to increase the SWP by approximately 252 TJ/d (post WORM), to allow up to 720 TJ/d to be injected into the SWP. The proposal assumes that the augmentation of the SWP by installing compressors at Stonehaven and Pirron has occurred. The capital expenditure is $14.8 million.

On face value the establishment of an LNG terminal at Geelong / Laverton could provide significant supply of natural gas to the VTS, subject to frequency of ship deliveries. However, uncertainty lies in the timing and frequency of these deliveries, along with complexities of having Iona UGS and the LNG terminals injecting into the same pipeline (SWP) which currently does not have the capacity to allow full injection rates from both facilities at the same time. This presents significant issues in the declared wholesale gas market processes to be able to optimise LNG and Iona UGS injections to the satisfaction of market participants.

The location of these LNG terminals is such that they will connect to the SWP resulting in constraint of Iona UGS gas flows when the vaporised LNG is injected into the SWP. As a result, the full benefits of Iona UGS and LNG terminal injection capacities would not be realised without significant capital expenditure investment in infrastructure such as pipeline looping, which in the current climate of supply-demand uncertainty would not appear to be prudent and is not proposed by APA at this time.

Given the issues relating to constraints with injection capacities, particularly from Iona UGS, and complexities associated with wholesale gas market processes in this instance, we do not recommend accepting this project until the multiple supply situation is clearer.

2. INTRODUCTION

2.1 BACKGROUND

In December 2021, APA submitted its revised Access Arrangement (AA) for its Victorian Transmission System (VTS) for the period from 1 January 2023 to 31 December 2027 to the Australian Energy Regulator (AER). To assist in the capital expenditure review, the AER engaged Zincara P/L (Zincara) to advise on the augmentation projects related to the Western Outer Ring Main (WORM), the South West Pipeline (SWP) and APA's Rule 80 applications.

2.2 SCOPE

The focus of the review is to advice the AER on whether the projects meets the requirement of the National Gas Rules (NGR) and in particular Rule 79:

Specifically, Zincara is to give regard to all relevant matters including:

- the AER's decisions in the current and past access arrangement periods in relation to the expenditure
- APA's actual expenditure on the SWP and WORM
- AEMO's and APA's demand forecasts
- Material submitted as part of the APA VTS 2023-27 Access Arrangement, including business cases, information request response and submissions.

2.3 NATIONAL GAS RULES (NGR)

The relevant section[4] of Rule 79 New Capital Expenditure states:

(1) Conforming capital expenditure is capital expenditure that conforms with the following criteria:

(a) the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services; and
(b) the capital expenditure must be justifiable on a ground stated in subrule (2); and
(c) the capital expenditure must be for expenditure that is properly allocated in accordance with the requirements of subrule (6).

(2) Capital expenditure is justifiable if:

(a) the overall economic value of the expenditure is positive; or
(b) the present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure; or
(c) the capital expenditure is necessary:

(i) to maintain and improve the safety of services; or
(ii) to maintain the integrity of services; or
(iii) to comply with a regulatory obligation or requirement; or
(iv) to maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or

[4] NGR v59

Rule 79, however, does not define the prudence, efficiency and good industry practice. As such, Zincara has adopted the following definitions:

"Prudence", means "*caution in managing one's activities to avoid undesirable consequences*[5]*".* Zincara has interpreted this to mean that for the project to be prudent, the decision is made on the basis that it is timely for the project to proceed to rectify ongoing safety and reliability issues.

'Efficiency' means *functioning or producing effectively and with the least waste of effort*[5]*.* This means that the choice of which option to adopt for the project must be made on the basis that the most effective solution has been adopted. The "least amount of effort" refers to the cost of the project and in that context the project must be carried out at market rates.

"Good industry Practice" means that the actions that a prudent operator would adopt in similar Australian conditions.

The relevant section of Rule 80 of the NGR states:

(1) The AER may, on application by a service provider, make a determination to the effect that, if capital expenditure is made in accordance with proposals made by the service provider and specified in the determination, the expenditure will meet the new capital expenditure criteria.

In regard to APA's Rule 80 application, Zincara's role is to assist the AER in making its determination on whether the expenditure meets the requirements in accordance with Rule 79.

2.4 APPROACH

The key steps of our approach are:

- Review the relevant documents provided by APA in its submission.
- Analyse AEMO's forecast in GSOO and VGPR.
- Evaluate comments from various stakeholders.
- Identify what are the strategic objectives for each project.
- Determine whether the most efficient option has been adopted and the appropriateness of the timing of the project.

Zincara's analysis is based on the APA's submission and Zincara has assumed the data to be accurate. Zincara has not verified the accuracy or veracity of the data.

2.5 STRUCTURE OF THE REPORT

The following sections of the report covers:

- Australian Energy Market Operator's (AEMO) Forecasts
- South West Pipeline (SWP)
- Western Outer Ring Main (WORM)
- Rule 80 Submissions

[5] Australian Concise Oxford Dictionary

3. AEMO FORECASTS

With respect to supply/demand forecasts, each year AEMO publishes its Gas Statement of Opportunities (GSOO) and Victorian Gas Planning Report (VGPR). This analysis refers to the recently published 2022 GSOO and 2022 VGPR Update.

3.1 2022 GAS STATEMENT OF OPPORTUNITIES (GSOO)

In the 2022 GSOO, AEMO said that the gas sector is transforming as Australia transitions to a net-zero-emission economy. As such, future gas needs are highly uncertain. AEMO then said that in the short term, new greenfield infrastructure solutions are unlikely to be operating in time for the earliest identified risk of gas shortfalls in 2023. AEMO also said that since last year, some producers are now expecting more short-term south-eastern supply and more pipeline capacity to move gas to the south-east has been committed but it does not remove the risk.

For the longer term, AEMO's commented[6] :

"*Longer term, annual domestic gas consumption is forecast to fall as consumers shift from gas to electricity or zero-emission fuels, but there are forecast to be peak winter days where gas demand may exceed supply.*

- *With forecasts showing increasing peakiness and volatility, as gas generation in the NEM plays its firming role for VRE, flexible solutions will be needed to cost-effectively cover peaks that are significant but infrequent.*
- *Existing, committed, and anticipated supply, including anticipated LNG imports, is forecast to meet declining domestic gas consumption until 2033, in the Step Change" scenario stakeholders consider "most likely". New gas sources will then need to become available to meet forecast consumer needs".*

In the GSOO report and also the VGPR, AEMO has outlined these forecasting scenarios:

- "Step Change" assumes tangible and rapid change, with gas demand declining quickly and significant electrification (users switching from gas to electricity). The VGPR[7] notes that in this scenario the Victorian gas consumption is forecast to decrease by 16.8% and peak day demand decreasing by 18%;

- "Progressive Change" assumes a slower transformation and gas consumption closer to historical levels. The VGPR notes that in this scenario Victorian gas consumption is forecast to decrease by 1.9% over the period to 2026, while peak demand is near current levels.

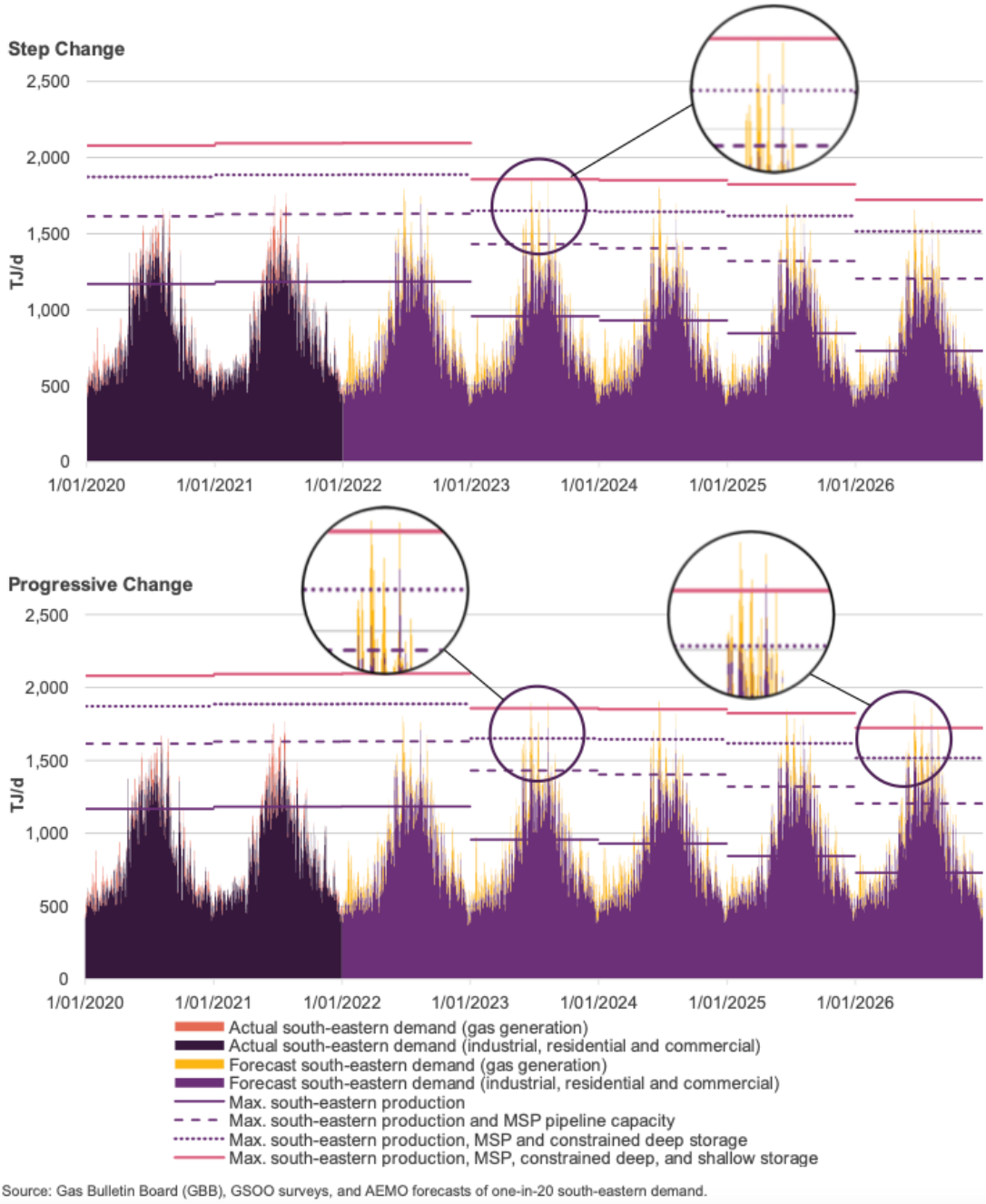
The following figure[8] shows forecast daily gas demand and production capability in south eastern states to 2026 for both "Step Change" and "Progressive Change":

In particular, the horizontal lines in the following figures show:

- Maximum production (solid purple line)
- Supply from Moomba and imported from Queensland (dashed purple line)
- Iona UGS deep storage (constrained by SWP) (dotted purple line)
- Dandenong and Newcastle LNG storage (solid red line)

[6] AEMO 2022 GSOO: page 5
[7] AEMO VGPR: page 4
[8] AEMO 2022 GSOO: Figure 4

Figure 3-1 Actual and Forecast Daily Gas Demand: 2020-26 (TJ/d)



Source: 2022 GSOO Figure 4

Note: Step Change (top) and Progressive Change (bottom) and production capacity in south-eastern regions with existing and committed projects only.

