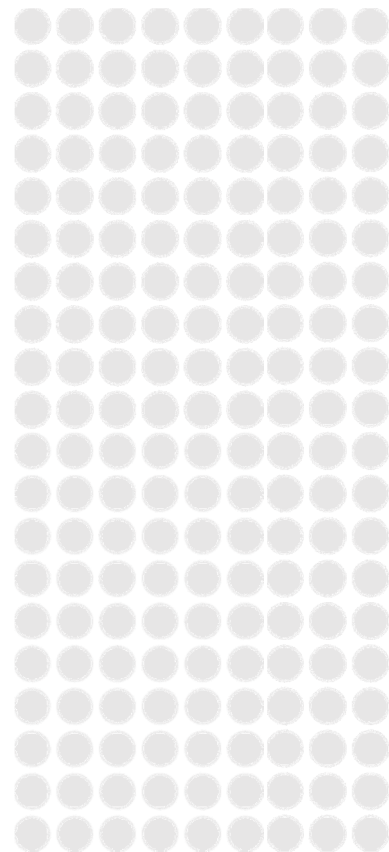3 January 2017

victorian transmission system
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Contents

energy. connected.

energy. connected.

energy. connected.

Figures and Tables

energy. connected.

energy. connected.

energy. connected.

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Abbreviations

ABS	Australian Bureau of Statistics
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AGN	Australian Gas Networks
AMDQ CC	Authorised Maximum Daily Quantity Credit Certificates
AMP	Asset Management Plan
APA VTS	APA VTS Australia (Operations) Pty Ltd & APA VTS Australia (NSW) Pty Ltd
Black CAPM	Black's Capital Asset Pricing Model
CPI	Consumer Price Index
CTM	Custody Transfer Meter
d	Day
DWGM	Declared Wholesale Gas Market
EBSS	Efficiency Benefit Sharing Scheme
ECM	Enterprise Content Management
EDD	Effective Degree Day
EMAT	Electro-Magnetic Acoustic Transducer
ERA	Economic Regulation Authority, Western Australia
GFC	Global Financial Crisis
GJ	Gigajoule
GPG	Gas Powered Generation
GWCF	Gas Wholesale Consultative Forum
GWh	Gigawatt hour
kPA	Kilopascal
LNG	Liquefied Natural Gas
MAOP	Maximum Allowable Operating Pressure
MPa	Megapascal (1 MPa =1,000 kPa)
MRP	Market Risk Premium
MW	Megawatt (1 MW = 1,000,000 watts)

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NGL	National Gas Law
NGFR	(AEMO) National Gas Forecasting Report
NGR	National Gas Rules
NPV	Net Present Value
PIMP	Pipeline Integrity Management Plan
PJ	Petajoule (1PJ=1,000,000GJ)
PRS	Pressure Reduction Station
PTRM	Post-Tax Revenue Model
RIN	Regulatory Information Notice
SCADA	Supervisory Control and Data Acquisition
SEA	Service Envelope Agreement
SL CAPM	Sharpe-Lintner Capital Asset Pricing Model
SWP	South West Pipeline
TAB	Tax Asset Base
TJ	Terajoule (1TJ=1,000GJ)
VNI	Victorian Northern Interconnect
VNIE	Victorian Northern Interconnect Expansion
VRET	Victorian Renewable Energy Targets
VTS	Victorian Transmission System
WACC	Weighted Average Cost of Capital
WTS	Western Transmission System

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Key themes for the access arrangement period

…changing demand patterns…

The east coast gas market has experienced a demand shift in the last five years. The start of liquefied natural gas exports from Queensland has driven a step change in gas demand, leading to a rapid evolution in the interconnected east coast gas transmission system to enable additional gas to be sourced from fields across the east coast to meet overall gas demand.

The Victorian Transmission System (VTS) has undergone significant expansion over the current access arrangement period as a result of changing gas demand on the east coast.

Additional demand for gas sourced from Port Campbell, as well as demand for capacity for gas to flow north out of the VTS at Culcairn, led to a major expansion of the system between 2013 and 2017. The zonal tariff structure means that those benefiting from the capital expenditure to deliver this capacity are paying for it, while others are benefiting from the reduction in per unit fixed costs resulting from the increased throughput.

APA VTS is also expanding the system to provide more capacity for the refill of the Iona storage facility. This too is a function of changing gas demand fundamentals, driving the need to increased refill capacity to allow the storage facility to be refilled more quickly over summer. Again, the tariff structure means that only those that benefit from this additional capacity are paying for it – other users of the system will bear none of the expansion costs.

…investing for the future…

The VTS transports almost 200PJ of gas a year to customers located in Victoria, and across the east coast of Australia. It is a critical link in the interconnected east coast gas transmission grid. As such, it needs to continually grow and adapt to changing gas demand patterns, and to the changing needs of the users of the system, and end users of gas.

To prepare the system for future growth, APA VTS proposes a significant purchase of easements for the future construction of the Western Outer Ring Main. This is to secure the easement against future urban development. APA VTS has calculated that to do so now is in the long term interests of

consumers as to wait will increase purchase costs, as well as lead to a longer (less optimal) pipeline corridor, thereby increasing construction costs.

…ensuring safety and integrity of the system…

The other main focus for this access arrangement period is safety and integrity works.

Pipeline integrity works are a continual feature of pipeline management, and the forecast period will see a peak in scheduled integrity inspection activities, combined with some age/condition-based major overhauls of facilities.

The VTS has seen significant urban encroachment since its construction in the 1950s, and the Victorian Government's moving of the urban boundary in 2011. This means there has been a change in land use form rural to urban in areas where APA VTS has pipelines, and parts of the VTS that were designed for rural zones are now operating in residential and high density areas.

This changes the way APA VTS must manage its pipeline assets, and ensure the safety of the community.

…policy changes may be coming…

There are significant changes mooted for the policy and market settings for the VTS. Two recent reviews suggest moving the current Victorian market arrangements to a 'virtual hub' model, with contracted pipeline capacity at entry and exit points. However, no policy decision has yet been made.

While this would be a very significant change that would be relevant to the structure and scope of the access arrangement applying to the VTS, it is very unlikely that a change to the Victorian market will occur in the course of this access arrangement period. In any case, the nature and scope of the required changes are not able to be predicted at this stage. APA VTS's access arrangement proposal does not contemplate these changes, but proposes that the costs of any policy implementation during the period be recoverable through a cost pass through event.

…consistency with current arrangements…

APA VTS does not propose widespread changes to the tariff structure or to how costs are allocated to tariffs for the forecast period. Tariffs remain cost reflective, within the same classes and zones as currently.

Summary - building block revenue proposal

The VTS comprises over 2000 kilometres of pipelines and associated facilities supplying the Melbourne metropolitan area, country Victoria, and supplying gas in New South Wales and South Australia. The VTS transports gas across the system and into NSW at Culcairn.

Capital expenditure and capital base

The VTS regulatory capital base at 1 January 2018 is $1,005 million.

This is higher than was forecast five years ago, driven by increased demand for gas flows from Victoria into New South Wales, and capital expenditure – which was not forecast – to facilitate those flows.

The increase in capital base is driving an increase in forecast regulated revenues for the next period – it flows through into both the return on and return of capital forecasts.

This investment is paid for by the users of the new capacity – all costs associated with the expansion are allocated to the relevant pipeline tariff zones. Residential and commercial users within Victoria are not bearing the extra costs of VTS expansion. In fact, they benefit from the investment through increased system security, and as a result of the higher forecast volumes which lower the allocation of overheads to the tariffs they pay.

Forecast capital expenditure is focused on system integrity and safety. In particular, projects to secure easements for future growth of the system, and to manage urban encroachment on the pipeline, feature prominently. There is also a peak in scheduled pigging activities in the period, as well as the need to undertake some major age/condition related overhauls of facilities.

Rate of return

This access arrangement revision proposal applies the AER Rate of Return Guideline to determine the appropriate rate of return. However, this access arrangement revision proposal includes more appropriate parameter values, as discussed in more detail in Chapter 7.

The proposed revised access arrangement includes a post-tax cost of equity of 8.5 per cent, a pre-tax cost of debt of 7.47 per cent, for a post-tax vanilla WACC of 7.88 per cent.

Operating expenditure

Notwithstanding the changes in the underlying market, APA VTS has achieved significant operating efficiencies in the current period that are benefiting customers through a lower operating expenditure allowance in the forecast period, as shown below.

Actual and forecast capital expenditure compared to AER approved forecast
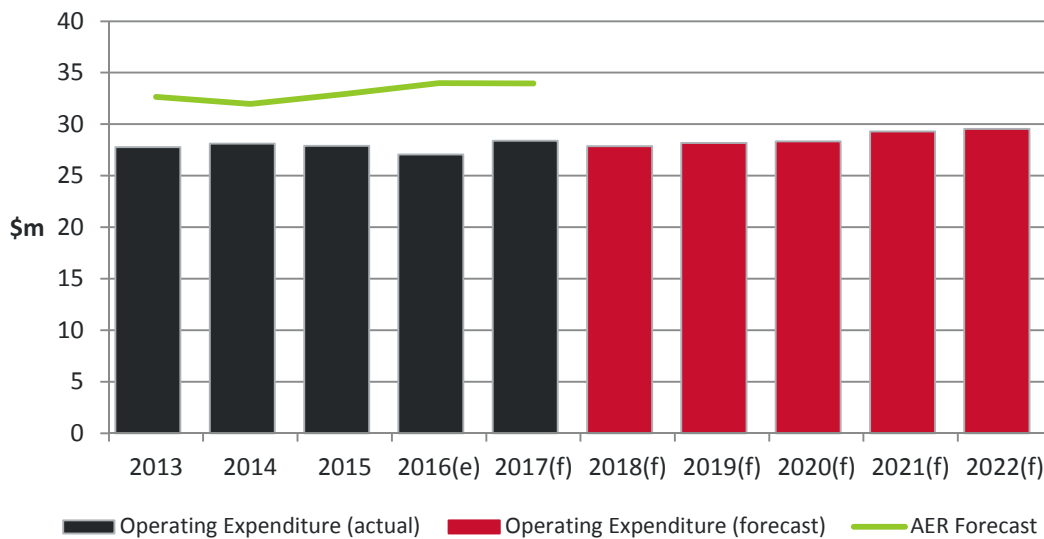
Demand forecast

The VTS serves a number of different types of end users, and their forecast demand profiles have been assessed by customer class.

For residential consumers (known as Tariff-V), demand tends to increase with population growth, but decreases as the efficiency of appliances and the quality of insulation in the housing stock improves. Over the next 5 years, APA VTS expects to see these two factors contribute to a relatively flat demand for the residential sector.

The Industrial sector (known as Tariff-D) is expected to continue a trend of declining gas consumption, related to reduced economic activity in that sector.

These trends are shown in the graph below.

Actual and forecast Tariff V and Tariff D volumes (PJ)
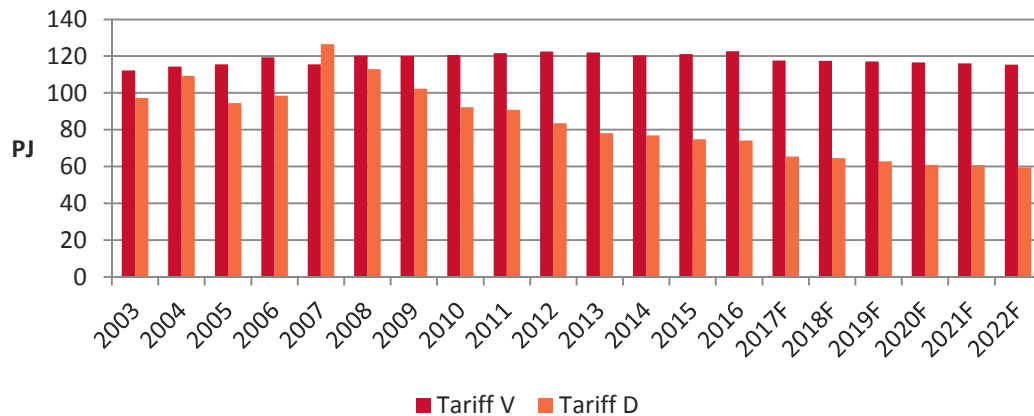
Gas-fired power generators are expecting to see an increase in production to replace the electricity generation load lost through the Hazelwood closure, but this is expected to be short-lived as new renewable generation, encouraged by the new Victorian Renewable Energy Target, enters the market.

Gas transported through the VTS to other markets (NSW, Queensland, and export), is forecast to show an increase relative to historical levels.

Forecast revenue requirement

The forecast revenue for each year of the access arrangement period, including all the elements of the proposal, is set out in the following table.

$m nominal	2018	2019	2020	2021	2022
Return on capital	79.4	83.5	85.3	85.8	85.5
Regulatory depreciation	17.5	20.1	22.9	24.9	20.6
Corporate tax allowance	4.8	5.1	5.3	5.7	3.8
Incentive mechanisms	8.6	4.8	3.7	2.3	0.0
Operating costs	26.2	26.9	27.5	29.0	29.9
Total	136.5	140.5	144.9	147.6	139.8
Smoothed revenue requirement	121.9	131.8	142.5	154.0	166.5
X factors tariff revenue (%)		-6.0	-6.0	-6.0	-6.0

Tariff outcomes

Although revenue is expected to increase in the forecast period, this is almost entirely driven by the increase in the capital base from the significant expansion of the Victorian Northern Interconnect for flows into New South Wales. It is important to note that those users that are benefiting from the capital expenditure to provide additional capacity are paying for it. The expansion is not driving an increase in costs to be recovered from other users of the VTS. In fact, this expansion and the increased gas volumes that come with it are reducing costs being recovered from other users of the VTS by driving a reduced allocation of overheads to those users under the cost allocation methodology (described in chapter 10 of this submission).

Looking at residential customer tariffs, transport charges for a volume class customer (consuming 60 GJ per annum) in the Metropolitan area will increase by approximately 7 cents per gigajoule in 2018. This equates to a $3 increase in the annual bill, or about a 0.3 per cent increase.

For a business customer (consuming 500GJ/annum) in the same region, the increase in annual bill is approximately $27, or about a 0.3 per cent increase.

These increases are driven by the forecast decline in volumes, coupled with a small increase in the rate of return compared to the earlier period.

1   Introduction

This submission provides supporting information for APA VTS Australia (Operations) Pty Limited's (APA VTS's)[1] proposed revision of the Access Arrangement applying to the Victorian Transmission System (VTS) from 1 January 2018.

In accordance with the requirements of section 132 of the National Gas Law (NGL) and Rule 43(1) of the National Gas Rules (NGR)[2], APA VTS has provided to the Australian Energy Regulator (AER) with this submission:

- A proposed revised access arrangement in respect of the VTS;

- An Access Arrangement Information document; and

- A submission in support of the proposed amendments to the VTS access arrangement (this document and attachments).

Together these documents make APA VTS's access arrangement revision proposal.

1.1   Information required by Regulatory Information Notice

On 28 October 2016, the AER served on APA VTS a Regulatory Information Notice (RIN) under Division 4 of Part 1 of Chapter 2 of the NGL. The RIN specifies information to be provided to the AER by APA VTS in its access arrangement revision proposal, and the form of that information.

This submission, along with the access arrangement proposal, access arrangement information, and accompanying financial models, provides information in satisfaction of the requirements placed on APA VTS in the RIN.

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[1] During the course of the earlier access arrangement period, APA changed the business names for the service providers relevant to the VTS. The former "APA GasNet Australia (Operations) Pty Limited" is now "APA VTS Australia (Operations) Pty Limited" and "APA GasNet Australia (NSW) Pty Limited" is now "APA VTS Australia (NSW) Pty Limited". This change to the business names has no effect on the scope of the responsibilities of these businesses, or the operation of the earlier access arrangement. Confirmation of the change in company name is provided with the supporting documentation to this submission.

[2] This submission proposal has been prepared under the version of NGR current at the time of submission – version 32

The RIN also requires that APA VTS submit to the AER an Index of Information outlining where the information to be provided under the RIN is contained in the access arrangement revision proposal. This Index of Information can be found at Appendix A.1 to this submission.

1.2 Basis of information in the access arrangement revision proposal

Rule 73 states that:

> *(a) Financial information must be provided on:*
>
> > *(i) a nominal basis; or*
> >
> > *(ii) a real basis; or*
> >
> > *(iii) some other recognised basis for dealing with the effects of inflation.*
>
> *(b) The basis on which financial information is provided must be stated in the access arrangement information.*
>
> *(c) All financial information must be provided, and all calculations made, consistently on the same basis.*

Unless otherwise stated, all historic information in this submission is in nominal dollars, and all forecast information is real December 2017 dollars.

The access arrangement revision proposal uses the following conventions for referring to access arrangement periods:

- Current access arrangement period or earlier access arrangement period, for the access arrangement period spanning 1 July 2013 to 31 December 2017; and

- Access arrangement period or forecast access arrangement period for the access arrangement period spanning 1 January 2018 and 31 December 2022.

1.3 Consumer engagement in respect of this submission

APA VTS has engaged with consumers in the preparation of this submission proposal. Direct users of the system are market participants of the Declared Wholesale Gas Market (DWGM). These are:

- Small retailers

- Large retailers

- Gas producers

- Large industrial customers

- Gas-powered generators

APA VTS engages with these customers (there are currently 21 different direct users of the VTS) in a number of ways. A key area of engagement is through involvement with the Australian Energy Market Operator's (AEMO's) Gas Wholesale Consultative Forum, of which many direct users are also members.

Through this forum, APA VTS raises issues relevant to users in respect to the system, for example planned maintenance that will impact capacity, and seeks feedback on appropriate timing in order to minimise adverse user impact. APA VTS also keeps forum members updated on planned system augmentations and, in respect to this access arrangement proposal, has specifically sought customer input on future system needs.

It is through the Gas Wholesale Consultative Forum, and through engagement with the operator of the Lochard Iona underground storage facility, and with shippers that use that storage facility, that APA VTS became aware of the emerging constraint on refills into the facility being driven by a change in shipper behaviour. This has directly led APA VTS to include in its access arrangement revision proposal the westbound South West Pipeline (SWP) expansion project for the forecast period, which is described in more detail in section 5.3.1.

APA VTS has also sought to directly engage with small end users of gas on the development of this access arrangement revision proposal through representative groups. For the last twelve months, APA VTS has attended the AEMO Consumer Forum and maintained a standing item for discussion on the VTS access arrangement, seeking input and feedback.

To date, interest within this forum on the VTS access arrangement development process has been limited. One member of the Consumer Forum advised that this is probably related to the minor impact of gas transmission prices on the end customer bill, and to the limited resources available to consumer groups. There was also a suggestion that the level of knowledge that consumer groups have of the gas industry is low compared

to the electricity industry, and that this may be impacting levels of engagement.

The users of the VTS and the end users of the gas it transports are diverse and geographically spread – they are no longer limited to the end users of gas located in Victoria. This is a key challenge for APA VTS in developing a meaningful and targeted approach to engaging with relevant small end use consumers.

APA VTS is committed to effective consumer engagement. While our engagement with direct users is deep and effective, we propose to increase or focus on engagement with small end users of gas.

APA VTS has developed the first phase of its Consumer Engagement Plan which is focused on identifying relevant consumer stakeholders and potential approaches for engagement. The Consumer Engagement Plan is provided at Attachment A.4 to this submission.

1.4   Overview of Victorian market regulatory arrangements and history

1.4.1   *Victorian wholesale gas market*

The Victorian Wholesale Gas Market is a market carriage system, implemented by the Victorian Government as part of the restructuring and privatisation of the Victorian gas industry in 1997 and 1998. The Victorian Wholesale Gas Market is a Declared Wholesale Gas Market under the NGL.

Market Carriage incorporates a number of important features that are different from traditional contract carriage arrangements. In particular:

- shippers are not required to reserve capacity under long-term take or pay contracts in order to ship gas through the market carriage system; tariffs are pay-as-you-go;

- AEMO operates a spot market into which Market Participants must bid gas supply and through which all gas imbalances are taken to be bought or sold; and

- subject to residual curtailment powers, AEMO will schedule gas supply from Market Participants as accepted in the spot market sufficient to meet demand.

This has a number of significant implications for APA VTS. For example, unlike other pipeline owners in Australia, APA VTS does not have contractual certainty, either on the term of gas supply to users or on minimum capacity payments from users at particular sites. This means that APA VTS is subject to greater gas demand volume risk, which is extremely sensitive to circumstances outside APA VTS's control including weather patterns and expansions and contractions in the economy. Some regulatory mechanisms are currently in place to alleviate some of these risks, such as normalisation of gas flows to weather and a mechanism to bound non (cold) weather related volume risk.

1.4.2 Service Envelope Agreement

Section 91BE of the NGL requires the service provider for a declared transmission system to have in place an agreement (referred to as the Service Envelope Agreement (SEA)) with AEMO for the control, operation, safety, security and reliability of the declared transmission system.[3] Under the law and reflected in the SEA, APA VTS makes the VTS available to AEMO, and in doing so provides a pipeline service within the meaning of the NGL.

The current SEA expires on 31 December 2022. Under the terms of this agreement:

- APA VTS agrees to:

  o Make available the APA VTS System to AEMO (section 4(a)); and

  o Provide a range of supporting services to AEMO (section 4(d)); and

- AEMO agrees to:

  o Operate the APA VTS System in accordance with the NGL and NGR; and

  o Amongst other things, observe good practice in operating the system and not operate facilities in a manner that will materially adversely affect APA VTS's ability to comply with its obligations under the SEA (section 8.1(a)).

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[3] The current Service Envelope Agreement is provided in the package of submission supporting material for this chapter

As a result of the SEA, AEMO has operational control of APA VTS System Capacity, which is the capacity of the covered pipeline and is agreed with AEMO. Extension to or expansions of the VTS can impact the APA VTS System Capacity if they form part of the covered pipeline.

While AEMO operates the APA VTS System, APA VTS has a direct contractual arrangement with shippers for the payment of transmission tariffs, called the Transmission Payment Deed.

1.4.3   *Direct connection of Tasmanian Gas Pipeline to the VTS*

During the earlier access arrangement period APA VTS completed a new connection to the VTS – the connection of the Tasmanian Gas Pipeline to the Longford to Melbourne Pipeline as an injection point. In making this connection, APA VTS completed a 626 metre extension to the Longford Gas Pipeline.

In required under section 7.1(a) of the extensions and expansions arrangements under the access arrangement, APA VTS applied to the AER, prior to commissioning the extension, for a decision on whether the extension formed part of the covered pipeline.[4] APA VTS proposed that the extension should form part of the covered pipeline, and therefore part of the DWGM.

APA VTS made this application on 13 October 2016. At the time of submitting this revision proposal, APA VTS had not received a decision from the AER. The AER's decision on this matter is relevant to this access arrangement revision proposal, as noted in APA VTS's letter to the AER, in respect of the treatment of this extension under the access arrangement.

APA VTS has proceeded on the basis that the AER will agree with APA VTS's proposal that this extension form part of the covered pipeline. Should the AER determine otherwise, then aspects of this access arrangement will need to be revised.

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[4] APA VTS letter to AER, Extension to the Longford Gas Pipeline, 13 October 2016. Letter provided in supporting documents to this chapter.

1.5   Overview of the Victorian transmission system

1.5.1   Service providers of the covered pipeline

APA VTS is the owner of the VTS, which is the primary transmission system for the delivery of gas throughout Victoria. APA VTS's subsidiary, APA VTS Australia (NSW), is the owner of that portion of the VTS that is located in NSW. However, APA VTS Australia (NSW) leases those assets to APA VTS under an operating lease agreement.

The Service Providers in respect of the VTS are APA VTS Australia (Operations) Pty Ltd and APA VTS Australia (NSW) Pty Ltd. APA VTS Australia (Operations) Pty Ltd is the complying service provider under the NGL[5] and submits this access arrangement revision proposal as:

- Owner of the VTS (other than the portion of the Interconnect Pipeline located in NSW); and

- The lessee (controller) of the portion of the Interconnect Pipeline located in NSW.

In this access arrangement revision proposal, APA VTS Australia (NSW) Pty Ltd and APA VTS Australia (Operations) Pty Ltd (which together own the entire VTS) will be collectively referred to as APA VTS.

1.5.2   Pipeline system characteristics

Overview

The VTS comprises over 2,000km of high pressure gas transmission pipelines throughout Victoria. The VTS supplies gas to the Melbourne metropolitan area and to a number of regional centres including Corio (near Geelong), Ballarat, Bendigo, Wodonga, Koonoomoo and Echuca. The Laverton North, Somerton, Valley Power (Loy Yang B), Jeeralang and Newport gas-fired power stations are all supplied from the VTS.

The main VTS pipelines and compression facilities include:

- Longford to Melbourne Pipeline (Longford-Dandenong-Wollert) with compression at Gooding.

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[5] NGL section 10

- South West Pipeline (Port Campbell-Geelong-Brooklyn) with compression at Winchelsea and Brooklyn.

- Victorian Northern Interconnect (Wollert-Wodonga-Culcairn) with compression at Wollert, Euroa and Springhurst.

- Western Transmission System (WTS) (Iona-Portland) with compression at Iona.

Gas transmitted through the VTS is supplied primarily by Esso/BHPB and injected into the VTS at the Longford injection point. Other gas supplies are sourced from the BassGas injection point at Pakenham and from the Iona injection points at Port Campbell. Gas is also supplied to the system through the Interconnect pipeline from NSW. A map of the VTS is at Figure 1-1 below.

Figure 1-1 – Victorian Transmission System
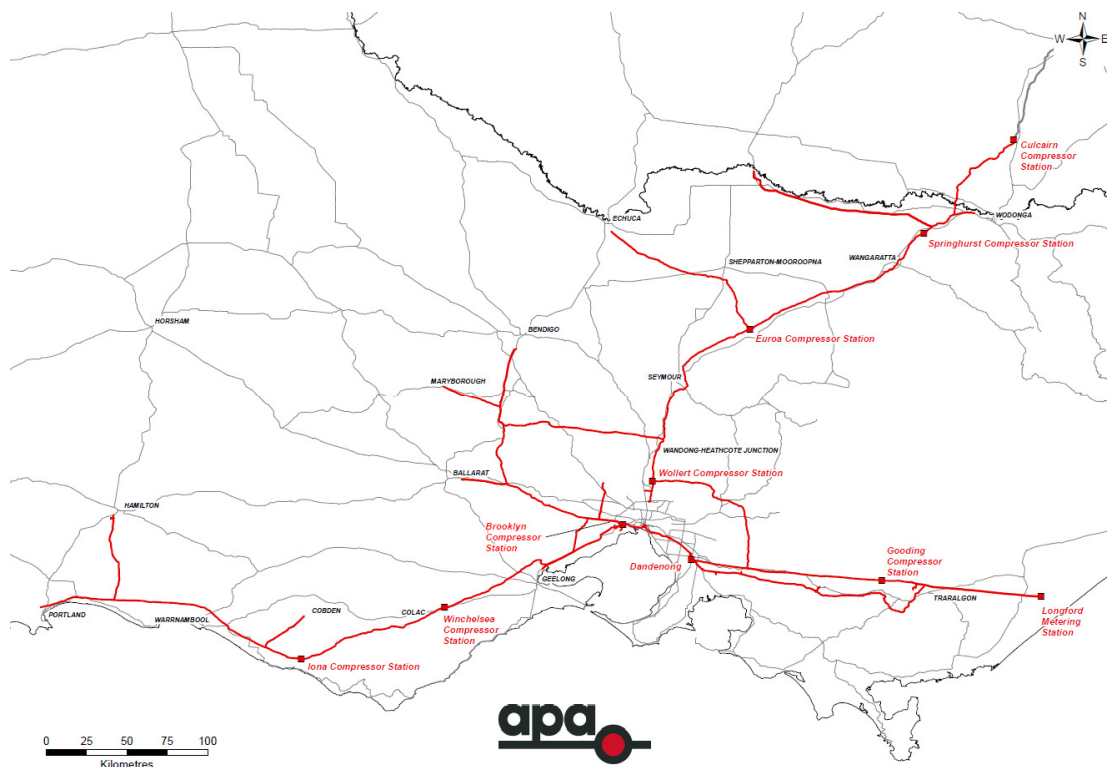
Pipelines

The VTS comprises pipelines of differing lengths, diameters, ages, construction materials and methodologies. These pipelines are generally in good condition, though corrosion induced metal loss, the deterioration of coatings systems and third party encroachment remain a threat.

Pipeline condition is monitored through a number of systems including in-line inspection (pigging), direct current voltage gradient surveys (where pigging is not possible) and physical inspection. The pipeline is protected by pipeline coating (of various types and quality) and cathodic protection.

Pipeline assemblies include scraper assemblies (pig traps), and mainline, isolating and branch valve assemblies.

Stations

The broad category of 'Stations' encapsulates the gas facilities that allow for control, measurement, storage, or pressure maintenance of pipeline fluids within the VTS including compressor stations, odourisation stations, pressure regulation and metering facilities.

Electrical equipment at stations includes station control systems, SCADA and communication systems, instrumentation, fire suppression systems, power systems (including emergency power generation) and earthing systems. Mechanical equipment at stations comprises emergency response equipment, isolation valves and actuators, station valves, pressure regulators, station pipework, siphons, filters and coalescers, gas heaters, oil and gas coolers, instrument air facilities, piping supports and pressurised control and power systems.

The current condition of most station components is good, though some are obsolete due to age or inability to obtain spare parts. APA VTS proposes a number of projects associated with station facilities in the access arrangement period, reflecting the diverse range of equipment this comprises.

Compression facilities

The VTS includes compressor stations at Gooding, Brooklyn, Iona, Wollert, Euroa, Springhurst and Winchelsea. AEMO remotely operates the compressor stations in accordance with the SEA. The key features of each compressor station are as follows.

Gooding compressor station is located north of Moe approximately halfway along the Longford to Dandenong pipeline. The compressor station was constructed in 1977 and currently comprises four Solar Centaur 40 gas turbine driven dry seal centrifugal compressors.

Brooklyn compressor station is located in western Melbourne and provides gas compression from the Dandenong to Brooklyn pipeline into the Brooklyn to Geelong and Brooklyn to Ballarat transmission systems. The current facilities were constructed between 1977 and 2006 and comprise two Saturn 10 and one Centaur 40 wet-seal centrifugal compressor packages and two Centaur 40 dry-seal centrifugal compressor packages.

Brooklyn compressor station operates throughout the year, providing supply from the metropolitan transmission system into the Brooklyn-Corio and Brooklyn-Ballarat pipelines during the colder months, and into the South West Pipeline via the Brooklyn-Corio pipeline for injection into the Iona Underground Storage Facility during the warmer months.

Iona compressor station, built in 2001, is located within the Iona Underground Storage Facility compound and provides compression from the South-West pipeline into the Western Transmission System to Portland to maintain system capacity when inlet pressure at Port Campbell is low.

Winchelsea Compressor Station was commissioned in 2015 and is located in western Victoria. It comprises one Solar Taurus 60 compressor unit to boost gas pressure along the South West Pipeline towards Melbourne (only). A diesel alternator provides standby power to the site.

Wollert compressor station is located north of Melbourne and is the key supply point for the Wollert to Wodonga transmission systems compressing Longford gas from the outer ring main from Pakenham. The original station (Station 'A') was built in 1981 and comprises three Solar Saturn 10 wet-seal centrifugal compressor sets. In 2011 Wollert Compressor Station 'B', comprising two Centaur 50 dry-seal compressor packages, was commissioned as part of the Northern Augmentation project.

Euroa compressor station is located in the mid-section of the Wollert to Wodonga/Culcairn transmission system. The station comprises one packaged Centaur 50 dry-seal centrifugal compressor, and is capable of compressing gas flowing north or south.

Springhurst compressor station, located in the northern section of the Wollert to Wodonga/Culcairn transmission system, was constructed in 1999 to support up to 92 TJ/d transfer of gas from NSW in winter. The station comprises one packaged Centaur 50 dry-seal centrifugal compressor. Although the station was initially capable of compression south only, bi-directional compression was made possible in 2011 with station pipework and valving alterations as part of the Northern Augmentation project.

Plant and operational assets

Plant and operational assets include mobile plant and emergency response tools and equipment such as emergency portable lighting, vehicles, vent systems and emergency vent equipment.

1.6 Context for this access arrangement

The VTS underwent significant growth in the earlier access arrangement period, triggered by the rapid increase in demand for gas on the east coast as a result of the new LNG facilities at Gladstone. This resulted in demand for increased capacity for gas sourced from Port Campbell, as well as demand for capacity for gas flows north at Culcairn. To meet this demand, some of which emerged during the earlier period, APA VTS invested in new capacity on the South West Pipeline and the Wollert to Barnawartha pipeline through compression and looping respectively. Given this investment, APA does not expect to further invest in capacity for 'throughput' flows to Culcairn during the forecast period for gas.

The main focus for this access arrangement period is integrity works.

The VTS is an ageing system and integrity works are a continual feature of pipeline management. However, the forecast period will see a peak in scheduled pigging activities (as required under relevant Australian Standards and by the Victorian technical regulator), combined with the need to undertake several age/condition based major overhauls of facilities.

The VTS has seen significant urban encroachment since its construction in the 1950s. This was further exacerbated by the Victorian Government moving the urban boundary in 2011. The movement of the boundary alters land use from rural to urban in areas where APA VTS has pipelines.

Many parts of the VTS, which were originally designed for rural zoning, are now operating in residential and high density urban areas. The changing risk

profile of the system, in particular as a result of urban encroachment, means that it is necessary to undertake a significant program of works to protect against pipeline rupture, to maintain a safe environment for the public.

APA VTS also proposes, in the access arrangement period, a significant purchase of easements for the future construction of the Western Outer Ring Main. This is to secure the easement against future urban development since the move of the urban boundary. APA VTS has determined that to do so now is in the long term interests of consumers. To wait will increase purchase costs, as well as lead to a longer (less optimal) pipeline corridor, thereby increasing future construction costs.

There are also significant changes mooted for the policy and market settings for the VTS. The recently completed *East Coast Wholesale Gas Market and Pipeline Frameworks Review*, and the *Review of the Declared Wholesale Gas Market* that is currently underway, suggest moving the current market carriage DWGM arrangements to a 'virtual hub' model, with contracted pipeline capacity at entry and exit points.

While this would be a very significant change that would be relevant to the structure and scope of the VTS access arrangement, a change to the Victorian market is unlikely in the course of this access arrangement period. In any case, the nature and scope of the required changes are not able to be predicted at this stage.

Should there be a decision to develop new arrangements to replace the existing DWGM arrangement with a virtual hub model (or alternative market model), it is anticipated that there will be significant development and systems costs incurred by APA VTS in the lead up to its implementation. These costs may not be captured in the definition of a 'regulatory change event': while the change would certainly be a regulatory change, the vast majority of costs incurred by APA VTS to prepare for the new market arrangements would be incurred prior to the commencement of the new market arrangements.

APA VTS has therefore included a new cost pass through event specifically related to the development of new market arrangements. The proposed event captures costs incurred in the development and implementation of systems, processes and procedures made necessary by a decision to develop a new gas market structure in Victoria. Specifically, it allows for the pass through of prudent and efficient costs incurred for actions necessary to

prepare for new market arrangements. This proposal is discussed in section 10.5.2 of this submission.

2 Services

2.1 Reference Services

The earlier access arrangement included two reference services:

- The Tariffed Transmission Service Reference Service; and

- The AMDQ CC Reference Service.

APA VTS proposes a single Reference Service for the access arrangement period, being the Tariffed Transmission Service.

2.1.1 Rule requirements

The NGR require a full access arrangement to specify at least one Reference Service:

> *101 Full access arrangement to contain statement of reference services*
>
> *(1) A full access arrangement must specify as a reference service:*
>
> > *(a) at least one pipeline service that is likely to be sought by a significant part of the market; and*
> >
> > *(b) any other pipeline service that is likely to be sought by a significant part of the market and which the AER considers should be specified as a reference service.*
>
> *(2) In deciding whether to specify a pipeline service as a reference service, the AER must take into account the revenue and pricing principles.*

2.1.2 Tariffed Transmission Service

APA VTS proposes to maintain the Tariffed Transmission Service as the only reference service in the access arrangement.

The Tariffed Transmission Service is a bundled service comprising the transportation of gas in accordance with the NGR for a declared transmission system. This service is provided to AEMO, who is the only User of the pipeline under the National Gas Law definition.

This legal arrangement arises from the market carriage model set out in the NGL and NGR. Under these arrangements, AEMO operates the VTS. Shippers (registered Market Participants of the Victorian Declared Wholesale Gas Market) access the reference service through AEMO in accordance with the NGL and NGR. The only relationship between APA VTS and Shippers is through the Transmission Payment Deed, key terms of which make up part of the Access Arrangement (Schedule F). For clarity, APA VTS does not provide any service directly to Shippers on the pipeline.

2.1.3   *AMDQ CC*

The AER required the inclusion of Authorised Maximum Daily Quantity Credit Certificates (AMDQ CC) as a reference service in the earlier access arrangement.[6] AMDQ CC provide users who purchase these certificates with preferential rights to specified amounts of pipeline capacity when the transmission system becomes constrained.

On 24 March 2016, the Australian Energy Market Commission (AEMC) released its final determination on the allocation of AMDQ within the DWGM.[7] The AEMC determined to make a rule change (the majority of which came into effect on 25 October 2016) making AEMO responsible for the allocation of AMDQ CC associated with expansions that are included in the regulated asset base, via an auction process.[8] The proceeds of the auction will be used to offset AEMO's costs to operate the Victorian market system and do not go to APA VTS.[9]

After the end of the earlier access arrangement period (that is, after 31 December 2017), APA VTS no longer has the ability to allocate AMDQ CC in

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[6] Australian Energy Regulator 2013, *Access Arrangement final decision, APA GasNet Australia (Operations) Pty Ltd*, Part 1, March, p 7

[7] Australian Energy Market Commission 2016, *National Gas Amendment (DWGM-AMDQ Allocation) Rule 2016: Final Determination*, 24 March

[8] NGR Part 19 Division 4 Subdivision 3

[9] AEMC 2016, *National Gas Amendment (DWGM-AMDQ Allocation) Rule 2016: Final Determination*, p summary i

respect of the covered pipeline.[10] As a result of this determination, APA VTS has removed the AMDQ CC service from the access arrangement.

2.2 Non-tariff components of the access arrangement

APA VTS has proposed only very minor changes to the access arrangement in respect of non-tariff components.

Substantive revisions to the access arrangement were approved as part of the last access arrangement revision process, and APA VTS anticipates that the form and structure of the access arrangement will remain stable for this access arrangement period. Limiting the scope of revisions also appears prudent in light of the anticipated changes to the operation of the DWGM that are being considered as part of the *Australian Energy Markets Commission East Coast Wholesale Gas Market and Pipeline Frameworks Review* (noted in section 1.6 above).

2.2.1 Minor changes

APA VTS has made the following minor revisions to the access arrangement:

- Changed references to "APA GasNet Australia (Operations) Pty Limited" to "APA VTS Australia (Operations) Pty Limited";

- Changed references to "APA GasNet Australia (NSW) Pty Limited" to "APA VTS Australia (NSW) Pty Limited";

- Consistently referred to numbered parts of the access arrangement as sections (body of the access arrangement), or clauses (schedules to the access arrangement) - these changes are not tracked to improve document readability;

- Updated the description of the VTS to take account of investments since the beginning of the earlier access arrangement period, and updated the technical descriptions in the Schedules to the access arrangement;

- Updated the website reference for the map of the system (section 1.5);

- Revised references to the *Review submission date* and *Revision commencement date* to match terms used under the Rules;

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[10] AEMC 2016, *National Gas Amendment (DWGM-AMDQ Allocation) Rule 2016: Final Determination*, pp iv and 46

- Revised references to 'market carriage' as this term is no longer relevant under the NGL (section 2.1), and removed the corresponding definition;

- Revised the description of the process to determine total revenue (chapter 3) to better reflect the current Rules;

- Removed unnecessary explanatory footnote describing the Rules in relation to capital contributions (section 3.2);

- "Rolled forward" relevant access arrangement periods and dates to refer to the next access arrangement period, and relevant dates with respect to:

  o capital redundancy mechanism (section 3.5);

  o description of the incentive mechanism (section 3.6);

  o description of the Fixed Principles (section 3.7);

  o the method of depreciation for the opening capital base for the next access arrangement period (section 3.8); and

  o description of initial reference tariff and the tariff variation mechanism (sections 4.6, 4.7 and 4.9);

- Updated contact details in Schedule A;

- Correction of a number of postcodes incorrectly listed in clause C.3.

These changes have been made to update the access arrangement or to correct errors identified in the access arrangement and do not change the scope or operation of the access arrangement.

2.2.2 *Review of the access arrangement*

APA VTS proposes a five year access arrangement period. Consistent with Rule 50(1), APA VTS proposes an access arrangement revisions submission date of 1 January 2022. This date provides the AER with a 12 month revision period, consistent with the general rule.

2.2.3 *Extensions and expansions*

APA VTS has made very minor revisions to the extensions and expansions provisions to correct existing errors in the text. Section 7.2(a) previously referred to existing capacity as a defined term, which it is not. APA VTS has

revised the text to no longer refer to expansions above existing capacity (a concept that is difficult to define) and now refers to expansions undertaken during the course of the access arrangement.

Section 7.2(b) relates to expansions to the pipeline, but incorrectly included a reference to extensions. This has been corrected.

2.2.4 *Capital redundancy mechanism*

APA VTS does not propose any variation to the capital redundancy mechanism in place in the earlier access arrangement period, except to update the date for the start of the following access arrangement period to 1 January 2023.

2.2.5 *Capital contributions mechanism*

APA VTS does not propose any variation to its approach to capital contributions set out in the earlier access arrangement.

As APA VTS does not propose to add users' contributions to the capital base, APA VTS has not included a mechanism in the access arrangement to prevent it from benefiting from increased revenue from the inclusion of capital contributions in the capital base.[11]

2.2.6 *Reference tariffs and tariff variation mechanism*

APA VTS has made changes to the description of reference tariffs, and to the reference tariff variation mechanism.

APA VTS has removed some historic text from the access arrangement related to former obligations to set out a reference tariff policy (former section 4.1). Reference tariffs are now governed by specific rules, with an overarching requirement that they are consistent with the National Gas Objective and pricing principles.

Changes to the tariff variation mechanism are described in section 10.5 of this submission.

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[11] NGR, Rule 82(3)

2.2.7 *Efficiency benefit sharing scheme*

APA VTS's earlier access arrangement included an Efficiency Benefit Sharing Scheme (EBSS) with a methodology for calculating the efficiency benefit sharing allowance to apply in the forecast period.[12]

APA VTS has retained this mechanism.

Under the EBSS, APA VTS retains any benefits (or penalties) for a period of five years after the year in which the benefits (or penalties) were realised. This means that the benefits carry over into the next access arrangement period.

The calculation of the efficiency benefit for each year is cumulative, i.e. benefits in a year accrue only to the extent that the savings in that year are greater than those already identified in prior years. This means that, especially in a later year of an access arrangement period, a saving from the originally approved operating and maintenance forecast can still generate a negative efficiency benefit if the expenditure in that year shows an increase on the previous year while the forecast remains constant.

Revisions to the EBSS are limited to rolling forward references to relevant years in the next access arrangement period.

2.2.8 *Fixed principles*

APA VTS proposes fixed principles to apply to the determination of allowed revenue for the next access arrangement period (the sixth period) covering:

- The inclusion of carry forward amounts arising from the operation of the revenue control calculation;

- The carry-over of benefits and penalties under the EBSS; and

- Cost pass-through amounts arising from the operation of the Cost Pass-through Reference Tariff Variation Mechanism.

The purpose of these fixed principles is to ensure that revenue adjustments (whether positive or negative) generated late in the access arrangement period can be realised by APA VTS.

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[12] *APA GasNet Access Arrangement 2013-17*, section 8.2. Document provided in general package of supporting material for this submission

Revisions to the fixed principles (and associated definitions) included in the earlier access arrangement are limited to rolling forward references to relevant access arrangement periods and dates to refer to the next access arrangement period.

Carry Forward Amounts

The carry forward of the First Carry Forward Amount and of the Second Carry Forward Amount calculated when applying the revenue control of the Scheduled Reference Tariff Variation Mechanism have been retained as a fixed principle.

EBSS

The EBSS described above is included in the access arrangement as a fixed principle to ensure its operation in the following access arrangement period.

Pass Through Amounts

In the event that a Cost Pass-through Event occurs in the access arrangement period that has a financial effect on APA VTS in the access arrangement period but is not the subject of a notice to the regulator within the access arrangement period, then APA VTS may make a statement to the AER in relation to that event and the effect (if approved as the AER) will be allowed as an adjustment to the allowed revenue for the next revenue control calculation.

2.2.9 *Transmission Payment Deed Terms*

Schedule F of the access arrangement includes the Transmission Payment Deed terms. This Deed is between APA VTS and market participants and relates to payment arrangements for use of the system.

The terms of the Transmission Payment Deed are unchanged from the earlier period, with the exception of a variation to clause F.11 (Confidentiality) to apply an amendment required by the AER to the identical clause appearing in the Amadeus Gas Pipeline access arrangement.[13]

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[13] Australian Energy Regulator 2015, *Draft Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021: Attachment 12 – Non-tariff components*, November, p12-13

3 Pipeline demand and utilisation

This chapter of the submission discusses pipeline demand and utilisation over the earlier access arrangement period, and provides a forecast of pipeline demand and utilisation over the access arrangement period.

3.1 Demand and utilisation during earlier access arrangement period

This section sets out usage of the pipeline over the earlier access arrangement period and discusses key drivers and trends for that usage.

3.1.1 Gas demand and volumes over the earlier access arrangement period

Gas demand on the VTS can be divided into a number of categories:

- Domestic and Commercial;

- Industrial;

- Electricity Generation; and

- Interstate transfers.

Further, gas flows through the VTS to refill the two storage facilities on the VTS, being the LNG storage facility at Dandenong, and the Lochard underground storage facility at Iona.

Gas demand on the VTS is subject to a number of drivers that vary with the type of demand, but also to two overall drivers that affect all types of demand. These are the level of economic activity in the State, and the weather. The level of economic activity drives the ongoing changes in gas demand as adjusted for population growth and energy efficiency.

Weather

The weather is an important driver of gas demand in Victoria because of the high level of penetration of gas supply at the domestic and commercial level, and the amount of that demand directly related to space heating. However, it is also important to note that the variability of weather can have a significant effect on peak and annual gas demand.

Victoria uses a specific version of the more generally known Heating Degree Day (a measure of "coldness") to measure the weather as it applies to gas demand. This version is known as the Effective Degree Day (EDD), and

encompasses other factors such as wind speed and hours of sunshine. Given the relatively high penetration of space heating load in Victoria, there is a relationship between the number of observed Effective Degree Days and the consumption of gas for space heating purposes: the more observed EDDs (the more "coldness"), the more gas consumption can be expected.[14]

Figure 3-1 – Relationship between Effective Degree Days and system load
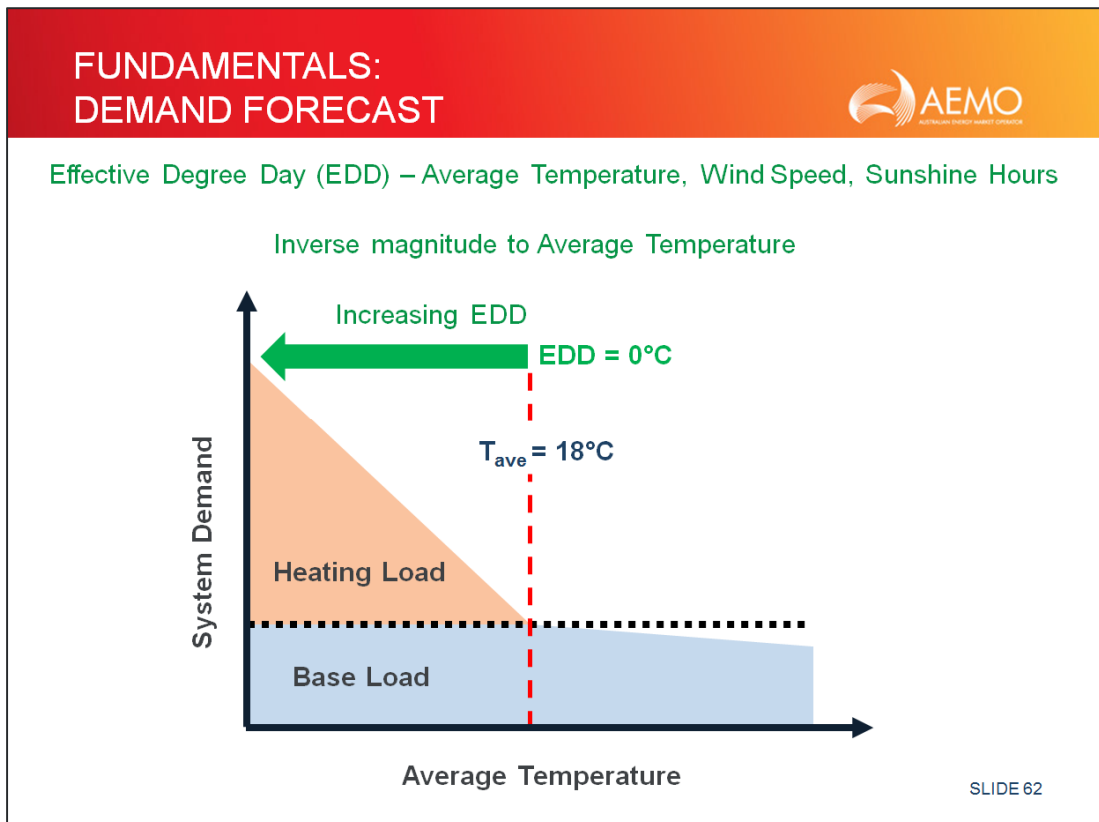
While the residential (Tariff V) load shows a clear relationship between EDD and load, the Industrial (Tariff D) load is largely independent of weather:

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[14] The following three figures are from AEMO, "Presentation slides for Victorian Gas Winter Operations Strategy 2016" 3 May 2016. Available at https://www.aemo.com.au/-/media/Files/PDF/Presentation-slides-for-Victorian-Gas-Winter-Operations-Strategy-2016.ppsx

Figure 3-2 – Residential and Industrial loads vs EDD
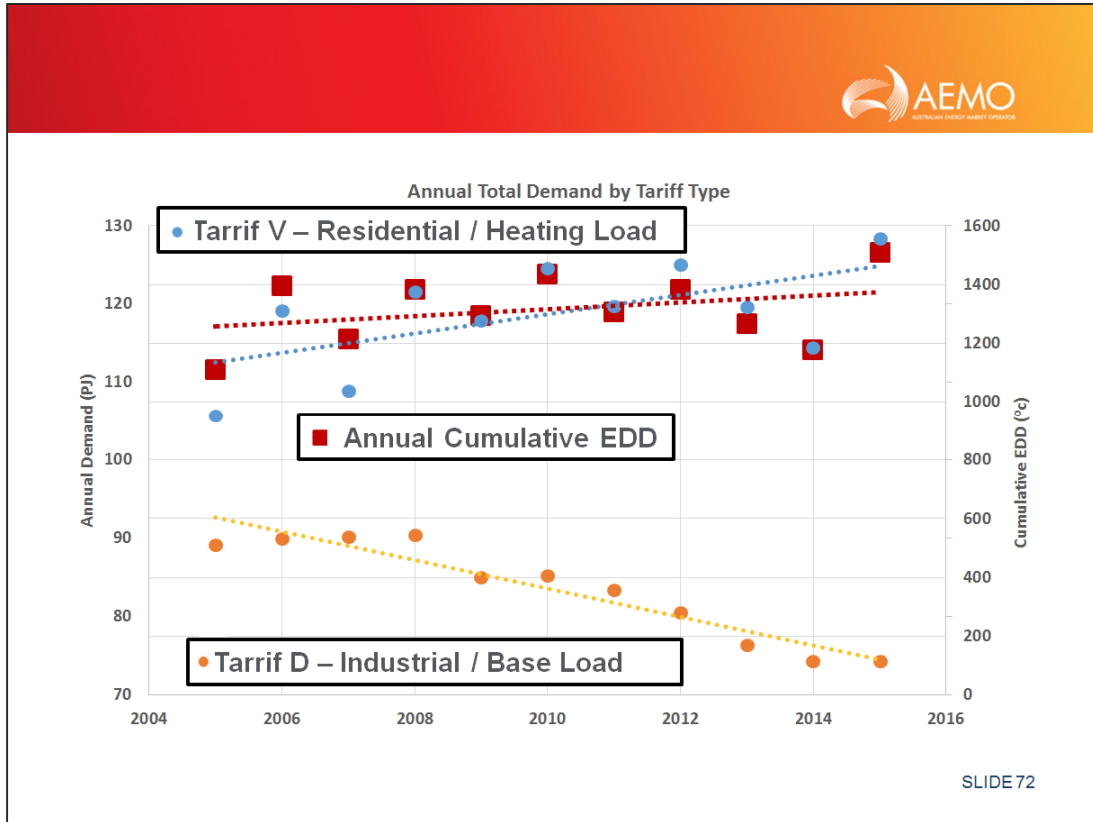
As can be seen from the above graph,[15] the residential load appears to be well correlated with temperature (allowing for population growth), whereas the industrial load is showing ongoing declines that are not related to temperature patterns. The relationship above can also be seen in the historical consumption by customer class shown below.

For Tariff V customers, after adjusting for weather variances, the average annual growth over the earlier access arrangement period has been almost flat at 0.2 per cent per annum,[16] as shown in Figure 3-3 below.

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[15] This graph has been edited from that presented by AEMO by modifying the format of the Residential and Industrial trend lines (from solid to dotted) and adding the EDD trend line. None of the underlying data has been modified.

[16] Indicating that load growth arising from population growth has been almost completely offset by improvements in appliance efficiency.

Figure 3-3 – Normalised base annual gas demand 2006-2016 (PJ)
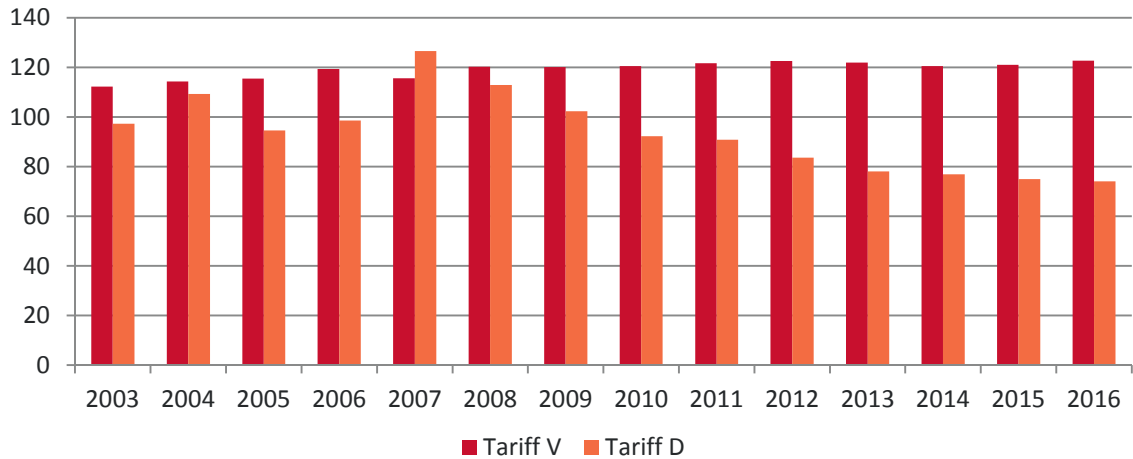
Forecasting EDD

As can be seen from visual inspection of Figure 3-2 above, the historically observed levels of EDD has demonstrated a modest ascending pattern. APA VTS has examined AEMO's most recent published work on this matter, and has adopted the AEMO 2015 NGFR EDD Forecast as shown in Figure 3-4 below.[17]

Figure 3-4 – AEMO 2015 NGFR – Forecast EDD

Table 31   Weather corrections in Victoria

Model	Annual EDD[32] in 2015 (˚C)	Trend (˚C / year)	Comments
2015 NGFR	1340	0	Constant across all years.

[32] Effective degree days (EDD) is a measure that combines a range of weather factors that affect energy demand.

While EDDs are measured daily, load is forecast using a cumulative annual EDD total as shown above.

Temperature Sensitivity

The sensitivity of the APA VTS load to temperature can be measured by plotting the relationship between observed daily EDD and observed daily system load. AEMO has plotted this relationship for 2014 and 2015, as shown in Figure 3-5 below.

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[17] AEMO 2015, 2015 National Gas Forecasting Report, Table 31, p 45

Figure 3-5 – Observed relationship between EDD and system demand
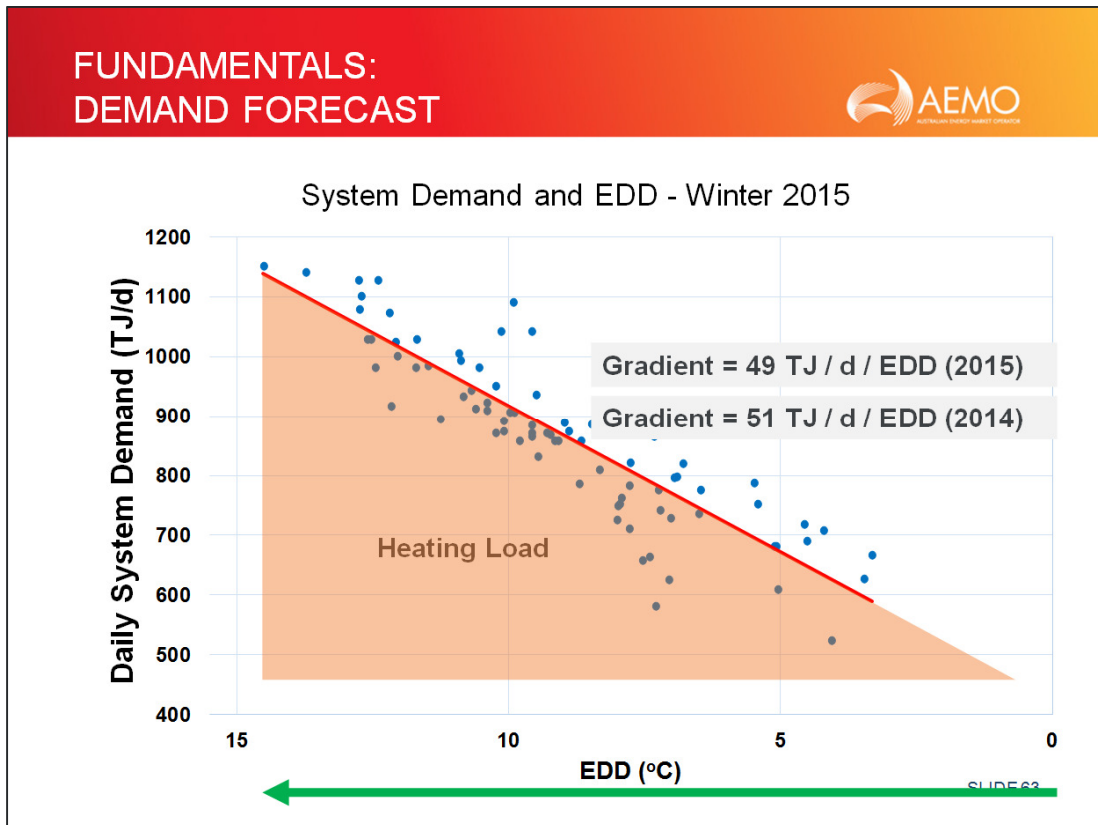
Gas demand is positively correlated with EDD, where such demand varied by 51TJ/day/EDD in 2014 and 49TJ/day/EDD in 2015. For the purposes of this submission, APA VTS proposes to use an average of these two figures – that is, the total system load can be expected to vary by 50 TJ/day for each unit increase or decrease in EDD.

As shown in Figure 3-2, over the period from 2005 through 2015, the total annual EDDs have varied from 1109 (2005) to 1509 (2015) - a difference of 400 EDD (a 36 per cent variance). With temperature sensitivity of 50TJ/EDD/day, this weather variance by itself would account for approximately 20PJ[18] or about 15 per cent of total demand. As can be gleaned by the variability of observed EDD in Figure 3-2 above, this cause of

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[18] In Figure 3-2 above, the 2005 Tariff V load was 105.75PJ against an observed EDD of 1109; in 2015, the Tariff V load was 128.5 PJ against an observed EDD of 1509.

demand variance is not forecastable as it directly relates to the severity of winter conditions in a particular year.

Domestic and Commercial (Tariff-V)

This demand is driven largely by population with growth rates correlated to population growth but moderated by ongoing technology changes, mostly related to energy efficiency. Thus increases in penetration of reverse cycle air conditioning and the requirement for new housing to meet 6 star energy efficiency ratings reduce the rate of gas demand growth.

Industrial (Tariff-D)

The VTS supplies a significant number of large industrial gas consumers. There are about 400 gas customers who each take more than 10TJ of gas annually. The largest customer takes between 6 and 7 PJ/year. In 2015 and 2016, industrial demand has declined at an annual rate of 4-5 per cent reflecting the decline in the manufacturing industry in Victoria in response to a weak global economy. As can be seen from Figure 3-3, this represents a continuation of a longer term trend.

3.1.2 *User numbers over the current access arrangement period*

The VTS is operated by AEMO as a market carriage system under the DWGM rules (Part 19 of the NGR). This means that shippers register with AEMO to operate in the Victorian wholesale gas market and, once registered, can make use of the VTS, subject to the gas market bid stack, without reference to APA VTS. APA VTS is able to provide user numbers only from the data provided by AEMO.

The VTS is divided into a number of withdrawal zones each of which contains one to more than 20 offtakes. APA VTS is able to provide user numbers for the VTS only at the level of withdrawal zones. These are set out in Table 3-1 below.

There are currently 21 active registered Market Participants in the Victorian wholesale gas market who use the VTS, however APA VTS expects that this will increase to 23 in 2018. The number of Market Participants using each withdrawal zone ranges from 1 to 14. Note that there are 2 inactive withdrawal zones.

Table 3-1 – User numbers by withdrawal zone over the earlier access arrangement period

Number of users (by zone)	2013	2014	2015	2016(e)	2017(f)
LaTrobe	12	12	14	14	14
West Gippsland	0	0	0	0	0
Lurgi	10	12	12	12	12
Metro North West	14	13	14	14	14
Calder	9	11	11	12	12
South Hume	10	11	12	13	13
Echuca	10	11	11	11	11
North Hume	10	10	12	13	13
Western	9	9	10	10	10
Murray Valley	9	10	11	11	11
Interconnect	1	1	1	1	1
South West	9	9	10	11	11
Wodonga	11	12	13	13	13
Tyers	10	11	11	11	11
NSW Transfers	6	7	6	6	7
Metro South East	13	12	14	14	15
Warrnambool	9	10	10	10	10
Koroit	9	9	10	10	10
Refill LNG	5	3	4	7	7

Number of users (by zone)	2013	2014	2015	2016(e)	2017(f)
Geelong	12	11	13	13	13
Maryvale	1	1	1	1	1
VicHub	6	7	7	4	4
Refill WUGS	7	7	7	7	7
SEAGas	3	2	1	2	2
Otway Gas	0	0	0	0	0
Total number of users	**23**	**23**	**23**	**21**	**23**

3.1.3 *Pipeline capacity and utilisation over the earlier access arrangement period*

Capacity

As the VTS is made up of the number of pipelines rather than a single main pipeline with a number of laterals, the capacity is variable. Therefore, only the capacity of the main pipelines rather than the system can be defined.

The main pipelines for flows towards Melbourne are the Longford to Melbourne Pipeline, the South West Pipeline, and the NSW Interconnect. Capacities for each of these pipelines, comparing the capacity in 2013 to that expected (after augmentation) in 2017, are set out in Table 3-2 below. Note that the South West Pipeline underwent a major expansion during the earlier access arrangement period.

Table 3-2 – Pipeline capacity 2013-2017 – flows towards Melbourne (TJ/day)

Pipeline TJ/day	2013	2017(f)
Longford to Melbourne	990	990
South West Pipeline	353	429
NSW Interconnect	120	125

As an example of the complexity of the VTS capacity, 68TJ/day can also be sourced from Pakenham for flow along the Longford pipeline towards

Melbourne but only if the capacity from Longford is reduced by 28TJ/day, for a total Longford to Melbourne pipeline capacity of 1030 TJ/day.

The main pipelines for flows away from Melbourne are the South West Pipeline, and the NSW Interconnect. Capacities for each of these pipelines, comparing 2013 to 2017, are set out in Table 3-3 below. These capacities reflect increases in capacity over the period on the South West Pipeline and Wollert to Barnawartha Pipeline over the earlier access arrangement period, as discussed in Chapter 5 of this submission.

Table 3-3 – Pipeline capacity 2013-2017 – flows away from Melbourne (TJ/day)

Pipeline TJ/day	2013	2017 (f)
South West Pipeline	92	102
NSW Interconnect	83 (summer) 46 (winter)	201
Western Transmission System	28	28

Utilisation

The 2016 utilisation of the main pipelines for flows towards Melbourne are set out in Table 3-4 below.[19]

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[19] This data has been estimated using actual 2016 data for January 3 to October, and adding November and December 2015 data to provide a comparable full year estimate.

Table 3-4 – Pipeline utilisation – 2016 – Flows towards Melbourne

Pipeline	Average	Peak
Longford to Melbourne	56%	84%
South West Pipeline	19%	80%
NSW Interconnect	6%	53%

The 2016 utilisation of the main pipelines for flows away from Melbourne are set out in Table 3-5 below.

Table 3-5 – Pipeline utilisation – 2016 – Flows away from Melbourne

Pipeline	Average	Peak
South West Pipeline	59%	84%
Victorian Northern Interconnect (summer)	49%	82%
Victorian Northern Interconnect (winter)	47%	109%
Western Transmission System	44%	71%

The peak usage of the Victorian Northern Interconnect (winter) is greater than 100 per cent because, if system conditions are optimum the pipeline can - on a once off basis - carry more than its rated capacity.

3.2 Demand and utilisation during access arrangement period

3.2.1 *Forecast demand*

Rule requirements

Under Rule 72, the Access Arrangement Information document accompanying an access arrangement must include to the extent practicable a forecast of pipeline capacity and utilisation. The operation of the DWGM means that tariff calculations are based on annual and peak volumes, not capacity. APA VTS can provide capacity and utilisation of individual pipelines within the system as defined under the National Gas Bulletin Board. The forecasts provided here are those relevant to the tariff calculations.

Rule 74 requires that any forecasts used in setting the Reference Tariff represent best estimates arrived at on a reasonable basis. This section provides an explanation of the assumptions underlying those forecasts.

Residential and commercial demand

For the purposes of this access arrangement revision submission, APA VTS has consulted with the three gas distribution businesses serving Victoria's residential and small commercial (Tariff-V) customers. These three gas distribution businesses (Australian Gas Networks, Multinet Gas and AusNet Services) are revising their own access arrangements at the same time as APA VTS. The gas distribution businesses have therefore undertaken considerable analysis in developing their own load forecasts for the purposes of their own access arrangement revisions.

APA VTS considers that these gas distribution businesses have the closest relationship with the customers they serve, and accordingly has adopted the distributors' forecasts for Tariff-V customers or the access arrangement period.

Table 3-6 – Forecast demand – Tariff-V

	2018	**2019**	**2020**	**2021**	**2022**
Annual (PJ)	117.5	117.1	116.6	116.1	115.3
1-in-2 Peak (TJ/day)	903.5	900.3	893.8	885.2	878.5
1-in-20 Peak (TJ/day)	1,009.0	1,005.6	998.41	989.0	981.8

Industrial demand

AEMO has aggregated forecast demand information from the distribution businesses for those industrial customers served from the distribution systems, and demand forecasts from those direct-connect customers served from the VTS. AEMO advises that it has undertaken an extensive interview process with those shippers to gauge their forecast demand. For the purposes of this submission, APA VTS has applied the AEMO forecast of industrial (Tariff-D) demand from its 2016 National Gas Forecasting Report (NGFR). This approach may be reviewed following the AER's draft decision to update for any industrial closures since this lodgement of this proposal.

The AEMO 2016 National Gas Forecasting Report identifies the following drivers for its forecast of Industrial gas demand:[20]

Forecast decline comes from manufacturing sector as:

- *Some large industrials shut down from rising input costs and depressed economic growth.*

- *Remaining manufacturing industrial users reduce gas consumption in response to sharp increase in gas price in the short term.*

However, AEMO noted a number of inter-related factors that would serve to depress industrial gas demand further than would appear to have been considered in the 2016 NGFR:

Closure of Hazelwood Power Station – modelling suggests the closure may initially lift electricity dispatch prices in Victoria by $19 per megawatt hour (MWh), with replacement generation coming from a 50/50 split between black coal-fired power generation and GPG. Based on AEMO's interviews with large electricity-intensive industrial users, a price lift of this magnitude is expected to reduce electricity use by this sector. This would cause a demand response that later offsets the price impact, and, because GPG is the marginal supplier in the dispatch, also offsets the initial increase in GPG.[21]

APA VTS considers that a price-driven reduction in industrial electricity demand may well be reflected in a similar (or consequential) reduction in industrial gas demand.

Moreover, AEMO comments:[22]

This summary assessment has found that gas prices are likely to increase due to two factors:

- *Lower cost reserves are depleting, replaced by new supply from higher-cost gas fields.*

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[20] AEMO, *National Gas Forecasting Report For Eastern And South-Eastern Australia,* Published: December 2016, p 22, access at http://www.aemo.com.au/-/media/Files/Gas/National_Planning_and_Forecasting/NGFR/2016/2016-National-Gas-Forecasting-Report-NGFR-Final.pdf

[21] AEMO 2016, *NGFR*, p 15

[22] AEMO 2016, *NGFR*, p 25

- *Tighter supply-demand balance may limit competitive tension, causing some price increase.*

The forecast result is higher cost gas and less competitive tension, driving increasing domestic [i.e. Australian] prices.

AEMO is also forecasting tight supply conditions going forward, which will be reflected in significant gas price increases. Moreover, AEMO considers that the [national] increase in gas demand for GPG could stretch domestic gas supply from 2018-24.[23] These factors signal price increases which, consistent with AEMO's findings on electricity demand in the face of rising prices, could well result in reductions to Industrial gas demand.[24]

AEMO has discussed this matter in the context of its findings that upstream gas prices are likely to increase:[25]

Electricity dispatch modelling of the announced 2017 closure of the (brown coal-fired) Hazelwood Power Station has projected generation being replaced with an initial 50/50 spilt [sic] between black coal-fired power generation and GPG. This could create new demand for gas supply contracts during a period of supply constraint.

While supply adequacy will be thoroughly explored in the 2017 GSOO, this NGFR's summary analysis suggests there are sufficient available gas reserves to enable this new supply in accordance with current cost-pricing structures.

AEMO has tested this outlook with selected retailers and has been informed that sufficient gas supplies are expected to be available, however the prices of available gas are beyond what some large industrial consumers are willing to pay. This agrees with AEMO's findings from its surveys and interviews with large energy-intensive industrial businesses.

APA VTS is concerned that the AEMO'S pessimistic comments outlined above do not appear to have been reflected in its forecast of industrial gas demand. Considering the gas price forecasts included in the NGFR and AEMO's stated supply concerns (which will not be investigated until the

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[23] AEMO 2016, *NGFR*, pp 7-8

[24] AEMO notes "Possible gas costs may not be affordable to the largest energy-intensive industrial businesses." *NGFR,* December 2016, p 6

[25] AEMO 2016, *NGFR*, p 25

development of the 2017 GSOO[26]), APA VTS has adopted the AEMO "Weak" forecast for industrial demand for the purposes of this access arrangement revision.[27]

Table 3-7 – Forecast demand – Tariff-D

	2018	**2019**	**2020**	**2021**	**2022**
Annual (PJ)	64.5	62.9	61.0	60.7	59.6
1-in-2 Peak (TJ/day)	247.7	242.0	237.6	238.2	236.4
1-in-20 Peak (TJ/day)	249.3	243.7	239.21	239.9	238.1

APA VTS also notes that there is uncertainty, at the time of lodging this access arrangement revision proposal, about the future of the Portland aluminium smelter,[28] with some speculation that a new gas-fired power station could be developed to allow the smelter to remain open. This load and demand forecast will be updated in response to the draft decision based on information available at that time.

The relationship of the forecast to historical levels of demand is shown in Figure 3-6 below.

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[26] AEMO 2016, *NGFR*, pp 8, 25

[27] Note that AEMO considers the Neutral, Weak and Strong scenarios are all credible [NGFR p 8]

[28] See The Age, *Portland smelter assistance to come on top of existing $100m-plus annual subsidy*, 20 December 2016. http://www.theage.com.au/business/portland-smelter-assistance-to-come-on-top-of-existing-100mplus-annual-subsidy-20161220-gteqcb.html

Figure 3-6 – Normalised historical and forecast demand – Tariff-V and Tariff-D (PJ)
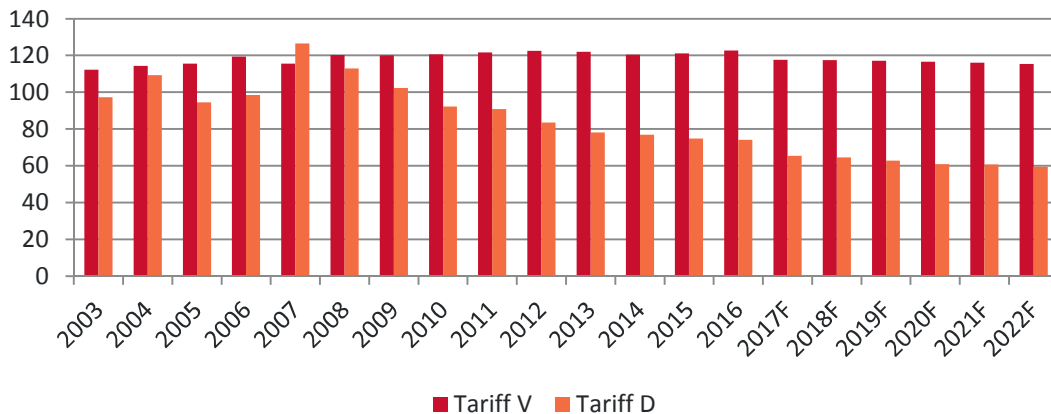
Gas-fired Power Generation

The VTS delivers gas to a number of gas-fired power generation (GPG) sites in Victoria, notably the Newport and Somerton stations in the Melbourne region, the Jeeralang A and B and Valley Power stations in the Gippsland region, and the Laverton North station in the Geelong region. Not all Victorian gas-fired power generators source gas through the VTS.

There have been significant developments in the Victorian electricity market recently:

• On 15 June 2016, the Government of Victoria announced[29] its renewable energy targets (VRET), under which the government anticipates that "by 2025, up to 5400 megawatts (MW) of new large-scale renewable energy capacity will be built in Victoria".

• On 3 November 2016, Engie announced[30] that it would close the 1600 MW Hazelwood power generation facility at the end of March 2017. Hazelwood produces a significant amount (approximately 10,000 GWh

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[29] http://www.premier.vic.gov.au/renewable-energy-targets-to-create-thousands-of-jobs/

[30] http://www.engie.com/en/journalists/press-releases/hazelwood-power-station-australia/

per year[31]) of electricity into the National Electricity Market; its closure is expected to have a significant impact on the sources of electricity supply into the Victorian market.

It is noteworthy that the VRET program is expected to deliver significantly more generation capacity than that withdrawn from the market due to the Hazelwood closure.

AEMO forecasts two market responses relative to these developments:[32]

- a near term (up to 2 years) response to accommodate the closure of the Hazelwood power station:

  AEMO forecasts that Victoria's electricity exports will decrease, and that the remaining shortfall will be made up by approximately equal shares of black coal-fired generation (in NSW) and GPG (some proportion of which may source gas through the VTS).

  Retirement of Hazelwood Power Station is expected to cause a spike in GPG consumption for 2017–18.[33]

  Closure of Hazelwood Power Station – modelling suggests the closure may initially lift electricity dispatch prices in Victoria by $19 per megawatt hour (MWh), with replacement generation coming from a 50/50 split between black coal-fired power generation and GPG. Based on AEMO's interviews with large electricity-intensive industrial users, a price lift of this magnitude is expected to reduce electricity use by this sector. This would cause a demand response that later offsets the price impact, and, because GPG is the marginal supplier in the dispatch, also offsets the initial increase in GPG.[34]

- a longer term (2+ years) response as renewable electricity generation capacity ramps up under the VRET program:

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[31] Hazelwood Power Station generated 10,350 gigawatt hours (GWh) in the 2015–16 financial year per AEMO *Update: Electricity Statement Of Opportunities for the National Electricity Market,* November 2016, p 5

[32] See AEMO, *Update: Electricity Statement Of Opportunities for the National Electricity Market*, November 2016

[33] AEMO 2016, *NGFR*, p 21

[34] AEMO 2016, *NGFR*, p 22

AEMO forecasts that renewable generation developed in response to the VRET program will ramp up quickly, and will displace GPG in the NEM bid stack by 2020, sharply reducing the amount of GPG activity in the Victorian market.