In the above figure it clear is that the resilience of the gas system (gap between maximum supply and peak daily demand) is forecast to reduce year on year, with shortfalls shown in the later years of the “Progressive Change” forecast. While the “Step Change” forecast does not show shortfalls, it does indicate a tightening supply/demand balance.

The following key points can be made with respect to the figure above:

- Gas adequacy is tight in 2023, with the risks of small, infrequent gas shortfalls.
- South eastern gas production will fall significantly from 2023 and stay at lower levels. Operational management of Dandenong/Newcastle LNG storages will be increasingly important to ensure these facilities have sufficient stored capacity to mitigate shortfalls.
- Gas generation (yellow vertical lines) is forecast to be a significant contributor to total peak day demand.
- In 2026, in "Progressive Change", forecast peaks start to exceed supply capacity more frequently, even without gas generation.

In the short term to 2026, AEMO said that the forecast risks can be mitigated by completion of "committed" infrastructure, development of anticipated projects, and especially for winter 2023, demand side solution". "Committed" infrastructure developments, include the WORM and the stage 1 upgrade of the MSP[9] need to be delivered on schedule. This will increase the operability of existing flexible solutions (such as existing gas and LNG storages) to meet a variable and infrequent need under extreme circumstances. Any delays will increase shortfall risks.

"After winter 2023, to 2026, shortfall risks are expected to be further reduced by anticipated projects including PKET, Golden Beach and some additional Victorian offshore field developments starting up".

"In the longer term new sources of supply will be needed, even though annual domestic gas consumption is forecast to decline". AEMO forecasts[10] "There is enough existing and currently committed supply available domestically to meet overall forecast annual domestic demand consumption (including for gas generation) until 2028 (or 2026 if electrification is slower than forecast in "Step Change")". However, MSP and SWP[11] constraints mean that not enough gas may be delivered to meet peak demand in the south-east under some conditions from 2023.

"After 2028 (or 2026 in Progressive Change) supply sources beyond existing and committed – such as those reported in the NGIP[12] – would need to be developed to meet forecast annual consumption. Although consumption is forecast to decline, projected supply is declining faster and gaps are expected". Note, this includes Iona UGS / SWP injection expansion.

If all currently "anticipated" gas supply projects are brought to market then annual gas supply gaps are delayed five years, until 2033 in "Step Change". This relies on full utilisation of LNG imports from the PKET project anticipated from late 2023.

AEMO states[13] that "While there is consumption uncertainty, increasing "peakiness" of gas demand is a common trend".

In this regard, Iona UGS/SWP injection capacity is increasingly important. The supply-demand balance is uncertain given the diverging consumption forecast scenarios and a greater reliance on "anticipated" and "potential" supply projects. In addition there is the likelihood of planned and unplanned peak demands, including gas for electricity generation demands, coinciding with cold weather events. On this basis we consider it prudent to adopt the Progressive Change scenario with respect to our assessment of the South West Pipeline injection capacity options (refer section 4 of this report).

[9] Moomba to Sydney Pipeline
[10] AEMO 2022 GSOO: Executive Summary: page 12
[11] South West Pipeline
[12] National Gas Infrastructure Plan
[13] AEMO 2022 GSOO: Executive Summary: page 12

3.2 2022 VICTORIAN GAS PLANNING REPORT (VGPR)

The Victorian Gas Planning Report which complements the GSOO, provides an assessment of the supply-demand balance to 2026 in Victoria's Declared Transmission System. AEMO indicated that it is primarily a security of supply assessment document.

Key findings outlined in the 2022 VGPR[14] include:

- Risks to peak day supply adequacy have increased for winter 2022 and peak day and seasonal adequacy risks are forecast to emerge as soon as 2023.

- Although the supply outlook has improved since the 2021 VGPR, Victorian production continues to decline with a large forecast reduction in capacity prior to winter 2023. Forecast available production ("existing" and "committed") is higher than the amounts reported in the 2021 VGRP, due to an increase from already producing fields, and newly committed projects, mainly in the Gippsland zone. However, it is forecast to reduce each year during the reporting period.

- The 2022 VGPR shows the deferral of the 500 TJ/d Port Kembla Energy Terminal (PKET) project from 2023 and is classified as "anticipated" from 2024, due to insufficient customer contracting. Therefore, it is not included in the supply forecasts of "available" and "committed".

- Timely completion of the WORM is also required to support declining resilience in the VTS and peak day supply adequacy, and to manage locational supply issues that emerge in late 2023 due to the planned one day outage of the Longford Gas Plant, and longer future full plant outages of up to one month.

- Participant contracted volumes of Dandenong LNG services have remained low and are insufficient to respond to both operational and emergency scenarios.

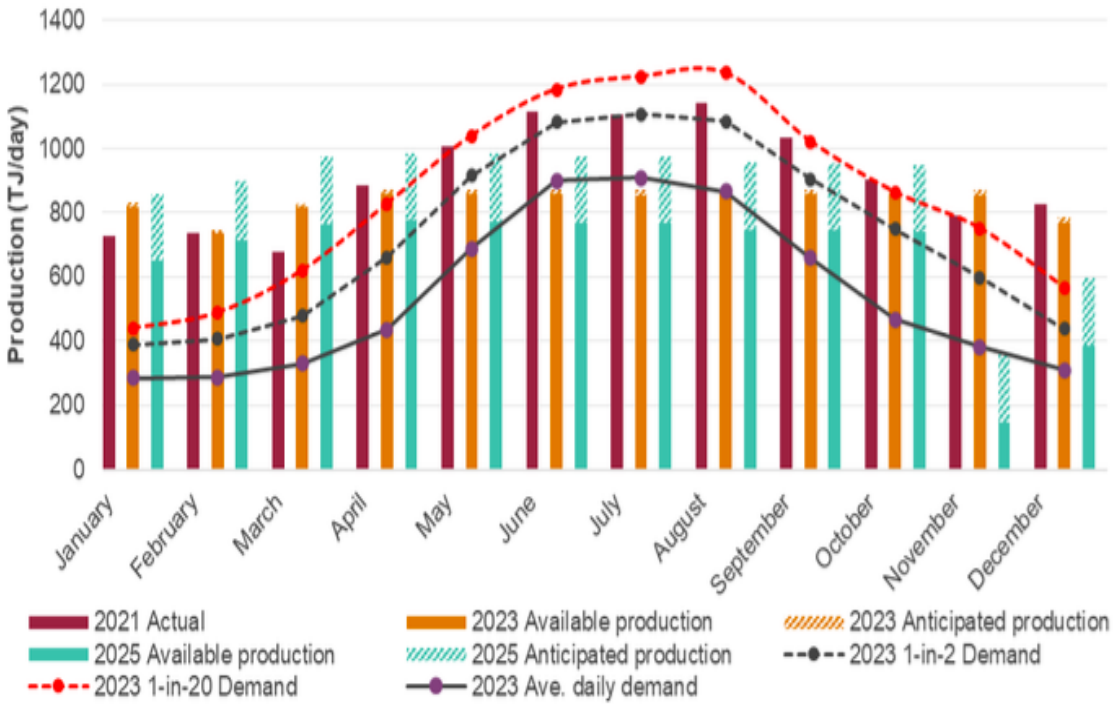
AEMO noted[15] that during its consultation process, "stakeholders identified "Step Change" as the scenario they considered to be the most likely pathway for Australia's energy sector. In the absence of significant additional policy commencing, there is also a material risk that in the near term gas use will not reduce in line with the "Step Change" scenario from 2023-26".

3.2.1 Monthly supply adequacy.

The following figure, highlights that from 2023 there is a large reduction in Victorian gas production capacity, particularly during the winter peak demand period, due to decreased Longford capacity. Victoria will need to rely on a combination of net imports of gas made available from Queensland and gas field in UGS to satisfy winter seasonal demand, until anticipated projects with sufficient aggregate capacity are developed.

[14] 2022 VGPR: Executive Summary: page 3-4
[15] 2022 VGPR: Executive Summary: page 5

Figure 3-2 Average monthly production



Note Actuals 2021and average monthly production forecast, 2023 and 2025 (TJ/d)
Source: AEMO 2022 VGPR: figure 2.

3.2.2 Peak day supply adequacy.

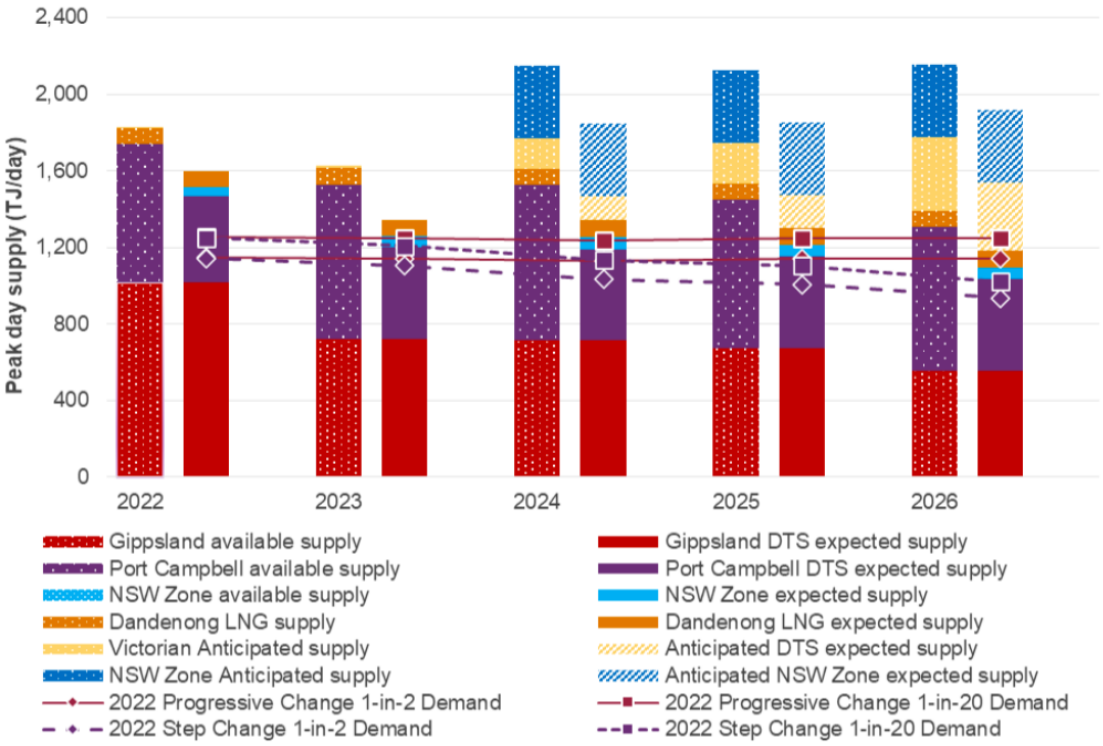
AEMO said that the peak day supply demand balance[16] remains finely balanced over the outlook period, with a slight improvement since the 2021 VGPR. However, the Victoria peak day supply capacity available to the VTS is expected to decline by 28% from 1,552 TJ/d in 2022 to 1,121 TJ/d in 2026 as supply declines more rapidly than demand.