From these changes, the greatest impacts on projections of GPG have come from:

- *VRET – modelling has found the proposed policy may:*

  - *Cause earlier retirements of brown coal-fired power generation in Victoria.*

  - *Bring forward investments in renewable energy generation, especially wind generation.*

  - *Move more of these investments to Victoria from other regions.[35]*

- *GPG consumption is expected to trend downwards over the next four years, due to projected rises in the gas price, coupled with the forecast influx of large volumes of new wind farm capacity required to satisfy the Large-scale Renewable Energy Target (LRET) and the VRET.[36]*

AEMO forecasts that, over the course of the access arrangement period, these two factors will lead to an increase in gas demand for Victorian GPG (some proportion of which may source gas through the VTS) for the first 2 years, followed by a sharp decline in Victorian GPG activity over the remainder of the access arrangement period.

In its December 2016 National Gas Forecasting Report,[37] AEMO identifies the following outlook for GPG (relating to Victoria):

Outlook for GPG

- *The forecast spike in 2018 consumption (150 PJ [nationally]) is driven by the retirement of Hazelwood, which results in increased*

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[35] AEMO 2016, *NGFR*, p 22

[36] AEMO 2016, *NGFR*, p 21

[37] AEMO 2016, *NGFR*, p 23

consumption in both Victoria and South Australia as GPG is expected to fill some of the supply gap resulting from Hazelwood's exit.

- *However, the projected growth trend in GPG is negative over the short term, caused by increasing penetration of renewable energy across the NEM and especially in Victoria to meet both the LRET and VRET, coupled with a sharp rise in the gas price.*

[AEMO] Figure 3 Annual GPG gas consumption forecast, by NEM region
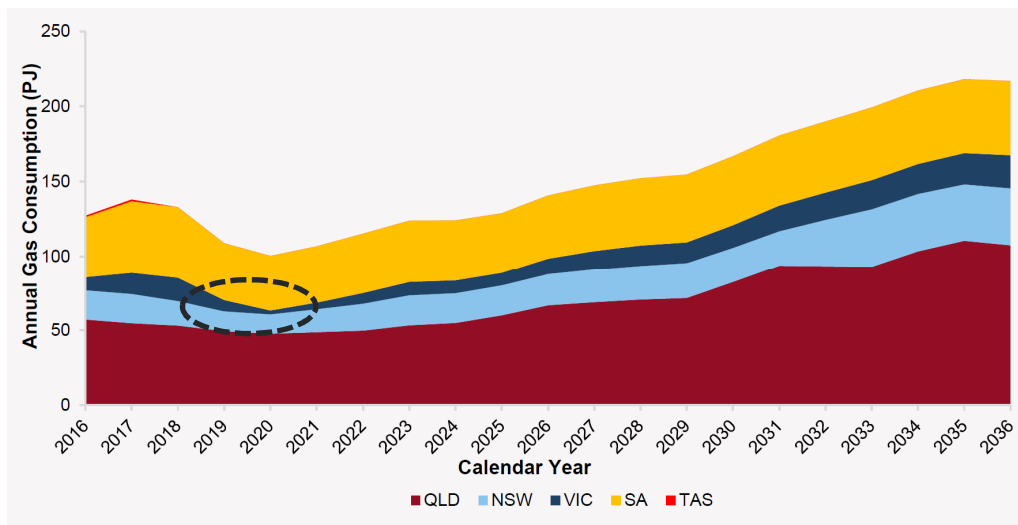
The increase in forecast GPG demand in response to the Hazelwood closure, and reduction in Victorian GPG gas consumption in response to the VRET are clearly visible from the national forecasts shown above. The impact is even clearer when only the Victorian components of the GPG forecast are displayed.

Figure 3-7 – AEMO forecast of Victorian GPG consumption
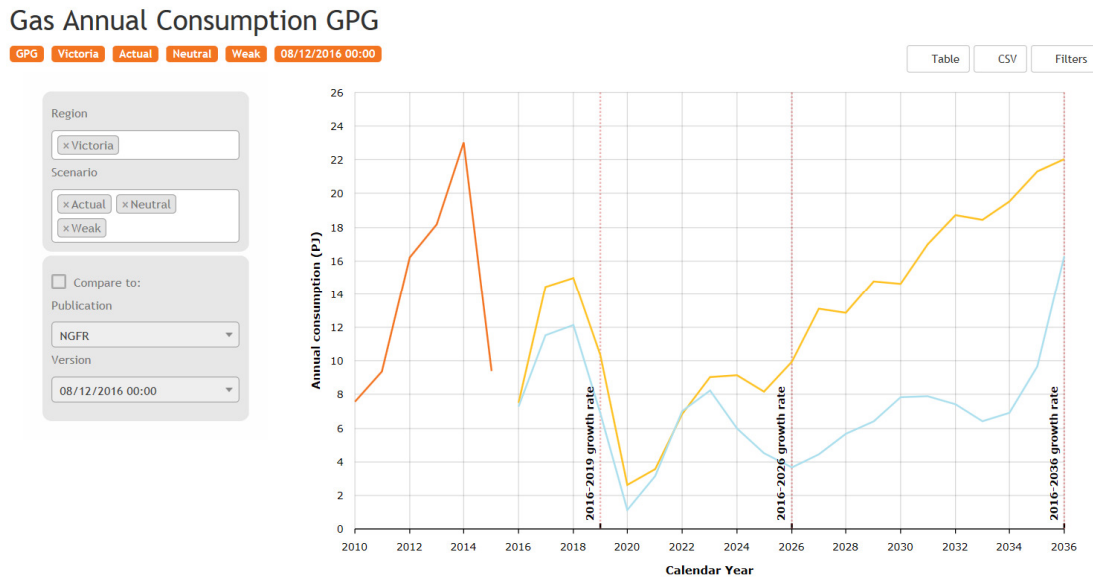
Source: AEMO Forecasting website[38]

Impact of a cost on carbon

The increase in GPG demand from 2020 onwards is driven by the AEMO assumption that "Proxy carbon abatement cost starting at $25/t CO2e in 2020, rising to $50/t CO2e in 2030, affecting both electricity and gas retail prices."[39] An increase in carbon abatement costs would serve to increase the electricity pool price and increase the frequency of dispatch of gas-fired generators.

This assumption is found in a consultant report by Jacobs,[40] provided to AEMO in the context of its 2016 National Electricity Forecasting Report (NEFR). Jacobs assumes:

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[38] http://forecasting.aemo.com.au/Gas/AnnualConsumption/Total Note that this is all Victorian GPG, not just those connected to the VTS.

[39] AEMO 2016, NGFR, p 11. APA VTS notes that the introduction of a cost on carbon is inconsistent with stated government policy and therefore does not accept that assumption.

[40] Jacobs 2016: "*Retail electricity price history and projections*", 23rd May, p 11. Report available at http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/-/media/E32734E08CD54504B2A5F408FAAB1870.ashx

> *Prices bounce back in 2020, despite the further commissioning of renewable energy capacity, because of the introduction of a $25/t CO2-e carbon price in that year. Prices continue to climb at a fairly rapid rate until about 2027, and they generally continue growing beyond 2027, although at a lower rate. Three factors contribute to rapid price growth in the early to mid 2020s:*
>
> - *The carbon price escalates from $25/t CO2e in 2020 to $50/t CO2e in 2030. This overall linear trend is reflected in wholesale prices. [p11]*
>
> *The Victorian price increases by 49% in 2020 with the introduction of the carbon price. The increase would have been greater were it not for the large amount of Victorian wind capacity commissioned in that year. In the five years post 2020 the Victorian price rises the most in relative terms compared with the other NEM regions. [p14]*

It is this "bounce-back" in prices, driven by the assumed introduction of a carbon price, that drives the conclusion that there will be an increase in dispatch of gas-fired generation (and therefore an increase in GPG gas demand).

The Jacobs report does not appear to include any justification or reasoning behind this assumption, commenting only that:

> *The Commonwealth Government introduced a carbon pricing mechanism on 1 July 2012. This was repealed in July 2014 following a change in government. For the purpose of modelling, it is assumed that a carbon scheme returns from 2020 at $25/t CO2-e and escalates linearly, reaching $50/t CO2-e by 2030. [p28]*

While AEMO's 2016 NEFR Methodology Paper makes no explicit mention of a carbon price assumption, it appears to have implicitly (and potentially inadvertently) incorporated Jacobs' assumption on this matter. This assumption is explicitly stated across all scenarios in the 2016 NGFR, but again with no supporting discussion.[41]

APA VTS considers that the question of introducing a price on carbon is a matter for government to decide. The government's current policy position is that it is "committed to tackling climate change without a carbon tax or an

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[41] See, in particular, AEMO 2016, NGFR, p 11

emissions trading scheme that will hike up power bills for families, pensioners and businesses".[42]

More recently, Prime Minister Malcolm Turnbull stated publicly in response to the announced Climate Policy Review:[43]

> *"The one thing I want to be very clear about, we are not going to take any steps that will increase the already-too-high cost of energy for Australian families," he said.*
>
> *"We will not be imposing a carbon tax and we will not be imposing an emissions trading scheme, however it is called.*
>
> *"An emissions intensity scheme is an emissions trading scheme — that is just another name for it."*

APA VTS considers that it is not reasonable to assume a change in government policy in the face of an existing contradictory policy position and public statements by the Prime Minister.

APA VTS does not accept AEMO's counter-policy assumption of an introduction of a price on carbon, and has engaged Frontier Economics to advise on the forecast of VTS-connected GPG load without an input assumption of a cost on carbon.[44] Frontier Economics' forecast is consistent with AEMO's in regards to the announcements of the Hazelwood closure, and the VRET scheme. Frontier Economics report is attached to this submission as Attachment C.1.

As discussed above, the AEMO GPG forecast assumes increasing dispatch of GPG post-2020, in response to the increased pool prices driven by the

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[42] "Australia's 2030 emissions reduction target", Joint media release by The Hon Tony Abbott MP, Prime Minister; The Hon Julie Bishop MP, Minister for Foreign Affairs; The Hon Greg Hunt MP, Minister for the Environment, 11 August 2015 http://foreignminister.gov.au/releases/Pages/2015/jb_mr_150811.aspx?w=tb1CaGpkPX%2FlS0 K%2Bg9ZKEg%3D%3D

[43] "*Climate policy review: Energy Minister Josh Frydenberg backtracks on emissions intensity scheme*" ABC News, http://www.abc.net.au/news/2016-12-07/frydenberg-denies-backtrack-on-emissions-intensity-scheme/8099250 accessed 8 December 2016

[44] Where AEMO assumes a carbon price as an input to its forecasting models, Frontier Economics assumes achievement of the Paris carbon targets as an input, without assuming a carbon price is to be implemented.

increase in carbon costs. This is shown in the (dark blue) "AEMO VIC Weak" series.[45] In the absence of a carbon cost assumption (and absent the resulting increase in pool prices, the Frontier Economics forecast shows the post-2020 GPG forecast as being virtually flat.

A graphic comparison of the AEMO and Frontier Economics forecasts is shown in Table 3-8 below.

Figure 3-8 – Comparison of AEMO and Frontier Economics GPG forecasts
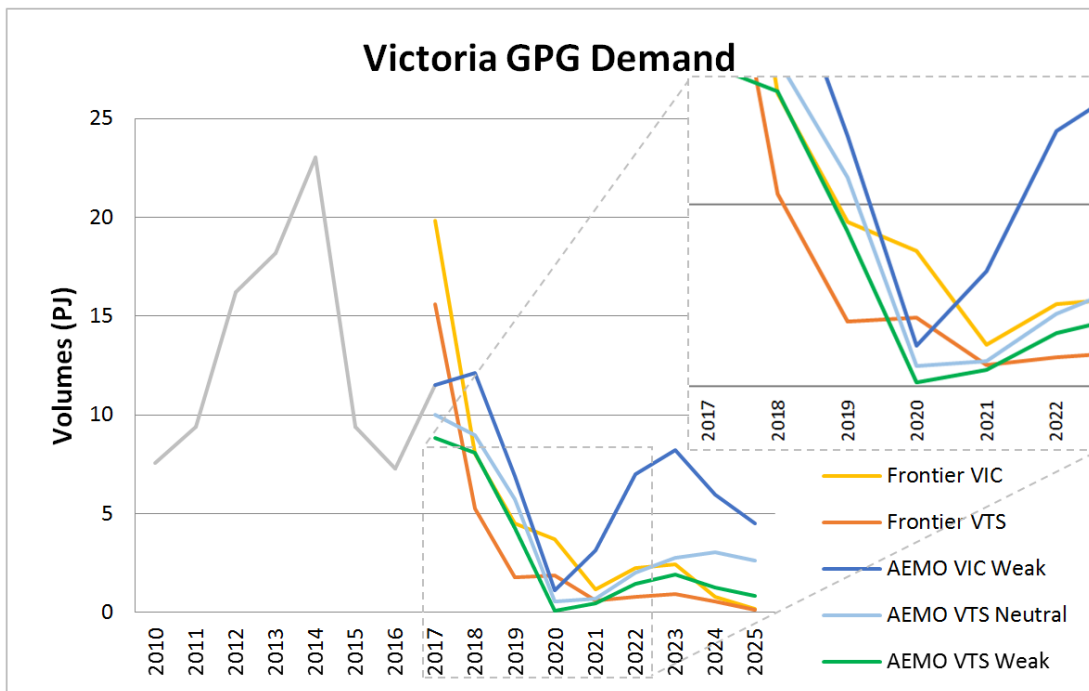
In summary, Frontier Economics and AEMO agree that:

- The Hazelwood closure will result in a (temporary) increase in GPG to replace Hazelwood's generation capacity;

- The amount of GPG dispatched will fall sharply as VRET-inspired renewable generation enters the market in earnest, displacing GPG from the NEM bid stack;

- Victorian GPG's contribution to the NEM will remain relatively subdued from 2020 onwards.

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[45] The "AEMO Vic Neutral" series shows a more aggressive increase in GPG demand

AEMO and Frontier Economics differ on a number of points:

- The speed at which renewable generation will be developed in Victoria, and the speed at which GPG will be displaced from the bid stack. Frontier forecasts a slower introduction of renewable generation in response to the VRET, and therefore more GPG demand early in the period;[46]

- The mix of GPG plants that will be dispatched, importantly differing between GPG plants that are connected to the VTS and those which are not. Frontier forecasts that the VTS connected Newport power station will be dispatched before Mortlake, which is not connected to the VTS, leading to a higher forecast for VTS connected GPG demand;[47]

- AEMO's assumption of a price on carbon being introduced, and the resulting forecast of GPG load post-2020.

Summary – GPG

The relevant questions for the VTS AA are, given no immediate decrease in Victorian electricity demand, how will the Hazelwood replacement supply requirement be sourced? How much of this replacement supply will come from GPG, and how much of this GPG will take gas from the VTS?

APA VTS has worked closely with AEMO and Frontier Economics over the course of preparing the load and demand forecast for the VTS. This work has indicated that the forecast for VTS-connected GPG over the access arrangement period is as shown below.

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[46] The decrease in GPG load is more precipitous in the AEMO series than the Frontier Economics series.

[47] This is particularly apparent in the comparison of the (dark blue) "AEMO VIC Weak" and (green) "AEMO VTS Weak" series. While the increase in all AEMO scenarios reflects the influence of the 2020 carbon price assumption, the sharp increase in the "AEMO VIC Weak" line post 2020 reflects increased dispatch of non-VTS-connected GPG in preference to VTS-connected GPG.

Figure 3-9 – Forecast VTS GPG fuel use, 2018-22
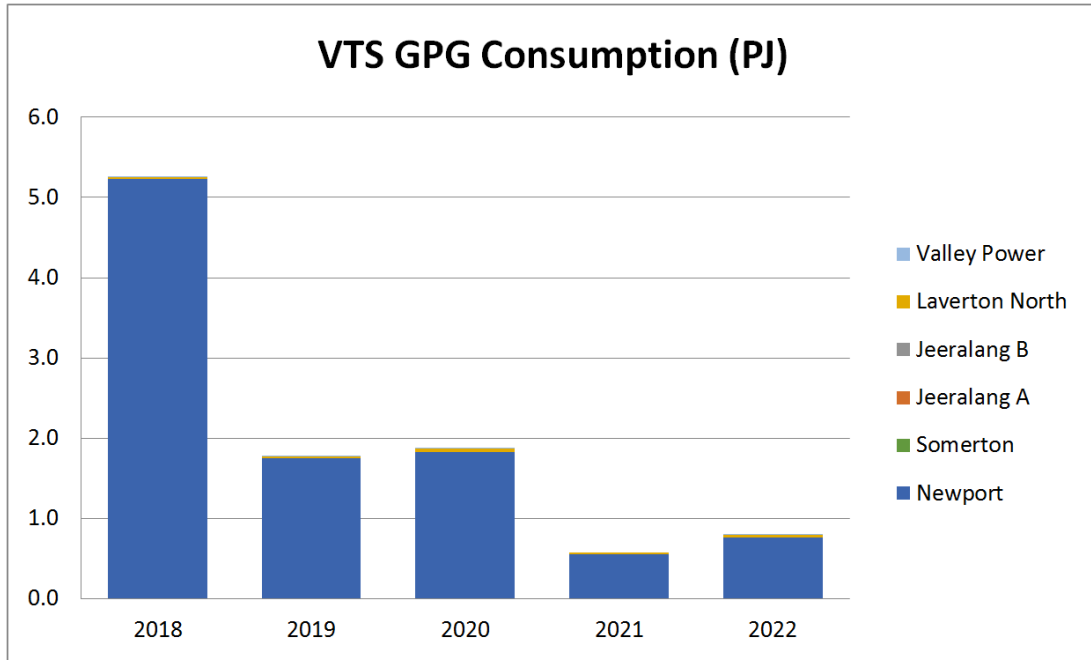
Source: Frontier Economics, *Victorian GPG forecasts - A Report Prepared for APA Group,* December 2016.

Table 3-8 – Forecast demand – GPG (PJ)

PJ	2018	2019	2020	2021	2022
GPG total	5.27	1.79	1.88	0.59	0.80

Summary - Withdrawal volumes

For the purposes of the access arrangement revision proposal, APA VTS requires forecasts of the annual and peak day gas volumes withdrawn from the VTS. These forecasts are used for the setting of transmission tariffs, and for the calibration of the revenue control formula. The forecast annual withdrawal volumes for the access arrangement period and the forecast peak day withdrawal volume are set out in Table 3-9 below.

Table 3-9 – Annual withdrawal volumes forecast for the access arrangement period

	2018	2019	2020	2021	2022
Annual (PJ)					
Tariffs V&D	181.99	179.91	177.58	176.73	174.90
GPG	5.27	1.79	1.88	0.59	0.80
Culcairn	29.60	29.60	29.60	29.60	29.60
VicHub	0	0	0	0	0
Sub-total	**216.86**	**211.30**	**209.06**	**206.92**	**205.30**
UGS/LNG refill	16.08	16.28	16.28	16.28	16.28
Total	**232.94**	**227.58**	**225.35**	**223.20**	**221.58**
1-in-2 Peak (TJ/day)					
Tariffs V&D	1,151.14	1,142.27	1,131.41	1,123.56	1,115.08
GPG	8.26	5.27	7.26	8.65	14.01
Culcairn	57.53	57.53	57.53	57.53	57.53
VicHub	0	0	0	0	0
UGS/LNG refill	0	0	0	0	0
Total	**1,216.94**	**1,205.07**	**1,196.20**	**1,189.74**	**1,186.63**
1-in-20 Peak (TJ/day)					
Per AEMO advice	1,258.21	1,249.12	1,237.67	1,229.03	1,220.10

3.2.2   *Forecast user numbers*

User numbers on the VTS are related to registration with AEMO to operate in the Victorian wholesale gas market. Apart from the expected registration of two new participants in 2017 (which are reflected in APA VTS's user number reporting for the earlier access arrangement period), APA VTS does not have any knowledge of further registrations of Market Participants nor of any current Market Participants withdrawing from the Victorian gas market. On this basis APA VTS forecasts that the number of users of the VTS will remain at 2017 levels over the access arrangement period.

3.2.3   *Forecast capacity and utilisation*

Forecast capacity for pipelines flowing towards Melbourne is forecast to remain steady over the access arrangement period, as shown in Table 3-10. APA VTS is not proposing any expansions in the period that would impact these capacities.

Table 3-10 – Pipeline capacity 2018-2022 – flows towards Melbourne (TJ/day)

Pipeline TJ/day	2018	2022
Longford to Melbourne	1030	1030
South West Pipeline	429	429
NSW Interconnect	125	125

Forecast capacities for pipelines for flows away from Melbourne are set out in Table 3-11 below. These capacities reflect a forecast increase in capacity over the period on the South West Pipeline for westbound flows, as discussed in Chapter 4 of this submission.

Table 3-11 – Pipeline capacity 2018-2022 – flows away from Melbourne (TJ/day)

Pipeline TJ/day	2018	2022
South West Pipeline	102	150
NSW Interconnect	201 (summer) / 201 (winter)	201
Western Transmission System	28	28

Utilisation

Forecast utilisations of the main pipelines for flows towards Melbourne are set out in Table 3-12 below.

Average utilisation is based on the average daily flow (annual forecast flow divided by 365 days per year) divided by the pipeline capacity. The forecast peak flow applies the historical ratio of maximum to average demand as observed over the earlier access arrangement period.

Utilisation falls slightly, reflecting the reductions in GPG and Industrial load.

Table 3-12 – Pipeline utilisation – Flows towards Melbourne

Pipeline	Average	Peak
Longford to Melbourne	45.5%	64.2%
South West Pipeline	15.8%	100%
NSW Interconnect	5.3%	52.8%

Forecast utilisations of the main pipelines for flows away from Melbourne are set out in Table 3-13 below.

Average utilisation is based on the average daily flow (annual forecast flow divided by 365 days per year) divided by the pipeline capacity. The forecast

peak flow applies the historical ratio of maximum to average demand as observed over the earlier access arrangement period.

Table 3-13 – Pipeline utilisation – Flows away from Melbourne

Pipeline	Average	Peak
South West Pipeline	25.8%	97.9%
Victorian Northern Interconnect	39.5%	92.7%
Western Transmission System	35.9%	57.3%

3.2.4 *Demand uncertainty*

APA VTS's forecast of VTS throughput has been arrived at on a reasonable basis, and represents the best forecast possible in the circumstances.

However, as the discussion in the preceding sections clearly shows, there is considerable uncertainty about the future development of East Coast energy markets, about the role of gas in those markets (particularly for power generation), and about the demand for gas in Victoria.

Under the reference tariff variation mechanism of the current access arrangement for the VTS, and under the variation mechanism of the VTS access arrangement revisions proposal (which is, in principle, unchanged from the current mechanism), APA VTS bears significant volume risk. Should there be a material change in the VTS throughput forecast during the revisions approval process, APA VTS will consider reinstating the "cap and collar" on the tariff variation which was in section 4.5 of Schedule 4 to the access arrangement approved by the Australian Competition and Consumer Commission in 2008, but which was removed as part of APA GasNet's 2012 proposed revisions.

4   Pipeline asset management planning

This chapter provides an overview of APA VTS's pipeline asset management planning, and of key governance and expenditure control processes.

Through these explicit processes for asset management planning, and for governance and expenditure control, APA VTS has confidence that:

- Its capital expenditures are those that would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable costs of providing service;[48] and

- Its operating expenditures are those that would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of delivering pipeline services.[49]

4.1   Asset management policy and objectives

Through an explicit process of asset management planning, APA VTS formulates management strategies and actions to ensure safe and reliable asset operation in order to meet legislative obligations for the intended life of its assets, while meeting APA Group business objectives of effectively managing risk, optimising lifecycle costs, and maximising financial return.

4.1.1   Asset management policy and objectives

APA VTS asset management policy and objectives are summarised in the Asset Management Plan for the VTS:

This document also outlines the strategic direction of each asset class to ensure compliance with regulatory, safety, and environmental obligations and to ensure the performance requirements of the pipeline system is maintained to a suitable standard for current and future needs.

…

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[48] NGR, Rule 79(1)(a)

[49] NGR, Rule 91(1)

> *The objective of the AMP is to ensure the VTS is maintained in a safe and reliable operating condition, and with a minimum level of risk with respect to its lifecycle cost whilst meeting stakeholder expectation through systematic management of all threats …to the operation and expansion of the asset throughout its lifecycle. [50]*

4.1.2   *Risk management policy*

Risk management is a key component of asset management. The VTS is operated within the overarching APA Group Risk Management Policy and framework.

Risk is inherent in all aspects of APA's business. The APA Risk Management Policy applies a consistent approach to the management of risks associated with all activities undertaken by APA.

The goal is to cost effectively manage risk through identification, assessment and active management and mitigation of potential outcomes. APA maintains a system of risk management appropriate to the level of risk considered acceptable by the APA Board, which is based on the international risk standard AS/NZS ISO 31000:2009 (Risk Management – Principles and Guidelines).

APA is committed to a culture where risks that could affect shareholder value, employees, stakeholders, the community, the environment, reputation, operating assets, financial and legal status, or which could prevent the achievement of its business objectives, are well managed. APA manages such risks by:

- Complying with all applicable regulatory and legislative requirements;

- Educating and involving employees and stakeholders in the process of risk management;

- Articulating the roles and responsibilities of the different controls and individuals within the risk management process;

- Prioritising risk management according to likelihood (probability) and the consequence (impact) of risks, with appropriate consideration of controls and their effectiveness;

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[50] APA VTS 2016, *Asset Management Plan*, November, p 4

- Developing action plans which assign responsibilities and accountabilities to minimise high level risks;

- Incorporating risk management into strategic plans, project plans, budgets, overall decision making and operating philosophy;

- Undertaking regular reviews of the risk management processes to ensure continuous improvement; and

- Regularly considering and updating the Company's risk registers and risk profile, including the identification of new business activities and unusual circumstances which may present new risks.

APA VTS operates in a potentially hazardous industry and recognises that this requires a rigorous and systematic approach to manage risk exposure. APA VTS is committed to ensuring that an integrated risk management system is applied throughout the organisation, one that will specifically address the risks of the industry.

4.2   Asset management process

The asset management process is a continuous loop of activity as depicted in the flowchart at Figure 4-1. The process is divided into major phases:

Issue identification

Issues are identified from a range of sources including asset assessments, change management processes and commercial considerations. They are assessed and potential solutions evaluated in terms of cost benefit and technical quality.

Scoping and prioritisation

Funding proposals are developed based on the evaluation performed in issue identification. Proposals are submitted for committee prioritisation and an options analysis is performed from a business perspective.

Funding approval

Final plans and associated budgets are submitted to the Executive for national and strategic review and approval.

Work program delivery

Approved projects proceed through the five steps of the APA Project Management Framework.

Review and improvement

Post implementation review assesses whether each asset solution has met the needs of the project scope of work and identifies ways of improving asset management performance.

Figure 4-1 – Asset Management Process
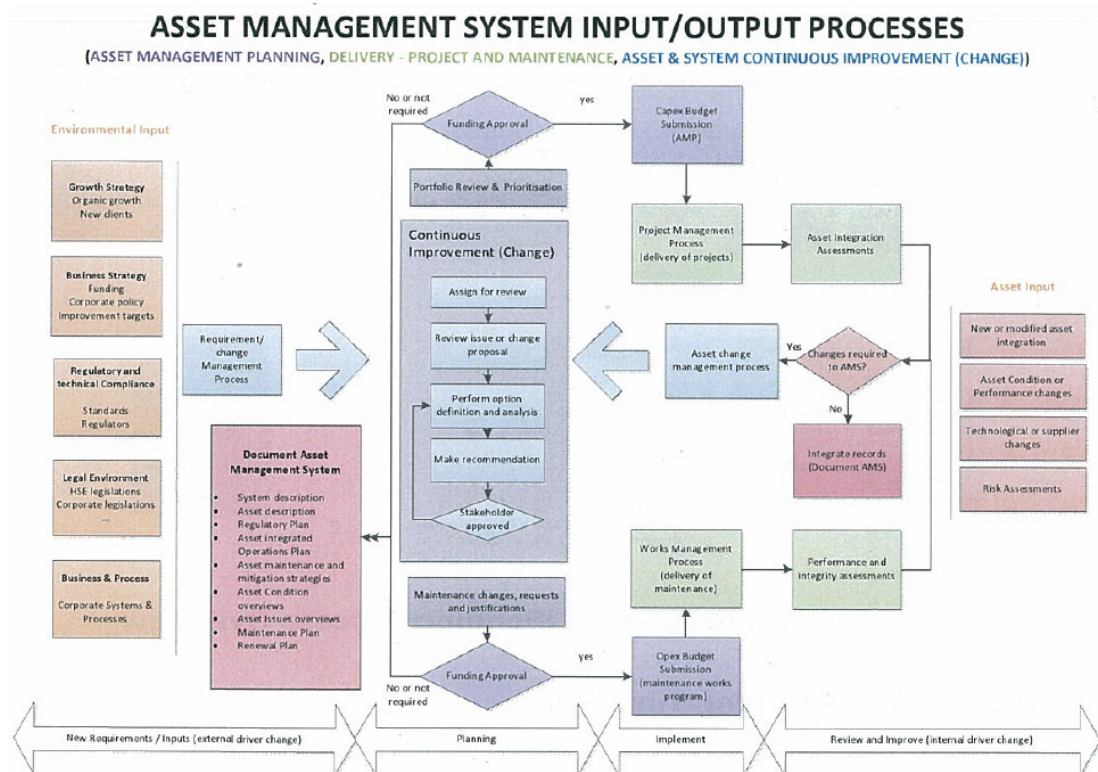
4.3   Key planning and asset management documents

APA VTS has developed a number of planning documents to assist in the development and management of the pipeline, and to comply with relevant regulatory obligations. Key documents are:

- Asset Management Plan

- Pipeline Integrity Management Plan

- Pipeline Management System

- Emergency Plan

- Safety Case

These are described in more detail below and, where possible, are provided as attachments to this submission at Attachment D.

4.3.1   *Asset Management Plan*

The VTS Asset Management Plan (AMP) contains the rolling five year plan for non-routine capital and operating expenditures for the pipeline, with some longer term projects such as intelligent pigging programs included. The AMP is limited to pipeline facilities and does not generally cover other facilities such as buildings, computers, vehicles, and small plant and equipment. The AMP is reviewed and revised on an annual basis. For 2016, the AMP was extended by one year to cover 2022 in order to forecast capital expenditure and major expenditure projects for the duration of the access arrangement period.

The VTS Pipeline Licence, AS2885 and other mandatory or statutory standards and regulations form the basis of compliance requirements addressed in the AMP. Other capital and operating works are determined by operator experience, integrity considerations and risk assessment.

Key components of the AMP are the asset management strategies for each asset class, which address pipeline, station, rotating equipment, plant and easement condition, and associated expenditure requirements.

The AMP also includes detailed project descriptions and costings.

4.3.2   *Pipeline Integrity Management Plan*

The Pipeline Integrity Management Plan (PIMP) is a component of the VTS Safety Case (R1) which details the integrity-related asset management requirements for, and techniques used on, pipeline assets.

It summarises the key integrity maintenance activities for each specific asset or set of assets, and the inspection and maintenance actions required to ensure safe and reliable operation in accordance with applicable pipeline integrity management procedures. These inspection and maintenance actions, and their frequencies, are developed based on the risks identified in

the Safety Management Study (SMS) and link to the AMP. The PIMP captures the technical information and engineering assessment behind the inspection and maintenance actions and frequencies.

APA has developed the PIMP for the VTS in compliance with the requirements of the Australian Standard AS 2885.3, and at all times will remain compliant with the Safety Case, Gas Safety Act 1997, and Pipelines Act 2005.

4.3.3   Pipeline Management System

The Pipeline Management System is designed to ensure that APA's pipeline system is compliant with AS 2885.3 and AS 2885.0 addressing the critical requirements related to asset development, maintenance and use including but not limited to legislative and legal requirements, external standards, and internal standards.

The Pipeline Management System is the system in which the Pipeline Integrity Management Plan and Asset Management Plan reside.

4.3.4   Emergency Plan

The purpose of the Emergency Plan is to provide APA personnel with an integrated and resilient management plan which ensures an effective, consistent and coordinated response to emergencies under the control of APA.

4.3.5   Safety Case

Under the *Gas Safety (Safety Case) Regulations 2008* the Safety Case is a document describing in detail the operating and management practices adopted by a business that seeks to minimise to "as low as reasonably practicable" (ALARP), the non-commercial risks and hazards arising from the operation of the business.

The document includes a facility description, formal safety assessment and details the Safety Management System implemented for the VTS. The document refers to other documents and plans within APA, such as the Pipeline Integrity Management Plan.

4.4 Expenditure governance

4.4.1 Budgets and expenditure approval processes

APA Group's Corporate Governance Statement has been developed in accordance with the *Corporate Governance Principles and Recommendations* issued by the Australian Stock Exchange Corporate Governance Council in August 2007. The statement sets out the principles and framework to be followed by the APA Group Board and senior management for the management of the business in areas such as risk management, ethical and responsible decision making and management and oversight.

APA Group Board responsibilities are set out in the Board Charter. Focusing on areas of particular relevance to this access arrangement, the APA Group Board is responsible for ensuring that effective audit, risk management, compliance and control systems are in place to protect APA VTS's assets and to minimise the possibility of the business operating beyond legal requirements or beyond acceptable risk parameters. The APA Group Board is also responsible for monitoring compliance with regulatory requirements.

APA Group has in place detailed capital expenditure governance processes to ensure that projects undertaken are prudent, efficient and in line with the overall strategy.

The capital expenditure budget is developed as an outcome of the AMP and includes concept plans, implementation schedules for major projects, and high level cost estimates for all proposed capital expenditure projects.

Replacement and upgrade capital expenditure works are included in the approved capital expenditure budget. Capital expenditure approval is required for all other capital projects and includes relevant information like identified needs, risk assessment, options considered, cost estimation, project justification and recommendation.

4.4.2 Allocation between regulated and non-regulated services

APA VTS has a robust process in place for allocating its costs and revenue between regulated and non-regulated activities to ensure that there is no cross subsidisation between regulated and non-regulated activities.

All expenditures are directly coded to job numbers created for non-regulated activities.

These expenditures are directly allocated to those non-regulated activities and are not included in the capital and operating expenditure discussed in the following sections.

All field personnel complete a timesheet which must be submitted to their leader for approval on a weekly basis. These timesheets accurately record time spent on non-regulated activities and all such time is not included in recorded expenditure on regulated assets.

All capital expenditure is also directly allocated to the asset to which it relates based on actual capital spent.

4.4.3 *Procurement Policy and Procurement Guidelines*

Operating in conjunction with the key asset planning and management framework is the APA procurement policy.

All APA purchases of goods and procurement of services must be undertaken in accordance with the APA procurement policy and guideline.

APA's procurement practices are designed to ensure:

- Financial, commercial, legal, operational, reputational, regulatory, environmental and occupational health and safety risks are determined, monitored, managed and reduced;

- Goods and/or services meet specification and are delivered on-time at competitive prices from financially stable suppliers;

- Best value for money is realised, as evaluated on a total cost of ownership basis; and

- Effective procurement processes and procedures, including rigorous ongoing contract management and supplier relationship management are applied consistently.

It achieves this through a strict governance framework for expenditure approvals and competitive procurement processes.

Expenditure approval

The governance framework operates through delegated limits on authority. Any expenditure undertaken within budget must have approval from a manager with the appropriate level of authority.

Competitive procurement processes

Where the procurement value is or is likely to be greater than:

- AUD$100,000 APA or APA VTS must obtain competitive written quotes or proposals from a minimum of three relevant Suppliers; and

- AUD$200,000 APA or APA VTS must conduct a formal Request for Quote, Request for Proposal or Request for Tender as set out in the Procurement Guide.

The successful tenderer will then be selected based on the criteria established for assessing the proposals prior to conducting the tender, request for quote or request for proposal.

5 Capital expenditure

This chapter sets out capital expenditure undertaken in the earlier access arrangement period and capital expenditure forecast for the access arrangement period, and provides explanations and justifications for actual and forecast capital expenditures by reference to the Rules.

For the purposes of the access arrangement revision proposal, APA VTS classifies its capital expenditure according to driver as follows:

- Augmentations, which are required to increase the capacity of transmission assets to ensure that the VTS can continue to supply services as demand changes, or to meet projected demand that is dependent on the expansion;

- Refurbishments and upgrades, which are required to maintain the service potentials of existing facilities as they age and deteriorate over time, including the asset upgrades and improvements required because of obsolescence, to deal with changed operating requirements, to meet new regulatory or legislated obligations, and to meet higher environmental or safety standards over time; and

- Non-system, which is required to augment, maintain or replace capital facilities that are essential for the delivery of pipeline services, but which do not make up part of the pipeline system itself (including buildings, vehicles, office equipment and IT and SCADA systems).

The NGR accommodates a degree of overlap between the categories above by allowing capital expenditure to be justified as more than one type of capital expenditure. Where relevant, the project descriptions in this section of this submission, the VTS Asset Management Plan, and individual business cases identify where multiple outcomes are sought from expenditure (e.g. increased capacity and refurbishment) and provide an analysis showing the efficiency of this approach compared to other options. Projects are categorised by their primary driver below.

5.1 Rules governing conforming capital expenditure

Rule 79(1) specifies that 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. The capital expenditure must also be justifiable on a ground stated in subrule (2).

Rule 79(2) goes on to set out three main subrules for capital expenditure as follows:

(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)*

The AER's discretion under this rule is limited such that the AER must not withhold its approval of capital expenditure if it is satisfied that it complies with the requirements of the law and is consistent with Rule 79. All forecasts and estimates must also comply with Rule 74.

5.2   Capital expenditure over the current access arrangement period

APA VTS capital expenditure over the earlier access arrangement period, compared to the AER forecast for that period, is shown in Table 5-1 and Figure 5-1 below.

Actual (and estimated and forecast) capital expenditure by asset class for the earlier access arrangement period is set out in Table 5-2 below.

Table 5-1 – Actual capital expenditure by driver for the earlier access arrangement period (nominal $m)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
AER Forecast						
Augmentation	6.6	74.0	12.3	-	-	**92.9**
Refurbishment and Upgrade	9.8	15.5	11.8	12.4	6.4	**55.9**
Non-System	3.3	6.0	1.1	1.8	2.9	**15.0**
Total	**19.7**	**95.4**	**25.2**	**14.1**	**9.3**	**163.7**
Actuals						
Augmentation	12.3	112.4	74.6	92.1	52.3	**343.8**
Refurbishment and Upgrade	1.6	7.5	14.2	10.5	8.1	**41.9**
Non-System	1.7	4.2	5.7	2.4	8.6	**22.6**
Total	**15.6**	**124.2**	**94.5**	**105.0**	**69.0**	**408.3**
Difference						
Augmentation	5.7	38.5	62.3	92.1	52.3	**250.9**
Refurbishment and Upgrade	-8.3	-7.9	2.4	-1.8	1.7	**-13.9**
Non-System	-1.6	-1.8	4.7	0.6	5.7	**7.6**
Total	**-4.1**	**28.7**	**69.3**	**90.9**	**59.7**	**244.6**

Figure 5-1 – Comparison of actual and forecast capital expenditure with the AER forecast (nominal $m)
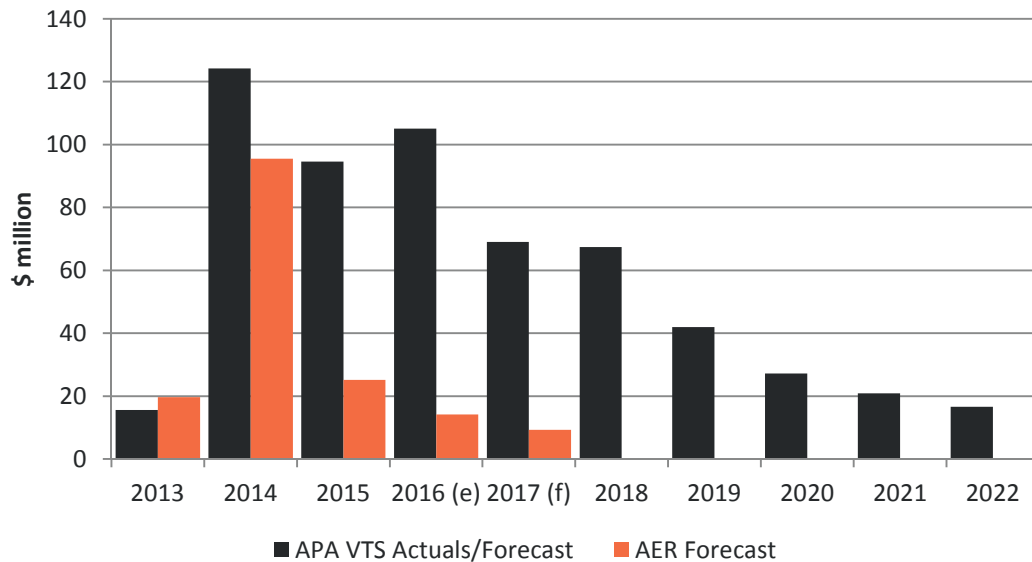
Table 5-2 – Actual capital expenditure by asset class for the current access arrangement period (nominal $m)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
Pipelines	4.1	85.8	72.1	93.3	52.5	**307.8**
Compressors	8.4	27.8	7.8	6.3	1.0	**51.2**
City Gates & Field Regs	1.1	5.1	8.4	1.5	3.5	**19.5**
Odourant Plants	-	-	-	-	-	**-**
Gas Quality	-	0.1	0.3	0.4	0.1	**0.8**
Other	1.9	5.1	5.0	3.5	6.9	**22.5**
Buildings	0.0	0.2	1.0	0.1	5.1	**6.5**
General Land	-	-	-	-	-	**-**
Total	**15.6**	**124.2**	**94.5**	**105.0**	**69.0**	**408.3**

Details of actual capital expenditure, and any deviations from forecast, are set out in the following sections.

5.2.1 *Augmentation capital expenditure*

The AER approved three augmentation projects to be undertaken during the earlier access arrangement period:

- Gas to Culcairn project;

- Anglesea Pipeline extension (now called SWP to Anglesea Pipeline); and

- Warragul lateral expansion.

As discussed in more detail in the following sections, APA undertook the Gas to Culcairn project during the earlier period, albeit with a significantly increased scope, as well as the Anglesea Pipeline extension project, also with an extended scope. APA VTS did not undertake the Warragul lateral expansion due to prudent deferral, however this project will be required in the forecast period.

Gas to Culcairn

The approved Gas to Culcairn project involved expansion of the South West Pipeline through installation of a Centaur 50 (4.5MW) compressor, to increase the capacity from Iona to Melbourne from 353TJ/day (uncompressed) to 414TJ/day. The project also involved increasing the capacity of the Wollert to Barnawartha Pipeline to support an additional 30TJ/day of capacity at Culcairn as follows:

- Looping of pipeline between Wollert and Clonbinane (35.4km x 450 mm Class 600 MAOP 10200 kPa).

- MAOP upgrade from 7400 kPa to 8800 kPa of pipeline between Euroa and Springhurst requiring:

  o Construction of a new pressure regulating station on the Echuca offtake to avoid replacement of the Custody Transfer Meters (CTMs) and 6 city gate stations along that lateral;

  o Relocation of the Euroa PRS to Springhurst to achieve the required class break at Springhurst;

- A short mains lay of 20m from the Euroa CTM and city gate to the downstream of the new Echuca PRS to avoid replacement of this CTM and city gate station; and

- Replacement of city gate piping, regulators and heaters at Benalla, Monsbent, Wangaratta and Wangaratta East.

These approved works were specifically designed to meet the known demand for increased capacity at the time of the access arrangement revision proposal and AER March 2013 final decision. The AER gave no consideration to potential future demand for capacity on the SWP (in either direction) or at Culcairn.

Approved capital expenditure for each element was:

- SWP - $38.6 million ($nominal); and

- Wollert to Barnawartha pipeline - $46.6 million ($nominal).

The approval of this project was made under Rule 79(2)(a), in that it delivered an overall economic value. This was supported by a statement of benefits accruing to one of the shippers from the increased SWP capacity. While the AER did not endorse the full calculation of economic benefits accruing to the shipper, the AER did conclude that the project was likely to deliver an overall economic benefit with some contribution from benefits accruing directly to the shipper, and therefore approved the project.[51]

After the AER final decision, APA VTS received further requests for more capacity on the SWP, and for gas withdrawals at Culcairn. Significant changes in the east coast gas market, including the commissioning of the three LNG plants in Queensland and demand for Victorian gas in NSW, resulted in an increase in demand for the northern flow of gas from Victoria. These changes in demand marginally changed the scope of works on the SWP for injections at Iona/Port Campbell, and significantly changed the scope of works on the Wollert to Barnawartha Pipeline for gas withdrawals at Culcairn.

The expanded Gas to Culcairn project was managed as a single project, with tranches of capacity progressively incorporated into project scope with

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[51] Australian Energy Regulator 2012, *Draft Decision, APA GasNet Australia (Operations) Pty Ltd - 2012-2017 - Part 4 - Confidential Appendixes*, September, p 3

staged delivery. The project was also renamed the Victorian Northern Interconnect Expansion (VNIE) project.

APA VTS has updated the business case for the Gas to Culcairn project to cover the full expenditure on both the SWP and Wollert to Barnawartha Pipeline to deliver the incremental capacity identified in the AER March 2013 final decision, as well as the additional capacity sought during the earlier access arrangement period.[52]

SWP expansion element

The AER approved the installation of a Centaur 50 compressor at Winchelsea, which would deliver an additional 61TJ/day capacity, meeting the known shipper demand at the time for an additional 49TJ/day.[53] This element of the Gas to Culcairn project had an approved cost estimate of $38.7 million ($nominal).

Prior to starting work on this project, but following the AER final decision, APA VTS identified the potential for further shipper demand for additional AMDQ CC capacity on the SWP. This expected demand warranted the installation of a Taurus 60 compressor at Winchelsea, delivering an additional 76TJ/day. The total incremental demand and, for comparison, the demand identified in the original project proposal provided to the AER, are set out in Table 5-3 below.

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[52] Business case for original approved Gas to Culcairn project (BC175) provided in the supporting documents

[53] Note that compressor capacity comes in discrete packages, and rarely matches the precise demand requirements at the time

Table 5-3 – Incremental capacity on SWP (TJ/day)

TJ/day	Original proposal	Expanded demand
Total	**49**	**76**

[Confidential]

APA VTS completed these works to deliver an incremental 76TJ/day capacity at a total cost of $40.3 million ($nominal).[54] All of the resulting AMDQ CC capacity was fully allocated for the duration of the earlier access arrangement period, demonstrating shipper demand for this capacity.

Expanded Victorian Northern Interconnect element

As set out in the original business case for the Gas to Culcairn Project, the additional SWP capacity was linked to increased gas flows at Culcairn.[55] This involved approved capital expenditure for the expansion of the Wollert to Clonbinane Pipeline and MAOP upgrade to deliver the forecast additional 30TJ/day of $46.6 million ($nominal).

Through a series of requests from six shippers for additional firm (that is, year round) capacity since the AER's final decision, APA VTS increased the capacity for withdrawals at Culcairn by a total of 149TJ/day from 2017. This

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[54] Total project costs, including expenditure in the previous period

[55] APA GasNet 2012, Gas to Culcairn Project: Business Case - BC175 – Confidential

demand is set out in Table 5-3 below, compared to that identified in the original proposal to the AER.

Table 5-4 – Incremental capacity at Culcairn (TJ/day)

TJ/day	Original proposal	Expanded demand
Total	**30**	**149**

[Confidential]

The increased demand for capacity at Culcairn led to the full looping of the pipeline between Wollert and Barnawartha. As a result, the MAOP upgrade approved as part of the original Gas to Culcairn project was redundant.

APA VTS made a further decision to use DN400 class 900 pipe for the loop, rather than the DN450 class 600 pipe proposed in the project approved by the AER. The main difference between the pipelines is in maximum allowable pressure. Class 900 pipe can be compressed to 15.3MPa, whereas class 600 pipe can only be compressed to 10.2MPa. The smaller diameter higher class pipe adds only very marginally to the cost (less than 1 per cent), but provides for significantly more future capacity.

APA VTS incurred $298.9 million ($nominal) on the VNIE element of the Gas to Culcairn project, spread across 2013-2017. Some of this expenditure was incurred in the previous access arrangement period.

Total VNIE project expenditure

Expenditure of the total VNIE project, in the years that expenditure was made, is set out in Table 5-5 below.

Table 5-5 – Total VNIE project expenditure (nominal $m)

$m nominal	2013 H1	2013 H2	2014	2015	2016(e)	2017(f)	Total
Winchelsea compressor	3.1	8.1	26.6	2.5	0.0	-	**40.3**
Wollert to Barnawartha looping	2.0	4.0	85.6	72.0	92.1	43.1	**298.9**
Total	**5.1**	**12.1**	**112.3**	**74.5**	**92.1**	**43.1**	**339.2**

APA VTS considers that its decision to fully loop the pipeline using DN400 class 900 pipe was the action of a prudent service provider acting efficiently to deliver the lowest sustainable costs for pipeline services. APA VTS considers that it is good industry practice to consider the long term demand for pipeline services, and to invest on the basis of the lowest costs over the life of the pipeline. This necessarily includes consideration of long term demand for pipeline services.

APA VTS further considers that not carrying out the MAOP upgrade, in light of full looping of the pipeline, was a prudent decision, as it avoided expenditure that would subsequently have been made redundant. As such, APA VTS considers that the VNIE project satisfies Rule 79(1) as conforming capital expenditure.

Further, forecast additional volumes at the prevailing tariffs on the SWP and for withdrawal at Culcairn deliver a positive net benefit to customers from the VNIE project.[56] As such, the project satisfies Rule 79(2)(b) as conforming capital expenditure.

APA VTS notes that the original AER approval of the Gas to Culcairn project included acceptance of benefits accruing to a shipper in relation to the SWP expansion. While the expanded project delivers a positive net benefit in its own right, it is worth noting that its benefits are greater than those calculated in the relevant NPV analysis[57], as they should also include (at least) the

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[56] See accompanying calculation at Attachment B.5 entitled: *APA VTS-B5-NPV analysis SWP & VNIE expansion-20181218-Public*

[57] Provided at Attachment B.5 to this submission

approved benefits accruing to the shipper in the AER's final decision for this project.[58]

South West Pipeline to Anglesea Pipeline

The forecast Anglesea pipeline extension project (now called the SWP to Anglesea Pipeline project) involved the installation of a second source of supply to the distribution system serving the Greater City of Geelong system, the Surf Coast Shore and the Bourough of Queenscliff. The project required approximately 15 km of 250 mm pipeline Class 600 transmission pipeline from APA VTS's South West Pipeline to Anglesea, operating at MAOP 10200 kPa, and the installation of a second CTM for the Geelong distribution system. The exact location of the CTM had not been determined at the time of revision proposal submission and the AER's March 2013 final decision, and was to be determined by AusNet Services, the relevant distribution network owner, closer to the time of identified need.

This is a security of supply project, ensuring continuity of gas supply to a growing region in the event of a disruption to the current single point of supply. It was approved by the AER in its draft decision in November 2012 (and confirmed in its final decision) as required to maintain the integrity of services to users, and was therefore conforming capital expenditure under Rule 79(2)(c)(ii).[59]

The project was expected to be completed by winter 2015.[60] This timing was intended to coincide with the corresponding (AER-approved) work by AusNet Services in building the new CTM, to which the APA VTS pipeline would connect.[61] Completion of the project has been delayed due to delays in the necessary distribution works, which are a prerequisite for the transmission works.

AusNet has advised that it is proceeding with the project in 2017, and will need the new SWP to Anglesea Pipeline to be operational by winter 2018.

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[58] Australian Energy Regulator 2012, *Draft Decision, APA GasNet Australia (Operations) Pty Ltd - 2012-2017 - Part 4 - Confidential Appendixes*, September p 3

[59] AER 2012, Draft Decision Part 2, p 73

[60] AER 2012, Draft Decision Part 2, p 73

[61] AER 2012, Draft Decision Part 2, p 73

AusNet Services has also confirmed the location of the new CTM near the intersection of Ghazeepore Road and Mount Duneed Road, Waurn Ponds. This location is more distant (at 20.2kms) from the South West Pipeline than the general locations considered in the approved proposal. The greater distance involves increased pipeline and construction costs.

Expected expenditure, which spans the earlier and forecast access arrangement periods, is set out in Table 5-6 below.

Table 5-6 – SWP to Anglesea Pipeline expenditure (nominal $m)

$m nominal	2013	2014	2015	2016(e)	2017(f)	2018(f)	Total
AER approved forecast	-	1.3	12.3	-	-	-	**13.7**
Actuals	-	-	-	-	9.3	17.4	**26.7**
Difference	-	-1.3	-12.3	-	9.3	17.4	**13.0**

In preparing these forecasts, APA VTS has updated its earlier costs estimates for the increased length of the pipeline, as well as updating its estimates for steel. The estimates also include costs associated with special pipeline construction, including trenchless construction, which will be required for this pipeline.

APA VTS considers that this expenditure, in line with the earlier AER approval, is necessary to ensure the integrity of services to Geelong and Bellarine area distribution system customers. The expenditure represents the efficient costs to construct the pipeline, the nature of which is routine for APA.

Warragul lateral expansion

The Warragul lateral expansion project involved looping of the Warragul lateral to accommodate increasing demand from distribution system connected customers.

Approximately 4.8 km of 150 mm diameter pipeline, with a MAOP of 2760 kPa, was to have been placed in the existing Warragul pipeline easement at a forecast cost of $2.5 million ($2012) to be spent in 2014.

When APA VTS undertook detailed analysis immediately prior to project commencement, it found that the necessary expenditure would significantly exceed that approved in the AER March 2013 final decision.[62] This led to delay as APA VTS carried out further investigations into alternative – potentially lower cost - options for the project.

In July 2014, demand growth in the Warragul region led to a breach in minimum delivery pressure requirements. On the day in question, there were very low overnight temperatures and a Tariff-D site on the pipeline system exceeded its MHQ. The pressure breach did not lead to an interruption in supply.[63]

APA VTS, with cooperation from the distribution system owner Australian Gas Networks (AGN) and AEMO, immediately implemented a number of emergency measures to support gas supply to the Warragul region. They included increasing the Morwell Backup regulator setting to its maximum pressure of 2760 kPa (which has the negative affect of reducing the Longford to Melbourne Pipeline declared capacity), and reducing the required minimum connection pressure at Warragul from 1400 kPa to 1150 kPa at the CTM.

These measures are currently in place, but are not ideal as they impact the capacity of the Longford to Melbourne Pipeline. In any case, continued growth in distribution system demand means that they will not be sufficient to maintain the required pressure by winter 2020, as shown in Figure 5-2 below.

Given significantly increased forecast costs, APA VTS considers that the deferral of the project in the earlier period, and implementation of the temporary measures noted above, was a prudent deferral of expenditure.

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[62] As set out in section 5.3.1 below, forecast costs of this project are now $7.6 million ($real 2017)

[63] AEMO 2016, *VGPR Update*, p 30

Figure 5-2 – Warragul CTM forecast showing growth and exceedance of minimum pressures under different configurations
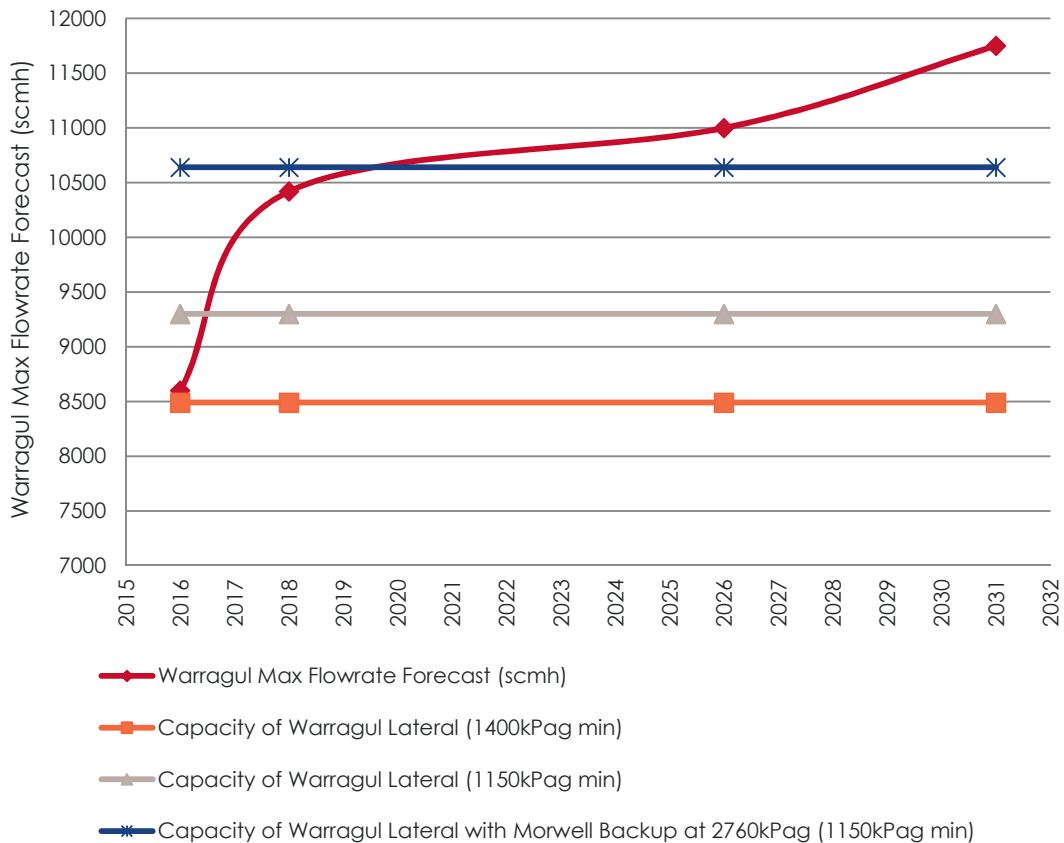
This project is now forecast to occur in the access arrangement period, as set out in section 5.3.1 below.

5.2.2 Refurbishment and upgrade capital expenditure

Refurbishment and upgrade of existing assets is essential to safety and integrity, and to meet the long term objectives of the VTS. The VTS is managed to ensure that it is maintained to its current condition and level of risk, whilst meeting stakeholder expectations through systematic management of all threats to the operation and expansion of the asset. APA VTS seeks to achieve operational efficiency over the entire lifetime of the assets in line with:

- Legislative obligations;

- Effective risk management;

71

- Regulated financial parameters;

- Best asset management practice; and

- Extraction of maximum value from assets.

APA VTS undertook less refurbishment and upgrade capital expenditure than was forecast by the AER for the current access arrangement period. As outlined in Table 5-7 the AER forecast $55.9 million of refurbishment and upgrade capital expenditure for the current access arrangement period, APA VTS spent $42.3 million, a difference of $13.6 million.

Table 5-7 – Earlier access arrangement period refurbishment and upgrade capital expenditure compared to AER forecast (nominal $m)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
AER forecast	9.8	15.5	11.8	12.4	6.4	55.9
Actuals	1.6	7.5	14.2	10.5	8.1	41.9
Difference	-8.3	-7.9	2.4	-1.8	1.7	-13.9

There were a number of drivers of the difference in capital expenditure. One significant driver was the amount of actual augmentation capital expenditure required in the current access arrangement period was higher than was forecast by the AER. This in turn meant that a number of the assets that were due for refurbishment or upgrade were augmented as part of this work rendering the need to refurbish these assets unnecessary. An example of this is the replacement of the Springhurst aftercooler.

Another driver was usage of the system differed from that underpinning the AER's forecast. The replacement cycles for certain types of assets are based on wear and tear and therefore are affected by the amount of utilisation of the asset. In the event that an asset is not as heavily utilised as was forecast, then refurbishment or upgrade can be delayed. An example of this is the Gooding Compressor Station unit 3 overhaul. The run hours of the turbine did not reach predicted levels initiating overhaul.

A number of major projects were undertaken in the current access arrangement period. The details of these projects and a demonstration of their consistency with the requirements of the NGR are set out below. These

four projects represent over 80 per cent of the historic refurbishment and upgrade capital expenditure.

Regulator Upgrade – Dandenong City Gate

The largest single item of capital expenditure for refurbishment and upgrade was the upgrade of the Dandenong City Gate. This expenditure was part of the capital expenditure forecast at the time of the last access arrangement submission.

The Dandenong City Gate is a major gas supply gateway into Melbourne, at the time supplying 60 to 70 per cent of natural gas to the Melbourne metropolitan areas. It was first built in 1969 and had a major upgrade in 1979 to add additional regulator runs. In the early 1990s, three out of seven regulators runs were converted from solely self-pneumatic control to basic electro-pneumatic control setup. Due to a range of factors detailed in the business case supplied to the AER as part of the last access arrangement submission, APA VTS determined that a fundamental redesign and construction of this facility was the only means of ensuring integrity in the short and long term. Table 5-8 below compares the AER's estimate with actuals.

There is a cost difference between the AER forecast and the actual costs incurred. This is because the estimate supplied to the AER was a preliminary estimate. After a more detailed design, it was revealed there was a need to replace underground cabling, build a new control room and provide instrument air at the site. Each of these additional activities is explained in more detail below.

Underground cabling

A previous control room was removed and replaced with a remote telemetry unit. However, the original underground cabling at the site connected to the control room was retained and utilised. This cabling was old and not up to standard. APA VTS replaced the old cabling with new underground cabling that connected to the current control room. This work has improved the reliability of the control system through ensuring better communication. This is consistent with NGR 79(2)(c)(ii).

New control room

A new control room was constructed. This control room uses electronic controls for the city gate as opposed to the more old fashioned pneumatic controls. Electronic controls are faster and more reliable. The requirement for faster and more reliable controls is consistent with a request that APA VTS received from AEMO outlining their operational requirements. The upgraded controls also have the advantage of automatically optimising the use of the different runs of the city gate thereby reducing the risk of early failure of the asset.

Instrument air

The conversion from instrument gas to instrument air is necessary to ensure the ongoing safe operation of the city gate. Instrument gas equipment vents small amounts of gas during normal operation. This means there is an almost constant release of natural gas to the atmosphere. This poses a risk to employees and the general public. It also can result in interruptions to supply should the gas ignite. As a result this capital expenditure is consistent with rule 79(2)(c)(i) and (ii).

The engineering, constructions costs and certain assets were procured on a competitive basis. Some of these competitively procured items cost more than was anticipated in the business case.

Table 5-8 – Dandenong City Gate AER forecast compared to Actuals (nominal $m)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
AER forecast	3.8	1.5	-	-	-	**5.3**
Actuals	0.5	2.6	7.8	0.8	-	**11.7**
Difference	-3.3	1.1	7.8	0.8	-	**6.3**

Inline inspection

The Victorian Pipeline Regulations 2007 require a pipeline must be operated in accordance with the Australian Standards. The Australian Standard AS2885 requires APA VTS to ensure that "…periodic inspections shall be carried out to

identify actual and potential problems that could affect the integrity of the pipeline."

Further, as required by the Gas Safety Act, APA VTS maintains the Victorian pipelines in accordance with a Safety Case approved by Energy Safe Victoria. The Safety Case also requires inspection of pipelines.

There are primarily two techniques to inspect an in-service pipeline:

- Direct Assessment

- Inline Inspection

Where either of these assessment techniques identifies faults in the pipeline work is then undertaken to repair these faults in order to maintain the safety and the integrity of the pipeline consistent with the obligations of both the Victorian Pipeline Regulations and the NGR.

Direct Assessment

The direct assessment technique is to excavate the pipeline, remove the coating and perform a non-destructive inspection at regular intervals to determine a statistical confidence level as to the condition of the pipeline.

The direct assessment technique is acknowledged throughout the pipeline industry as the only means of determining the pipeline integrity where no other inspection technique is viable. APA VTS utilises Direct Current Voltage Gradient surveys and other means to determine the location of where direct assessment are most likely to find a pipe wall defect. Direct assessment when undertaken to minimise risk requires a sample of 15 per cent of possible pipe wall defect locations to be directly inspected to achieve a 95 per cent level of confidence those locations directly inspected are representative of pipe wall defects. If the number of locations is 12 or less then all locations are directly assessed.

Inline Inspection

The most commonly used means of undertaking inspection of conditions of pipelines in the natural gas pipeline industry is inline inspection. It is the one of the most important and conclusive activities in a series of integrity management processes that allows pipeline deterioration to be identified and rectified prior to failure.

Inline inspection comes in a number of different forms, each of which focuses on different threats to the integrity of the pipeline. The main forms used by APA VTS are:

- High-resolution magnetic flux leakage inspection – detects corrosion, gouges, grooves, mill defects, girth weld anomalies and other metal loss features.

- Geometry or caliper inspection – detects dents, ovality (out of roundness) and similar – can indicate third party mechanical damage, rock dents from flooding or landslides, or dents remaining in the pipeline since construction.

- XYZ (3-dimensional) inertial mapping – Maps the geographical position of the pipeline centreline and records any movement or change in shape since previous inspection. XYZ inline inspection enables curvature and strain analysis which is a key factor in mitigation of circumferential stress corrosion cracking.

- Electro-Magnetic Acoustic Transducer (EMAT) inspection – a recently developed technology that detects cracking and crack-like features. EMAT is used on the VTS to detect and manage stress corrosion cracking and longitudinal weld anomalies.

Expenditure on inline inspection is driven by the type and number of inline inspection runs that are scheduled in any given year. This in turn is driven by the time since the last round of inline inspection was conducted on the line and the condition of the line identified by previous inline inspection, integrity upgrade dig ups and Cathodic Protection monitoring.

Pipelines identified as having more defects are scheduled more frequently for inline inspection to make sure any further deterioration is identified early. Typically, reinspection by inline inspection reduces the need for forward prediction of repair requirements and the cost of the inline inspection is small in comparison to the excavation and repair cost savings.

APA VTS has a metal loss inline inspection frequency policy to determine the ideal reinspection interval.[64] The frequency is based upon modelling. This modelling is the preferred approach as it considers a number of factors

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[64] This policy is provided in the supporting documents to this submission

including predicted corrosion growth rate and the pipe wall thickness based on previous inspection results. There is a maximum of 10 years between inline inspections unless an engineering assessment has been undertaken suggesting a different timetable.

Pipeline rectification to enable inline inspection

Due to the superior characteristics of inline inspection compared to direct assessment, APA VTS identifies pipelines that have the following characteristics as needing to be subject to inline inspection:

- Pipeline operating at a stress level of ≥30 per cent of Specified Minimum Yield Stress

- Pipeline traverses High Consequence Areas

- Pipeline diameter ≥350mm nominal bore

- Pipeline mainline coating is coal tar enamel or field applied

At the commencement of the current access arrangement period there were some pipelines that met these characteristics that were not capable of having inline inspection undertaken. Given the obvious safety, integrity and efficiency benefits that are provided by inline inspection the capital expenditure to convert pipelines to make them able to have inline inspection is consistent with rule 79(2)(c)(i) and (ii). APA VTS undertook rectification work at the following locations:

- Pipeline Licence 108 to Newport

- Dandenong to Princes Highway Pipeline

- Keon Park to Wollert Pipeline

- Princes Highway to Regent Street Pipeline

- Somerton to Somerton Pipeline Installation

All of these projects were included in the AER approved forecast of capital expenditure for the current access arrangement period.

Table 5-9 below compares the approved forecasts for inline inspection for the current period compared to the actual costs incurred.

Table 5-9 – In line inspection AER approved forecast compared to Actuals (nominal $m)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
AER forecast	0.3	0.2	1.6	6.9	3.9	**13.0**
Actuals	0.3	2.3	0.6	2.2	6.2	**11.6**
Difference	-0.0	2.1	-1.0	-4.7	2.2	**-1.4**

Brooklyn Compressor Station Compressor Unit 10 & 11 Cooler Upgrade

Brooklyn Compressor Station, located just west of metropolitan Melbourne, was built in 1972 to recompress natural gas to the regional towns of Geelong, Ballarat and Bendigo. Since that time the station has been extensively expanded and also serves as a hub linking supply to Melbourne from the Otway gas facilities near Iona. The main role today for gas compression at the site is for peak compression to Ballarat, supply to the North Laverton GPG (Snowy) and supply of Longford gas to western Victoria when Otway gas facilities are not injecting into the system.

APA VTS noted in our proposal for the earlier access arrangement period that should there be a need to retain the compressors at Brooklyn Compressor Station then the coolers for Unit 10 and 11 would need to be upgraded as a result of corrosion and legionella threats associated with the water cooling systems that were in place at that time. This expenditure was included in the AER approved forecast.

As noted in the business case at the time, a failure of the cooler creates a significant risk of failure of the compressor. This has obvious implications for the safety and the integrity of gas supply and satisfies the requirements of rule 79of the NGR.

As a means of finding efficiencies in delivery the Brooklyn compressor station cooler upgrade project, work also incorporated the work at the station in regard to Fast Stop Valves and Anti-surge Valves upgrades. The valve upgrade project was also included in the approved forecast for the current period.

The cost of the project was different from the costs in the AER approved forecast. This was driven by the following factors:

- AEMO, as pipeline operator, delayed commencement of the site works (see letter dated 8 May 2015).

- AEMO constrained the window of the site works to a shorter time period (see letter dated 8 May 2015) which resulted in higher construction contractor's bids for the work.

- AEMO required APA VTS to maintain either Brooklyn compressor station Unit 10 or 11 to be available for use during the entire construction period (see letter dated 8 May 2015). This reduced the construction efficiencies that could be gained from delivering two units concurrently.

- Unit 11 aftercooler failed during normal operation. This required significant expediting effort in order to satisfy AEMO demands of having at least one unit available (see letter dated 8 May 2015).

- A temporary water cooler and treatment plant was required to be constructed and maintained during the works - this was not anticipated at the time of business case and estimate development.

- Contaminated soil (latent defect) was discovered at the site, increasing construction costs.

- The estimate anticipated some of the process valves and piping would require replacement. Closer investigation as part of the detailed design work revealed that significantly more piping and valves were required to be replaced, resulting in higher procurement and construction costs.

Table 5-10 – Brooklyn Compressor Station Cooling Towers for Units 10 and 11 AER forecast compared to Actuals (nominal $m)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
AER forecast	-0.0	4.4	-	-	-	**4.4**
Actuals	0.0	0.9	5.0	3.3	-	**9.2**
Difference	0.0	-3.5	5.0	3.3	-	**4.8**

Brooklyn Compressor Station Isolation and Loading Valves

The Brooklyn Compressor station isolation valves are buried, do not have loading valves, and are actuated by electric actuators which are inherently

not fail-safe. The fail-safe station valves are intended to be closed during an emergency shutdown or on failure of instrument air or signal. This is to reduce consequences from plant upset conditions. As a consequence, incidents have occurred at the station where the station valves have failed to close. Valve seats are damaged due to loading through the main valve and leak such that they are unable to provide necessary gas isolation. It is impractical to attempt to repair the valves as they are buried and welded to the pipeline.

A failure of the valves to close or seal properly can lead to:

- pipeline accidents and incidents with the potential for mortality or morbidity; and

- damage to be caused to the valve seats rapidly destroying the sealing capability and impacting the performance of the equipment.

The upgrade was consistent with the requirements of Rule 79(2)(c)(i) and (ii). The upgrade to the isolation and loading valves at Brooklyn compressor station was completed in 2016. This capital expenditure was included in the AER approved forecast of capital expenditure for the current access arrangement period.

In undertaking the capital expenditure APA VTS experienced delays resulting from poor weather and delays in regulatory approvals. There were also greater excavation difficulties, for instance the location required to be excavated was very close to existing plant and footings. As a result, a non-ideal excavation technique was required in that location which added cost to the works. The cost of valves and actuators also increased by more than was included in estimate.

Table 5-11 sets out the actual cost of the upgrade compared to the AER forecast.

Table 5-11 – Brooklyn Compressor Station Isolation and Loading Valves AER forecast compared to Actuals (nominal $m)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
AER forecast	-	0.9	-	-	-	**0.9**
Actuals	0.0	0.0	0.2	1.6	-	**1.8**
Difference	0.0	-0.9	0.2	1.6	-	**0.9**

5.2.3   *Non-system capital expenditure*

The actual non-system capital expenditure incurred by APA VTS was higher than the AER approved forecast for the current access arrangement period. As outlined in Table 5-12 the AER forecast $15.0 million of non-system capital expenditure for the current access arrangement period, APA VTS spent $22.6 million, a difference of $7.6 million.

Table 5-12 – Current access arrangement non-system capital expenditure compared to AER forecast (nominal $m)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
AER forecast	3.3	6.0	1.1	1.8	2.9	**15.0**
Actuals	1.7	4.2	5.7	2.4	8.6	**22.6**
Difference	-1.6	-1.8	4.7	0.6	5.7	**7.6**

A number of major projects were undertaken in the earlier access arrangement period. The details of these projects and a demonstration of their consistency with the requirements of the NGR are set out below. These seven projects represent over 80 per cent of the historic capital expenditure in this category.

Corporate IT, business and technology projects

The sub-category of corporate IT, business and technology projects is made up of a number of corporate projects that are allocated to APA in accordance with the corporate cost allocation methodology set out in the operating expenditure chapter (see section 8.2.3). The major projects in this category are described in more detail below.

Enterprise Asset Management

Effective and safe asset management is essential for the maintenance of energy assets. APA previously used six standalone maintenance systems across the Networks and Transmission businesses. This project involved development and migration to a new enterprise wide asset management system, supporting maintenance scheduling and recording of maintenance activities, inventory management and financial control. It also provides data to facilitate analysis of equipment performance.

The previous system used by APA VTS had a number of problems. These were:

- hardware and software supporting these systems was near the end of its serviceable life.

- The system used was a comparatively simple 'stand-alone' system with substantially manual interfaces with APA's other management systems.

The new system enterprise asset management system adopted was superior as it was consistent with the other systems and platforms utilised by APA VTS, in particular the shared stores system which enables improvements to just in time maintenance practices.

Data Centre

APA's internal data centres were inappropriate as recovery from an outage required manual steps that varied from system to system. The Data Centre Project delivered data capability of a standard consistent with APA's needs. The new data centre is more resilient and has better 'Infrastructure Platforms' to service APA VTS's business needs and cater for future VTS projects.

Enterprise Content Management

This project involves the selection and implementation of an Enterprise Content Management tool for use, initially, by Infrastructure Development Projects. Infrastructure Development is responsible for major capital expenditure projects in relation to the VTS.

This project is a blueprint for the discovery, design, development and implementation of Enterprise Content Management process and practices. If successful, the selected tool will be rolled out to other functions relevant for the VTS such as Transmission operations.

APA Grid

The APA Grid (Project Colin or Energy Components) project comprises a number of functions which seek to transform APA Group's management of its gas assets. The project comprised of a new web-based customer interface to provide metering and billing information for users, as well as customer invoicing capabilities and customer access to real time pipeline capacity information to support nominations.

Finance Transformation System

APA Group businesses have, over the years, utilised multiple finance systems and charts of accounts, reflecting numerous legacy systems. Until recently, APA Group had three different finance systems creating considerable complexity in managing financial reporting, analysis and controls. APA Group has undertaken a project to rationalise the previous suite of finance systems to deliver ongoing savings to the APA Group businesses.

Portfolio and Project Operating Model

The portfolio and project operating model provides frameworks for managing projects, change, benefits, assurance, competency and risk. APA manages an internal website which contains handbooks, project artefacts, information about active projects, and how to start a project.

Projects are supported by the Portfolio Office which is responsible for prioritisation, governance and portfolio level reporting, and the Project Delivery team which is responsible for project management, process, resourcing, change and system support.

This expenditure covers a series of incremental improvements to the project model, the internal website and documentation. This ensures that APA VTS remains a best practice project manager which in turn means that projects will continue to be identified and delivered in the long term interests of consumers and the integrity of projects and outcomes on the pipeline will be maintained. This is consistent with Rule 79(2)(c)(ii).

Transmission Dashboard & Enterprise Pilot

This project implements an interactive dashboard/business management platform that will provide financial and statistical information for measurement and to ensure meaningful and sound business decisions.

This delivers the Enterprise platform for all business information requirements as well as a dashboard to replace the current manual Transmission Services based on Microsoft excel spreadsheets.

This helps ensure ongoing sound decisions with regards to asset management and investment for the VTS in the long term. It also reduces the risk inherent in any system based on manual data entry and data analysis. This is consistent with Rule 79(2)(c)(ii).

Replacement of hardware and minor software

This covered the replacement of servers, network equipment and mobile phones on failure, at end of life or subject to minor upgrades. Minor software purchases are also captured in this category. As it enables the ongoing long term operation of the VTS this is consistent with NGR 79(2)(c)(ii).