For "Step Change" consumption there is a supply-demand surplus throughout the period, albeit reducing, but for "Progressive Change" consumption the supply-demand balance is tight throughout the period with 2025 and 2026 declining into shortfall conditions. For 2026, even the 1-in-2 peak day shows a supply-demand balance shortfall.

The following figure shows the peak day supply and VTS adequacy from 2022 to 2026:

[16] 2022 VGPR: chapter 3: key findings: page 44.

Figure 3-3 Peak day supply and DTS adequacy



Source: AEMO 2022 VGPR: Executive Summary: figure 4.

The above figure highlights the following key points, for 1-in-20 peak demand conditions along with "current" and committed" supply:

- **Winter 2023:** supply demand balance is tight with Dandenong LNG injections required to satisfy a 1-in-20 year system demand. The increased reliance on Dandenong LNG increases the risk of the tank's 600 TJ inventory being depleted. There is likely to be insufficient supply to support high levels of gas generation on a peak day. There are no anticipated supply or VTS augmentation projects able to be implemented to improve the 2023 supply outlook. Note that the WORM project is categorised as "committed" with commissioning expected prior to winter 2023:
    - "Step Change": supply-demand balance improves slightly with supply of 1,287 TJ/d and demand of 1,209 TJ/d, a surplus of 79 TJ/d;
    - "Progressive Change": supply-demand balance is very tight, with available supply of 1,287 TJ/d and demand of 1,248 TJ/d, a 39 TJ/d surplus.

- **Winter 2024:** the supply demand balance is also tight under the "Progressive Change", with Dandenong LNG required to support peak days. The development of anticipated supply projects will be important to provide additional supply to support coincident gas generation and to respond to unplanned production, storage or transmission outages that coincide with peak demand conditions.
    - "Step Change": supply-demand balance shows a surplus of 145 TJ/d;
    - "Progressive Change": supply-demand balance shows a surplus of 45 TJ/d.

- **Winter 2025:** development of anticipated supply projects, including from the NSW zone is required to avert shortfalls on peak system demand days under "Progressive Change".

    - "Step Change": supply-demand balance shows a surplus of 136 TJ/d;
    - "Progressive Change": supply-demand balance shows a surplus of -6 TJ/d.

- **Winter 2026:** development of anticipated supply projects, including from the NSW zone is required to avert shortfalls on peak system demand days under "Progressive Change".

    - "Step Change": supply-demand balance shows a surplus of 99 TJ/d;
    - "Progressive Change": supply-demand balance shows a surplus of -130 TJ/d. Even a "1-in-2" peak day shows -23 TJ/d (shortfall).

3.2.3 System Resilience:

- **Longford Gas Plant.** The declining production capacity is expected to reduce system resilience. Esso's maintenance plans show shutdown requirements during Q4 2023 and a longer shutdown in late 2025. Existing supply sources can support these outages under low demand conditions, but the WORM is needed to provide a reliable supply of gas from Port Campbell to eastern Victoria. The capacity to support coincident gas generation will be limited. An outage on a peak demand day is likely to result in a threat to system security, which may require operational response LNG to manage.

- **Dandenong LNG.** This facility has historically been used as an "operational response" to alleviate threats to the system security and for "emergency response" to support demand during the implementation of customer curtailment. Contracted supplies are currently not sufficient to increase storage capacity and AEMO intends to respond to ensure sufficient capacity for emergency response. It is noted that once depleted, the LNG tank is very slow to refill (in the order of 3 months). Insufficient capacity to cover operational response increases the risk of curtailment.

- **Threat to system security.** Due to the projected reduction in available supply AEMO has identified the low Dandenong LNG inventory as a threat to system security and is seeking a market response.

3.2.4 Risk to supply adequacy.

AEMO's VGPR shows that the peak day and seasonal supply demand balance is tight from winter 2023 and for the remainder of the forecast period without additional supply. In particular, AEMO[17] notes that "the WORM is a key infrastructure project that increases supply capacity, reliability and security". It is expected to be commissioned prior to winter 2023 and any delay would present a risk to VTS supply. The 2022 VGPR details a number of risks to VTS supply.

[17] AEMO 2022 VGPR: page 12

3.2.5 Anticipated and Potential supplies.

The VGPR[18] categorises supply as:

- "existing" and "committed" supply currently exists or projects that have achieved FID. These supply categories are used in this forecast.
- "anticipated" supply projects are those that have a reasonable expectation of being delivered but have not achieved FID. They are not included in the supply forecast.
- "potential" supply projects are those that have been identified or proposed but have not progressed significantly or are considered less certain.

The report lists a number of projects that could provide additional supply capacity during the forecast period which includes:

- "Anticipated" Production projects. The three Gippsland projects include Golden Beach field (2 years production – 2024 and 2025, then operating as a storage facility "anticipated" for 2026), the Enterprise gas field (expected to assist the Otway Gas Plant to return to capacity) and further development of the Kipper gas field (from 2024).

- "Potential" LNG import terminals, such as proposed by Viva Energy (Geelong) and Vopak (Avalon).

- "Potential" SWP expansion. Two proposals as part of APA's AA submission:
    - Increasing SWP capacity – to 570 TJ/d from Iona UGS into VTS. Lochard Energy have achieved FID to increase injection capacity of Iona UGS to 570 TJ/d. APA have submitted a matching proposal to increase the injection capacity of the SWP;
    - Increasing SWP capacity – to 670 TJ/d. Lochard Energy have commenced a study to increase injection capacity of Iona UGS to 670 TJ/d. However, this project has not achieved FID at this stage. APA have therefore submitted a matching proposal to be considered under Rule 80.
    - Section 5 of this paper provides our assessment of the SWP expansion projects.

- "Potential" increased supply from outside Victoria.
    - East Coast Pipeline project. APA project to increase supply capacity on MSP and SWQP. Stage 1 to increase MSP capacity by 30 TJ/d, is "committed" with completion expected Q1 2023 (and included in the supply forecast). Stage 2 is "potential", to increase capacity by a further 90 TJ/d.

- "Anticipated" PKET project to increase southbound capacity to approximately 350 TJ/d. While some works have commenced on this project, it has been delayed due to insufficient customer contracting. AEMO anticipate that this project may be operational for winter 2024.

[18] AEMO 2022 VGPR: Table 3

3.3 SUMMARY – SUPPLY AND DEMAND FORECASTS

AEMO's 2022 GSOO and VGPR supply-demand forecasts show that with the declining production from Longford there will be an increasing reliance on "committed" and "anticipated" supply projects. Given the uncertainty of consumers transitioning away from gas, AEMO has considered two consumption forecasting scenarios, being "Step Change" and "Progressive Change" to reflect a rapid move away from gas and a more business as usual decline in consumption respectively.

Given the uncertainty of a number of gas supply projects, AEMO forecasts the risk of peak day shortfalls from 2023. This is compounded by the likelihood of production facility maintenance shutdowns and unforeseen infrastructure outages, with little or no resilience in the VTS to enable AEMO to effectively manage the system during these events.

While the 2022 GSOO and VGPR show an improved supply forecast, the reports identify increasing peakiness in peak day demand, requiring flexible supply such as available from Iona UGS. The current SWP injection capacity constraints limit the ability of AEMO to effectively manage the peak demand events. We have therefore adopted the Progressive Change scenario in our analysis of the South West Pipeline.

Analysis of peak day supply adequacy using "existing" and "committed" supply along with "Progressive Change" demand scenario, shows that the supply-demand balance is tight throughout planning period with the risk of supply shortfalls towards the later years with the forecast showing 2025 (6 TJ shortfall) and 2026 (130 TJ shortfall). Under the "Step Change" scenario, there is no shortfall in the forecast.

There are a number of "anticipated" and "potential" supply projects identified in the reports that can be expected to provide adequate annual supply to meet the declining demand. However, significant peaks due to gas generation, infrastructure outages or weather related will require flexible and rapid supply response that can be provided by Iona UGS/SWP, linepack and Dandenong LNG.

Based on our analysis of the currently available supply-demand forecast information we consider it prudent to address the injection capacity of the SWP to ensure increased gas supply can be injected into the VTS to meet these periods of high gas demand thereby preventing or minimising the potential shortfalls and restore a level of resilience to the VTS.

4. SOUTH WEST PIPELINE

4.1 INTRODUCTION

As noted in section 3, the supply and demand forecasts have a greater degree of uncertainty due to Longford production declining more quickly than forecast, and also more quickly than demand as consumers transition away from gas consumption. With respect to consumption, AEMO has developed two scenarios being "Step Change" (a rapid transition away from gas) and "Progressive Change" (slower transition closer to historic levels). Our analysis is based on the Progressive change scenario as discussed in section 3.

AEMO sees a greater reliance on committed and anticipated supply projects to prevent or minimise shortfall / curtailment events and restore some level of resilience in the Victorian Transmission System (VTS) to enable AEMO to effectively manage the system. In particular, AEMO notes that it requires rapid access to flexible gas supply as can be provided by linepack, completion of the WORM project, and injection capacity from Iona Underground Gas Storage (UGS) facility into the VTS via the South West Pipeline.

4.2 ROLE OF SOUTH WEST PIPELINE (SWP)

The SWP runs from Port Campbell, in western Victoria to the Brooklyn City Gate in Melbourne's west. At the western end it takes supply from gas fields in the offshore Otway Basin, connects to the SEAGas pipeline to send gas west to Adelaide and also connects to the Iona underground gas storage facility.