SharePoint

The SharePoint platform is in use on intranet and extranet sites, web applications and reporting. This includes The Hub, Project Server, Corp Grid, APA Grid and Business Intelligence (BI). All but APA Grid and eForms reside in the same SharePoint Farm. The underpinning Database Management System is SQL Server Standard.

The current SharePoint software (SharePoint 2010) is over five years old and is two major versions behind. [Confidential]

This obviously poses a significant risk to the business and the safe and secure continuation of its operations. The upgrade will rectify these issues. This is consistent with rule 79(2)(c)(ii).

Table 5-13 – Corporate IT, business and technology projects capital expenditure in the current access arrangement period ($m nominal)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
AER forecast	-1.5	-	-	-	-	-1.5
Actuals	0.2	0.3	0.3	0.4	2.2	3.4
Difference	1.7	0.3	0.3	0.4	2.2	4.9

Southbank lease and Dandenong Redevelopment

APA VTS had two offices at its Dandenong site. The Administration and Operations Buildings were constructed in 1980 and subsequently refurbished in the mid-1990s.

The Administration Building was built as office accommodation. The Operations Building was originally a store and workshop and was converted to office accommodation in the refurbishment.

The Administration and Operations Buildings were filled to their practical capacity and were insufficient to meet the current demand for office space. A recent survey of current and projected office workstation requirements at the Dandenong site indicated that currently, 190 workstations are required and the number is expected to remain static or increase slightly over the next few years.

Given the age of the buildings (over 30 years old), issues are arising with their repair and maintenance and the resulting employee discomfort and increased costs. There are ongoing problems with plumbing, mechanical services and roofing.

Recognising the issues at this site, the AER included $9.5 million (nominal) capital expenditure for work at the site in its capital expenditure forecast for the current period.

In 2015, APA engaged an independent Property Consultant, HillPDA to conduct a study of the current and long term office accommodation requirements of the business both at Dandenong and the Melbourne CBD office.

The primary purpose of the study was to evaluate long term accommodation options for APA Group staff that are based in Dandenong South and in the Melbourne CBD.

A number of options were considered, including upgrading the facilities at Dandenong to accommodate personnel currently located in the city and provide sufficient scope for anticipated growth in personnel numbers.

However, the most cost effective approach was found to be providing office space at a different location on the Dandenong site for Dandenong South Operations Group with all other staff being accommodated in a leased site in Southbank. For more details on the Southbank lease see section 5.3.3 of this submission.

The premises for the Dandenong South Operations Group will offer a comprehensive solution that is the most prudent and cost effective way of addressing the existing situation. It comprehensively addresses the issues of substandard office conditions, ageing buildings and services, ongoing risks associated with hazardous building materials and non-compliance with OHS requirements.

This is consistent with National Gas Rule 79(2)(c)(ii) as it is necessary to provide the services that maintain the integrity of the VTS.

The capital expenditure associated with the construction of the office space is set out in Table 5-14 below.

Table 5-14 – Dandenong redevelopment capital expenditure in the current access arrangement period ($m nominal)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
AER forecast	-	3.9	5.6	-	-	**9.5**
Actuals	-	-	-	-	5.1	**5.1**
Difference	-	-3.9	-5.6	-	5.1	**4.4**

5.3 Capital expenditure over the forecast access arrangement period

The capital expenditure for the period 2018 to 2022 is forecast to be lower than that which occurred in the current access arrangement period. The main driver for the reduction is the lower expected capital expenditure for

augmentation of the VTS. Table 5-15 below sets out the forecast capital expenditure by driver.

Table 5-15 – Forecast Capital Expenditure for the VTS (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Augmentation	29.4	14.4	11.0	-	-	**54.8**
Refurbishment and Upgrade	32.1	22.7	11.9	16.4	13.4	**96.5**
Non-System	4.6	3.5	3.2	3.5	2.3	**17.1**
Total	**66.1**	**40.7**	**26.1**	**19.9**	**15.6**	**168.4**

As can be seen from this table the augmentation capital expenditure is expected to be significantly reduced compared to the current access arrangement period (see Table 5-1). There is some growth expected in the capital expenditure to refurbish the VTS see section 5.3.2 below. The non-system capex is expected to remain at a similar level to that experienced in the current access arrangement period.

5.3.1   *Augmentation capital expenditure*

Augmentation capital expenditure increases the capacity of transmission assets. There can be a number of drivers for increasing capacity, including:

* to meet actual or forecast increases in demand (usually justified on the basis of a positive net present value under Rule 79(2)(b));

* to ensure continued reliability of supply to parts of the system where flow paths or pressures change in the system (usually justified on the basis of maintaining capacity for existing users under Rule 79(2)(c)(iv)); and

* to improve the security of supply for some or all system users (usually justified on the basis of maintaining the integrity of services under Rules 79(2)(c)(ii) and (iv).

At times more than one of these drivers will apply to the single project.

APA VTS proposes the following augmentation projects to be completed in the forecast period:

* Warragul lateral expansion; and

- Expansion of the SWP to deliver additional capacity for peak westbound flows to Iona.

These are discussed below.

Warragul lateral expansion

As noted above in respect of expenditure in the earlier access arrangement period, APA VTS has deferred expansion of the Warragul lateral from the earlier period through a number of temporary measures. Peak load growth in the forecast period will mean that these temporary measures will no longer be sufficient to maintain minimum contractual pressures at Warragul from winter 2020.

The need for further expenditure to accommodate growing demand in Warragul is identified in the AEMO 2016 Victorian Gas Planning Report Update.[65] APA VTS agrees with this assessment, and considers that expenditure is justified under Rule 79(2)(c)(i), (ii) and (iv) as follows:

- To maintain and improve the safety of services: failure to maintain minimum pressures in the connected distribution system can lead to unplanned loss of supply. This is potentially a dangerous event with air ingress in the system increasing the risk of explosion;

- To maintain the integrity of services: failure to maintain minimum pressures in the connected distribution system can lead to unplanned loss of supply.

- To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred: demand on the Warragul network is already breaching minimum contractual pressures in the absence of temporary measures in place that impact the capacity on the Longford Gas Pipeline. Warragul demand is an uncontrollable load, and is therefore not dependent on the provision of new capacity.

APA VTS has undertaken a full assessment of options in the accompanying business case (see Attachment D.2.1) looping the existing 4.8km pipeline with 150mm diameter pipeline is the most prudent and efficient option to deliver

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[65] AEMO 2016, Victorian Gas Planning Report Update, p 30

additional capacity to the Warragul region to meet expected demand growth in the long term.

The forecast expenditure on this project is set out in Table 5-16 below.

Table 5-16 – Warragul lateral expansion (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	-	5.5	2.1	-	-	**7.6**

This proposed expenditure is higher than that forecast in the earlier period. The increase is due to a number of factors that were not known at the time of the earlier forecast, which was completed before the design development process and site survey were completed. Contributing factors include:

- Environmental and cultural heritage preservation requirements and notifications that have been determined and resulting costs added to the estimate.

- The assumption of land value in rural land was revised to reflect the majority of private land parcels are in the urban growth zone.

- The procurement cost of line pipe has been re-estimated with the current prevailing steel price and revised quantity.

- The pipeline construction cost was determined from a $/in/km graph in the previous submission. APA has since engaged pipeline construction contractors to provide budget quotes. The contractors have determined and priced in special constructions including trenchless crossings, rigorous traffic management and ecological management requirements specific to the terrain in which the pipeline traverses.

- Specific tie-in requirements have been determined and costs added to the estimate.

- Hot tap construction cost estimates have been prepared from subcontractor pricing, vendor quotes and benchmarked against recent similar projects.

These factors make the forecast expenditure for the Warragul expansion project a more accurate estimate than that included in the earlier proposal.

APA VTS considers that this expenditure, in line with the earlier AER approval, is necessary to meet existing demand and future growth of the Warragul region, and is therefore necessary to maintain the integrity of services and to maintain the capacity to meet levels of demand for services. The expenditure represents the efficient costs to construct the new loop, the nature of which is routine for APA.

Westbound expansion of the South West Pipeline

The South West Pipeline is a bi-directional pipeline that is used to supply gas from the gas plants at Port Campbell (including the Iona Underground Storage facility) to Melbourne. During low demand periods, the SWP transports gas from Melbourne to Port Campbell to refill the Lochard Iona Underground Storage reservoirs and to flow to South Australia via the SEA Gas Pipeline. The stored gas is reinjected into the VTS during the winter peak period to manage the supply and demand in the pipeline system.

A transportation capacity limitation has been identified within the 2016 AEMO Victorian Gas Planning Review report for westernhaul gas flows on the SWP in refilling the Lochard storage facility. As shown in Table 5-17 below, peak utilisation has been high over the earlier access arrangement period, routinely exceeding the pipeline capacity.[66]

Table 5-17 – Westbound SWP peak capacity utilisation over the earlier access arrangement period

South West Pipeline	2013	2014	2015	2016
Peak capacity utilisation	107%	115%	99%	102%

The Lochard Storage Facility plays an important role in supplementing gas supplies to Victoria in the winter months. To adequately fulfil this role, the storage facility needs to be full at the start of winter.

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[66] Peak utilisation (that is the peak utilisation day in that year divided by the pipeline capacity) can exceed 100 per cent when system conditions are benign (lower demand than expected, particularly in the shoulder period), allowing more gas to flow into storage. These peak utilisations do not reflect the achievable capacity of the SWP on every day (that is, its firm capacity).

Gas supplies from the Port Campbell production plant are gradually declining. This puts greater call on supplies from Victoria to both fill the Lochard Storage Facility and to flow gas to South Australia on the SEA Gas Pipeline. These flows occur via the SWP to Iona, which has a current summer capacity of 102TJ/day. The shoulder capacity is approximately 60TJ/day.

While total flows into the Iona facility are not forecast to change significantly, their profile is, with increased need for peak capacity to ensure that the storage facility can be completely refilled in the summer period, potentially over a shorter period of time. Current forecasts prepared by AEMO suggest that, from 2018, SWP withdrawals are expected to be above pipeline capacity during December and January. This is shown in Figure 5-3, reproduced from the AEMO 2016 VGPR Update.[67]

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[67] Australian Energy Market Operator 2016, Victorian Gas Planning Report Update, February, p 19

Figure 5-3 – Forecast withdrawal capacity (source, AEMO VGPR Update 2016)

Figure 9   South West Pipeline projected daily withdrawal quantity[26], September – May
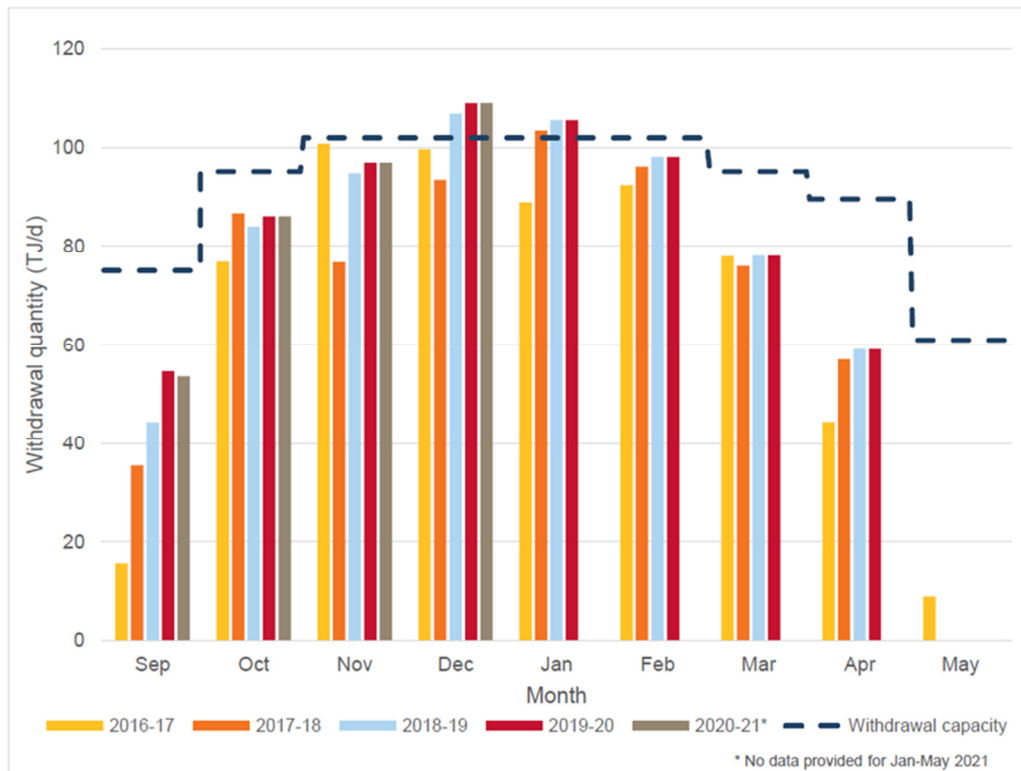
APA VTS has reviewed this situation and assessed a number of alternatives to expansion of the SWP. These include changing the profile of storage injections, and relying on alternative gas sources.

There appears to be adequate capacity to provide storage refill services if shippers shifted their refill activities to the summer shoulder period (September, March and April), such that they avoid summer congestion. APA VTS estimates that an additional 4PJ of additional refill could be achieved in this way with a flatter load profile.

The degree to which shippers can do this is uncertain. The summer shoulder period can still see significant call on gas supply, including from the Lochard Storage Facility. Further, shippers may have other gas commitments that mean that gas is not available for storage injection at that time.

APA VTS considers that, while there is scope to use more capacity during the summer shoulder, a number of factors may limit this scope in practice, including the potential for facility outages (planned and unplanned) to disrupt refill activities. It would not appear prudent to rely on this strategy alone.

There are other storage service providers in Victoria, as well as competing sources of supply, which may be able to meet the market demand with no additional capital expenditure. These facilities include:

- Dandenong LNG facility – maximum standing injection capacity of 60TJ/d (firm basis)

- VicHub – Eastern Gas Pipeline 120TJ/d

- TasHub – Tasmanian Gas Pipeline 120TJ/d

- NSW interconnect (Culcairn) - 125TJ/d

However, these facilities may not be able to be relied upon to provide capacity during the winter peak period to supplement a shortfall at Iona, as they themselves can be expected to be running during the peak even when Iona is at capacity.

For example, injections from NSW via the Interconnect may not be available if the Uranquinty Power Station is operating or if there are gas exports through Culcairn to supply NSW customers or for LNG in Queensland. Similarly for the TasHub, the flow is not available if there is gas-fired power generation running in Tasmania. The Dandenong facilities are already used to manage linepack and peak shaving during winter peak, hence they are operating at capacity. This does not appear to be an option that can be relied upon to reliably deliver peak winter capacity.

APA VTS has therefore explored capital expenditure options to increase SWP westernhaul capacity. APA VTS has identified a suite of relatively low cost options to increase capacity of the SWP to effectively match the refill capacity of the Lochard facility. APA VTS considers that these projects are prudent given the modest expenditure involved to avoid a potentially significant winter gas shortfall in Victoria. APA VTS recommends the following expenditure:

- Reconfiguration of the Brooklyn Compressor Station to enable concurrent compression of the Brooklyn Corio Pipeline and the Brooklyn Lara Pipeline

at different pressures, thereby reducing compression to Geelong but increasing the SWP withdrawal capacity at Iona from 102TJ/day to 132TJ/day. These works are forecast to cost $2.0 million ($2017); and

• Convert Winchelsea compressor to be bidirectional. In conjunction with the Brooklyn Compressor Station reconfiguration, this option would deliver an additional 15TJ/day capacity, bring the total SWP withdrawal capacity at Iona to 150TJ/day.[68] These works are forecast to cost $1.5 million ($2017).

In light of the risks of a shortfall of gas in a Victorian winter from 2018, APA VTS considers that this expenditure would comply with Rule 79(2)(c)(ii) and (iv) as it is necessary to maintain integrity of services, and to maintain the capacity to meet existing levels of demand for services. Proposed expenditure is set out in Table 5-18 below.

Table 5-18 – Westbound expansion of the South West Pipeline (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Brooklyn reconfiguration	2.0	-	-	-	-	**2.0**
Winchelsea bi-directional works	1.5	-	-	-	-	**1.5**
Total	**3.5**	**-**	**-**	**-**	**-**	**3.5**

As described in more detail in chapter 10, APA VTS has allocated the costs of this expansion entirely to the Iona storage refill tariff (WUGS refill) as the driver of this expenditure. It has done this by calculating a return on and of this expenditure and adding this to the existing refill charge. This approach means that other users of the VTS do not bear any of the costs of this expansion, and APA VTS bears full risk in relation to demand, and therefore the recovery of this expenditure through the WUGS refill tariff.

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[68] Note that this project is not feasible as a standalone project – it requires the Brooklyn reconfiguration to deliver this additional capacity.

Western Outer Ring Main Easement

There are several benefits for customers of the VTS arising from the removal of constraints through the construction of the Western Outer Ring Main.

In event of loss of supply from any of the market scheduled gas trains, it would be possible for alternate supplies to be scheduled. Flow constraints on either South West Pipeline/Brooklyn Lara Pipeline or Eastern systems are removed with the Western Outer Ring Main.

A direct connection between the Western Outer Ring Main and the Pakenham to Wollert pipeline would allow gas to flow interchangeably between the east and west systems with fixed operating set points and without direct operator intervention. The VTS will therefore be able to operate within a tighter band of operation than is currently achieved. AEMO currently manages linepack with stop/start operation at Brooklyn and Wollert Compressor Stations and Brooklyn City Gate.

With the Western Outer Ring Main in place, there will be better management of the VTS. Currently, the VTS operates within a tight band of linepack. The Western Outer Ring Main creates additional "storage" or buffer, hence having the following benefits:

- Linepack Balancing: The capability of balancing linepack across the Western/Northern/Eastern systems using the Western Outer Ring Main and Wollert compressor hub reduces the risk of Longford or Iona plant trip due to a high pressure constraint (e.g. in early morning) in the supplying Longford or Iona pipelines. High operating pressures at both Longford and Iona are required in order to meet peak loads.

- Gas Powered Generation readiness: Management of linepack depletion due to short-term operation of gas powered generation in the first half of the gas day becomes easier with the facility to transfer gas across the Western Outer Ring Main as required, matching the available supply to the demand location. Operation of the Geelong pipeline at 5000 kPa typical pressure (fixed nominal setpoints at Lara and Brooklyn) allows gas powered generation at North Laverton to be capable of immediate operation (whether gas is sourced from either Longford or Iona), unlike the current operating position where system pressures may need to be adjusted or compressors started to permit the gas powered generators to operate. Similarly, gas powered generation at Somerton would be

capable of immediate operation, unlike current operations when Wollert is periodically shut down to facilitate SWP/BLP flows via Brooklyn.

- Gas-on-gas competition: Ability to maintain gas contracts with the assurance that any surplus gas supply can be physically injected into the VTS, even in periods of low system demand.

The benefits of the WORM are set out in more detail in the attached business case and the business case supplied to the AER as part of APA VTS's previous access arrangement submission.

While the AER did not approve the WORM project at the last access arrangement review, they did state in their Final Decision that the completion of the outer ring main around Melbourne "to have merit from a technical perspective and in the future, prove to be a prudent response to the augmentation needs of the VTS in the longer term".

Currently, APA VTS does not believe the benefits are not yet sufficient to warrant constructing the Western Outer Ring Main. Therefore, the construction of the Western Outer Ring Main itself is not included in the forecast capital expenditure. However, undertaking the procurement of the easement for the pipeline in the forecast access arrangement period is consistent with National Gas Rule 79(2)(a). This is because procuring the easement will reduce the overall cost by more than the time cost of the advance purchase.

If the purchase of the easements is delayed there is a high risk that it will not be possible to construct the pipeline along the preferred route due to anticipated urban encroachment between now and 2025. If this occurs, the pipeline will have to follow a longer route to avoid the newly built-up areas, at significantly greater cost.

The Western Outer Ring Main (including easement costs) is likely to cost over $100 million on the currently planned route. Acquiring the easement now for $26.03 million is justified if the alternative is to spend more when the pipeline is required prior to 2025.

The preferred route utilises both existing pipeline easement as well as new (or "Greenfield") easement. The total pipeline corridor is approximately 60 km in length, comprising 25 kms within existing pipeline easement (includes completed 8.3km Stage 1) and 35 kms along a Greenfield route.

A total of 18.4 kms of the 35 kms greenfield route is likely to be developed as residential in the next 10 to 15 years due to it residing inside the Melbourne urban growth boundary. The additional cost of construction through these residential areas, including purchasing and management of an easement, will be approximately $18 million (real $2017). It is also likely the length of pipeline through the future developed area and associated cost will increase when following road alignments. At a minimum an additional length of 20 per cent would be required. Cost estimates have been based on the APA VTS's latest estimates of material and construction costs.

APA VTS's present value analysis demonstrates that it is cost effective to procure the easement now to avoid the $18 million (real $2017) increased construction cost of waiting to procure the easement. APA VTS's analysis demonstrates that acquiring the easements from 2018 to 2020 (as proposed) is worthwhile provided it avoids a cost increase at least 7.2 per cent. This is significantly less than the 18 per cent cost increases that APA VTS is expecting as a result of a delay in purchasing easements.

APA VTS's analysis also demonstrates that if the cost increase as a result of delaying the purchasing easements is $18 million (real $2017) purchasing the easements up to 9 years in advance is justified.

APA VTS notes that each time the purchase of the easement has been proposed to the AER the cost has substantially increased. The expected cost of the easement acquisition has risen from $5.3 million ($2007) to $9.5 million ($2012). It is now forecast to cost $26 million ($2017). Based on the history of the project a further rejection of this expenditure would be expected to further increase the cost of the easement purchase in the future.

Table 5-19 – Western Outer Ring Main easement forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	8.9	8.9	8.9	-	-	**26.7**

5.3.2   *Refurbishment and upgrade capital expenditure*

The forecast refurbishment capital expenditure is overwhelmingly directed at maintaining the safety and the integrity of the pipelines themselves. This is age driven. The age of pipelines has two significant impacts. The first is the pipeline suffers wear and tear from the underground environment in which it

resides and requires close monitoring to ensure its ongoing integrity (see section 5.2.2). The second is the use of the land changes over time with the most relevant change is the increase in urbanisation. This is where previously rural land now has and other buildings constructed on it over time.

Relevant projects in the forecast period are set out below. The projects below describe at least 80 per cent of the total Refurbishment and Upgrade capital expenditure forecast.

Inline Assessment

The driver for inline inspection and the basis on which inline inspection meets the requirements of the NGR is set out in section 5.2.2.

APA VTS inline inspection schedule

As noted in section 5.2.2, APA has a Metal Loss Pigging Frequency Policy to determine the ideal re-inspection interval.

As a result, the pipelines set out in Table 5-20 have been identified for pigging in the forecast access arrangement period.

Table 5-20 – Pipelines identified for pigging

Pipeline	Length (km)	Diameter (mm)	Cost ($m)	Year of ILI
T57 Ballan – Ballarat	22	150	0.6	2018/19
T61 Pakenham – Wollert	93	750	0.7	2019/20
T62 Derrimut – Sunbury	24	150	0.4	2017/18
T66-70 Mt Franklin -Kyneton - Bendigo	91	300	0.6	2019/20
T75 Wandong - Kyneton	84	300	0.6	2019/2020
T108 Newport	1	450	0.5	2018
T65 Dandenong - Princes Highway	6	750	0.6	2018
T24 Brooklyn - Corio	51	350	0.2	2021
T16 Dandenong – West Melbourne	36	750	0.2	2021

T60 Longford -Dandenong	109	750	0.3	2022
T70 Ballan – Bendigo	91	150	0.6	2020
T33 South Melbourne – Brooklyn	13	750	0.1	2021
T60 Longford – Tyers	65	750	0.9	2022
T63 Tyers - Morwell	16	500	0.7	2021
T96 & T98 Chiltern- Rutherglen – Koonoomoo	104	200	0.6	2022
James Street - Laverton Pipeline (253)	2	350	0.5	After trap installation
T37 Tyres - Maryvale	5	150	0.4	After trap installation
T118 Truganina-Plumpton	8	500	0.6	2022
T01 Morwell – Dandenong (post inspection program)	127	450	0.1	2018

Pipelines that can't currently have inline inspection

There are a number of pipelines that have characteristics that mean it is not possible to undertake inline inspection as it is not possible to launch a pig or to capture it once launched or have bends that are too tight for the pig to traverse. Noting the superior characteristics of pigging compared to direct assessment, where a pipeline is capable of being rectified in a prudent and efficient manner APA VTS will undertake the necessary capital expenditure to enable inline inspection (see criteria outlined in 5.2.2). APA VTS have identified the following pipelines for rectification:

- James St

- Tyres – Maryvale

- Truganina to Plumpton

Further, the pipelines listed below do not have capability for inline inspection, but do not meet the criteria for prudent and efficient rectification. As a result these pipelines will be subject to direct assessment in the forecast regulatory control period:

- Pakenham (both pipelines)

- South Melbourne – Brooklyn (up to start of pig launcher)

- Bay St

- Dandenong-Princes Hwy

- Somerton

- Laverton North

- Regent St

Table 5-21 sets out the forecast capital expenditure for inline inspection and direct assessment for the VTS for the forecast access arrangement period.

Table 5-21 – Inline inspection forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	5.5	6.0	4.4	7.9	4.6	**28.5**

The benefits to this approach are that inline inspection is the most comprehensive technique to managing integrity for in-service pipelines, so the expenditure is prudent and efficient and meets the requirements of rule 79(2)(c)(i) and (ii). More detail on this is available in the business case provided at Attachment D.2.2 of this submission.

Safety Management - High Consequence Areas

APA VTS is legally required to ensure that its pipelines are operating in a way that is consistent with AS2885 and, where this is not the case, take steps to bring the pipeline back into compliance.

AS2885

Transmission Pipelines have an Australian Standard for design, AS2885.1. This standard requires physical and procedural mitigation measures to be applied against risks of rupture as a result of 'external interference' or mechanical damage (eg auger, excavators, horizontal directional drills).

The number of physical and procedural measures required depends on the location classification. Where a location is classified as a high consequence area (Residential, High Density or sensitive use) APA VTS is required to reduce

the risk of rupture from external interference or mechanical damage threats to Low or where that is not possible to "As Low As Reasonably Practical" (ALARP). ALARP is defined as lowering the risk to the point where the necessary cost of further reducing the risk is grossly disproportionate to the benefit gained.

Urban Encroachment

One of the significant drivers for a need to undertake additional work to address the risk of pipeline rupture is urban encroachment on the VTS pipelines.

The VTS has seen significant urban encroachment since its construction in the 1950s. This was further exacerbated by the Victorian Government moving the urban boundary in 2011. The expansion alters the land use from rural to urban in areas where APA VTS has pipelines.

This means that many parts of the VTS not designed for residential areas that were originally passing through rural zones are now operating in residential and high density areas. For many pipelines in these areas APA VTS determined the risk of rupture to be Intermediate. This requires APA VTS to undertake steps to reduce it to Low or where not possible to reduce it to ALARP.

Approach to addressing the risk

There are two broad approaches to reducing the risk associated with pipeline rupture from external interference or mechanical damage threats.

- Pressure reduction – a lower pressure means a lower consequence of puncture as the force of the gas behind the rupture is reduced.

- Slabbing – this puts a physical barrier above the pipeline which acts as a deterrent to the operator of the excavator or other equipment from rupturing the pipeline.

APA's forecast capital expenditure

Consistent with the requirements of the Australian standard, and in response to changing land use, the projects that APA VTS is proposing address those high consequence areas of the pipeline where the threat of puncture is credible and the consequences of a puncture are not low or ALARP.

The proposed solution can vary to ensure that APA VTS is adopting the most prudent and efficient option taking account of the specific circumstances of the risk.

T24 Brooklyn-Corio

The Brooklyn – Corio pipeline operates at 7,390 kPa and has two wall thicknesses of 5.56mm and 6.35mm and was constructed in 1971. The land the pipeline route traverses is renowned for rock and large excavators are commonly used for earth moving activities in the area.

The excavators that could credibly be used in vicinity of the pipeline would be equipped with either twin tiger teeth or penetration teeth both of which are capable of penetrating the pipeline in such a manner that would produce a rupture. APA analysis demonstrates that the 6.35mm pipeline is susceptible to penetration from excavators down to 20 tonnes in size. Note pipelines with thinner wall thicknesses generally are more susceptible to rupture from external interference or mechanical damage threats.

APA VTS will be slabbing a little over 9kms of this section of the pipeline to reduce the risk to ALARP. This is the most efficient and prudent option under the current conditions. APA VTS notes that should the Victorian Government increase the urban growth boundary, pressure reduction long this pipeline stretch may be more appropriate.

T74 Wollert – Wodonga

The Wollert to Wodonga pipeline operates at 8,800 and 7,400 kPa and has two wall thicknesses of 7.55mm and 6.35mm and was constructed in 1976. The land the pipeline route traverses is renowned for rock and large excavators are commonly used for earth moving activities in the area. APA recently looped this pipeline and the contractor used an 80 tonne excavator and multiple excavators of mass greater than 55 tonnes.

The excavators that could credibly be used in vicinity of the pipeline would be equipped with either twin tiger teeth or penetration teeth both of which are capable of penetrating the pipeline in such a manner that would produce a rupture. APA VTS has identified that twin tiger teeth excavators down to 30 tonnes and penetration teeth excavators down to 20 tonnes are capable of rupturing the 7.55mm pipeline.

The total required length of protective slabbing for the T74 pipeline is 13.8 km. The location of these areas is discontinuous and is spasmodic across the full length of the pipeline.

Brooklyn to Lara

The Brooklyn to Lara pipeline operates at 10,200 kPa and has wall thicknesses of 7.9, 9.0 and 11.1mm and was constructed in 2007. The land the pipeline route traverses is renowned for rock and large excavators are commonly used for earth moving activities in the area.

This pipeline was designed and constructed in 2007 and designed based on the knowledge of the urban expansion available at the time. As described in the section on urban encroachment above, the urban boundary was changed in 2011. This pipeline is greatly affected by the change in urban boundary. Alternatives to protection slabbing are very limited.

The 7.9mm is susceptible to puncture from 20 tonne to 55 tonne excavators with the two different tooth types. When this pipeline was constructed, multiple large excavators were utilised. In total 16.6kms will be slabbed.

GPA Engineering review

Due to the importance of this project APA VTS requested GPA engineering review the APA VTS business case.

GPA engineering have significant experience in relation to AS 2885 Pipeline Safety Management Studies.

Following their review GPA Engineering find that, for each project outlined in the business case, it is reasonable to conclude that pipeline rupture is a credible failure mode for each pipeline.

Importantly they also concluded in relation to APA VTS's approach to rectifying these issues, that:

> "APA's approach is consistent with current best practice for ALARP assessment in the Australian pipeline industry"[69]

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[69] GPA Engineering 2016, Victorian Networks Urban Encroachment Business Case Review, December, p ii

The GPA Engineering report is provided as an attachment to this submission at Attachment D.3.

National Gas Rules

As it reduces the risk to the safety of the public, operators of digging equipment and APA employees, as well as protects the operational integrity of the pipeline, this expenditure is consistent with NGR 79(2)(c)(i) and (ii).

Table 5-22 – Safety Management - High Consequence Areas forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	15.8	11.5	-	-	-	**27.3**

Brooklyn Compressor Station Upgrade

This project is to upgrade the following aspects of the Brooklyn Compressor Station:

- Safety and Process Control systems

- Unit 8, 9, 10, 11 unit control systems

- Unit 8, 9, 10, 11 ventilation system

- Unit 8, 9, 10, 11 fuel gas

- Unit 8, 9, 10, 11 exhaust stack replacement

The Brooklyn Compressor Station has been constructed in multiple stages with each compressor unit installed at different times with various upgrades of equipment.

The strategy employed at Brooklyn is to replace each component of the station as necessary to ensure the life of the units and station past 2022. This strategy has commenced with the replacement of the after coolers for units 8, 9, 10 &11.

The Australian Standard AS3814-2015 section 1.2.6: requires that where an appliance is modified or relocated, it should be upgraded to meet the requirements of this Standard current at the time of the modification or relocation. ESV has advised that they expect all equipment in this category to comply with AS3814 applied retrospectively where equipment controls are

upgraded. The upgrade to the control system triggers this requirement and this means those elements such as the fuel gas systems that were compliant with the standard when installed but do not meet the current standard will also need to be upgraded

Station Safety System

The station safety system controls the overall station, including the inter-relationship between individual turbine control systems. There are five turbines and a common vents system at Brooklyn. In addition there is common instrument air, fuel gas and electrical power.

The existing safety system is a programmable electronic control system installed circa 1998, has not been upgraded for some time, and includes safety instrumented functions for units that were demolished many years ago.

The station safety system does not support Ethernet communications, increasing the difficulty of interfacing with other equipment such as human machine interfaces and remote telemetry units that are undergoing upgrades. The proposal is to replace the communications module and main processors in the station safety system to improve support, improve compatibility with other systems, speed up the processing speed and reduce safety times during trip incidents.

A failure of the station safety system could lead to an inability to control a complex station safely.

Station Process Control System

The station process control system was installed circa 1998 at the same time as the station safety system; the station control system provides controls such as pressure control, load sharing, start / stop logic for the compressors, alarms and diagnostic functions. The process control system has logic installed for equipment that is no longer installed at site.

The process control system is due for a major upgrade involving Construction, Hazard to Operability Study, programming and re-validation to ensure the control system program is up to date and redundant logic is removed.

As with the safety system, the station control system does not support Ethernet communications, increasing the difficulty of interfacing with other equipment such as human machine interfaces and remote telemetry units

that are undergoing upgrades. The proposal is to replace the communications module and main processors in the station control system to improve support and improve the processing speed.

Unit Control Systems

In accordance with the Gas Safety Regulations (Gas Installations) s35(b), APA must maintain Type B appliances in a safe condition and in a proper state of repair. The control systems on units 8 & 9 were installed in 1982 and are relay based. The control systems on units 10 & 11 were installed in 1999 and use a vendor-supplied programmable control system.

The unit control systems are obsolete, difficult to maintain and spare parts are no longer supported. Without replacement of control system and instruments, a significant failure of the control system will lead to a prolonged loss of availability. In addition, the latest control systems create a safer platform for process safety control.

Ventilation System

The enclosure ventilation system does not meet performance requirements on the hottest days in summer. The unit safety system will shut down the unit when maximum allowable temperature is reached. This has occurred on a number of occasions in the past. Thus the capacity of the station and VTS are reduced on hot days.

The enclosure and ventilation fans must be modified or replaced to provide sufficient cooling capacity for continued operation on hot days without reducing VTS capacity.

Fuel gas

The fuel gas system does not comply with the Type B appliance requirements of AS 3814 and needs to be upgraded. The fuel gas modification involves installation of a replacement fuel control module by the equipment manufacturer and requires the upgrading of the unit control system as described above.

Exhaust stack replacement

The exhaust stacks at Brooklyn Compressor Station are in poor condition. Exhaust Stacks are the most common item of corrosion and failure across the APA fleet of turbomachinery. This is due to the high temperatures and

thermal cycling during service. The exhaust stacks penetrate the roof the buildings that house the units and the roofs have asbestos lining that will need to be replaced when exhaust stack replacement occurs.

Total forecast expenditure at the Brooklyn Compressor Station is set out in Table 5-23 below.

Table 5-23 – Brooklyn Compressor Station upgrade forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	1.6	1.1	1.1	2.5	3.2	**9.6**

VTS Turbine Overhauls

APA uses Solar gas turbine engines in compressor packages located at numerous sites on the VTS, including Wollert compressor station (Centaur T6102S engines and Saturn T1202/T1302 engines) and Gooding compressor station (four Centaur T4002 engines).

The turbines drive gas compressors that are used to compress gas which enables the pipelines to flow larger volumes. The Melbourne market requires most of the compressors across the VTS to be operating to meet the peak loads. APA VTS's compressors are operated by AEMO as the independent system operator of the VTS and maintained by APA VTS.

The gas turbines require maintenance based on total running hours. Solar Turbines Australia recommendation is for major overhaul at 32,000 hours for Centaur engines. Where the turbines operate with clean dry gas under ideal conditions they have often been proven to operate successfully at longer hours than Solar Turbines Australia recommendations.

However, where turbines are operated hard for short bursts this reduces the total number of hours the engine is capable of before requiring overhaul.

The Gooding engines are operated very frequently for short durations. This operation style is increasing, with the average hours per start of 23 having reduced to 21 since 2010. The GCS Unit 3 engine hours as of the 7 December 2016 was 27,934.

The Wollert Compressor Station (station B) has two Solar Centaur engines that operate almost continuously. The recently installed pipeline has increased

the need for compression at Wollert. In addition, the station and pipeline is being reconfigured so it can operate to 10,200kPa-the maximum allowable operating pressure of station B. These factors will require the two Solar Centaur engines at Wollert to operate for longer durations.

The run hours of the existing engines with current usage rate, and with a 10 per cent more usage prediction, are shown below.

Table 5-24 – Turbine run hours

Current usage pattern	12/2015	01/2018	01/2020	01/2021	01/2022
WCS 4	14,760	20,538	26,315	29,204	32,093
WCS 5	14,375	20,002	25,629	28,442	31,256
Increased Rate of 10%					
WCS 4	14,760	21,115	27,471	30,648	33,826
WCS 5	14,375	20,565	26,754	29,849	32,944

APA has an agreement with the Solar Turbines Australia which provides for reduced costs for overhaul of engines provided the assessment (performed by Solar Turbines Australia) indicates failure is not imminent. APA's policy is therefore to utilise periodic internal inspections of the machines and to utilise their observed condition to extend the overhaul intervals where possible or intervene to prevent premature failure.

An overhauled engine, power turbine and auxiliary gearbox are returned in zero-hour condition, equivalent to new condition (turbine blades and wear parts such as discs, seals and shafts are re-worked or replaced as required).

APA VTS is forecasting the overhaul of Wollert compressor station units 4 and 5 and Gooding compressor station unit 3 in the forecast access arrangement period.

As noted above the overhaul is necessary to reduce the risk of compressor failure with the subsequent risks to VTS integrity and safety. This capital expenditure is consistent with Rule 79(2)(c)(i) and (ii).

Table 5-25 – Turbine overhauls forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	-	-	-	1.0	3.7	**4.7**

Actuate mainline valves in high consequence areas

The 16 mainline valves on the Dandenong to West Melbourne Pipeline (T16) are buried, and located under the carriageway. The area is broadly categorised a high consequence area, and involves higher risks for both the pipeline and landowners in the vicinity to the pipeline due to the built up nature of the area.