Iona UGS' core operation involves injecting natural gas into storage during low demand periods and withdrawing the gas to meet high demand periods, including gas powered generation and especially during the winter months in Victoria (and South Australia). Iona's role helps the underpin energy security and likely to help smooth out extreme price events.

The SWP is a bi-directional pipeline, with one compressor located at Winchelsea, midway along the pipeline. It transports gas from the Victorian Transmission System (VTS) to Port Campbell to refill Iona UGS and to flow to South Australia via the SEA Gas Pipeline. During the winter months and peak demand periods the stored gas is injected into the VTS via the SWP.

The SWP eastbound injection capacity (ie into the VTS) is currently limited to 445 TJ/d. After completion of the WORM (expected 2023), injection will increase to 468 TJ/d. The Iona UGS has a standing injection capacity of 530 TJ/d which is shared between the VTS and SEAGas pipeline.

Iona UGS along with the SWP provide AEMO with a flexible management of the gas balance. It also enables AEMO to manage supply during events such as planned and unplanned outages, and production facility maintenance.

4.3 BUSINESS CASE PROPOSALS RELATING TO THE SWP

Lochard Energy, owner of Iona UGS, (achieved FID[19] in December 2020) has commenced a project to increase Iona's UGS injection capacity to 570 TJ/d, with expected completion by January 2023. We understand that this capacity represents the requirements of consortium members[20]. APA has submitted a Business Case to increase injection capacity of the SWP to match Iona UGS.

In addition, Lochard Energy are investigating the requirements to further increase Iona UGS' injection capacity to 670 TJ/d and increasing their storage to 30 PJ by Q4 2024. They have indicated that they may be in a position achieve a financial investment decision (FID) later in 2022. As this proposal has not achieved FID, APA submitted a business case under Rule 80.

Other gas supply proposals currently under consideration relate to the possibility of LNG terminal(s) connecting to the SWP at Lara/Geelong for Viva Energy and Vopak. They may achieve FID later in 2022 with potential for gas supply from 2024. Again, as these proposals have not yet achieved FID, APA submitted a business case under Rule 80.

This paper considers three Business Case proposals:

- Business Case 601: SWP expansion – Iona 570 TJ/d injection
- Business Case 602: SWP expansion – Iona 670 TJ/d injection
- Business Case 603: LNG terminal connection to SWP – Brooklyn facilities upgrade

4.3.1 Submissions to the AER relating to the South West Pipeline

As part of our consideration of the above business case proposals, we note submissions made to the AER from stakeholders.

In its submission[21] to the AER, the consortium of **East Coast Gas Market Members** noted:

- "In the DWGM, assets such as Iona and Dandenong LNG storage play critical roles in minimising extreme price events and providing system security even when their capacity is not fully utilised, thereby continuing to provide value to customers";
- There has been a decline in resilience of the VTS;
- Members see an increasing demand for GPG gas, with an expected increase in correlation between high gas demand days and high electricity demand;
- Short term, unforced outages of Longford have been increasing as the 2021 winter has demonstrated;
- The 2021 winter showed that Iona UGS was used as a mid-merit "supply" or "deep storage" source as opposed to purely peak shaving;
- Increasing reliance will be placed on the SWP as Longford declines. Expansion of the SWP would reduce systemic risk. An increase in SWP capacity could provide certainty of access to the market for further field expansion in the Otway region. Market participants will have difficulty committing to buying additional capacity at Iona or additional supply from Otway if there is no surety of scheduling and dispatch to DWGM.

AGL[22] is supportive of APA's proposal "we believe that there is significant uncertainty arising from the changing sources of supply and this expansion will be an important contribution to the security of supply during the winter peak over the next regulatory period".

[19] Final Investment Decision
[20] Consortium submission: 17 February 2022: page2
[21] Dated 17 February 2022
[22] Letter to AER dated 18 February 2022

Other submissions[23] to the AER such as CCP28, Energy Users Association of Australia, Red Lumo and Victorian Community Organisations were not supportive of APA's proposal to increase injection capacity of the SWP, typically suggesting demand management mechanism and concern for potential future stranding of these assets. They also recommended a reassessment using 2022 GSOO and VGPR.

4.4 BUSINESS CASE 601: SOUTH WEST PIPELINE EXPANSION – IONA 570 TJ/D INJECTION

As part of its 2023-2027 Access Arrangement capital expenditure proposals, APA has submitted a Business Case[24] to upgrade the SWP facilities to increase injection capacity to 570 TJ/d, matching Iona UGS capacity. This is a 102 TJ/d increase (post WORM) project of additional supply to the VTS predominantly during the winter peak.

APA has submitted this proposal under the criteria of Rule 79(2)(c)(ii) and (iv), that is, the South West Pipeline investment is required for integrity of services, and to maintain the capacity to meet existing levels of demand for services.

APA's preferred solution is to install two compressors on the SWP, at Stonehaven (in 2024) and Pirron (in 2025 due to time required to acquire land). Works will also be required to the existing Winchelsea compressor to de-bottleneck high pressure drops across the suction and discharge headers due to higher flows. Also, an upgrade of Brooklyn City Gate to enable increased flowrates into the Melbourne transmission network. The capital expenditure is shown in the following table:

Table 4-1: SWP 570 project – capital expenditure ($millions)

Preferred Option	Estimate	2023	2024	2025
Brooklyn CG and Winchelsea Aftercooler bypass	3.6	-	3.6	
Stonehaven CS	42.0	24.0	18.0	
Pirron CS	45.2	10.5	27.9	6.8
Total	**90.9**	**34.5**	**49.6**	**6.8**

(Source: IR001: Q5.3 – SWP cost breakdown – preferred option)

4.4.1 Options

In arriving at its preferred solution, APA considered a range of options, outlined below:

(i) Do Nothing.

With this option, injection capacity from Iona UGS into the SWP will continue be limited to 468 TJ/d (assuming WORM is completed), a shortfall of 102 TJ/d compared to the recommended option. There will be greater risk of a threat to VTS system security whereby AEMO may need to take short-term operational measures to reduce the threat such as injection from the Dandenong LNG storage or controlled interruption of demand. APA considers this option to be unacceptable to VTS system security if the supply shortfall is significantly higher than predicted.

[23] Dated 18 February 2022
[24] Business Case 601: South West Pipeline expansion – Iona 570 TJ/d injection

(ii) Compression on SWP.

While APA proposes augmentation (with two compressors) to match the injection capacity of Iona UGS, its analysis has considered a range of compressor configurations on the SWP as shown in the following table:

Table 4-2: Injection capacity for range of compressor configurations

Location	Iona injection capability-TJ/d	
Winchelsea	445	Installed 2017. Current capability (ie pre-WORM)
Winchelsea	468	Capability post WORM
Stonehaven	517	Lowest increase being furthest from Iona. APA own land
2nd Winchelsea	533	Also requires restaging of the existing compressor
Pirron	544	Highest increase, but APA would need to acquire land
Stonehaven + Pirron	570	Match capacity of Iona UGS (APA proposal)

(Source: APA Business Case – 601: Tables 1 and 2)

Note: APA owns land at Stonehaven and Winchelsea sites. Winchelsea already has one compressor at this site with provision for a second. APA will need to purchase land at Pirron which is expected to extend the timeframe for compressor installation at that site.

APA notes that the installation of an additional single compressor does not achieve the capacity increase proposed to match Iona's injection capacity.

Modelling indicates that installing compressors at Pirron and Stonehaven meets the target capacity of 570 TJ/d. AEMO confirmed[25] that this configuration is the best option to achieve 570 TJ/d.

APA notes that the minimum lead time to install a compressor is 18 months, while installing an additional compressor at Winchelsea requires some additional staging works and hence a longer timeframe.

As Stonehaven is already owned by APA, they see this as the quickest (stage 1) approach to achieve some capacity increase with anticipated completion by May 2024 (assuming project is initiated in December 2022). Stage 2 would be to install a compressor at Pirron, where land will need to be purchased, and would be completed by early 2025.

As noted in the above table, completion of stage 1 would provide an initial increase of 49 TJ/d, taking injection capacity to 517 TJ/d before winter 2024.

An additional benefit of this option is that it would enable western haul capacity (to Iona UGS for refilling) to be increased from 200 TJ/d (with the WORM) to 329 TJ/d. This is expected to result in more gas in storage to enable longer periods of peak load management and providing more flexibility to AEMO in managing the system.

AEMO has suggested that installation of a second compressor at Winchelsea would provide the greatest increase in injection capacity (65 TJ/d) in the earliest timeframe, possibly for winter 2023. Based on APA's business case information regarding timing we anticipate that the earliest date would be for 2024. As this option is not included in APA's Business Case, APA would need to determine scope details, timeframe, and costing. It should be noted that if a further capacity increase was later required then it would need to be with pipeline looping which would be relatively expensive (see Table 4-3 below, that shows a compressor at Winchelsea plus looping to achieve injection capacity of 570 TJ/d would require capex of $139m), whereas installing one compressor at Stonehaven would allow another compressor at Pirron at a later date for a total capex of $91 million. It should be noted that pipeline looping can be hydrogen compatible.

[25] AER and AEMO meeting 25 February 2022

(iii) Compression and Looping

APA present two options to achieve 570 TJ/d injection capacity:

- Install two compressors (Stonehaven and Winchelsea) with 9 km (20") of looping. Land approvals and construction time would mean completion after winter 2024. However, installation of the compressors could be completed before the looping, with Stonehaven by May 2024 and Winchelsea later due to additional works.

- Install a second compressor at Winchelsea and 37 km (20") of looping. Lands approval and construction time would mean completion by 2025.

(iv) Looping Only

This requires 65 km (20") looping upstream and downstream of Winchelsea to achieve the 570 TJ/d capability, with completion in early 2027. Note that looping would be preferred if hydrogen is introduced into the VTS.

4.5 SUMMARY OF OPTIONS AND CAPITAL EXPENDITURE

The following table shows the options included in the business case, plus a further option of an additional compressor at Winchelsea, and for completeness, options for a single compressor at Stonehaven and a single compressor at Pirron. The business case options are those that will increase injection capability to 570 TJ/d, so as to match Iona UGS. AEMO's modelling shows that installation of an additional compressor at Winchelsea, where APA owns the land, may provide a good increase in injection capacity in a shorter timeframe than for the combined Stonehaven and Pirron option.

Table 4-3: SWP increased injection capacity and capex

Option	Iona injection capability	Capex	Comment
Do Nothing (without WORM)	445 TJ/d	Nil	Risk of shortfall during winter peak from 2023.
Do Nothing (with WORM)	468 TJ/d	Nil	Risk of shortfall from 2023
Stonehaven + Pirron	570 TJ/d	$91m	Stage 1 (2024); Stage 2 (2025) (**APA recommended option**)
Stonehaven + Winchelsea + 9km looping	570 TJ/d	$108m	
Winchelsea + 37km looping	570 TJ/d	$139m	Completion 2025.
65km looping	570 TJ/d	$174m	Completion 2027.
Stonehaven	517 TJ/d	$45m*	Completion 2024
Pirron	544 TJ/d	$48m*	Completion 2025
Winchelsea**	533 TJ/d	$47m*	Completion winter 2024*

(Source: APA Business Case 601)

Note:
* Capex estimates for the single compressor options are for guidance only and will need to be determined by APA. They are based on APA's capex estimate with allowance for a compressor, works at Brooklyn City Gate and Winchelsea. For Pirron there is additional expenditure required to acquire land.
** Winchelsea capex includes some provision for restaging of existing compressor, and it is noted that some additional time may be required to undertake this work. Also any necessary works at Brooklyn City Gate and Winchelsea.

4.6 ANALYSIS

4.6.1 What is the need?

AEMO's 2022 GSOO and VGPR supply-demand forecasts show that with the declining production from Longford, there will be an increasing reliance on "committed" and "anticipated" supply projects, which in themselves have a degree of uncertainty. AEMO forecasts the risk of peak day shortfalls from 2023. This is compounded by the likelihood of production facility maintenance shutdowns and unforeseen infrastructure outages, with little or no resilience in the VTS to enable AEMO to effectively manage the system during these events.

Analysis of peak day supply adequacy using "existing" and "committed" supply along with "Progressive Change" demand scenario, shows that the supply-demand balance is tight throughout planning period with the risk of supply shortfalls towards the later years with the forecast showing 2025 (6 TJ shortfall) and 2026 (130 TJ shortfall). Under the "Step Change" scenario, there is no shortfall in the forecast. This analysis is based on 1-in-20 year peak system demand.

Based on our analysis of the currently available supply / demand forecast information we consider it prudent to address the injection capacity of the SWP to ensure increased gas supply can be injected into the VTS to meet these periods of high gas demand thereby preventing or minimising the potential shortfalls. Importantly it would be prudent to restore some resilience to the VTS so that AEMO can effectively manage any planned/unplanned peak demand events. In particular, forecasts show a deteriorating supply/demand balance towards the later years of the 2023-2027 AA period, and advice that the following period will continue this trend. We also note that potential options would require extended timeframes, particularly where they include pipeline looping works.

Lochard Energy have achieved FID to increase Iona UGS injection capacity to 570 TJ/d by January 2023. The proposed capacity requirement[26] on the SWP of 570 TJ/d, was developed by a consortium of east coast gas market participants.

The SWP injection capacity will be 468 TJ/d (post WORM), thereby constraining the full availability of domestic gas that can be utilised in the VTS particularly for managing peak demand events including peak demand days that typically occur during winter.

4.6.2 Analysis of Options

From the above there appear to be three main option categories. We consider that the compressor/pipeline looping options and pipeline looping option are not cost effective:

(i) **Do Nothing.**

While Iona's UGS would have capacity to inject 570 TJ/d from early 2023, it would be constrained to 468 TJ/d, post WORM. AEMO has advised that it sees an increasing reliance on the Iona UGS and SWP to provide flexibility and assist in managing peak demand events. The 2022 GSOO and VGPR show that there is little or no resilience in the supply-demand forecast, so we do not consider this option to be prudent.

[26] Consortium of east cost market participants and Lochard Energy: submission dated 17 February 2022

(ii) **APA's preferred option.**

Project to increase injection capacity of SWP to 570 TJ/d, matching the proposed capacity of Iona UGS. Project includes installation of compressors at Stonehaven and Pirron along with associated facility upgrades with capital expenditure of $91 million. The APA project would see Stonehaven completed in 2024 (increasing injection to 517 TJ/d) and Pirron in 2025 (achieving the target of 570 TJ/d).

Benefits:

- Increases injection to VTS by 49 TJ/d for winter 2024 and further increases to 570 TJ/d for winter 2025, a total increase of 102 TJ/d compared with 468 TJ/d.
- The staged increase in capacity with this option, provides additional resilience from 2024, eliminates the shortfall in 2025 and significantly reduces the risk of any material shortfall in 2026, under the "Progressive Change" scenario.
- Provides the "best" match of the considered options to manage the supply-demand balance under the "Progressive Change" scenario. Further improves the resilience of the system under the "Step Change" scenario.
- AEMO has confirmed that this configuration is the most efficient in achieving 570 TJ/d injection capacity.
- Matches Port Campbell consortium members' domestic gas injection requirements from winter 2025.
- This is APA's recommended proposal to match Iona UGS' proposed injection capacity. APA has advised that this level of expansion is based on Lochard Energy having achieved FID for expansion of Iona UGS to 570 TJ/d.
- Maximises the volume of stored domestic (currently lowest cost) gas to be available to the VTS, providing the most cost effective operation of the gas market, rather than being constrained with lower injection rates.
- With the expectation that some "anticipated" and "potential" supply projects will proceed to operation, this option will provide effective flexibility in managing peak demand events for the longest term of the options.

Issues:

- Capital expenditure is $91 million.
- While AEMO has noted its support for this proposal, they have also suggested a single compressor option to achieve a lower capacity increase at lower cost.
- Given the uncertainties with "anticipated" and "potential" supply projects along with uncertainties for consumer demand, AEMO has not provided specific requirements regarding injection capacity from Iona UGS. As such we are not able to ensure that this option is not overreach in terms of injection capacity and capital investment in the longer term.
- Any further injection increase, beyond 570 TJ/d, if required, would require pipeline looping. For example refer to APA business case 602 to increase injection capacity to 670 TJ/d.
- The compressors may not be suitable if hydrogen is introduced to the SWP. The timeframe of and likelihood of such an outcome is unknown, however, this issue would present a far greater concern across VTS given the number of compressors in service.

(iii) **Installation of a single compressor.**

This option provides for some additional injection capacity to assist AEMO with peak demand events, while at the same time minimising capital expenditure, given the uncertainty with future supply and demand. We consider the following options:

a. Stage 1 of APA's business case (ie. installation of a compressor at Stonehaven along with any other necessary associated works. This would increase injection capacity to 517 TJ/d, an increase of 49 TJ/d (post WORM), from winter 2024. While

APA would need to confirm scope and capital expenditure, we consider that it would be approximately $45 million.

Benefits:

- Increases injection to VTS by 49 TJ/d for winter 2024.
- The increase in capacity with this option, provides additional resilience from 2024, avoids the shortfall in 2025 and reduces the shortfall in 2026, under the "Progressive Change" scenario.
- Further improves the resilience of the system under the "Step Change" scenario.
- With the expectation that some "anticipated" and "potential" supply projects will proceed to market operation, this option could be sufficient to achieve effective management of peak demand events.
- Lowest cost option to provide some increased injection capacity from Iona UGS and at the earliest opportunity, being 2024.
- This option is stage 1 of APA's preferred option and therefore provides the flexibility to upgrade further to 570 TJ/d with the installation of a compressor at Pirron, at an additional capex of approximately $46 million. Noting that Pirron requires land acquisition, which would extend the stage 2 project timeframe, and therefore needs to be considered during planning.
- This option provides a lower initial capital expenditure commitment with the flexibility of further staged increase(s) in injection capacity as supply-demand forecasts become more certain.

Issues:

- While a 49 TJ/d improvement in injection capacity, this option does not enable gas suppliers to fully access their domestic gas from Iona UGS during periods of peak demand.
- Under the "Progressive Change" scenario the supply-demand forecast indicates shortfall of 130 TJ/d in 2026. If so then up to 53 TJ/d of domestic gas from Iona UGS could be stranded in storage during period(s) of shortfall, with potential impacts on the cost of gas during these events and customers curtailed.
- As noted in the previous option, the supply-demand uncertainties are such that, we are not able to ensure that this capital investment satisfies the needs of the system beyond the next few years, albeit this option does provide next stage(s) flexibility.

b. Installation of a compressor at Pirron along with necessary associated works. This would increase injection capacity to 544 TJ/d, an increase of 76 TJ/d (post WORM). As land will need to be acquired then the earliest that this compressor would be available is 2025. Capex estimate is $48 million to allow for land acquisition costs compared to Stonehaven.

Benefits:

- This option provides the greatest increase in injection capacity from one compressor (76 TJ/d), albeit the compressor would not be available until 2025 due to additional time required for land acquisition.
- Under the "Progressive Change" scenario, the timing of this project does not provide any additional resilience to the system until 2025 but should avoid the forecast shortfall in 2025. With 76 TJ/d increased injection capacity the forecast shortfall of 130 TJ/d in 2026 would be significantly reduced but not avoided.
- Further improves the resilience of the system under the "Step Change" scenario.
- Lower initial capital investment compared with APA's preferred option.
- This option is stage 2 of APA's preferred option. As such it provides the flexibility of adding a further compressor at Stonehaven or some other location

to increase injection capacity. If an additional compressor is required and located on APA's land then project timeframe would be shorter, with additional capex of approximately $42 million.
- With the expectation that some "anticipated" and "potential" supply projects will proceed to market operation, this option could provide effective flexibility in managing peak demand events for an extended period of time.

Issues:
- No improvement to injection capacity or system resilience until 2025.
- Suppliers would have constrained access to Iona UGS gas until 2025 and after that constrained to 544 TJ/d rather than 570 TJ/d.
- Under the "Progressive Change" scenario the supply-demand forecast indicates shortfall of 130 TJ/d in 2026. If so then up to 26 TJ/d of domestic gas from Iona UGS could be stranded in storage during period(s) of shortfall, with potential impacts on the cost of gas during these events and customers curtailed.
- As noted in the previous option, the supply-demand uncertainties are such that, we are not able to ensure that this capital investment satisfies the needs of the system beyond the next few years, albeit this option does provide next stage(s) flexibility.

c. Installation of a compressor at Winchelsea along with necessary associated works. This provides injection increase to 533 TJ/d, an increase of 65 TJ/d (post WORM). APA noted that a second compressor at Winchelsea would require some additional staging works and hence timeframe would likely be longer than the Stonehaven option and may also be slightly more expensive than that option. Notwithstanding the additional project timeframe, we anticipate that APA would be able to complete this project before winter 2024. We estimate the capital investment in the order of $47 million, with some restaging works required for the existing Winchelsea compressor in addition to potential works at Brooklyn City Gate and Winchelsea aftercooler bypass.