The valves are manually operated and are mostly located in the roadway, requiring APA staff to enter the 'confined space' pits through heavy Gatic vehicle strength covers to operate the valve. All of these factors increase the time taken to operate the valve in an emergency situation and increase the preventative steps that need to be taken in order to manage the occupational health and safety for the APA VTS employee.

The valves are primarily installed to provide smaller sections for emergency shut-downs. This means they need to be readily accessible, which is not always the case with their location being in carriageway pits.

A significant pipeline leak or a rupture in a high consequence area has the potential to destroy property and involve multiple fatalities. The pipeline is segregated into small sections of a few kilometres using the valves. This reduces any escaping or flaming gas to the gas in that section rather than the pipeline continuing to send gas under pressure into the leak.

Actuating the valve (allowing it to operate remotely) reduces the time taken to respond to an emergency. Currently the time taken includes the travel time of the APA VTS employee going to the location of the valve and then getting access and operating the valve.

Actuating the valve also removes the need for the APA VTS employee to be located in the roadway and lifting the heavy covers over the valve.

Removing the current delay in responding to an emergency is consistent with Rule 79(2)(c)(i) and (ii).

Table 5-26 – Actuate mainline valves in high consequence areas forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	1.0	1.0	-	-	-	**2.0**

Coogee decommissioning

In the early 1990s a methanol plant was constructed in Laverton, Victoria and required a large natural gas connection. The gas was supplied by a 150 nominal bore pipeline connected to the Brooklyn-Corio pipeline at the Laverton North City Gate.

The methanol plant has now ceased operation and is unlikely to restart production. This means that the pipe and the Laverton North City Gate would need to be decommissioned.

The ongoing risk associated with pipeline operation cannot be justified for a pipeline that provides no services to users.

This capital expenditure is consistent with National Gas Rule 79(2)(c)(i) and it maintains the safety of the pipeline services.

Table 5-27 – Coogee decommissioning forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	1.8	-	-	-	-	**1.8**

Iona CS aftercooler upgrade

The Iona Compressor Station is located south west of Melbourne and compresses gas into the Iona-Paaratte Pipeline that supplies western Victoria. The station comprises two package gas compressors each with engine-driven coolers for gas, oil and jacket water cooling, supplemented by fin-fan coolers for jacket water and oil cooling.

The compressor station compresses gas to a higher pressure and by doing so increases the temperature of the process gas. This temperature is too high to be injected into the downstream pipeline system so an aftercooler is installed.

The original gas aftercooler is now incorrectly sized for the necessary flow rates of the station. It is also not suitable for summer conditions. It creates a large pressure drop. The current solution is to operate a bypass valve around the gas aftercooler which reduces the pressure drop, however the outlet gas temperature rises.

The control system prevents unacceptable gas temperature from being injected into the downstream pipeline. So the control system shuts down the compressor when temperatures reach certain levels. This creates a loss of system capacity when the shutdown occurs.

The existing cooler is also undersized for oil cooling and jacket water cooling for which additional radiators have been connected using hoses. These also present an environmental spill risk.

The proposed solution is to construct a new aftercooler similar to the recently installed aftercoolers at Winchelsea, Brooklyn and Euroa. Additional process coils for oil and jacket water cooling will remove the need for hoses and reduce controls complexity. These are appropriately sized for ambient temperature in summer and for minimum pressure drop. This capital expenditure will address the system integrity issue and so is consistent with Rule 79(2)(c)(ii).

Table 5-28 – Iona CS aftercooler augmentation forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	-	-	-	1.7	-	**1.7**

Emergency Equipment

The Pipeline License requires APA VTS to maintain compliance with Australian Standard AS2885.3. This standard stipulates that the Pipeline Operator must maintain suitable emergency response equipment.

Analysis of the fittings and equipment that enable APA VTS to respond to emergencies show that it is old and in many cases not suitable for the pressure levels of the newer pipelines constructed on the VTS.

The assets to be replaced fall into the following categories:

• Emergency repair fittings

- Emergency equipment

- Emergency vent stacks

- Emergency fuel storage

The emergency repair fittings and equipment to be replaced include:

- Hot Tap Fittings:

- Bolt-On Repair Clamps for temporary pipeline repairs

- Weldable Repair Fittings.

The emergency equipment is due for replacement or upgrade include:

- Breathing Apparatus & Confined Space equipment

- Spark-proof tools

- Emergency Caravan

The risks associated with poor emergency response and recovery equipment is the inability to prevent increasing damage and harm in an emergency situation and a delay in reinstating normal operations.

While the VTS has gas supplied from multiple sources, the capacity of the network may be severely constrained during an emergency scenario. This would potentially lead to a loss of supply of gas to major customers and consumers.

In addition, the Field Services team requires the most appropriate equipment to perform emergency work safely. Attempting to perform high risk work without appropriate equipment represents a significant and real risk to both the VTS personnel and the general public.

More detail in relation to the different types of equipment and why they need to be replaced or upgraded is available in the business case number 239 Emergency Response provided at Attachment D.2.3 of this submission.

Table 5-29 – Emergency Equipment forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	0.3	0.3	0.4	0.4	0.3	**1.6**

5.3.3 *Non-system capital expenditure*

There are a number of non-system capital expenditure projects in the forecast access arrangement period. The projects described below make up at least 80 per cent of the total non-system capital expenditure forecast.

Business and Technology projects

APA will be undertaking 28 projects that will affect APA VTS in the forecast access arrangement period. The most significant of these projects are set out below. The key benefits from these projects is to substantially reduce the level of risk of system(s) failure or integration between systems not working as required and improving the levels of systems security and data integrity. This is consistent with Rule 79(2)(c)(ii).

Applications Renewal

The Applications Renewal project is required to ensure that the APA VTS's critical information technology applications are kept up-to-date over the forecast access arrangement period.

The Applications Renewal project will involve systematically upgrading the nationalised software and applications that manage APA's operational business and pipeline services. The key objectives of this project are to:

- continue to maintain reliable, secure, compliant and efficient business processes and systems;

- preserve the ongoing integrity of APA pipeline services; and

- comply with regulatory and customer obligations.

The upgrade will involve a number of APA systems relevant to the VTS. As this is a national project, the share of this project relevant to the Amadeus Gas Pipeline was approved by the AER in its Draft Decision of November 2015.[70]

eForm Digitisation

This project will combine the existing eForm tools currently in use to remove the bureaucracy and inefficiency of the manual processes in regard to forms and approvals. The tool will also look to provide easy maintenance and ongoing system security.

Infrastructure Renewal

The Infrastructure Renewal project involves the upgrade of desktop and telephony infrastructure over the forecast access arrangement period.

The upgrade of this infrastructure will ensure that APA VTS continues to maintain reliable, compliant and efficient business processes and systems and preserves the ongoing integrity of its pipeline services.

If the project is not carried out, the APA's critical business systems may be exposed to higher security risks and a greater risk of failure or prolonged outage, which would adversely affect the safety and integrity of APA services and could result in APA not fulfilling its customer and regulatory obligations.

As this is a national project, the share of this project relevant to the Amadeus Gas Pipeline was approved by the AER in its Draft Decision of November 2015.[71]

Business Intelligence - Transmission Dashboard and Enterprise Pilot

The project will implement an interactive dashboard/business management platform that will provide financial and statistical information for measurement and to ensure meaningful and sound business decisions. This first business intelligence project will deliver the Enterprise platform for all business information requirements as well as a dashboard to replace the current manual Transmission Services excel based dashboard.

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[70] Australian Energy Regulator 2015, Draft Decision Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 6 – Capital expenditure, November, pp 6-32

[71] AER 2015, Draft Decision AGP AA 2016 to 2021, Attachment 6 – Capital expenditure, pp 6-32

PPM Refresh

PPM Refresh is an update of the processes and tools required to deliver projects at APA. APA is currently using Microsoft Project Server 2010 as the tool to manage projects however this is now out of date and not quite fit for current or future purposes. A refreshed project delivery tool will modernise the way APA manages and delivers both Infrastructure Development (responsible for the delivery of major engineering projects) and Business and Technology projects.

The PPM Refresh project will undertake a review of current processes and new tools on the market to determine the best fit for APA VTS's requirements. The project will then implement the chosen tool and processes to enable APA to manage its projects in the most efficient way for the foreseeable future.

Table 5-30 – B&T projects forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	2.4	1.5	1.1	1.4	0.7	**7.2**

Storage shed-Dandenong, Wollert & Springhurst

In order to maintain their availability for maintenance and repair, all pipelines store parts that have long procurement lead times or are technically important materials such as emergency fittings, that must be kept for decades in corrosion free environments to prevent premature failure. As the size and complexity of the VTS increases the greater need for these types of parts has put additional pressure on the current storage facilities.

In particular, the Dandenong site has issues with the amount of undercover storage capacity. Equipment has to be currently stored in transport containers which are not appropriate for spare pipe and heavy equipment. Other equipment is being stored outside and exposed to rain and ultraviolet light which can degrade equipment. This creates a substantial risk in some assets deteriorating to the point of not being able to be used.

The Springhurst and Wollert compressor stations are also without suitable storage capacity for operational spares and basic equipment needed for maintenance activities.

Doing nothing represents a risk to APA VTS's ability to repair the pipeline and facilities in a timely manner. This risks supply to customers being interrupted due to an inability to repair or undertake maintenance until appropriate spares are located.

The construction of a larger storage shed for Dandenong will permit protection of emergency materials and operational equipment from environmental damage and theft.

It will also enable equipment to be delivered, checked and stored in a secure dry environment when APA VTS is commencing a major project as it may be several months from when equipment is delivered before it is required at site. A larger storage shed also means that the quality assurance on delivered parts can be undertaken at the storage shed before being delivered to the site.

The construction of a storage shed for Springhurst and Wollert will reduce the losses sustained from damage and theft.

The availability of parts for use on the pipeline and facilities is consistent with maintaining the integrity of services and is consistent with Rule 79(2)(c)(ii).

Table 5-31 – Storage shed-Dandenong, Wollert & Springhurst forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	-	0.6	0.6	0.6	-	**1.8**

Security - Physical

Under the Emergency Management Act 2013, APA must prepare a risk management plan meeting the requirements set out in the Act. The risk management plan has identified several High and Moderate risk sites that require security upgrade. Failing to undertake the upgrade means APA risks being found in breach of the Act.

[Confidential]

Table 5-32 – Security - Physical forecast capital expenditure (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Capex	0.3	0.3	0.3	0.3	0.3	**1.7**

6   Capital base

6.1   Roll forward of the capital base

APT VTS has used the AER's roll forward model to roll forward the VTS capital base from 1 July 2013 to 31 December 2017. Consistent with the provisions of the earlier access arrangement, APA VTS has rolled forward the capital base using the previous forecast depreciation, rather than actual depreciation calculated on actual capital expenditure.

In applying the roll forward model, APA VTS has used the forecast of regulatory depreciation used in the post-tax revenue modelling for the AER's March 2013 Final Decision. The total revenue established using this forecast was used to determine the reference tariffs for the VTS applicable during the earlier access arrangement period. Those reference tariffs recovered from users a return of capital calculated using forecast – and not actual – inflation. To apply actual outturn inflation in the roll forward model risks error, as APA VTS explains in the paragraphs which follow.

In the AER's post-tax revenue modelling, regulatory depreciation of the capital base – the depreciation building block of total revenue – is calculated as the difference between indexed straight line depreciation on the capital base and an amount of indexation on the capital base itself.

For the purposes of determining the projected capital base and reference tariffs for a forthcoming access arrangement period, the calculation of the indexed straight line depreciation, and of the indexation on the capital base, use a forecast of inflation which is applied across that forthcoming period.

When the capital base is subsequently rolled forward in the AER's roll forward model, the forecast of capital expenditure used in projecting the capital base is replaced by the actual capital expenditure, and the forecast of inflation used to index depreciation, and in the indexation of the capital base itself, is replaced by actual inflation.

If the forecast of inflation differs from actual inflation, this leads to a mismatch: the capital recovered via regulatory depreciation included in the reference tariffs for an access arrangement period will (other things being equal) be different from the capital which is assumed to have been

recovered during that period when rolling forward the capital base to the start of the next access arrangement period.

If actual inflation over an access arrangement period is lower than the forecast of inflation which was used in post-tax total revenue modelling for that period, the regulatory depreciation in the roll forward model will exceed the regulatory depreciation which was included in the total revenue for the period. The capital recovery in the roll forward model will exceed the capital which has been recovered from users through the reference tariff. The capital base at the commencement of the next access arrangement period, from which the reference tariffs for that next period are to be determined, will then be lower than should be the case, and the tariffs for that next period will be set to recover the lower capital base. In these circumstances, the service provider loses the opportunity to recover the difference between the regulatory depreciation of the roll forward model for an access arrangement period and the lower depreciation recovered through the reference tariff applying during that period.

Conversely, if actual outturn inflation were higher than the forecast of inflation used in post-tax revenue modelling for an access arrangement period, the regulatory depreciation in the roll forward model would be less than the regulatory depreciation which was included in the total revenue for the period, and recovered through the reference tariff. The capital assumed to have been recovered in the roll forward model would be less than the capital which has been recovered from users through the reference tariff. The capital base at the commencement of the next access arrangement period would be higher than should have been the case, and the reference tariff for that next period would be set to recover that higher capital base. Users of the reference service would be overcharged by the extent of the difference between the regulatory depreciation recovered through reference tariffs, and the lower regulatory depreciation of the roll forward model.

In the specific context of the VTS, the impact of a difference between forecast and actual inflation can be seen from Table 6-1. Table 6-1 compares the (nominal) regulatory depreciation calculated in the roll forward model for the period 2013 to 2017 using actual inflation (strictly, actual inflation for 2013 to 2015, and forecasts for 2016 and 2017) with regulatory depreciation calculated using a forecast of inflation of 2.50 per cent. This was the forecast of inflation which was used in reference tariff

determination for the AER's March 2013 Final Decision on proposed revisions to the VTS access arrangement.

Table 6-1 – Impact of differences between forecast and actual inflation ($m nominal)

$m nominal	2013	2014	2015	2016	2017	Total
Roll forward model (APA VTS 2016): actual inflation						
Inflation	1.66%	1.33%	1.31%	1.30%	2.00%	
Regulatory depreciation	2.3	17.7	20.3	23.0	14.2	**77.5**
PTRM (AER November 2013)						
Inflation	2.50%	2.50%	2.50%	2.50%	2.50%	
Regulatory depreciation	4.9	10.4	12.1	14.8	11.3	**53.6**

The roll forward model incorporates a view that, over the period 2013 to 2017, some $77.5 million was recovered via regulatory depreciation. Regulatory depreciation in the post-tax revenue model used in determining the total revenue and in setting the reference tariffs for the same period was, however, only $53.6 million. With actual inflation lower than the forecast for the period, APA VTS is precluded from recovering some $23.9 million of its investment in the VTS.

The practice of using a forecast of inflation when calculating (nominal) regulatory depreciation for the purpose of determining the total revenue for each regulatory year of an access arrangement period, but using actual inflation in the roll forward of the capital base from one access arrangement period to the next, is likely to lead to over-recovery or under-recovery of a service provider's investment in its pipeline system. Neither over-recovery, nor under-recovery, is conducive to efficient investment in the pipeline system, or to the efficient operation and use of the system; neither is it in the long term interests of consumers of natural gas.

APA VTS therefore proposes to roll forward the capital base from 2013 taking into account the amount of capital returned to investors through tariffs. APA VTS proposes to:

• apply the forecast of inflation used in reference tariff determination for the earlier access arrangement period, and not actual inflation, in the roll

forward model to establish the correct value of the VTS capital base at the start of the access arrangement period;[72]

- use, in the post-tax revenue model, for calculation of the total revenue for the access arrangement period, a forecast of inflation which is equal to actual inflation immediately prior to the start of the period; and

- annually update this forecast of inflation during the access arrangement period, using actual inflation, and progressively incorporate the effects of the changes in depreciation in the reference tariffs through changes to the Scheduled Reference Tariff Variation Mechanism of the VTS access arrangement (see section 10.3.4 below); and

- apply actual inflation in the roll forward model to establish the VTS capital base at the start of the next access arrangement period.

This should, over time significantly reduce (but may not entirely eliminate) over-recovery or under-recovery of the investment in the VTS, and should lead to reference tariffs which are neither too low nor too high.

6.2 Opening capital base for the access arrangement period

6.2.1 *Opening capital base for the earlier access arrangement period*

There are no adjustments required to the opening capital base for the earlier access arrangement period. This is because the opening capital base was set for the earlier access arrangement period using actual data, following the decision of the Australian Competition Tribunal in September 2013 that the earlier access arrangement period started on 1 July 2013, and there was no interval of delay between 1 January 2013 and 1 July 2013 that required an adjustment of tariffs.

To implement this decision in November 2013, the capital base at 1 July 2013 was reset using actual data to June 2013.

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[72] Additional worksheets have been added to the Roll Forward Model to demonstrate the relevant calculations.

6.2.2 *Conforming capital expenditure during the earlier access arrangement period*

Conforming capital expenditure during the earlier access arrangement period is described in section 5.2 and is set out in Table 5-1. As discussed in chapter 4, APA VTS submits that the capital expenditure in the earlier access arrangement period is prudent and efficient.

The conforming capital expenditure for the earlier access arrangement period is summarised in Table 6-2.

Table 6-2 – Capital expenditure over the earlier access arrangement period ($m nominal)

$m nominal	2013	2014	2015	2016(e)	2017(f)	Total
Capital expenditure	15.6	124.2	94.5	105.0	69.0	**408.3**

APA VTS has recorded all capital expenditure on an "as Incurred" basis. The distinction between capital expenditure "as Incurred" vs "as Commissioned" is that the Service Provider is allowed to earn a return on capital invested "as Incurred", but does not record depreciation on the investment until a depreciable asset has been created (that is, it has been Commissioned).

Since APA VTS has applied the forecast depreciation from the earlier PTRM, the distinction between capex "as Incurred" and "as Commissioned" is not required to drive the calculation of depreciation in the Roll Forward Model.

6.2.3 *Amounts added to the capital base under Rules 82, 84 and 86*

Rule 82 addresses the treatment of capital contributions by users in capital expenditure. The effect of the rule is that capital expenditure, to the extent contributed by users, is not eligible for inclusion in the capital base unless a mechanism is proposed under sub-rule 82(3) to prevent the service provider from raising increased revenue as a result of the inclusion.

APA VTS receives contributions from parties seeking to undertake works near APA VTS pipelines, which may result in works to lower VTS pipelines. These parties include VicRoads, VLINE and property developers. Capital expenditure in the roll forward model is reported net of these contributed amounts.

Rule 84 relates to the formation of a speculative capital expenditure account, and how amounts included in a speculative capital expenditure account can be added to the capital base. APA VTS does not currently have any expenditure in a speculative capital expenditure account, and did not roll any expenditure from a speculative capital expenditure account into the capital base during the earlier access arrangement period.

Further, APA VTS did not undertake any non-conforming capital expenditure over the earlier access arrangement period that was recovered through a surcharge or that was added to a speculative capital expenditure account.

A redundant asset is an asset that ceases to contribute in any way to the delivery of pipeline services. APA VTS has not identified any assets that became redundant during the earlier access arrangement period, and therefore has not identified any redundant assets that must be removed from the capital base.

Rule 86 relates to the re-use of redundant assets. APA VTS did not re-use any assets during the earlier access arrangement period that it had previously identified as redundant, and therefore does not forecast any amounts to be added to the capital base under this Rule.

6.2.4 Disposals

APA VTS has not disposed of any assets over the earlier access arrangement period, save for routine disposals of vehicles and other equipment in the normal course of business. Proceeds of disposal, being the amount of capital returned to APA VTS, have been reflected in the "Disposals" section of the Roll Forward Model.

6.2.5 Depreciation over the earlier access arrangement period

In accordance with section 3.8 of the access arrangement, the capital base has been rolled forward using depreciation based on forecast capital expenditure as allowed by the AER in the earlier access arrangement period, as shown in Table 6-3 below.

Table 6-3 – AER forecast depreciation over the earlier access arrangement period ($m nominal)

$m nominal	2013	2014	2015	2016	2017
Pipelines	-7.64	-15.72	-17.03	-17.79	-18.41
Compressors	-2.53	-5.23	-6.97	-7.21	-7.42
City gates and field regulators	-0.95	-1.98	-2.53	-2.75	-2.88
Odourant plants	-0.01	-0.01	-0.02	-0.02	-0.02
Gas quality	-	-0.02	-0.06	-0.08	-0.09
General building	-0.10	-0.22	-0.40	-0.41	-0.42
General land	-	-	-	-	-
Other	-1.57	-3.29	-3.49	-5.33	-0.84
Total	**-12.80**	**-26.48**	**-30.49**	**-33.58**	**-30.07**

6.2.6   *Indexation*

As outlined above, the capital base has been indexed using indexation consistent with the forecast of inflation (2.50 per cent) used in determining forecast depreciation for the period 2013 to 2017.

When adjusting capital expenditure estimates, made in real terms, for inflation to report the nominal values shown in Table 6-4 below, APA VTS has used:

- An inflation forecast of 1.3 per cent for 2016 (based on the year on year increase in the ABS *All Groups CPI Weighted average eight capital cities* for the September quarter); and

- An inflation forecast of 2.0 per cent for 2017 (which is the midpoint of the inflation forecast for 2017 from Table 6.1 of the Reserve Bank of Australia's November 2016 *Statement on Monetary Policy*).

6.2.7 *Capital base roll forward 2013-2017*

The capital base has been rolled forward in accordance with the provision of Rule 77(2). The opening capital base for the access arrangement period is shown in Table 6-4 below.

Table 6-4 – Capital base roll forward 2013-2017 ($m nominal)

$m nominal	2013	2014	2015	2016	2017
Opening capital base	631.21	642.22	760.22	846.91	942.73
Plus conforming capex	15.92	128.58	98.51	109.44	72.12
Plus speculative capex	0.00	0.00	0.00	0.00	0.00
Plus reused redundant assets	0.00	0.00	0.00	0.00	0.00
Less depreciation	-12.80	-26.48	-30.49	-33.58	-30.07
Plus indexation	7.89	16.08	18.72	20.00	22.60
Less redundant assets	0.00	0.00	0.00	0.00	0.00
Less disposals	-0.01	-0.18	-0.04	-0.04	-0.07
Closing capital base	**642.22**	**760.22**	**846.91**	**942.73**	**1,007.31**

6.3 Projected capital base for the access arrangement period

6.3.1 *Opening capital base in 2018*

Consistent with provisions of Rule 77(2), the opening capital base as at 1 January 2018 is the same as the closing capital base as at 31 December 2017, which is calculated in Table 6-4 above.

6.3.2 *Forecast capital expenditure*

Forecast capital expenditure is addressed in section 5.3, and is summarised in Table 6-5 below.

Table 6-5 – Forecast capital expenditure ($m 2017)

$m real 2017	2018	2019	2020	2021	2022	Total
Capital expenditure	66.1	40.7	26.1	19.9	15.6	**$168.4**

6.3.3 *Non-conforming capital expenditure*

Capital contributions

APA VTS does not forecast any non-conforming capital expenditure to be recovered through capital contributions during the access arrangement period.

Surcharges

APA VTS does not forecast any non-conforming capital expenditure to be recovered through surcharges during the access arrangement period.

Speculative capital expenditure

APA VTS does not currently have any expenditure in a speculative capital expenditure account, and does not forecast any expenditure during the access arrangement period that it intends to add to speculative capital expenditure account.

Disposals

As discussed in section 6.2.4, APA VTS recorded some proceeds from disposals of vehicles in the normal course of business during the earlier access arrangement period. Going forward, APA VTS has elected to lease vehicles rather than own them. Accordingly, APA VTS will not own any vehicles, and accordingly no asset disposals are forecast.

6.3.4 *Depreciation over the access arrangement period*

APA VTS has not changed the standard asset lives from those approved by the AER at the last review. The remaining asset lives, as at 1 January 2018, for forecast depreciation purposes are as shown Table 6-6 below.

Table 6-6 – Remaining asset lives for depreciation purposes

Asset class	Standard life (years)	Remaining life (years)
Pipelines	55	37.9
Compressors	30	22.0
City Gates & Field Regulators	30	22.6
Odourant Plants	30	17.6
Gas Quality	10	9.0
Other	5	4.0
General Buildings	60	34.3
General Land	n/a	n/a

6.3.5 *Forecast inflation*

As noted in section 6.1 above, APA VTS proposes to annually update the forecast of inflation during the access arrangement period so that subsequent variations between actual and forecast are minimised, and any over-recovery or under-recovery of investment is minimised, leading to reference tariffs which are neither too low nor too high.

In these circumstances, the forecasting of inflation for total revenue determination via the post-tax revenue model can be kept simple.

APA VTS proposes that the forecast of inflation used in the post-tax revenue model be the year-on-year change in the June quarter CPI in 2017. This forecast is to be input into the model at the time the AER inputs the rate of return to determine the total revenue (and subsequently the revised reference tariffs) of its final decision on the VTS access arrangement revisions proposal.

APA VTS's forecast of inflation would, initially, be applied in each year of the access arrangement period. In the process of reference tariff variation (in accordance with the Scheduled Reference Tariff Variation Mechanism of the VTS access arrangement revisions proposal), this forecast would be updated for the second regulatory year of the access arrangement period.

The updated forecast, to be used in varying the reference tariffs for 2019, would be the year-on-year change in the June quarter CPI in 2018.

Tariff variation in subsequent regulatory years would use the year-on-year change in the CPI for the June quarter of the year preceding the year in which the varied reference tariffs are to apply.

If the year-on-year change in the June quarter CPI in 2017 is used as the initial forecast of inflation for VTS total revenue and reference tariff determination, a placeholder for that forecast is required for APA VTS's access arrangement revisions proposal.

APA VTS has used, as this placeholder, the geometric average of the upper and lower limits of the CPI inflation forecast for the year ended June 2017 from Table 6.1 of the Reserve Bank of Australia's November 2016 *Statement on Monetary Policy*. That average is 2.0 per cent.

APA VTS notes that the AER has previously used Reserve Bank inflation forecasts in its decisions, advising that:

- evidence indicates that the Bank's control of official interest rates and commentary has an impact on outturn inflation and inflation expectations; and

- the Bank's research indicates that its one year inflation forecasts have substantial explanatory power.[73]

6.3.6 *Indexation of the capital base*

As discussed in section 10.5.3, APA VTS proposes to index the value of the capital basis using actual inflation as it occurs. This update is to be effected through the annual tariff revision process, in a manner similar to the annual update for the rolling average cost of debt. Under this approach, the differences between the amount of capital returned to the business through tariffs derived through the post tax revenue model, and the amount of indexation of the capital base applied through the roll forward model, will be minimised.

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[73] Australian Energy Regulator 2015, *Final Decision Amadeus Gas Pipeline Access Arrangement 2016-2019, Attachment 3 – Rate of Return*, pp 3-148

For the first application of this approach, the inflation rate applied is 2.0 per cent, as discussed above.

6.3.7 *Project capital base over the period*

The projected capital base has been rolled forward in accordance with the provisions of Rule 78, as shown in Table 6-7.

Table 6-7 – Capital base roll forward 2018-2022 ($m nominal)

$m nominal	2018	2019	2020	2021	2022
Opening capital base	1,007.31	1,059.13	1,082.56	1,088.15	1,085.38
Plus conforming capex	69.33	43.54	28.51	22.13	17.75
Plus speculative capex	0.00	0.00	0.00	0.00	0.00
Plus reused redundant assets	0.00	0.00	0.00	0.00	0.00
Less depreciation	-37.66	-41.29	-44.57	-46.66	-42.32
Plus indexation	20.15	21.18	21.65	21.76	21.71
Less redundant assets	0.00	0.00	0.00	0.00	0.00
Less disposals	0.00	0.00	0.00	0.00	0.00
Closing capital base	**1,059.13**	**1,082.56**	**1,088.15**	**1,085.38**	**1,082.52**

6.4 Tax Asset Base

Rule 87A requires:

> *The estimated cost of corporate income tax of a service provider for each regulatory year of an access arrangement period (ETC_t) is to be estimated in accordance with the following formula:*

$$ETC_t = (ETI_t \times r_t)(1 - \gamma)$$

Where

ETI_t is an estimate of the taxable income for that regulatory year that would be earned by a benchmark efficient entity as a result of the

provision of reference services if such an entity, rather than the service provider, operated the business of the service provider;

r$_t$ is the expected statutory income tax rate for that regulatory year as determined by the AER; and

γ   is the value of imputation credits.

In order to calculate the estimated cost of corporate income tax, it is necessary to establish the amount of tax depreciation that can be deducted from taxable revenue to determine the amount of tax payable. As tax depreciation is based on depreciation rates different from those used for statutory accounting or regulatory purposes, the value of the Tax Asset Base (TAB) is likely to be, at any given point in time, different from the statutory and regulatory asset bases. It is therefore necessary to establish a TAB for regulatory purposes.

APA VTS has rolled forward the TAB in the earlier access arrangement period using the same principles as the normal asset base roll forward. That is, APA VTS has applied the AER's Asset Base Roll Forward Model adopting the opening TAB in the earlier access arrangement period, and rolled it forward using actual capital expenditure using the AER's RFM methodology. As the TAB is not indexed, it was not necessary to update the roll forward for outturn CPI increases.

The TAB roll forward is shown in Table 6-8, and the forecast TAB is shown in Table 6-9.

Table 6-8 – Tax Asset Base roll forward 2013-2017 ($m nominal)

$m nominal	2013	2014	2015	2026	2017
Opening TAB	225.5	220.8	343.8	415.2	494.2
net additions	4.0	140.5	94.9	103.9	69.9
tax depreciation	-8.6	-17.6	-23.5	-24.9	-25.6
Closing TAB	**220.8**	**343.8**	**415.2**	**494.2**	**538.4**

Table 6-9 – Forecast Tax Asset Base ($m nominal)

$m nominal	2018	2019	2020	2021	2022
Opening TAB	538.44	560.03	573.63	556.83	543.07
net additions	56.88	52.06	24.51	28.64	24.66
tax depreciation	-35.28	-38.46	-41.31	-42.41	-44.50
Closing TAB	**560.03**	**73.63**	**556.83**	**543.07**	**523.23**

The tax depreciation of the forecast TAB calculation is then applied to determine the corporate income tax allowance derived for the revenue model as indicated in section 9.3.

7 Rate of Return and value of imputation credits

The return on the projected capital base included in the total revenue is to be determined as the product of the allowed rate of return and the projected capital base at the beginning of each regulatory year of an access arrangement period (Rule 87(1)).

The way in which APA VTS proposes to determine the allowed rate of return, guided by the AER's Rate of Return Guideline, is set out in this chapter of this submission.[74]

The value APA VTS proposes to attach to the franking credits available to equity investors under the dividend imputation provisions of Australian taxation law is also noted and discussed.

The allowed rate of return of Rule 87 is to be the weighted average of a return on equity and a return on debt. APA VTS proposes to estimate a single return on equity for the access arrangement period (January 2018 to December 2022), and a (potentially different) rate of return on debt for each of the regulatory years in that period. APA VTS proposes, by estimating a rate of return on debt for each regulatory year, to update that rate annually to reflect prevailing financial market conditions in each year of the access arrangement period.

The allowed rate of return used to calculate the revised reference tariffs of the VTS access arrangement revisions proposal has been determined assuming that the rate of return on debt estimated for the first regulatory year of the access arrangement period will apply in each of the remaining years of that period.

APA VTS's proposed allowed rate of return is 7.88 per cent.

The way in which APA VTS has established the proposed allowed rate of return is set out in sections 7.1 to 7.3 below.

Four implementation issues – credit rating, data, annual updating process, and averaging periods – are discussed in section 7.4.

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[74] Australian Energy Regulator 2013, *Rate of Return Guideline*, December

Section 7.5 discusses estimation of the value of imputation credits, and explains APA VTS's gamma estimate of 0.25.

7.1 Gearing

The allowed rate of return of Rule 87 is to be the weighted average of a return on equity and a return on debt determined on a nominal vanilla basis (Rules 87(4)(a) and (b)). In a weighted average determined on a nominal vanilla basis, the weight to be given to the return on equity should be the proportion of equity in the total capital of the benchmark efficient entity (which is assumed to be financed by equity and debt). The weight to be given to the return on debt – the gearing – should be the proportion of debt in the total capital of the benchmark efficient entity.

Section 4.3.2 of the Rate of Return Guideline advises that the gearing of the benchmark efficient entity for which the weighted average of the return on equity and the return on debt is to be determined is to be 0.6.

APA VTS has therefore used gearing of 0.6 to calculate the nominal vanilla weighted average of returns on equity and debt which is to be the allowed rate of return for the VTS access arrangement revisions proposal.

7.2 Estimating the return on equity

This section of the submission sets out APA VTS's approach to estimating the return on equity for the VTS access arrangement revisions proposal.

APA VTS proposes that an initial estimate of the return on equity of 8.45 per cent be used in establishing the allowed rate of return for the access arrangement revisions.

This initial estimate has been made using financial market data available prior to submission of the VTS access arrangement revision proposal. It will be updated – by updating the estimate of the risk free rate of return – using data which become available during the access arrangement revisions approval process so that the rate of return on equity used in determining the allowed rate of return has been estimated having regard to prevailing conditions in the market for equity funds.

The foundation model of the Rate of Return Guideline – the Sharpe-Lintner Capital Asset Pricing Model (SL CAPM) – is noted in section 7.2.1. The way in which APA VTS has applied the foundation model to estimate the return on

equity using is explained in sections 7.2.2 to 7.2.4. APA VTS's estimation of the return on equity is summarised in section 7.2.5. In section 7.2.6, APA VTS evaluates its estimate of the return on equity against the requirements of the NGR, and in section 7.2.7 explains why a view that it has applied the "Wright approach" would be incorrect.

7.2.1   *Foundation model*

The Rate of Return Guideline identifies four quantitative financial models which may have a role in estimating the return on equity. These four financial models are:

- the SL CAPM;

- Black's Capital Asset Pricing Model (Black CAPM);

- the dividend growth model; [75] and

- the Fama-French Three Factor Model.

The SL CAPM is referred to as the "foundation model". It is to be the starting point for estimating the expected return on equity.

The Black CAPM is not to be used directly to estimate the return on equity. It is to be used only to inform estimation of the beta to be used in applying the SL CAPM.

Similarly, the dividend growth model is to be used to inform estimates of the market risk premium (MRP) to be used in applying the foundation model. It is not to be used for the purpose of estimating the return on equity itself.

Although the Fama-French Three Factor Model is a relevant financial model, the Rate of Return Guideline advises that it has no role in estimating the return on equity.

The SL CAPM explains the expected return, $E(r_j)$, on financial asset j, as the sum of the rate of return on a risk free asset and a premium for risk:

$$E(r_j) = r_f + \beta_j \times [E(r_M) - r_f]$$

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[75] APA VTS uses the singular term dividend growth model to refer to the class of financial models which can be used to estimate the return on equity as the discount rate which equates the present value of future dividends with the current share price.

where r_f is the return on the risk free asset, and β_j x $[E(r_M) - r_f]$ is the premium for risk. β_j is the beta for financial asset j, defined as $cov(r_j, r_M)/var(r_M)$, and $E(r_M)$ is the expected return on the market portfolio of assets. $E(r_M) - r_f$ is the MRP.

Rule 87(7) requires that an estimate of the return on equity be made having regard to prevailing conditions in the market for equity funds.

The SL CAPM is, as the AER notes, a forward looking model. It provides an estimate of a forward looking – expected – rate of return on equity. If the model is to produce the estimate required by Rule 87(7), it must be used with parameters which are, as appropriate, current or forward looking. The estimates of the risk free rate and beta used in applying the SL CAPM must be current estimates; they must be made having regard to prevailing conditions in financial markets. The MRP is inherently forward looking.

The AER has noted that historical data may be used in estimating the parameters of the SL CAPM where those data are good evidence of forward looking parameters. Historically based estimates that are clearly not representative of the forward-looking rate should not be used; they will result in biased estimates of the return on equity.[76] APA VTS would add that historically based estimates that are clearly not representative of current rates should, similarly, not be used.

That the SL CAPM provides a forward looking estimate of the rate of return on equity, and requires current or forward looking parameter estimates, raises significant issues for the estimation of beta and the MRP. These are discussed in sections 7.2.3 and 7.2.4 below. Estimation of the risk free rate of return is less contentious; it is discussed in section 7.2.2.

7.2.2 *Risk free rate of return*

The risk free rate is the rate of return on a financial asset which is without risk. To estimate the risk free rate, a proxy for this riskless financial asset – the risk free asset – must be found from among the traded financial assets for which returns can be observed. The Rate of Return Guideline proposes that Australian Government securities with a term to maturity of 10 years be the

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[76] AER 2016, *Final Decision Amadeus Gas Pipeline Access Arrangement 2016-2019, Attachment 3 – Rate of Return*, pp 3-198

proxy for the risk free asset. The risk free rate of return is then to be estimated from the yields on these securities.

When estimating the return on equity, recognition will be given to conditions prevailing in the market for equity funds if, when applying the foundation model, the risk free rate is commensurate with prevailing conditions in financial markets at the commencement of the access arrangement period. The estimate of the risk free rate used in estimating the return on equity should, then, be an estimate made immediately prior to the commencement of that period.

To remove the effects of "noise" from the estimate of the risk free rate, yields on Australian Government securities with the required term to maturity should be averaged over a period of between 10 consecutive business days and one year. To provide an estimate of the risk free rate which is commensurate with prevailing conditions in financial markets, this period should be as close as practicably possible to the commencement of the access arrangement period for which the allowed rate of return is being determined.

APA VTS understands the reasons for choosing the averaging period as close as practicably possible to the commencement of the access arrangement period, and anticipates that the AER will estimate the risk free rate for an averaging period which is close to the time of its making a final decision on the VTS access arrangement revisions proposal.

For the rate of return for this VTS access arrangement revisions proposal, a much earlier averaging period must necessarily be assumed. For the purpose of this revisions proposal, APA VTS has estimated the risk free rate as the average of yields on Australian Government securities with terms to maturity of 10 years over the period of 20 consecutive business days ending 31 October 2016.

APA VTS's estimate of the risk free rate of return is 2.24 per cent.

7.2.3   *Beta*

Application of the SL CAPM, the foundation model of the Rate of Return Guideline, requires an estimate of beta for a benchmark efficient entity with degree of risk similar to APA VTS in respect of its provision of reference services using the Victorian transmission system.

APA VTS's estimate of beta is 0.8.