Benefits:
- Increases injection to VTS by 65 TJ/d for winter 2024, the largest increase of the options considered.
- The increase in capacity with this option, provides additional resilience from 2024, avoids a shortfall in 2025 and reduces the shortfall in 2026 by half, under the "Progressive Change" scenario.
- Further improves the resilience of the system under the "Step Change" scenario.
- AEMO proposed this option, albeit with the possibility that it could be operational for 2023.
- With the expectation that some "anticipated" and "potential" supply projects will proceed to market operation, this option could be sufficient to achieve effective ongoing management of peak demand events.
- This option provides a lower initial capital expenditure commitment compared to the APA preferred option and similar to other single compressor options.

Issues:
- While a 65 TJ/d improvement in injection capacity, this option does not enable gas suppliers to fully access their domestic gas from Iona UGS during periods of peak demand.
- Under the "Progressive Change" scenario the supply-demand forecast indicates shortfall of 130 TJ/d in 2026. If so then up to 37 TJ/d of domestic gas from Iona UGS could be stranded in storage during period(s) of shortfall, with potential impacts on the cost of gas during these events and customers curtailed.

- As noted in the previous option, the supply-demand uncertainties are such that, we are not able to ensure that this capital investment satisfies the needs of the system beyond the next few years.
- If a further capacity injection increase is required, then it would require pipeline looping which is relatively more expensive. For example, to increase capacity to 570 TJ/d then additional capital investment would be in the order of $92 million (refer Table 5-2 above), making this scenario approximately $48 million more expensive than the APA preferred option.

4.7 CONCLUSION AND RECOMMENDATION

It should be noted that APA has prepared its business case on the basis of Lochard Energy achieving FID to increase injection capacity of Iona UGS to 570 TJ/d. This capacity having been developed by a consortium of east coast gas market participants.

However, the key driver for our assessment has been related to the supply-demand balance of the VTS with consideration of "anticipated" and "potential" supply projects that might offset the declining Longford production, together with the declining "step change" and progressive change" demand scenarios.

Based on our analysis of the currently available AEMO 2022 GSOO and VGPR supply-demand forecast information we consider it prudent to address the injection capacity of the SWP to ensure increased gas supply can be injected into the VTS to meet these periods of high gas demand thereby preventing or minimising the potential shortfalls and restore a level of resilience to the VTS.

Our analysis of the range of options to increase injection capacity of the SWP is based on 1-in-20 peak day supply-demand forecasts mainly using the "Progressive Change" demand scenario, while also noting the impact with "Step Change" demand scenario. We believe this approach to be in accordance with good gas industry practice for transmission system assets.

A recurring theme during our analysis is the uncertainty for both supply ("existing/committed" and "anticipated"/"potential") and demand ("progressive change"/"step change"). While the current supply situation is deteriorating, largely due to the declining production from Longford, there are a range of "anticipated" and "potential" supply projects that could restore resilience to the VTS. The uncertainty of supply lies in which projects may progress to production, when that might occur and, in particular, what level of flexibility they provide to AEMO in managing peak day demand events. It is noted that this project has been categorised as "potential" in AEMO's 2022 GSOO and 2022 VGPR.

At the same time demand is expected to reduce over time as consumers move away from gas. However, forecasting the rate of change is such that AEMO has applied two scenarios "progressive change" and "step change".

Our analysis leads to consider two categories of options:

- Two compressors, as proposed in APA's business case, to achieve matching injection capacity with Iona UGS. Stage 1 would increase injection capacity by 49 TJ/d in 2024 to 517 TJ/d, and stage 2 which achieves 570 TJ/d in 2025 a total increase of 102 TJ/d. The capital investment is $91 million.

- Single compressor. While there are a range of injection capacities, the capital investment is similar and in the order of $45-$48 million:
    - Stonehaven: increase injection to 517 TJ/d, an increase of 49 TJ/d, in 2024
    - Pirron: increase injection to 544 TJ/d, an increase of 76 TJ/d in 2025
    - Winchelsea: increase injection to 533 TJ/d, an increase of 65 TJ/d in 2024

Both Stonehaven and Pirron options relate to the APA proposal, being either stage 1 or stage 2 respectively. As such they have flexibility for future expansion if required, firstly with another compressor (per the APA proposal) and beyond that with pipeline looping..

Winchelsea had been suggested by AEMO as offering the best capacity increase that could be achieved at the earliest opportunity. However, any future expansion of this option would require pipeline looping at significant capital investment, compared to another compressor. AEMO's 2022 VGPR[27] suggests that pipeline looping has benefits such as being hydrogen compatible, offers increased linepack, while avoiding compressor fuel costs.

While recognising a need to provide greater flexibility in gas supply to meet peak day demand events, including planned and unplanned production and infrastructure outages, we also need to consider the potential additional supply impact if/when other supply sources come into operation. Also the potential change in the rate of consumer transition away from gas, which is expected to trend from "Progressive Change" towards "Step Change" over time.

Our analysis leads us to conclude that it is prudent to increase injection capacity of the SWP, however the uncertainty of supply-demand balance into the future does not provide a definitive level of injection capacity necessary to adequately manage the periods of peak demand and therefore which of the project options will provide the most prudent and efficient outcome.

In order to provide a level of increased injection capacity to the SWP, while at the same time recognising the current supply-demand uncertainties, we consider that we can only recommend acceptance of a single compressor option at this time.

Given the range of options considered in this paper we do not propose to recommend a specific location for the compressor, but rather recommend that the AER make capital investment provision in their Draft Decision in the order of $45 million. This provides APA with the flexibility to determine the most suitable location (optimum injection capacity increase) and timing for the compressor, along with appropriate works that may be necessary with respect to other assets. This recommendation allows for future staged expansion as supply-demand uncertainties become clearer.

[27] 2022 VGPR: section 6.4 South West Pipeline Expansion

5. WESTERN OUTER RING MAIN

5.1 BACKGROUND

The Western Outer Ring Main (WORM) was accepted in AER's 2017 Final Decision of the 2018-22 access arrangement for APA, with capital expenditure of $127 million ($2017) and planned completion by Q1 2021. The project was justified based on the need to maintain system security.

In its 2017 submission APA proposed[28] a 49 km (500 mm diameter) bidirectional pipeline[29] interconnection between Plumpton and Wollert (noting that a short 8.3 km section of the WORM had been laid between Rockbank and Plumpton in 2012). The WORM project also included:

(i) installation of an additional compressor (WCS6 – Centaur 50) at Wollert Compressor Station B and
(ii) (ii) new interconnecting Pressure Reduction Station at Wollert, connecting the Brooklyn Lara Pipeline (BLP) to the Pakenham-Wollert Pipeline.

The AER, in its Draft Decision (2017)[30] states: *"we agree with the reasoning set out in APA's proposal and AEMO's submission as to the benefits of the WORM for better management of the VTS by enabling high pressure gas flow between the east and west systems and providing linepack storage capacity close to Melbourne to balance peaking residential and GPG demand. We consider the expenditure is justified on this basis and any benefit to non-Victorian consumers does not detract from this justification"*.

APA's submission[31] for 2023-27 noted that the project has been delayed due to the requirement to prepare an Environment Effects Statement (EES), requested by the Victorian government in December 2019. They also reported that the capital expenditure had increased significantly and now forecast expenditure of $184.8 million, with $136 million expected to be incurred during 2018-22 period and $49 million in 2023-27 period.

Given the delay of this project beyond the 2018-22 Access Arrangement period and the proposed significant cost increase, the AER requested[32] the APA to "provide a revised business case to demonstrate that the project remains prudent and efficient and to support the inclusion of this project in the total capex". The APA has subsequently provided an updated business case[33].

5.2 IDENTIFIED IMPACTS OF THE WORM

The Melbourne inner ring between Dandenong, to Melbourne's east, and Brooklyn, to Melbourne's west, operates at 2.760 MPa, for safety reasons, as it goes through the Melbourne CBD high consequence area. As a result, it is constrained to move large volumes of gas between the east and west. The WORM which will operate at 10.2MPa, will provide a higher-pressure link main around Melbourne, hence removing the bottleneck.

[28] Business Case 506: April 2017 supplement to initial AA proposal
[29] APA Business Case WORM project March 18 2022 shows WORM will now be 50.1 kilometres.
[30] AER Draft Decision - Attachment 6 – Capital expenditure p. 22
[31] APA: "A look at plans for Victorian Transmission System", December 1, 2021; pg. 33)
[32] IR006: Q3
[33] APA Business Case WORM project March 18 2022

The WORM is intrinsically linked to the system security role that the Iona UGS plays in Victoria. Iona provides at-call supply of gas and capacity into the southern markets. The WORM will allow larger volumes of gas to travel around Melbourne at high pressure, enabling Iona UGS to be filled faster and thereby providing greater capacity to supply gas to the VTS for both seasonal and peak demand, increasing system resilience. During peak demand, Brooklyn City Gate has limited capacity to supply gas from Iona to the east, while the WORM can transport Iona gas north to Wollert and then onwards to Pakenham/Dandenong to meet Melbourne's peak day demands.

AEMO's 2022 GSOO[34] states that "In the short term to 2026 forecast risks can be mitigated by completion of "committed" infrastructure, development of anticipated projects, and especially for winter 2023, demand side solution". "Committed" infrastructure developments, include the WORM and the stage 1 upgrade of the MSP need to be delivered on schedule. This will increase the operability of existing flexible solutions (such as existing gas and LNG storages) to meet a variable and infrequent need under extreme circumstances. Any delays will increase shortfall risks.

The GSOO also notes that any delay to the WORM would exacerbate the risk of winter 2023 shortfalls. The WORM will increase the capacity of the South West Pipeline (SWP) so more gas can flow from Port Campbell, including from Iona gas storage, to south-eastern states' consumers.

The following represent key benefits of the WORM:

- Unlocking capacity to and from Port Campbell. The WORM would enable gas supply from/to the north or east of Melbourne to be transported at higher pressure, thereby substantially increasing the ability to refill the Iona storage facility (ie. faster) and providing increased system security. Bypassing the low pressure Melbourne Inner Ring Main also achieves significant fuel gas and compressor operating cost savings (at least $3 million per year)[35]. Changing gas demand patterns and flow paths are key drivers for the WORM project.

- Security of supply. In the event of loss of supply from Longford, Port Campbell or Pakenham, it would be possible for alternate supplies to be scheduled. Similarly if there were a compressor outage event.

- Operational benefits. A direct connection between the WORM and the Pakenham to Wollert pipeline would allow gas to flow interchangeably between east and west systems with fixed operating set points and without direct operator intervention. This also enables linepack balancing across the systems, along with improved gas powered generation readiness.

- Reducing reliance on the aged and congested Brooklyn Compressor station site. APA notes that Brooklyn is not the optimal location in terms of capacity expansion of the VTS and the site is heavily congested making augmentations technically difficult and expensive. It also notes that one compressor at Wollert would improve capacity into Iona storage, with considerably less than half the compression required compared to using two or more compressors at Brooklyn.

- Future connections. The WORM's route and capacity provides future connection provisions for network operations particularly to the northern fringes of Melbourne.

- Increases refilling of Iona UGS from 150 TJ/d up to 220 TJ/d. The WORM provides a small amount of consequential eastbound capacity to the SWP, from 452 to 468 TJ/day. Filling Iona UGS means that it has more gas to supply to VTS for longer periods and particularly for peak demand days. Iona UGS has storage capacity of 23.5 PJ.

[34] AEMO 2022 GSOO: Executive Summary, page 7
[35] AEMO letter dated 16 May 2017

- Provides additional linepack. Provides more flexibility to AEMO to manage linepack and transporting gas across the VTS.

- Dandenong LNG storage provides 2-3 days supply (0.7 PJ) but can take around 100 days to refill (APA advised that it is not economic to speed up refill capability).

- Floating storage and regassification unit (FSRU)[36]. The WORM will be integral for LNG injections due to its high gasflows if gas was to be transported around Melbourne and for linepack. Capacity approximately 250 TJ/day. Viva Energy stated that without the WORM they would need to reassess their project's viability.

- The WORM will not be redundant if the Geelong/ Avalon LNG import terminals come online. It will provide additional capacity and another pathway for the gas to be moved into Melbourne.

- Similar to the existing eastern Outer Ring Main (Pakenham to Wollert) which currently transports the primary gas supply from Longford, the WORM completes the "backbone" from the South West Pipeline / Brooklyn-Lara Pipeline to Wollert when the major supply source comes from the south west.

AEMO has provided its comments[37] to the AER in support of the WORM, noting that it has included the WORM in all its planning analysis since the 2018 VGPR, as a committed project. Apart from benefits in its 2017 submission to the AER in support of the project, which are still relevant, it notes the following benefits of the WORM:

- Increased system supply capacity, reliability and security
- Increased Iona UGS refill capability and reduced dependency on Longford injections
- Improved operability of the VTS by increasing available system linepack and adding the ability to transfer linepack between pipelines that are currently disconnected
- Reduced dependency on Brooklyn Compressor Station
- Provide capacity for future growth in Melbourne's west and north, to facilitate new offtakes into distribution systems, or new gas-fired generation sites along the WORM.

Without the WORM, an LNG receiving terminal is unlikely to materially increase the SWP injection capacity and would back off more of the Port Campbell injection capacity. The other additional SWP augmentations rely on the completion of the WORM as the first step of SWP augmentation. AEMO notes that it would need to undertake significantly more work to understand the full capacity impacts of VTS augmentations without the WORM.

AEMO has noted that it does not consider there are viable alternatives to the completion of the WORM. In fact all AEMO planning since 2019 has included the WORM, and in its 2022 GSOO / VGPR advised that any delays in completing the WORM will increase shortfall risks.

5.3 WORM TIMEFRAME

The WORM project, as submitted in 2017, was expected to be completed by Q1 2021.

The Victorian Government's requirement for an Environmental Effects Statement (EES) has delayed the project in the order of two years, and resulted in some pipeline routing changes, and requirements for additional directional drilling. APA's updated business case states:

"On 26 January 2022, the Minister for Planning completed the assessment under the Environment Effects Act 1978. The Minister's assessment concluded that the project can

[36] Meeting with AER and Viva February 2022
[37] AEMO submission to the AER dated 18 February 2022

proceed with acceptable environmental effects, subject to the implementation of project modifications recommended in the assessment and environmental management measures consistent with those endorsed by the enquiry and refined as per the findings and recommendations of the assessment".

APA advised[38] the following key milestones:

- Pipeline licence expected late April 2022.
- Construction contracts anticipated to be issued for tender in May 2022.
- Pipelaying anticipated from October 2022.
- Commissioning anticipated around May 2023

5.4 WORM PROJECT EXPENDITURE

The WORM project was accepted by the AER in the 2018-22 access arrangement with capital expenditure of $127 million (2017), while the current[39] estimated expenditure has increased to $184.8 million[40] as of 1 December 2021.

APA has noted that project costs are still subject to change as a result of the Victorian Planning Minister's assessment of the Environment Effects Statement for the WORM and outcomes from market tenders for construction of the WORM.

In February 2022, APA[41] provided an updated project expenditure, as summarised by project category in the following table. The update noted that project expenditure, as at the end of January 2022, was xxxxxx. While the capital expenditure shown in the business case has further updated the expenditure forecast, the following table provides a useful order of magnitude as to the variations in each category between the initial submission and current.

Table 5-1: WORM capital expenditure ($ millions)

Category	2017 estimate*	2022 Forecast[42]	Variance
Project mgt, design, commissioning	12.3	xxxx	xxxxx
Land & approvals	26.0	xxxx	xxxxx
Procurement	27.5	xxxx	xxxx
Construction	56.5	xxxx	xxxx
Total	**122.4**	**xxxx**	**xxxx**

*2017 business case ($2016)

Key cost variances outlined in the updated business case and other supporting documents:

- Land and approvals
  - Environmental Effects study
  - Additional Net gain Offset costs with the removal of more native vegetation than originally planned. Both state and federal vegetation offset requirements have contributed to the increase in these costs.
  - Higher compensation payments to some landowners arising from land valuations associated with the Land within the Urban Growth Boundary and subject to the Department of Transport's Public Acquisition Overlay (PAO).
  - Higher easement compensation due to the increase in land value over time.
  - More complex cultural heritage surveys were required along with a higher level of salvage works prior to construction.

[38] Meeting with AER and APA dated 10 February 2022
[39] APA business case: WORM project – update: 18 March 2022
[40] APA business case: WORM project – update: 18 March 2022
[41] IR006 response: spreadsheet of actual and forecast expenditure dated February 2022
[42] IR006 response: WORM financial summary: dated February 2022

- Materials procurement increases due to higher prices for coated line pipe, pipe and fittings and valves. Increased amount of abrasive resistant coating required for the increased length of horizontal directional drilled sections. Increased sea freight costs due to Covid and Chinese Government removal of its export tax rebate.

- Construction cost increases due to the number and length of sections requiring horizontal directional drilling, more rock than expected, deeper depth of burial and more concrete slabbing where the pipeline interfaces with Department of Transport's PAOs, increased number of sensitive receptors near the construction works as a result of urban development.

The updated business case anticipates expenditure totalling approximately $136 million will be incurred during the 2018-22 AA period with $49 million during the 2023-27 AA period.

Table 5-2: WORM project: capital expenditure ($ millions)

	2018 - 2021	2022	2023	2024	Total
WORM	44.8	91.0	46.3	2.8	184.8

(Source: WORM business case update: Table 4: March 2022)
Note: Cost estimate as of 1 December 2021

The significant cost increases for the WORM project arise largely as a result of the outcomes of the Environmental Effects study and period of time elapsed since the initial preparation of the business case which was accepted by the AER in its Decision for the 2018-2022 access arrangement period.

The extent of changes including environmental impacts, additional directional drilling, land approvals and compensation, procurement increases and construction tendering can be expected to have a significant impact on project expenditure. APA's competitive procurement processes, project management governance and reporting along with the fact that APA, as an ASX listed company, faces market scrutiny for its investments, provide a level of assurance that the expenditure is efficient in the circumstances.

5.5 CONCLUSION AND RECOMMENDATION

The Western Outer Ring Main (WORM) was accepted in AER's 2017 Final Decision of the 2018-22 access arrangement for APA, with capital expenditure of $127 million ($2017) and planned completion by Q1 2021. The project was justified based on the need to maintain system security.

Largely due to a requirement to prepare an Environment Effects Statement the project has been significantly delayed with completion now expected in Q2 2023. Requirements arising from the environmental study, land approvals processes, along with procurement and construction tendering processes have all seen cost increases, with the current estimate of capital expenditure being $185 million.

Given the delay of this project beyond the 2018-22 Access Arrangement period and the proposed significant cost increase, the AER requested the APA to "provide an revised business case to demonstrate that the project remains prudent and efficient and to support the inclusion of this project in the total capex", which the APA provided in March 2022.

APA's updated business case has also included assessment of an option to cancel the WORM project and also the potential to utilise demand management instead of completing the WORM. We have reviewed these scenarios and agree with APA that they are neither prudent nor efficient.

Our assessment of the WORM project shows that it will provide significant benefit in the operation of the VTS including:

- Unlocking capacity to and from Port Campbell, in particular the Iona underground gas storage facility, increasing the rate of refilling and the capacity to transfer larger volumes of gas across the VTS;
- Security of supply in the event of temporary loss of supply from production facilities or infrastructure across the VTS;
- Improved operability of the VTS by increasing available system linepack and adding the ability to transfer linepack between pipelines that are currently disconnected;
- Reducing reliance on the aged and congested Brooklyn Compressor site;
- Providing increased capacity and gas flow flexibility to optimise any new sources of gas supply

In terms of the increased capital expenditure for the project, we consider that the benefits of completing the WORM outweigh the additional cost. We also consider that APA's procurement processes, particularly relating to competitive tender processes will ensure that costs are as efficient as can be expected in the circumstances.

In spite of the significant cost increase, we consider that the WORM project remains prudent and efficient as was the case when it was initially accepted as part of the 2018-22 access arrangement.

6. RULE 80 BUSINESS CASES

6.1 BUSINESS CASE 602. SWP EXPANSION – IONA 670TJ/D.

6.1.1 Introduction

AEMO's 2022 GSOO and VGPR forecasts show that with the declining production from Longford, its peak day adequacy in Victoria using "existing" and "committed" supply is tight throughout planning period, with the risk of supply shortfalls towards the later years and also noting that the following period will expected to continue this trend. As such there will be an increasing reliance on "committed" and "anticipated" supply projects to restore some resilience in the VTS to enable AEMO to effectively manage the system during peak day events.

Lochard Energy owns the Iona UGS at Port Campbell. This storage facility provides the flexibility to be filled during periods of lower demand and then provide capacity to inject this gas into the VTS during periods of high demand. In December 2020 Lochard Energy achieved FID to increase the Iona UGS injection capacity to 570 TJ/d by January 2023. This capacity requirement [43] was developed by a consortium of east coast gas market participants. The SWP current injection capacity into the VTS constrains the full availability of domestic gas that can be utilised from Iona UGS. As part of its access arrangement capital expenditure proposals for 2023-27, APA has submitted a business case 601 to increase the injection capacity of the SWP to match the 570 TJ/d capacity. We have considered that project in section 4 of this report.