This was the estimate of beta which the AER made for the purpose of estimating the return on equity for its Final Decision on proposed revisions to the APA GasNet Access Arrangement in March 2013.[77]

Beta estimate in the AER's March 2013 Final Decision

In revisions to the VTS access arrangement submitted to the AER in September 2012, APA VTS proposed an estimate of beta of 0.8.

In its March 2013 Final Decision on the revisions proposal, the AER accepted APA VTS's proposed beta. (The AER had, earlier, accepted an estimate of 0.8 in its Draft Decision.)

In accepting an estimate of beta of 0.8, the AER advised that empirical evidence which it had considered indicated a point estimate of between 0.4 and 0.7 for the beta of electricity and gas service providers, and concluded that an estimate just above this range was justified in recognition of the level of imprecision around beta estimation, and taking into account the desirability of stability in regulatory decision making over time.[78]

Rate of Return Guideline

In its Rate of Return Guideline, the AER proposed estimation of a range for beta, and selection of a point estimate from within that range.

The AER advised that it would obtain a range of estimates of beta from empirical analysis using data from a set of Australian energy network businesses. These network businesses for which data were available were, the AER contended, reasonably comparable to the benchmark efficient entity referred to in Rule 87(3).

The AER then proposed to use other information sources to inform the selection of a point estimate from within the empirical range of beta estimates. This additional information included:

• empirical estimates of betas for overseas energy networks; and

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[77] Australian Energy Regulator 2013, *Access Arrangement Final Decision: APA GasNet Australia (Operations) Pty Ltd 2013-17, Part 1*, March, Table 5.1, p 25

[78] Australian Energy Regulator 2013*, Access Arrangement Final Decision: APA GasNet Australia (Operations) Pty Ltd 2013-17, Part 2: Attachments*, March, p 93

- the theoretical principles underpinning the Black CAPM.

The AER's range for beta estimates was subsequently established by reference to updated econometric analysis by Professor Olan T. Henry in April 2014.[79] Professor Henry advised that, from his consideration of a number of estimation methods, and ranges of data for individual firms and portfolios of those firms, a point estimate for beta could be expected to lie in the range 0.3 to 0.8. The average of the ordinary least squares estimates of beta which he had obtained was 0.5223, and the median estimate was 0.3285.[80]

Professor Henry's April 2014 econometric analysis used samples for varying periods between 29 May 1992 and 28 June 2013.

The AER concluded that the evidence from Professor Henry's 2014 econometric analysis indicated an empirical estimate for beta of approximately 0.5.[81]

The AER examined, in addition to the results from Professor Henry's 2014 analysis, the estimates of beta which had been made by Professor Henry for a 2009 review of WACC parameters, estimates made by the Western Australian Economic Regulation Authority (ERA), and estimates made by consultant SFG. All of this work, the AER concluded, supported an estimate of beta in the range 0.4 to 0.7.[82]

Beta estimates for overseas energy networks, the AER advised, supported a point estimate at the upper end of the range 0.4 to 0.7.[83] The difficulties of comparing entities operating in different financial market conditions and under different regulatory regimes precluded a more precise conclusion. The theoretical principles underpinning the Black CAPM similarly, and as imprecisely, pointed to an estimate at the upper end of the range.[84]

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[79] Olan T. Henry, *Estimating β: An update*, April 2014

[80] Olan T. Henry, *Estimating β: An update*, April 2014, p 63

[81] Australian Energy Regulator 2015, *Final Decision Ausgrid distribution determination 2015-16 to 2018-19, Attachment 3 - Rate of return*, April, pp 3-129

[82] See Australian Energy Regulator 2013, *Explanatory Statement: Rate of Return Guideline*, December, section 6.2.3

[83] AER 2013, *Explanatory Statement: Rate of Return Guideline* p 86

[84] AER 2013, *Explanatory Statement: Rate of Return Guideline*, p 86

This led the AER to propose, in its Rate of Return Guideline, a point estimate of 0.7 for beta.

Current evidence supports an estimate of beta higher than 0.7

In June 2016, in the context of a final decision on proposed revisions to the access arrangement for the Dampier to Bunbury Natural Gas Pipeline, the ERA updated its estimation of beta using data for the five years to 31 May 2016. The ERA found that, using returns data for portfolios of the Australian energy network businesses used for beta estimation, a 95 per cent confidence interval for beta was 0.479 to 0.870. The ERA concluded that the mean beta, 0.7, obtained as an average across the estimates for equally weighted and value weighted portfolios, made using the ordinary least squares, least absolute deviation, MM and Theil-Sen estimators, was an appropriate point estimate for use in the SL CAPM.[85]

The ERA's process of estimation indicated an increase in beta since its own earlier (2013) work, and since Professor Henry's updated (2014) analysis for the AER. The ERA noted:

> *Across the four firms β has increased on average from 0.368 to 0.578 from 2013 to 2016 across all estimators (OLS, LAD, MM, T-S). Hence, elasticity in the response of individual asset returns to market returns has increased within the gas infrastructure sector during a period when mean market returns have decreased, consistent with the findings of CEG.*[86]

Consultant CEG had reported, in work undertaken for Dampier to Bunbury Natural Gas Pipeline owner and operator DBP, that structural break tests which it had carried out using betas estimated from recent data showed multiple structural breaks. CEG advised:

> *When regard is had to the rising level of beta and the structural break results described above then this suggests the best estimate of the most recent β is higher than that reported by the ERA in its draft decision and discussed in*

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[85] Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020*, Appendix 4, Rate of Return, paragraph 474

[86] ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020*, Appendix 4, Rate of Return, paragraph 935

section 4.3. Indeed, the most recent mean estimates (not bias adjusted) of 3 year betas are around 0.91 (0.96 when adjusted for low beta bias).[87]

The ERA's beta estimate of 0.7 was obtained without any consideration being given to either beta estimates for overseas energy networks, or to the theoretical principles underpinning the Black CAPM. Consideration of these factors, in the way the AER proposes, should lead to a higher estimate for beta.

Frontier Economics' beta estimates

In view of the work by the ERA and CEG which was indicating an increase in beta since the estimates made by Professor Henry, for the AER, in 2014, APA VTS asked Frontier Economics to estimate beta using current data. Frontier Economics was asked to use data for the Australian energy network businesses which were used by Professor Henry, and to use statistical methods which were the similar to those used by Professor Henry.

Frontier Economics' report for APA VTS is provided as Attachment E.1 to this submission.

Frontier Economics restricted its use of statistical methods to ordinary least squares estimation, advising that the ordinary least squares estimator of the slope coefficient in the regression of stock returns on market returns (the standard method of estimating beta) had the same definition as beta in the SL CAPM. Other estimators (including the least absolute deviation estimator, which was used by Professor Henry and the ERA) did not have this equivalence between the estimator and the parameter which was to be estimated.[88]

Using weekly data for the period of five years to 1 September 2016, Frontier Economics obtained value and equally weighted portfolio estimates for beta of 0.65 and 0.72, respectively.[89] Frontier Economics advised that its current

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[87] CEG 2016, *Estimating beta to be used in the Sharpe-Lintner CAPM*, February, paragraph 120. The CEG report is Appendix F to DBP's submission 56 to the ERA dated 24 February 2016.

[88] Frontier Economics 2016, *An equity beta estimate for Australian energy network businesses: Report prepared for APA Group*, December, p 17

[89] Frontier Economics 2016, *An equity beta estimate for Australian energy network businesses*, p 16

beta estimates were materially higher than the AER's empirical estimate of approximately 0.5 (which had been obtained using data no more recent than 28 June 2013).[90]

Consistent with the results obtained by the ERA and CEG, the Frontier Economics results indicated an increase in beta estimates for equally weighted and value weighted portfolios as data from 2014, 2015 and 2016 is introduced into the sample from which the estimates are made, and older data from 2006 to 2008 are deleted. Frontier Economics made a series of rolling beta estimates for the two portfolios using data for successive periods of five years. The rolling beta estimates were sufficiently high that the AER's empirical estimate of 0.5 was not within the standard 95 per cent confidence intervals for the most recent periods. Estimates of beta have increased significantly since the time of the Rate of Return Guideline (December 2013).[91]

Frontier Economics sough to confirm its view that the estimates of beta for Australian energy network businesses obtained using recent data were significantly higher than the AER's empirical estimate of approximately 0.5 by examining beta estimates for a set of comparable infrastructure businesses operating in the transport sector. These businesses, like the energy networks:

• owned and operated tangible assets with long lives;

• were capital intensive;

• provided an access service to customers which yielded relatively stable cash flows; and

• were listed on the ASX.

The beta estimates for equally weighted and value weighted portfolios of these transport infrastructure businesses were 0.98 and 0.79, respectively.[92] They were clearly well above 0.5.

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[90] Frontier Economics 2016, *An equity beta estimate for Australian energy network businesses,* p 18

[91] Frontier Economics 2016, *An equity beta estimate for Australian energy network businesses*, pp 19-20

[92] Frontier Economics 2016, *An equity beta estimate for Australian energy network businesses*, p 23

Beta estimate for VTS access arrangement revisions proposal

In 2013, the evidence available to the AER indicated that a point estimate for beta would lie in the range 0.4 to 0.7.

In its March 2013 Final Decision on APA GasNet's proposed revisions to the VTS access arrangement, the AER advised that an estimate just above this range was justified:

- in recognition of the level of imprecision around beta estimation; and

- taking into account the desirability of stability in regulatory decision making over time.

In the Final Decision, the AER adopted an estimate of beta of 0.8.

By April 2014, the AER had the evidence of a number of studies in which beta had been estimated, including Professor Henry's update of his earlier work. These studies continued to show a range of 0.4 to 0.7 for beta.

Professor Henry's econometric analysis, in 2014, indicated to the AER an empirical estimate of beta of 0.5.

More recent analyses, by the ERA, by CEG, and now by Frontier Economics, provide statistical evidence of an increase in estimates of beta since 2014.

When estimates of beta are increasing, an updated estimate is essential to making an estimate of the return on equity which has been made having regard to prevailing conditions in the market for equity funds.[93] A current beta estimate is essential to estimating a rate of return on equity which contributes to the achievement of a rate of return commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree

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[93] The time variation of beta is well known, even though the model in which it is used, the SL CAPM, is a static equilibrium model in which beta is necessarily time-invariant. On the time variation of beta, see, for example, Robert D. Brooks, Robert W. Faff and Thomas Josev (1997), "Beta stability and monthly seasonal effects: evidence from the Australian capital market", Applied Economics Letters, 4, pages 563-566). Torben G. Andersen, Tim Bollerslev, Francis X. Diebold and Jin Wu (2006),"A Framework for Exploring the Macroeconomic Determinants of Systematic Risk", American Economic Association Papers and Proceedings, 95(2), pages 398-404, report economically significant variation in the betas of NSYE-listed stocks with variation in macroeconomic indicators such as industrial production growth.

of risk as that which applies to the service provider in the provision of reference services.

There is now clear evidence that beta has increased above the AER's estimate of approximately 0.5.

The ERA has proposed an estimate of 0.7 from its own – recent – econometric analyses, and CEG has reported higher values for recent estimates of beta.

Econometric analyses by Frontier Economics show an increase in estimates of beta when estimation makes use of data for the period 2014 to 2016. Higher beta estimates for Australian energy network businesses are supported by estimates of beta which Frontier Economics has made for a set of comparable infrastructure businesses operating in the transport sector.

If empirical estimates of beta for Australian energy network businesses are now above 0.5, the additional information provided by beta estimates for overseas energy networks, and the theoretical principles underpinning the Black CAPM, indicate that a beta above 0.7 is now appropriate for estimating the return on equity of a gas pipeline service provider.

As Frontier Economics notes, using data for the most recent five years in beta estimation risks producing estimates with relatively low statistical precision. Longer data series are required to improve the precision of the resulting beta estimates.

Frontier Economics recommends using at least ten years of data for estimation. But simply taking data for the last ten years accords weight to a period of some 7 years in which betas appear to have been relatively low. The is shown by Frontier Economics' estimates of beta: using data for the most recent 10 years, the value and equally weighted portfolio estimates were, respectively, 0.52 and 0.57.[94]

Beta has risen, but the magnitude if the increase is difficult to gauge.

For application of the SL CAPM in estimating the return on equity for the VTS access arrangement revisions proposal, APA VTS therefore proposes to retain the AER's 2013 estimate of 0.8.

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[94] Frontier Economics 2016, *An equity beta estimate for Australian energy network businesses*

This is entirely consistent with the AER's reasoning in March 2013, that an estimate of 0.8 was justified in recognition of the level of imprecision in beta estimation, and taking into account the desirability of stability in regulatory decision making over time.

In 2013, an access arrangement incorporating a rate of return which had been calculated using a beta estimate of 0.8 achieved the broader requirements of the national gas objective. An access arrangement now incorporating a rate of return calculated using a beta estimate of 0.8 should continue to achieve the requirements of that objective. That will be the case, irrespective of the fact that the AER has made and published the guidelines required by Rule 87(13). Those guidelines may now, in any case, require revision given the higher estimates of beta obtained using current data.

7.2.4 *Market risk premium*

The approach to the MRP in the Rate of Return Guideline, and the AER's preferred approach as presented in its recent regulatory decisions, is to treat the term $E(r_M) - r_f$ in the SL CAPM as a single discrete parameter. In this section of this submission APA VTS examines this approach to estimating the MRP, and finds that it is inconsistent with the conceptual and theoretical foundations of the SL CAPM.

Estimation of the MRP in a manner consistent with the conceptual and theoretical foundations of the SL CAPM requires separate estimates for the risk free rate r_f (as set out in section 7.2.2 above), and for the expected return on the market $E(r_M)$. APA VTS discusses estimation of the expected return on the market in this section of the submission, and proposes an estimate of 10.0 per cent for that expected return.

When estimating the MRP and the return on equity for the VTS access arrangement revisions proposal, APA VTS has not used the so-called "Wright approach", an approach which the AER sees as having, at most, only a very limited role in the estimation of equity returns. APA VTS discusses the Wright approach in section 7.2.7 below.

MRP in the Rate of Return Guideline and recent AER decisions

In the Rate of Return Guideline, the AER proposed that the return on equity be estimated, using the SL CAPM, by adding to the risk free rate a premium for risk determined as the product of beta and the MRP. The MRP was, the

AER advised, unobservable, and was to be estimated. A range for the estimate was to be established, and a point estimate selected from within that range. MRP estimation would, the AER proposed, have regard to dividend growth model estimates, survey evidence and conditioning variables, but the base for the estimate was to be historical excess returns.

At the time of this submission, the AER's most recent estimations of return on equity were for its September 2016 Draft Decisions for the 2017-22 Powerlink transmission determination, and for the 2017-19 TasNetworks distribution determination. In each of these decisions, the AER selected 6.5 per cent as a point estimate for the MRP, reasoning that:

- historical excess returns provided a baseline estimate and indicated a MRP of approximately 5.5 per cent to 6.0 per cent from a range of 4.9 per cent to 6.0 per cent;

- dividend growth model estimates indicated a MRP estimate above this baseline with a range of 7.54 per cent to 8.86 per cent, but:

  o although the AER's dividend growth model was theoretically sound, its implementation raised a number of practical issues which led to the view that recent increases in estimates of the MRP made using the model did not necessarily reflect an increase in the 'true' expected ten-year forward looking MRP;

  o dividend growth model estimates were not reliable on their own; nevertheless they provided some support for a point estimate above the range from historical returns;

- survey evidence supported a MRP around 6.0 per cent to 6.8 per cent;

- other regulators' estimates used as a cross check indicated that a market risk premium estimate of around 6.5 per cent was reasonable;

- conditioning variables indicated that there had not been a material change in market conditions since the AER's May 2016 decisions;

- stakeholder submissions (excluding submissions by service providers) generally supported a MRP at or below 6.5 per cent; and

- a departure from the Rate of Return Guideline on the basis of the information and material before the regulator was not justified and would

not contribute to the achievement of the allowed rate of return objective and the National Electricity Objective.[95]

Although the AER considered forward looking estimates of the MRP obtained using the dividend growth model, its estimate of 6.5 per cent was anchored on historical excess returns. Anchoring the estimate in this way produces an MRP which varies only slowly over time as historical returns and the risk free rate vary. This would not be a problem if the MRP were relatively stable, but it is not. The AER advised, in the Explanatory Statement accompanying the Rate of Return Guideline, that the MRP varied over time:

> *Evidence suggests the MRP may vary over time. In their advice to the AER, Professor Lally and Professor Mackenzie and Associate Professor Partington have expressed the view that the MRP likely varies over time. They also suggest it would be better to use a wide range of models and information to estimate the MRP.[96]*

If the MRP varies over time, a method of estimation which anchors the estimate on the average of historical excess returns is unlikely to lead to a forward looking estimate of the premium.

Furthermore, Rule 87(7) requires that, when estimating the return on equity, regard be had to prevailing conditions in the market for equity funds. The AER may, as it has advised, have had regard to prevailing market conditions through its use of the dividend growth model and conditioning variables to inform its estimate of the MRP.[97] However, an estimate which is anchored on an average of historical excess returns does not give much weight to prevailing conditions.

An estimate of 6.5 per cent, which is anchored on historical excess returns, and which is not forward looking, would not be an appropriate estimate for application of the SL CAPM, and could not lead to an estimate of the return

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[95] Australian Energy Regulator 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 3 – Rate of return*, September, pp 3-40 and pp 3-46 to 3-49; Australian Energy Regulator 2016, *Draft Decision TasNetworks distribution determination 2017-18 to 2018-19, Attachment 3 – Rate of return*, September, pp 3-40 and pp 3-46 to 3-49

[96] AER 2013, *Rate of Return Guideline: Explanatory Statement*, p 91

[97] AER 2016, *Final Decision Amadeus Gas Pipeline Access Arrangement 2016-2019, Attachment 3 – Rate of Return*, pp 3-83

on equity which contributed to a rate of return commensurate with the efficient financing costs of the benchmark efficient entity referred to in Rule 87(3).

These were problems recognised by the ERA in its recent final decisions on the proposed revisions of the access arrangements of the three Western Australian providers of regulated pipeline services.

ERA estimation of the MRP

Reliance on historical excess returns could not, the ERA reasoned, provide the forward looking estimate of the MRP required for application of the SL CAPM. In the absence of an adequate theory of expectations formation, the only model available for making such a forward looking estimate was the dividend growth model.

The present value to an equity investor, today (time 0), of the future dividends from investment in one share of the stock of a firm which is not expected to fail, is:

$$PV_0 = \frac{D_1}{(1 + r_e)} + \frac{D_2}{(1 + r_e)^2} + \ldots + \frac{D_n}{(1 + r_e)^n} + \ldots$$

where:

- D_n is the expected dividend on the share at time $t = n$, which is assumed to be paid at the end of year n; and

- r_e is the investor's discount rate, which is the required rate of return on equity.

If dividends are expected to grow at a constant annual rate g, the present value of the expected future dividends is:

$$PV_0 = \frac{D_1}{(1 + r_e)} + \frac{D_1(1 + g)}{(1 + r_e)^2} + \ldots + \frac{D_1(1 + g)^{n-1}}{(1 + r_e)^n} + \ldots = \frac{D_1}{r_e - g}$$

provided $g < r_e$.

The price the investor would be prepared to pay for the share today (at time 0) is, then:

$$p_0 = \frac{D_1}{r_e - g}.$$

Today's share price, p_0, is set in the market for financial assets, so that, given the expected dividend in one year, D_1, and the dividend growth rate, g, the investor's required rate of return – the expected rate of return on equity, r_e – is:

$$r_e = \frac{D_1}{p_0} + g.$$

This is the simplest form of the dividend growth model. Through its explicit use of a forecast of the dividend expected one year hence (D_1), and an assumed rate of growth in future dividends (g), it clearly provides a forward looking estimate of the return on equity (r_e).

The average of historical excess returns is neither forward looking nor strongly reflective of prevailing financial market conditions. Nor, as the ERA advised, is the time series of excess returns stationary. However, the ERA found the market return on equity series to be stationary, with the implication that an average of a long span of data could provide a cross check on any estimate of the market return on equity made using the dividend growth model.[98]

The ERA therefore inverted the AER's approach to MRP estimation, using the estimates from a set of dividend growth models, and using the average of historical excess returns as a cross check.

The set of dividend growth models used by the ERA included its own model, and the model developed by the AER. From these models, the ERA established a range for the upper limit of possible values for the MRP. This range was 7.6 per cent to 8.8 per cent.[99]

The average of historical excess returns themselves, the ERA contended, provided, at best, a lower bound on the range of the estimate of the MRP. The value or values of this lower bound would depend on the way in which the average was calculated, either as an arithmetic mean or as a geometric

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[98] Economic Regulation Authority 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1011

[99] ERA 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1031

mean. In its calculations, the ERA gave weight to both means, finding that a reasonable lower bound on the estimate of the MRP was 5.4 per cent.[100]

The ERA concluded that:

- the range for the MRP implied by recent estimates made using dividend growth models was 7.6 per cent to 8.8 per cent, and

- the range for the MRP implied by historical excess returns was 5.4 per cent to 8.5 per cent.[101]

A point estimate, for use in the SL CAPM, must be established, the ERA advised, by reference to these ranges. Like the AER, the ERA examined a number of forward looking indicators – "conditioning variables" – to establish its point estimate. The indicators were:

- the dividend yield on the All Ordinaries which, the ERA found, supported an estimate for the forward looking MRP that was above the mid-point of the range implied by historical excess returns;[102]

- interest rate swap and bond default spreads, which were relatively high, indicating slightly elevated risk premiums;[103]

- the ASX 200 volatility index, which indicated an MRP below the mid-point of the range implied by historical excess returns;[104] and

- the (qualitative) assessment of the Reserve Bank of Australia, in its May 2016 Statement on Monetary Policy, that there was uncertainty

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[100] ERA 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1038

[101] ERA 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1065

[102] ERA 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1049

[103] ERA 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1055

[104] ERA 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1059

concerning future growth in the Australian economy, which the ERA saw as driving a somewhat higher MRP at the present time.[105]

The conditioning variables indicated, to the ERA, a forward looking rate of return which was higher than the mid-point of the range for the MRP implied by historical excess returns.

The range of estimates of the MRP from dividend growth models was 7.6 per cent to 8.8 per cent but, the ERA advised, these models tended to overestimate returns.

The ERA concluded that an estimate of the MRP of 7.4 per cent would reflect market expectations at the end of May 2016.[106] It was an appropriate estimate of the MRP for estimating the rate of return on equity using the SL CAPM.[107]

The ERA's estimate of the MRP is more closely grounded in prevailing conditions in equity markets than the estimate made by the AER, and better reflects the requirement for a forward looking estimate.

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[105] ERA 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1062

[106] ERA 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1070

[107] APA VTS notes that, in its estimation of rates of return, the ERA assumed the appropriate proxy for the risk free rate was the yield on Australian Government securities with a term to maturity of five years. APA VTS does not agree with the ERA's view that securities with a term to maturity of five years are an appropriate proxy for the risk free rate. As noted above, APA VTS has used Australian Government securities with a term to maturity of 10 years as the proxy for the risk free asset. This is consistent with economic theory, with financial market practice, and with the AER's Rate of Return Guideline. The ERA's use of Australian Government securities with term to maturity of five years as the proxy for the risk free asset is likely to overstate the estimate of the MRP (relative to an estimate calculated using yields on securities with a maturity of 10 years as the proxy for the risk free asset). However, this overstatement does not significantly influence the result.

Conceptual and theoretical foundations of the SL CAPM and interpretation of the MRP

In the Rate of Return Guideline and in the AER's practice, as indicated by its recent decisions, the MRP is taken to be a single discrete variable, which is to be estimated, along with the risk free rate and beta, when applying the SL CAPM. The ERA, in contrast, seems to estimate the MRP as the difference between an estimate of the expected return on the market, and an estimate of the risk free rate of return. Which is the correct approach?

A careful examination of the conceptual and theoretical foundations of the SL CAPM shows that the MRP should be estimated, not as a single discrete variable, but as a difference between estimates of the return on the market and the risk free rate. This examination of the foundations of the SL CAPM and its implications for estimation of the MRP are set out in this section of this submission.

The SL CAPM has its foundations in a single period – essentially static – general equilibrium model of exchange among a large number, m, of individuals or "investors".

At a point in time (time 0), each investor makes a decision to consume from her wealth, and to invest the remainder of that wealth in financial assets. One period later (at time 1), the investor sells those financial assets to buy goods and services.[108] That is, at time 0, the investor makes a decision to form a portfolio of financial assets for the purpose of transferring wealth to time 1 to finance future consumption.

At time 0, each investor chooses a portfolio from the N financial assets available at that time. These N financial assets are N – 1 risky financial assets, and a risk free asset:

• x_{ij} is the dollar value of risky financial asset j, j = 1, 2, . . ., N – 1 in investor i's portfolio; and

• x_{iN} is the dollar value of the risk free asset in investor i's portfolio.

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[108] In a multi-period setting, the investor would also buy financial assets for the next period. The SL CAPM is not, however, a multi-period asset pricing model, and the present discussion does not need to extend beyond a single period. Most recent asset pricing research uses a multi-period or continuous time setting for the purpose of overcoming the inherent limitations of a single period model.

If investor i invests the total of her remaining wealth, W_{i0}, at time 0, then:

$$W_{i0} = \sum_{j=1}^{N-1} x_{ij} + x_{iN} \,.$$

Each of the N – 1 risky financial assets provides investor i with a total return R_j on an investment of \$1 at time 1. $R_j = 1 + r_j$, where r_j is the rate of return on risky financial asset j.

Different circumstances over which the investors have no control – different contingent states – are possible during the period of the investment (between time 0 and time 1), and lead to different possible returns on each risky financial asset. R_j is, then, a random variable. Investor i is assumed to know the probability distribution of R_j. Moreover, each investor, is assumed to have the same knowledge of this distribution.

Investment of \$1 in the risk free asset provides investor i with a total return R_f during the period of the investment. $r_f = R_f - 1$ is the risk free rate of return. There is no uncertainty about the return on the risk free asset. That asset provides the investor with the same total return, R_f, in all of the contingent states between time 0 and time 1. R_f is known to all investors.

Investor i's wealth at time 1, W_{i1}, is:

$$W_{i1} = \sum_{j=1}^{N-1} x_{ij} R_j + x_{iN} R_f.$$

Investor i is assumed to have preferences for period 1 wealth which can be represented by a (von Neumann-Morgenstern) utility function $U_i(W_{i1})$. U_i is assumed to be increasing and twice differentiable.

At time 0, investors trade financial assets (choose portfolios x_{ij}, j = 1, 2, . . ., N) to maximize expected utility of wealth at time 1. Through trading, a market equilibrium is established at a set of prices for the risky financial assets at which supply and demand are equal for each of those assets.

Each investor i chooses portfolio x_{ij}, j = 1, 2, . . ., N, to maximize:

$E[U_i(W_{i1})]$

subject to

$$W_{i0} = \sum_{j=1}^{N-1} x_{ij} + x_{iN}.$$

The (first order) conditions for a maximum,

$$E[U_i' R_j] = E[U_i' R_f]$$

and

$$W_{i0} = \sum_{j=1}^{N-1} x_{ij} + x_{iN},$$

for all assets j, imply

$$E[U_i'(R_j - R_f)] = E(U_i')E(R_j - R_f) + cov(U_i', R_j - R_f) = 0.$$

If investor utility functions are quadratic with

$$U_i(W_{i1}) = W_{i1} - a_i W_{i1}^2,$$

a_i a constant, for each investor i, then

$$U_i'(W_{i1}) = 1 - 2a_i W_{i1},$$

and

$$E\left(U_i'\right)E(R_j - R_f) + cov\left(U_i', R_j - R_f\right) = E\left(U_i'\right)E(R_j - R_f) - 2a_i cov(W_{i1}, R_j),$$

so that

$$[E(R_j) - R_f]\frac{E\left(U_i'\right)}{2a_i} = cov(W_{i1}, R_j)$$

for each investor i.

Summing across all investors in the market:

$$[E(R_j) - R_f]\sum_{1=1}^{m}\frac{E\left(U_i'\right)}{2a_i} = \sum_{i=1}^{m} cov(W_{i1}, R_j) = cov(\sum_{i=1}^{m} W_{i1}, R_j)$$

Now,

$$\sum_{i=1}^{m} W_{i1} = \sum_{i=1}^{m}\left[\sum_{j=1}^{N-1} x_{ij}R_j + x_{iN}R_f\right] = \sum_{j=1}^{N-1} x_j R_j + \sum_{i=1}^{N-1} x_{iN}R_f = R_M \sum_{j=1}^{N-1} x_j + R_f \sum_{i=1}^{m} x_{iN}$$

where

$$R_M = \sum_{j=1}^{N-1} x_j R_j \bigg/ \sum_{j=1}^{N-1} x_j$$

is the total return on the market portfolio of risky financial assets.

Since $\sum_j^{N-1} x_j$ and $R_f \sum_{i-1}^{m} x_{iN}$ are not random,

$$\text{cov}\left(\sum_{i=1}^{m} W_{i1}, R_j\right) = \text{cov}\left(R_M \sum_{j=1}^{N-1} x_j, R_j\right) = \sum_{j=1}^{N-1} x_j \text{cov}(R_M, R_j),$$

and

$$E(R_j) = R_f - A\,\text{cov}(R_M, R_j) \qquad\qquad (1)$$

where

$$A = \sum_{j=1}^{N-1} x_j \bigg/ \sum_{i=1}^{m} \frac{E(U_i')}{2a_i}$$

The market portfolio is an asset for which the total return R_M is described by equation (1), and so

$$E(R_M) = R_f + A\,\text{cov}(R_M, R_M) = A\,\text{var}(R_M)$$

and

$$A = \frac{E(R_M) - R_f}{\text{var}(R_M)}.$$

Therefore:

$$E(R_j) = R_f + \frac{E(R_M) - R_f}{\text{var}(R_M)} \cdot \text{cov}((R_j, R_M) = R_f + \beta_j[E(R_M) - R_f]$$

where

$$\beta_j = \frac{\text{cov}(R_j, R_M)}{\text{var}(R_M)}.$$

In terms of rates of return,

$$E(r_j) = r_f + \beta_j[E(r_M) - r_f],$$

which is the SL CAPM.

APA VTS's purpose in deriving the SL CAPM is not explication of the mathematical details of the derivation, but to show the conceptual and theoretical foundations from which the model is logically derived. [109]

The SL CAPM is an equilibrium asset pricing model built on the foundations of the portfolio choices of individual investors choosing, at a point in time, portfolios of the N - 1 risky financial assets and the risk free asset which are available at that time. The investors know, at the time of portfolio choice, the probability distributions of the returns on each of the N – 1 risky assets, and therefore know the expected return on the market portfolio of those assets. The investors also know, with certainty, the rate of return on the risk free asset which is available at that time.

In these circumstances, there is no single discrete variable $E(r_M) - r_f$ in the SL CAPM. There are, clearly and distinctly, the expected value of the uncertain future return, $E(r_M)$, on the market portfolio of the N - 1 risky assets available to those investors, and the known return, r_f, on the risk free asset available at the time of portfolio choice.

The term $E(r_M) - r_f$ as it appears in the SL CAPM is not a single discrete variable; it is simply the difference between the conceptually distinct r_f and $E(r_M)$ assumed for model derivation. It must be treated as such when applying the model. Estimates must be made, at the time the SL CAPM is applied, of:

- the rate of return on the risk free asset assumed to be available to investors at that time; and

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[109] The mathematics of the derivation of the SL CAPM presented in the preceding paragraphs is from Mark E Rubinstein (1973), "A Mean-Variance Synthesis of Corporate Financial Theory", Journal of Finance, 28(1): pages 167-181. A derivation, with the same conceptual foundations, but which focuses more closely on the implications of period 1 wealth being a linear function of the random total returns R_j on the risky financial assets (and on the means and standard deviations of those risky returns), can be found in Eugene F. Fama (1968), "Risk, Return and Equilibrium: Some Clarifying Comments", Journal of Finance, 23(1), pp 29-40

- the return those investors expect, at that time, to earn on the market portfolio.

A long term average of past returns on the market portfolio may be used as an estimate of the expected return on the market, $E(r_M)$, but the use of that average involves the making of a specific assumption about the way in which expectations are formed. This assumption – indeed, any assumption which might be made about expectations formation – lies beyond the set of assumptions made for derivation of the SL CAPM itself. The absence of an explicit hypothesis about how expectations are formed about a critical element of the model (the expected return on the market portfolio) is a significant limitation of the SL CAPM.

Moreover, the use of a long term average of historical risk premiums to estimate $E(r_M) – r_f$ has the effect of replacing the risk free rate of return at the time of portfolio choice with a long term average of risk free rates of returns. But a long term average of risk free rates has no role in the derivation of the SL CAPM, and no role in the application of the model. In the derivation of the SL CAPM, there is no consideration of how expectations are formed about an uncertain future risk free rate of return. There does not need to be. The risk free rate is known with certainty at the time of portfolio choice: it is the known rate of return on the risk free asset which is available to investors at that time.

The AER supports the approach of the Rate of Return Guideline, and its current practice, in which the MRP is taken to be a single discrete variable to be estimated, along with the risk free rate and beta, when applying the SL CAPM, by reference to advice it has received from its advisor Associate Professor John Handley.

Associate Professor Handley advised the AER that:

> The standard approach to estimation [of the SL CAPM] is to treat the MRP as a distinct random variable.[110]

This, Associate Professor Handley contended, " . . . largely follows from the risk-return trade off paradigm". He presented the trade-off as follows:

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[110] Handley, John C 2014, *Report prepared for the Australian Energy Regulator: Advice on the Return on Equity*, 16 October, p 15

In deriving the Sharpe-CAPM one arrives at the less familiar relationship between expected return and risk:

$$E(r_j) = r_f + A\ cov(r_j, r_m) \qquad (4)$$

where $E(r_j)$ is the expected return on asset j, r_f is the risk free rate, $cov(r_j, r_m)$ is the covariance of the return on j with the return on the market, and A is a measure of the aggregate relative risk aversion in the economy in equilibrium – which in turn is a complex weighted average of the relative risk aversion of the individual investors in the economy. Equation (4) says that the appropriate risk premium on asset j is equal to $A\ cov(r_j, r_m)$, where A represents the "price of risk" and $cov(r_j, r_m)$ represents the "quantity of risk". Unfortunately A is unobservable but applying (4) to the market portfolio gives:

$$A = \frac{E(r_m) - r_f}{var(r_m)} \qquad (5)$$

where $var(r_m)$ is the variance of the return on the market. Substituting (5) into (4) gives the CAPM in its more familiar form:

$$E(r_j) = r_f + \beta_j\ [E(r_m) - r_f] \qquad (6)$$

where β_j is the beta of asset j and $E(r_m) - r_f$ is the expected MRP. Equation (6) says that the appropriate risk premium on asset j is equal to $\beta_j\ [E(r_m) - r_f]$ where $[E(r_m) - r_f]$ represents the "price of risk" and β_j represents the "quantity of risk".

Associate Professor Handley concluded: "the standard approach is then to directly estimate the item of interest – the expected MRP". However, this does not follow from his argument. Associate Professor Handley did not consider the context within which his equation (4) was derived, and the implications of that context for his interpretation of equation (6). The MRP is not a distinct random variable; it is not single, discrete item of interest. It is the difference between the return on the market at the rates of return on risky financial assets expected by all investors, and the rate of return on the risk free asset which is known to all investors, at the time of portfolio choice. This is the case even if one chooses to think of $E(r_M) - r_f$ as a price of risk, and β_j as a quantity of risk

Associate Professor Handley's equation (4) is equation (1) above. Equation (1) follows, as APA VTS has already noted, from investors choosing portfolios at a point in time from the risky financial assets and the risk free asset available at that time, knowing the probability distributions of the rates of return on the risky assets available, and knowing, with certainty, the rate of return on the risk free asset.

The term $E(r_M) - r_f$, the MRP of the SL CAPM is not a single discrete variable. It is not a single parameter for which an estimate is required separate from the estimates of the risk free rate and beta.

The term $E(r_M) - r_f$ comprises two separate and conceptually distinct components, the risk free rate and the expected return on the market. When applying the SL CAPM, estimates must be made, at the time the model is applied, of:

- the rate of return on the risk free asset assumed to be available to investors at that time; and

- the return the on the market portfolio at the rates of return which investors expect on each of the risky financial assets available at that time.

The use of an average of historical excess returns to estimate $E(r_M) - r_f$ as a single discrete variable for the purpose of applying the SL CAPM is inconsistent with the conceptual and theoretical foundations of the model.

The use of an average of historical excess returns to estimate $E(r_M) - r_f$ has the effect of replacing the risk free rate of return at the time of portfolio choice with an average of past risk free rates of return. But an average of past risk free rates has no role in the SL CAPM, and no role in the application of the model. In the derivation of the SL CAPM, there is no consideration of how expectations are formed about an uncertain future risk free rate of return. There does not need to be. The risk free rate is known with certainty at the time of portfolio choice: it is the known rate of return on the risk free asset which is available to investors at that time.

Since the term $E(r_M) - r_f$ as it appears in the SL CAPM is not a single discrete variable, and must be estimated using the rates of return on assets available to investors at the time the model is applied, survey and other evidence which supposedly directly informs estimates of the MRP, is irrelevant.

None of this means that the MRP, interpreted as a long term average of differences between the return on the market portfolio and the risk free rate, is not relevant in other contexts. Considered independently of the SL CAPM, the MRP has been, and continues to be, of great interest to investors and to financial economists. Whether the MRP is a premium for bearing non-diversifiable risk or a liquidity premium, or whether it arises from borrowing

constraints or taxes and other regulatory arrangements remain open questions.[111]

In estimating the return on equity for the VTS access arrangement revisions proposal, APA VTS has estimated the MRP, in a way consistent with the conceptual and theoretical foundations of the SL CAPM, using an estimate of the expected return on the market and an estimate of the risk free rate. APA VTS's estimate of the risk free rate was discussed in section 7.2.2 above. Estimation of the expected return on the market is discussed in the following section of this submission.

Estimating the expected return on the market

The expected return on the market in the SL CAPM is the return on the market portfolio at the rates of return on risky financial assets expected by investors at the time of portfolio choice. The expected return on the market is inherently "forward looking", and must be estimated, either directly from expectations data, or indirectly using a model of expectations formation.

APA VTS is not aware of any expectations data which might be suitable for directly estimating the expected return on the Australian market for risky financial assets. APA VTS has, therefore, relied on two simple, but widely used, models of expectations formation. These are:

- the averaging of past values of the variable for which a forward looking estimate or expected value is required; and

- the dividend growth model, the application of which is limited to determining expected rates of return in the way discussed above.