Further, Lochard Energy is currently considering a proposal to increase the Iona UGS injection capacity to 670 TJ/d and increasing their storage to 30 PJ by Q4 2024, subject to achieving Financial Investment Decision (FID) in Q3 2022.

Noting that the timeframe of Lochard's proposal falls within the 2023-27 access arrangement, APA has prepared a business case 602 to further expand the SWP to allow more gas from Iona UGS to be injected into the VTS, matching the injection capacity being proposed for Iona UGS. As this proposal has not achieved FID, APA is submitting this business case under Rule 80.

6.1.2 APA's recommended option

APA's business case notes the following options:

- Do nothing
  APA does not submit any capital expenditure proposal at this stage

- Looping
  This is APA's recommended, and least cost, option to increase injection capacity. This option, proposes the laying of 74 kilometres of 20 inch pipeline looping, restaging the Winchelsea compressor along with aftercooler bypass works. Also upgrade Brooklyn City Gate and Brooklyn Lara City Gate. Note that this option assumes that Stonehaven and Pirron compressors have been installed as part of the project to increase injection capacity to 570 TJ/d. If instead, an additional compressor has been installed at

[43] Consortium of east cost market participants and Lochard Energy: submission dated 17 February 2022

Winchelsea, then additional pipeline looping would be required to achieve the required injection capacity of this proposal, along with the respective additional capital expenditure. Modelling indicates that this option will increase SWP injection capacity to 650 TJ/d. Capital expenditure is estimated at $216 million.

- Compression and Looping
  This option includes the installation of a compressor at Winchelsea along with 65 kilometres of 20 inch pipeline looping. In addition, it requires restaging of the existing Winchelsea compressor and aftercooler bypass works, and upgrade of Brooklyn City Gate and Brooklyn Lara City Gate. Capital expenditure is estimated at $219 million.

For the Looping, and Compression and Looping options, the pipelines would be constructed to be hydrogen ready. For both options, completion would be 2027, as land approvals for the pipelines could take up to 36 months and a further 13 months to complete the project.

6.1.3 Conclusion and recommendation

As noted in the 2022 GSOO and VGPR there is considerable uncertainty with both supply and demand forecasts. With respect to demand AEMO has applied two scenarios "Step Change" and "Progressive Change" to forecast the range of demand over its planning period and beyond towards 2041. These two scenarios diverge significantly in later years. With respect to supply, AEMO has noted in its forecasts that there will be greater reliance on "anticipated" and "potential" projects, particularly in later years.

In our assessment of APA's proposal to increase injection capacity on the SWP to 570 TJ/d we noted that AEMO sees the flexibility, and rapid response capabilities of Iona UGS, in addressing peak demand events as becoming increasingly important in coming years. However, there are a number of anticipated and potential supply projects that may (or may not) proceed to production and therefore the level of Iona UGS injection capacity is very uncertain. It is made more complex given the fact that there are two potential LNG terminal supply options currently under consideration that would have a direct impact of Iona UGS' ability to injection freely into the VTS.

This project has been categorised as a "potential" supply in AEMO's 2022 GSOO and VGPR. While acknowledging that this project has an extended lead time of 4-5 years, we consider that there is too much uncertainty regarding demand and supply at this time. We also note that the AER decision relating to APA's proposal to increase SWP injection capacity to 570 TJ/d would need to be fully resolved before consideration of this proposal. This project also requires extensive capital investment of $216 million. As such we do not consider that this project is currently prudent and efficient.

6.2 BUSINESS CASE 603. LNG IMPORT TERMINAL CONNECTION TO SWP

6.2.1 Introduction

AEMO's 2022 GSOO and VGPR forecasts show that with the declining production from Longford, its peak day adequacy in Victoria using "existing" and "committed" supply is tight throughout planning period, with the risk of supply shortfalls towards the later years and also noting that the following period will continue this trend. As such there will be an increasing reliance on "committed" and "anticipated" supply projects to restore some resilience in the VTS to enable AEMO to effectively manage the system during these events.

There are currently two LNG import terminal projects undertaking investment (FEED) studies to connect to the SWP around the Geelong area. Viva Energy and Vopak are proposing to connect at Lara/Avalon and may achieve FID later in 2022 and targeting supply from 2024. Both projects propose injection capacity of up to 500-600 TJ/d from their facilities. Given the timing of these LNG projects, APA has prepared a business case and submitted to the AER for consideration under Rule 80.

6.2.2 APA's recommended option

APA's business case notes the following options:

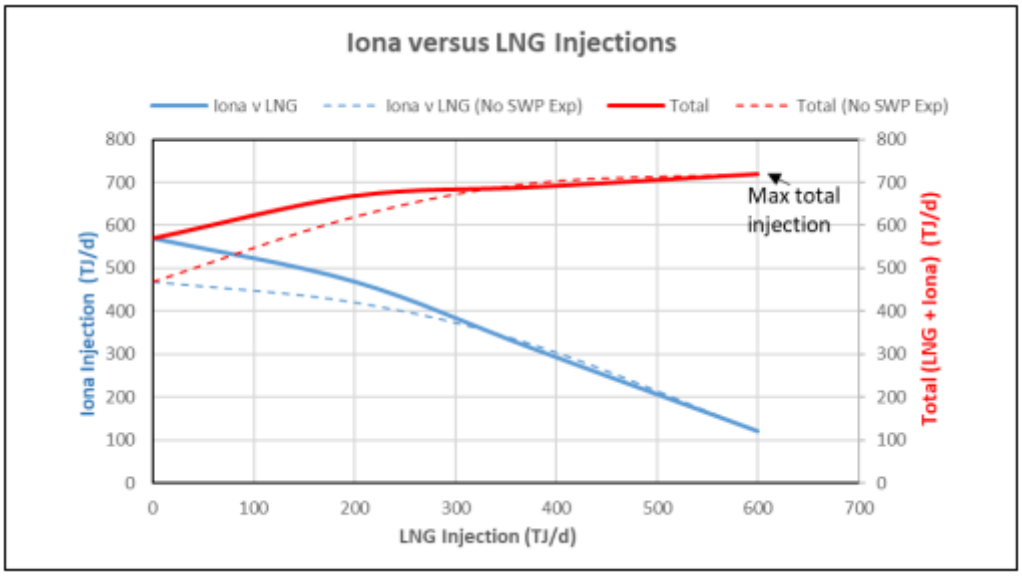
- Do nothing
- APA's recommended option is to upgrade Brooklyn City Gate and Brooklyn Lara Pipeline City Gate, which would allow higher flows to be supplied to the VTS should either one of the projects connect to the VTS. The upgrade of the Brooklyn facilities is the minimum capital expenditure required to increase the SWP by approximately 252 TJ/d (post WORM), to allow up to 720 TJ/d to be injected into the SWP. The proposal assumes that the augmentation of the SWP by installing compressors at Stonehaven and Pirron has occurred. The capital expenditure is $14.8 million.

6.2.3 Assessment

APA has noted that this business case proposal does not allow full injection capacity of Iona UGS and LNG terminal at the same time, and that significant capital expenditure would be required for that to occur.

The following chart shows the relationship between Iona UGS injection and LNG terminal injection. The maximum combined injection is 720 TJ/d, comprising 600 TJ/d from the LNG terminal and 120 TJ/d from Iona UGS. In the chart, the thick lines show the relationship where the SWP expansion (Stonehaven and Pirron compressors) has been implemented to allow Iona maximum injections of 570 TJ/d. The dotted lines show the case without the SWP expansion.

Figure 6-1: Iona UGS – LNG injection relationship



(Source: APA Business Case 603: Figure 1)

LNG terminal description. With reference to Viva Energy's publicly available information[44], its gas terminal project comprises LNG ships that would bring LNG from various locations in Australia and overseas to its facilities adjacent to its Refinery in Geelong. The LNG is transferred to a ship known as a floating storage and regasification unit (FSRU) moored at the pier, where it is stored and converted into natural gas when needed. A treatment facility within the refinery ensures that the gas meets transmission system standards. A pipeline then carries the gas from the FSRU to the SWP connection point at Lara. While the LNG can be stored in the FSRU for an extended period and can be progressively injected as natural gas into the SWP, the FSRU would need to have capacity available for delivery from the LNG ships, subject to their frequency of arrival.

It is clear from the above figure that when gas is being injected into the SWP, it will significantly constrain gas flowing from Iona UGS. There are also potential issues relating to the declared wholesale gas market operation that will need to be resolved to ensure smooth operation of flows from Iona UGS and the LNG terminals to meet the requirements of all market participants. It can also be expected that natural gas from LNG terminals is likely to be more expensive. Notwithstanding these issues, Iona UGS has the flexibility to refill and inject gas into the VTS. The significant challenge for AEMO and the market participants will be in scheduling injections so that both Iona UGS and LNG terminal(s) can provide benefit in base load supply and during periods of peak demand.

6.2.4 Conclusion and recommendation

As noted in the 2022 GSOO and VGPR there is considerable uncertainty with both supply and demand forecasts. With respect to demand AEMO has applied two scenarios "Step Change" and "Progressive Change" to forecast the range of demand over its planning period and beyond towards 2041. These two scenarios diverge significantly in later years. With respect to supply, AEMO has noted in its forecasts that there will be greater reliance on "anticipated" and "potential" projects, particularly in later years. These LNG terminal projects have been classified as "potential" in AEMO's 2022 GSOO and 2022 VGPR.

[44] Viva Energy website.

On face value the establishment of an LNG terminal at Geelong / Laverton could provide significant supply of natural gas to the VTS, subject to frequency of ship deliveries. However, uncertainty lies in the timing and frequency of these deliveries, along with complexities of having Iona UGS and the LNG terminals injecting into the same pipeline (SWP) which currently does not have the capacity to allow full injection rates from both facilities at the same time. This presents significant issues in the declared wholesale gas market processes to be able to optimise LNG and Iona UGS injections to the satisfaction of market participants.

The location of these LNG terminals is such that they will connect to the SWP resulting in constraint of Iona UGS gas flows when the vaporised LNG is injected into the SWP. As a result the full benefits of Iona UGS and LNG terminal injection capacities would not be realised without significant capital expenditure investment in infrastructure such as pipeline looping, which in the current climate of supply-demand uncertainty would not appear to be prudent and is not proposed by APA at this time.

APA notes that its proposal represents the minimum amount of capital expenditure required ($15 million) to increase the SWP by 150-252 TJ/d, which in itself is significant.

Given the issues relating to constraints with injection capacities, particularly from Iona UGS, and complexities associated with wholesale gas market processes in this instance, we do not recommend accepting this project at this stage and until the multiple supply situation is clearer.