Using these two models, APA VTS obtained an estimate of 10.0 per cent for the expected return on the market to be used in applying the SL CAPM to estimate the return on equity for the VTS access arrangement revisions proposal.

APA VTS notes that the AER implicitly accepts that the averaging of past values can provide reasonable estimates of forward looking expectations

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[111] See Rajnish Mehra and Edward C. Prescott (2003), "The equity premium in retrospect", in George M. Constantinides, Milton Harris and René Stulz (eds.), *Handbook of the Economics of Finance*, Volume 1, Part B, Financial Markets and Asset Prices, New York: Elsevier, pp 889-938

when it makes estimates of the MRP which are anchored on historical excess returns.

The AER has advised that, although historical data on excess returns on the market are not themselves forward looking, their use in estimating a forward looking MRP may be reasonable if investors form forward looking expectations based on past experience.[112]

The AER has also recognised that dividend growth models can be used to estimate forward looking returns on the market. The Rate of Return Guideline is explicit, advising that results from dividend growth models can inform the input parameters used in the SL CAPM and can, in particular, inform estimation of a forward looking MRP.[113]

As noted earlier, the ERA advises that, if a time series is stationary, the series of historical data can reasonably be considered as a predictor of future values in the series.

Broadly, a series is stationary if its mean, variance and autocovariance are constant over time. Such a series will tend to return to its constant mean (mean reversion), and fluctuations around this mean will have a relatively constant amplitude. Because it has a finite and constant variance, a stationary series will not drift too far away from its mean value.

A nonstationary time series has a time-varying mean, or a time-varying variance, or both. In consequence, the series of historical data may not be a good predictor of future values in the series.

In preparing its Rate of Return Guidelines, the ERA examined the series of historical returns on the Australian stock market, and the corresponding series of historical excess returns. The Western Australian regulator found that the excess returns series was not stationary, but the market return series was stationary.[114]

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[112] AER 2013, *Rate of Return Guideline: Explanatory Statement*, Appendix D, p 78

[113] AER 2013, *Rate of Return Guideline: Explanatory Statement*, Appendix D, pp 4 and 13

[114] ERA 2016, *Appendices to the Explanatory Statement for the Rate of Return Guidelines*, 30 June, Appendix 16

In its June 2016 Final Decision on proposed revisions to the access arrangement for the Goldfields Gas Pipeline, the ERA concluded:

> *As the available evidence supports the hypothesis that the market return on equity is mean reverting, this historic outcome from a long span of data may be used as a cross check for the long run average of the forward looking market return on equity from each regulatory period.[115]*

In Table 3-17 of Attachment 3 to its September 2016 Draft Decision on the 2017-22 Powerlink transmission determination (reproduced below as Table 7-1), the AER listed average historical returns on the market portfolio (in nominal terms) for a number of different periods.[116] These long term averages of market return ranged from 9.9 per cent to 12.5 per cent.

Table 7-1 – Historical returns on the market portfolio (per cent)

Sampling period	Market return (real)	Market return (nominal)
1883–2015	8.6	11.3
1937–2015	7.3	9.9
1958–2015	8.8	11.5
1980–2015	9.7	12.5
1988–2015	9.0	11.7

In the context of dividend growth model estimates of the expected return on the market, the ERA noted that estimates from these models show considerable variability because the inputs of different models incorporate new information coming from financial markets. The latest information is the most relevant to expectations of market returns and, the ERA advised that only the results from models which have been developed in the last 12 months should be relied upon.

In its June 2016 Final Decision on proposed revisions to the access arrangement for the Dampier to Bunbury Natural Gas Pipeline, the ERA

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[115] ERA 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1011

[116] AER 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 3 – Rate of return*, September, Table 3-17, pp 3-105

reported the dividend growth model estimates of the expected return on the market shown in Table 6-2. [117] The set of models from which the ERA reported estimates was restricted to models which had been developed no more than one year prior to its Final Decision.

Table 7-2 – Recent estimates of the expected return on the market obtained using the DGM

Study	Date	Market return (nominal)
SFG	May 2015	11.37%
Frontier Economics	July 2015	11.2%
AER	September 2016	9.49% – 10.81%
ERA	May 2016	9.94%

The dividend growth model estimates indicate a range of 9.5 per cent to 11.4 per cent for the expected return on the market.

Although both the AER and the ERA advise that dividend growth model estimates tend to overstate market returns, the dividend growth model estimates of expected return on the market shown in Table 6-2 have a range similar to the range of historical market returns shown in Table 7-1 (9.9 per cent to 12.5 per cent).

APA VTS has therefore looked to the lower limits of both ranges to establish an estimate of the expected return on the market of 10.0 per cent. APA VTS has used this estimate when applying the SL CAPM to estimate the return on equity for the VTS access arrangement revisions proposal.

APA VTS notes that, from an examination of the data compiled by Brailsford, Handley and Maheswaran, and taking into account (but not fully adjusting for) NERA's suggested corrections to the early part of the series for equity

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[117] ERA 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020, Appendix 4 Rate of Return,* 30 June, Table 6, p 114

returns, the ERA concluded that a reasonable estimate of the nominal average return on the market was 10.3 per cent.[118]

7.2.5 Estimating the return on equity

Using the estimates discussed in the preceding sections of this submission (r_f = 2.24 per cent, β = 0.8, and $E(r_M)$ = 10.0 per cent), the foundation model – the SL CAPM – delivers an estimate of the return on equity of 8.45 per cent.

7.2.6 Evaluation of APA VTS's estimate of the return on equity

APA VTS considers that an estimate of the return on equity of 8.45 per cent is the best estimate in the circumstances. It is an estimate made using the AER's foundation model, and having regard to prevailing conditions in the market for equity funds. It is an estimate which can contribute to achievement of the allowed rate of return objective of Rule 87(3).

APA VTS has derived its estimate using the SL CAPM, which is a model for estimating equity returns long used by financial market practitioners and regulators. After examining the alternatives, the AER found the SL CAPM to be an appropriate model for estimating the return on equity required by Rule 87 of the NGR, and adopted that model as its foundation model.

Two of the three parameters which must be estimated when applying the SL CAPM are the risk free rate of return and the equity beta. There are well established and accepted methods of estimating the risk free rate and beta. APA VTS has used the method of estimating the risk free rate of return proposed in the Rate of Return Guideline. When estimating beta, APA VTS has drawn on the estimates made for, and adopted by the AER, and has also had regard to the more recent estimates made by the ERA. These more recent estimates indicate that beta has changed since 2013. If, as Rule 87(7) requires, the return on equity is to be estimated having regard to prevailing conditions in equity markets, then a current estimate is required when applying the SL CAPM. APA VTS has used a current estimate, 0.8, and not the dated estimate of 0.7 associated with the Rate of Return Guideline.

APA VTS has explained above that the AER's approach to estimation of the third parameter of the SL CAPM – the MRP – is based on a view of the model

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[118] AER 2016, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June, paragraph 1010

which is conceptually incorrect. The MRP of the SL CAPM is the difference between the expected return on the market portfolio and the risk free rate at the time the model is applied.

APA VTS notes that this is not the Wright approach, and that it has not applied the Wright approach to the SL CAPM.

The result is a higher MRP and, in consequence, a higher return on equity, than would have been obtained by using the estimate of the MRP of the Rate of Return Guideline (6.5 per cent).

7.2.7   *The Wright approach*

The way in which APA VTS has estimated the MRP for use in the VTS access arrangement revisions proposal aligns with the way in which the MRP was estimated in APT Pipelines (NT) Pty Limited's January 2016 revised proposal in respect of proposed revisions to the access arrangement for the Amadeus Gas Pipeline, and in the APT Petroleum Pipelines Limited September 2016 Roma to Brisbane Pipeline access arrangement revisions proposal. The AER has not yet issued a draft decision on the Roma to Brisbane Pipeline proposal, but has made a final decision on the proposed revisions to the access arrangement for the Amadeus Gas Pipeline. In its final decision, the AER described APT Pipelines (NT)'s approach to estimation of the MRP, and to estimation of the return on equity, as the "Wright approach". The Wright approach, the AER advised, may provide some insights into return on equity estimation, but these were limited.[119] The Wright approach would not result in an unbiased estimate of the rate of return on equity, and should not be used.[120]

In its Amadeus Gas Pipeline final decision, the AER noted:

> *APTNT submitted that it did not use the Wright approach but rather "applies the model by making estimates of the expected return on the market, and of the risk free rate, and by estimating the market risk premium as the difference between the two". We do not consider that*

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[119] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, May, p 3-46

[120] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, May, p 3-46, Table 3.5, pp 3-58

there is any substantive difference between APTNT's approach and the Wright approach.[121]

However, the AER did not examine the difference between APT Pipelines (NT)'s approach and the Wright approach, and its conclusion that there was no substantive difference between the two approaches was unsubstantiated.

Table 7-3 summarises the key aspects of the Wright approach, the SL CAPM, and the AER's foundation model. [122]

APT Pipelines (NT) did not use the Wright approach in its access arrangement revisions proposal for the Amadeus Gas Pipeline, and APA VTS has not now adopted the Wright approach for its VTS access arrangement revisions proposal. In this section of this submission, APA VTS explains why its approach to estimation of the MRP, and to estimation of the return on equity, is not the Wright approach.

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[121] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, May, footnote 220, p 3-57

[122] APA VTS notes that, in this discussion of the Wright approach, it makes no direct reference to the writings of Professor Stephen Wright. It is the AER's interpretation of Professor Wright's views which led the AER to its incorrect conclusion that the approach taken by APT Pipelines (NT) to estimation of the MRP, and to its estimation of the return on equity for the Amadeus Gas Pipeline, was the Wright approach.

Table 7-3 – Approaches to estimating return on equity

	Wright approach (used by UK regulators)	SL CAPM (used by APA VTS)	AER foundation model
Risk free rate	Point estimate for r_f	Point estimate for r_f	Point estimate for r_f
Expected return on market	Point estimate for $E(r_M)$	Point estimate for $E(r_M)$	-
Market risk premium (MRP = $E(r_M) - r_f$)	Point estimate for $E(r_M)$ minus point estimate for r_f	Point estimate for $E(r_M)$ minus point estimate for r_f	MRP is treated as a single parameter. Estimated as a long term average of difference between return on the market and the risk free rate
Relationship between r_f and MRP	r_f and MRP are inversely related	No assumption	No inverse relationship between r_f and MRP
Real return on equity	Relatively constant over time	No assumption	-
Return on market	Stable over time	No assumption	-
MRP	Varies over time	No assumption	Constant over time
Risk free rate	Varies over time	No assumption	Varies over time

The AER's view of the Wright approach

In its Amadeus Gas Pipeline final decision the AER stated:

> *The Wright CAPM is an alternative implementation of the Sharpe-Lintner CAPM. This is where the return on the market portfolio and the risk free rate are estimated as separate components of the market risk premium.*[123]

If this were the AER's view of the Wright approach, APA VTS would contend that:

- the Wright approach is no more than the correct approach to the SL CAPM, as APA VTS has explained above; and

- the AER was in error in rejecting use of the Wright approach.

However, there is more: the AER has a broader view of what constitutes the Wright approach. Moreover, the AER's reasons for rejecting the Wright approach do not derive from concern about estimation of the return on the market portfolio and the risk free rate as separate components of the market risk premium. The AER's rejection of the approach derives from its concern about other aspects of its broader view of the Wright approach. As APA VTS discusses in the paragraphs which follow, these other aspects of the AER's view of the Wright approach involve assumptions which lie outside the set of assumptions made for derivation of the SL CAPM. Whether they might be appropriate in the context of estimating the rate return on equity is irrelevant if the SL CAPM is to be used to estimate that rate of return in the way APA VTS proposes.

In the Rate of Return Guideline, the AER describes the Wright approach as an alternative – "non-standard" – implementation of the SL CAPM in which the market portfolio and the risk free rate were estimated as separate components of the MRP. The Explanatory Statement for the Rate of Return Guideline explains:

> *Effectively, under the Wright approach the estimation of the MRP is replaced by the estimation of the return on the market. If the return on the market portfolio is assumed to be relatively constant (and this is a*

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[123] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, pp 3-197

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strong assumption), estimates of the expected return on equity for the benchmark efficient entity, therefore, will only move marginally with variations in the risk free rate.[124]

. . .

The Wright approach, however, has a number of limitations. In particular, it assumes that the relationship between the risk free rate and the MRP is perfectly negatively correlated, and the return on equity is relatively stable over time.[125]

. . .

Consistent with our final decision for the Victorian gas service providers, we consider there is no consensus in the academic literature on the direction, magnitude or stability of the relationship between the risk free rate and the MRP. Instead, there is evidence to support both a positive and negative relationship. Given these uncertainties – in particular, that the direction of any relationship may be variable and unstable – we consider it more reasonable to assume that no consistent relationship exists between the MRP and risk free rate.[126]

The Wright approach, the AER advises, uses the model:

$k_e = r_f + \beta_e \times (r_M - r_f)$**,**

where:

- k_e is the expected return on equity;

- r_f is the risk free rate of return;

- β_e is the equity beta; and

- r_M is the expected return on the market.[127]

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[124] AER 2013, *Explanatory Statement: Rate of Return Guideline*, p **24**

[125] AER 2013, *Explanatory Statement: Rate of Return Guideline*, p 25

[126] AER 2013, *Explanatory Statement: Rate of Return Guideline*, p 26

[127] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, pp 3-197

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This is the SL CAPM. However, the AER sees the Wright approach as introducing a number of auxiliary assumptions to effect implementation of that model in a particular way. These auxiliary assumptions include:

- the (real?) return on the market is relatively constant;[128]

- the return on the market is estimated using historical data;[129] and

- there is an inverse relationship between movements in the risk free rate and the market risk premium.[130]

None of these assumptions is made for the purpose of deriving the SL CAPM. They are all part of the AER's view of the Wright approach. The AER's rejection of the Wright approach derives from its concerns about these assumptions, and not from estimation of the return on the market portfolio and the risk free rate as separate components of the MRP (which, as APA VTS has explained above, is the conceptually and theoretically correct interpretation of the SL CAPM).

The SL CAPM is, the AER explains, a forward-looking equilibrium asset pricing model and therefore requires forward looking input parameters; it is an ex ante model, which means that all of the variables represent before-the-fact, expected values. APA VTS agrees, and agrees that historical returns on the market cannot automatically replace the required – forward looking – expected return on the market.

The AER is concerned that the Wright approach does not take into account changing market conditions. Therefore, it is unlikely (at a given point in time) to provide an unbiased forward-looking estimate of the required return on equity.[131] This may well be the case. But it arises because the base on which the Wright approach is built is the SL CAPM. The SL CAPM is a static

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[128] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*

[129] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*

[130] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, pp 3-75

[131] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, pp 3-198

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equilibrium model: it does not take into account changing market conditions. If the Wright approach does not provide unbiased forward-looking estimates of the return on equity, neither does the AER's foundation model.

The AER says that it does not agree with the underlying premise of the Wright approach that there is a clear inverse relationship between movements in the risk free rate and market risk premium.[132] If this is the reason for the AER's conclusion that the Wright approach is not theoretically justified, then that conclusion may be justified.[133] But the premise in question is irrelevant to the derivation and application of the SL CAPM.

The AER contends that there is no compelling empirical evidence before it to support the use of the Wright approach.[134] Indeed, there may not be compelling empirical evidence for the proposition that return on the market is relatively constant, or for the proposition that there is an inverse relationship between movements in the risk free rate and the market risk premium. These propositions are part of the AER's view of the Wright approach, but they are not propositions required for derivation of the SL CAPM. There may be no compelling evidence for them, but these propositions are not necessary to correct application of that model.

The AER advises that market practitioners, academics and regulators do not generally accept the Wright approach. An analysis of 78 suitable independent valuation reports over the period May 2013 to January 2016, the AER notes, indicates there are no reports that appear to use the Wright CAPM.[135] This may well be the case, but it is not clear from the AER's advice why those market practitioners do not generally accept the Wright approach. If it is because they do not accept that the return on the market is relatively constant, the return on the market must be estimated using

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[132] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, pp 3-198

[133] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, pp 3-198

[134] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*

[135] AER 2016, *Final Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*

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historical data, or that there is an inverse relationship between movements in the risk free rate and the market risk premium, then the observation that he Wright approach is not generally accepted is irrelevant to acceptance of the SL CAPM, and to the way in which it is applied.

Finally, the AER advises that Wright approach has been considered, and found deficient, by its consultants.

Associate Professor Handley considered the Wright approach and advised the AER:

> *It appears to be based on two main ideas. First, a claim that the standard approach is internally inconsistent as it purportedly uses a different estimate of the risk free rate for the purposes of estimating the MRP. But this is not correct. As discussed above, the item being estimated under the standard approach and the item being substituted into (6) is the MRP. It is a single estimate of a single item. It is not an estimate of the expected return on the market and an estimate of the risk free rate. Second, Wright draws on previous work by Wright, Mason and Miles (2003) which in turn draws on work by Siegel (1998) to conclude that:*

> *"regulators should work on the assumption that the real market cost of equity is constant … as a direct consequence, whatever assumption is made on the risk free rate, the implied equity premium must move point by point in the opposite direction."*

> *The theoretical justification for such an assumption is far from clear whilst the empirical evidence that is presented is not compelling. More importantly, this is a proposition whose widespread use and acceptance is yet to be established. Until then (if at all), there is no compelling reason to move from the standard approach to estimation.[136]*

Associate Professor Handley sees the Wright approach as being based on a view that the standard approach to the SL CAPM is inconsistent because it uses a different estimate of the risk free rate for the purpose of estimating the MRP. Handley contends that the item being estimated is the MRP, which it is a single estimate of a single item. However, as APA VTS has explained above, the MRP in the SL CAPM is not a "single item". It comprises two parameters,

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[136] John C. Handley 2014, *Report prepared for the Australian Energy Regulator: Advice on the Return on Equity*, 16 October, pp 17-18

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the expected return on the market and the risk free rate. Each of these two parameters must be estimated at the time the model is applied, and the correct estimate of the MRP is the difference the two parameter estimates.

The Wright approach, Associate Professor Handley argues, incorporates the assumption that the real cost of equity is constant. This assumption has been drawn from work by Professor Wright and others, and by Siegel. However, Handley contends, the theoretical justification for such an assumption is far from clear, and the empirical evidence advanced in support is far from compelling. This may well be the case, and may justify rejection of the Wright approach. But no assumption of the constancy of the real cost of equity is required for derivation of the SL CAPM, and no such assumption is necessary to correct application of the model.

Partington and Satchell also examined the Wright approach for the AER, and advised that they were unconvinced by the approach in the context of estimating the market risk premium, and recommended that the regulator give it little weight.[137] Partington and Satchell noted that the Wright CAPM had no well accepted theoretical support, did not seem to be much used, if at all, in practice, and runs contrary to the well accepted view that asset prices are inversely related to interest rates.

Partington and Satchell were not explicit about what they saw as key assumptions underpinning the Wright approach. However, their comment that the model ran contrary to the well accepted view that asset prices are inversely related to interest rates indicates that an inverse relationship between the risk free rate and the market risk premium was one of those assumptions. Concern about this assumption, and possibly about other auxiliary assumptions, appear to be the reasons for their assessment that the model did not have well accepted theoretical support, and was not much used in practice. But the assumption of an inverse relationship between the risk free rate and the market risk premium, and the other auxiliary assumptions of the Wright approach which were noted above, are not relevant to the derivation of the SL CAPM, and are not necessary to correct application of that model.

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[137] Graham Partington and Stephen Satchell 2016, *Report to the AER: Cost of Equity Issues 2016 Electricity and Gas Determinations*, April, p 31

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In estimating the return on equity, APA VTS has established the MRP as the difference between:

- an estimate of the expected return on the market at the time of estimating the return on equity; and

- an estimate of the risk free rate at that time.

APA VTS has used the SL CAPM a way which is consistent with the way in which the model – essentially a static general equilibrium model of financial asset exchange – is derived.

APA VTS has explicitly recognised that what must be estimated, consistent with the structure of the model, is the expected return on the market, and has proposed an estimate of that expected return.

APA VTS has not made any assumption about whether the return on the market is relatively constant. APA VTS has not imposed a requirement that the return on the market be determined using historical data, although it acknowledges that historical data on market returns might be used to estimate the expected return required for application of the SL CAPM.

APA VTS has not assumed that there is an inverse relationship between movements in the risk free rate and the market risk premium. No such assumption is required for the proper application of the SL CAPM.

APA VTS has not used the Wright approach.

7.3 Estimating the return on debt

7.3.1 Requirements of the National Gas Rules

Rule 87(8) of the National Gas Rules (NGR) provides that the return on debt for a regulatory year is to be estimated such that it contributes to the achievement of the allowed rate of return objective. Rule 87(8) is mandatory – it prescribes the way in which the return on debt is to be estimated for each regulatory year of the access arrangement period.

The allowed rate of return objective is that the rate of return for a service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services (Rule 87(3)). Thus, the rate of return objective requires an assessment of the

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efficient financing costs that would be faced in each regulatory year of the access arrangement period, by a benchmark efficient entity with a similar degree of risk as that which applies to APA VTS in respect of the provision of reference services. This in turn requires an assessment of what an efficient financing practice would be for that benchmark efficient entity. Efficient financing costs are those costs that would be faced in each regulatory year of the access arrangement period, by a benchmark efficient entity engaged in efficient financing practices.

Rule 87(11) sets out a number of factors that the AER must have regard to in estimating the return on debt under Rule 87(8). Of course, these factors cannot override the primary decision-making rule in Rule 87(8). Rather, they are factors to be taken into account in applying that rule.

7.3.2 *Rate of Return Guideline*

The benchmark efficient entity of Rule 87(3) would, the AER advised in the Explanatory Statement which accompanied the Rate of Return Guideline, issue debt with a term to maturity of 10 years. To mitigate its refinancing risk the benchmark efficient entity would hold a portfolio of debt with staggered maturities.

In the Rate of Return Guideline, the AER proposed to use a trailing average portfolio approach to estimating the return on debt, since the trailing average approach would approximate efficient financing costs for a benchmark efficient entity with a staggered portfolio of fixed rate debt. However, the AER did not propose to implement the trailing average approach immediately. Rather, the AER proposed to transition to the trailing average approach over a period of ten years.

The Rate of Return Guideline proposed that the return on debt be estimated:

- for debt with a benchmark term to maturity of 10 years;

- using an on-the-day approach (return on debt equal to the sum of a current base rate and current debt risk premium) in the first regulatory year of the access arrangement period; and

- transitioning the rate obtained using the on-the-day approach into a trailing average over 10 years by updating one tenth of the return on debt in each subsequent year to accord with prevailing financial market conditions.

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The Explanatory Statement set out the rationale for a transition to trailing average estimation of the return of debt rather than its immediate implementation. Under the on-the-day approach to return on debt estimation which had been previously applied, the benchmark efficient entity would have:

- borrowed long term (10 years) and staggered its borrowings so that only a proportion (10 per cent) of the debt matured each year and needed to be refinanced;

- borrowed using floating rate debt (or using fixed rate debt converted into floating rate debt using fixed-to-floating interest rate swaps); and

- entered into floating-to-fixed interest rate swaps, during the averaging period at the commencement of each access arrangement period, for the risk free rate component of the return on debt, for the duration of the access arrangement period.

As a result, the benchmark efficient entity would have held a portfolio of floating rate debt at the time a new approach to estimation of the return on debt was to be implemented. This portfolio would need to be "unwound" as part of any change from an on-the-day to a trailing average approach to estimation of the return on debt. This, the AER proposed, would be effected by transition to the trailing average over a period of 10 years.

The hedging arrangements through which the benchmark efficient entity's portfolio of floating rate debt was created were in respect of the risk free rate components of its long term borrowings. There was no market in which the debt risk premium component could be hedged.

Transition to a trailing average approach was, in the AER's view, necessary to allow the benchmark efficient entity for which the return on debt is estimated to unwind the hedging arrangements it had entered into under the previously used on-the-day approach. Only a regulated entity would have had to contend with on-the-day estimation of the return on debt, and would have hedged in response to that on-the-day estimation of the return on debt. Thus, the AER's decision to impose a transition in the Rate of Return Guideline was premised on its view of the benchmark efficient entity as a regulated entity.

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7.3.3 *Tribunal review of the AER's approach to estimation of the return on debt*

On 26 February 2016, the Australian Competition Tribunal (Tribunal) handed down decisions on applications for merits reviews by Networks NSW, ActewAGL and Jemena Gas Networks (NSW) Ltd (Jemena). The Tribunal decided to set aside the AER's decisions for each of the businesses, and to remit various matters to the AER for reconsideration, including in relation to the return on debt.

The Tribunal's key conclusions on the estimation of the return on debt in the AER's decisions for Networks NSW, ActewAGL and Jemena were:

- the benchmark efficient entity referred to in the allowed rate of return objective is an unregulated entity, and the AER therefore erred in treating it as regulated for the purposes of its decision on the form of transition to the trailing average method;[138]

- the AER erred in deciding that there must be a single, standard benchmark efficient entity, and that there must be a single, standard form of transition appropriate for all service providers;[139]

- in the light of the AER's errors in interpretation of the rate of return objective and in characterisation of the benchmark efficient entity, the AER's approach to transitioning to the trailing average must be reconsidered.

The Tribunal also provided some direction as to the proper implementation and application of clause 6.5.2(k)(4) of the National Electricity Rules, which is equivalent to Rule 87(11)(d) of the NGR.[140] The Tribunal stated that taking into account this factor involves:

- starting with the efficient financing costs of an unregulated benchmark efficient entity;

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[138] *Applications by Public Interest Advocacy Centre Ltd and Ausgrid Distribution* [2016] ACompT 1, [907], [914]

[139] *Applications by Public Interest Advocacy Centre Ltd and Ausgrid Distribution* [2016] ACompT 1, [916]

[140] *Applications by Public Interest Advocacy Centre Ltd and Ausgrid Distribution* [2016] ACompT 1, [933]

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- where the AER is intending to change the method for estimating the return on debt, considering whether there would be any impact on the benchmark efficient entity as a result of the changed method; and

- taking into account any such impacts in deciding on the transition to the new method.

In relation to the first step, the Tribunal noted that as the financing costs structure of Networks NSW was readily applied to the trailing average method, the relevant inquiry would start with whether the actual financing costs were efficient as at the commencement of the new regulatory period, and only if the actual structure was not efficient would that of the benchmark efficient entity be applied prospectively.[141]

The Tribunal did not identify what it considered to be the correct form of transition for each business. Rather, the Tribunal directed the AER to remake its decision on the transition method in accordance with the principles and guidance set out in the Tribunal's reasons.

On 24 March 2016, the AER applied to the Federal Court for judicial review of the Tribunal's decision. In particular, the AER applied for review of:

- the Tribunal's finding that the benchmark efficient was an unregulated entity;

- the Tribunal's rejection of a single benchmark efficient entity; and

- the interpretation of clause 6.5.2(k)(4) of the National Electricity Rules (which is the equivalent of Rule 87(11)(d) in the NGR).[142]

These matters are still before the Federal Court.

The AER is yet to remake its decisions on the transition in respect of the New South Wales distribution network service providers, and has continued to develop its approach to estimation of the return on debt in its most recent decisions.

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[141] *Applications by Public Interest Advocacy Centre Ltd and Ausgrid Distribution* [2016] ACompT 1, [934]

[142] AER 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 3 – Rate of return*, September, pp 3-38

7.3.4   *Recent AER decisions on the return on debt*

In recent decisions, the AER has adopted a justification for its preferred transition which is different from that set out in the Rate of Return Guideline.

For example, in its recent access arrangement decision for ActewAGL, the AER noted that, in response to the service providers proposing an immediate adoption of the trailing average approach, the AER had reconsidered whether its approach to estimating the allowed return on debt would contribute to achieving the allowed rate of return objective.[143] The AER determined that it would apply the transition as set out in the Rate of Return Guideline (and as applied in distribution determinations for service providers in NSW and the ACT). However, the reasons relied upon by the AER for adopting the transition were entirely new.

There were two new aspects to the AER's reasoning in its decision for ActewAGL and its decisions for other service providers made around the same time.

First, rather than defining efficient financing costs by reference to an efficient financing practice that would be adopted by a benchmark efficient entity, the AER defined efficient financing costs as being those costs that are reflected in the prevailing market cost of capital.[144] The AER relied on a report that it had commissioned from Graham Partington and Stephen Satchell in defining efficient financing costs as current (or prevailing) market costs, rather than the costs relating to an assumed financing strategy.[145] This was a departure from the approach adopted in the Rate of Return Guideline (and the earlier decisions in respect of the NSW and ACT electricity distribution network service providers) where the AER had considered efficient financing costs by reference to the financing practice of a particular type of entity (i.e. by reference to the practice of a regulated benchmark efficient entity).

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[143] AER 2016, *Final Decision ActewAGL Distribution Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, May, pp 3-95

[144] AER 2016, *Final Decision ActewAGL Distribution Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, May, pp 3-281

[145] AER 2016, *Final Decision ActewAGL Distribution Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, May, pp 3-17, footnote 57, referring to: Graham Partington and Stephen Satchell, *Report to the AER: Discussion of the Allowed Cost of Debt*, 5 May 2016

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Secondly, the AER considered that any transition should be "revenue neutral", relative to continuation of the on-the-day methodology.[146] The AER's position was that there should be a transition because service providers are appropriately compensated for efficient financing costs under the on-the-day approach and under the AER's transition to the trailing average approach. On the basis of this finding, the AER determined that an approach that is other than the on-the-day approach or the AER's transition (including immediate adoption of the trailing average approach or some hybrid approach) would result in over or under compensation of the benchmark efficient entity.

APA VTS considers that the approach taken by the AER in these recent decisions is incorrect. The allowed rate of return objective requires an assessment of the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services. In this context, efficient financing costs cannot simply be equated with the current (or prevailing) market cost of capital. Rather, the efficient financing costs of the relevant benchmark efficient entity must be assessed by reference to the efficient financing practice of that entity. When the efficient financing practices of the benchmark efficient entity are considered, it may be that efficient financing costs reflect a mixture of market financing rates prevailing at various points in time.

Moreover, there is no requirement under the NGR for a transition from one methodology to another to be "revenue neutral", relative to continuation of the old methodology. Indeed, if the imposition of such a condition leads to incongruence with Rule 87(8), then it will be contrary to the NGR.

The correct approach to estimating the return on debt is as set out by the Tribunal in its decision in the NSW and ACT matters.[147] This involves consideration of the efficient financing practice of the relevant (unregulated) benchmark efficient entity, and an assessment of the efficient financing costs associated with that practice.

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[146] AER 2016, *Final Decision ActewAGL Distribution Access Arrangement 2016 to 2021, Attachment 3 – Rate of return*, May, pp 3-28

[147] *Applications by Public Interest Advocacy Centre Ltd and Ausgrid Distribution* [2016] ACompT 1

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7.3.5   *APA VTS's estimation of the return on debt*

For the purpose of estimating the return on debt, APA VTS has assumed that the benchmark efficient entity referred to in Rule 87(3) is an unregulated entity which raises debt with a term to maturity of 10 years. Debt raising is staggered so that only a part of the total debt must be refinanced each year, thereby reducing refinancing risk. The efficient financing practice of an unregulated benchmark efficient entity facing a degree of risk similar to that of the VTS service provider is, then, to have a staggered portfolio of rate debt with 10 per cent of its debt refinanced annually.

Since the benchmark efficient entity is unregulated, it may or may not benefit from hedging interest rate risk. In the case of an unregulated entity there is, of course, no regulatory allowance for the return on debt against which the entity might hedge the risk of adverse movements in the interest rates on the debt it has, in fact, raised. Moreover, as Partington and Satchell have noted: "Hedging is a choice, but not necessarily the best choice, so not all firms will choose to fully hedge and possibly some may choose not to hedge at all".[148] In the case of an unregulated entity, whether there are benefits from hedging will depend on the specific circumstances of the entity. The benchmark efficient entity is not, therefore, assumed to hedge, and there are no hedges to be unwound.

Therefore, the efficient financing costs of the benchmark efficient entity are properly estimated using a trailing average approach. Since there are no relevant hedging arrangements to be unwound in this case, the trailing average estimation can be implemented immediately. There is no need for a transition.

APA VTS has, therefore, estimated for the benchmark efficient entity (an entity with a credit rating in the BBB range) an equally weighted average cost of debt for fixed rate debt raised in each of the last 10 years (including the current year). For this, APA VTS has used the yields on the BBB rated debt of non-financial corporations, published by the Reserve Bank of Australia, extrapolated to maturities of 10 years. Consistent with other aspects of its determination of a proposed allowed rate of return, APA VTS has used the

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[148] Graham Partington and Stephen Satchell 2016, *Report to the AER: Discussion of the Allowed Cost of Debt*, 5 May 2016, p 18

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yield on debt in November of each year in estimating the return on debt for that year.

APA VTS's estimate of the return on debt of the benchmark efficient entity, made as a historical trailing average of yields over the last 10 years, is 7.47 per cent. This is an estimate of the return on debt which reflects the efficient financing practice of the benchmark efficient entity as required by the allowed rate of return objective of Rule 87(3).

APA VTS itself did not raise any debt under the previous on-the-day approach to estimating the regulatory allowance for the return on debt and therefore, its financing cost structure can be readily applied to the trailing average approach.

APA VTS is a company within the APA Group of companies. All debt raising and portfolio management, including interest rate and foreign currency hedging, is undertaken by the Group Treasury department. To the extent that financing practices at the APA Group level are relevant, these practices are consistent with what might be expected of an efficient unregulated business, operating in a workably competitive market. As part of its financial risk management, the Treasury department typically issues long-term fixed rate debt and staggers its raising of this debt for the Group. As at 30 June 2016, 86.5 per cent of interest obligations on gross borrowings was either hedged into or issued at fixed interest rates for varying periods extending out to 2035.[149]

Interest rate swaps are used to hedge the risk of rising interest rates. However, only a relatively small proportion of APA Group revenue is affected by regulatory determinations and, in hedging interest rate risk, there is no alignment of hedging arrangements with regulatory allowances: APA Group does not hedge the base rate components in the debt which it has raised with the risk free rates in any of the determinations for entities within the Group which are subject to economic regulation. Thus, APA's practice is consistent with what would be expected of an unregulated benchmark efficient entity.

In the case of APA VTS, then, there is no relevant "impact" that would need to be taken into account in moving to a trailing average method for

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[149] APA Group, *Annual Report For the financial year ended 30 June 2016*, p 30

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estimating the return on debt, and so no adjustment is warranted under Rule 87(11)(d). Rather, the effect of moving to the trailing average method will simply be to better align the allowed rate of return with the efficient financing costs of a benchmark efficient entity facing a degree of risk similar to that faced by APA VTS.

The estimate of the return on debt required by Rule 87 is, in these circumstances, simply the historical trailing average of the costs of debt for the benchmark efficient entity. It is 7.47 per cent.

APA VTS's return on debt calculation is set out in the spreadsheet *Return on debt calculation* which is attachment E.2 to this submission.

7.4   Implementation

Four issues which arise in the implementation of the allowed rate of return are addressed in this section of the submission. They are:

- credit rating;

- data;

- annual updating process; and

- the averaging periods to be used when updating the rate of return.

7.4.1   *Credit rating*

Determination of a rate of return for a benchmark efficient entity with degree of risk similar to that of the service provider in its provision of reference services, in accordance with Rule 87(3), requires a measure of credit risk.

Paragraph 6.3.3 of the Rate of Return Guideline proposes that this measure of credit risk be a credit rating of BBB+ from Standard and Poor's or the equivalent rating from another recognised rating agency. If financial data used to estimate the allowed rate of return do not reflect a credit rating of BBB+, or the equivalent, they are to be those which most closely approximate data for an entity with a BBB+ credit rating.

APA VTS has therefore assumed a credit rating of BBB+ for the benchmark efficient entity. Where financial data to be used in estimating the rate of return are not available for entities with that credit rating, APA VTS has used data for BBB rated entities.

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7.4.2   *Data*

APA VTS has estimated its trailing average return on debt using historical data on Australian Government securities yields and corporate bond spreads published by the Reserve Bank of Australia.[150]

Observed yields on securities with nominated maturities of 7 years and 10 years were interpolated to provide estimates of yields for maturities of exactly 7 years and exactly 10 years, respectively.

Spreads on BBB rated bonds of non-financial corporate issuers with effective tenors of 7 years and 10 years were extrapolated from the actual tenors reported by the Reserve Bank to tenors of exactly 7 years and exactly 10 years, respectively.

Although APA VTS has used a historical trailing average for estimation of the return on debt, it has used interpolation and extrapolation methods which are the same as those used by the AER in its estimation of the return on debt.

For the annual updating of the return on debt (see section 7.4.3 below), APA VTS will estimate the rate return on debt for the current regulatory year in the same way as the AER has proposed estimating that rate of return. That is, APA VTS will estimate the current rate of return as a simple average of current yields for BBB rated bonds obtained from the Reserve Bank's corporate bond spread series, and from the series BVCSAB10 available from the Bloomberg service. These current yields will, themselves, be averages of daily yields over the 20 trading days of the averaging periods nominated by APA VTS.[151]

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[150] Bond yields were from the Reserve Bank's series *Indicative Mid Rates of Australian Government Securities – F16* (current and historical). The corporate debt spreads were from the series *Aggregate Measures of Australian Corporate Bond Spreads and Yields – F3*. Both series were available at http://www.rba.gov.au/statistics/tables/#interest-rates at the time of preparation of this submission.

[151] The Reserve Bank of Australia corporate debt spreads are, of course, currently a monthly series. Daily yield estimates must be obtained by interpolation of the spreads for successive months.

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7.4.3 *Annual updating process*

Rule 87(9)(b) permits the return on debt to be estimated using a method which results in that return, and the allowed rate of return, being different for different regulatory years in an access arrangement period.

APA VTS intends that the estimate of the return on debt be updated annually during the access arrangement period.

APA VTS proposes that the return on debt be estimated, immediately prior to commencement of the access arrangement period, as a historical trailing average of equally weighted annual debt returns, with the terms of the average spanning a period of 10 years. The most recent term in the trailing average would be the debt return estimated using current market data; the oldest term would indicate the return on debt raised 10 years earlier.

In the process of annual updating, the oldest term would be dropped from the average, and a new term, estimated using current year data, would be added. The new average would then become the updated return on debt to be used in the post-tax revenue model for the next and subsequent years of the access arrangement period.

If the return on debt is updated annually, then the total revenue is to be changed through the automatic application of a formula that is specified in the AER's decision on the VTS access arrangement revision proposal.[152]

APA VTS proposes to use the functionality which the AER has now built in to its post-tax revenue model to update the total revenue for the updated return on debt. The updated total revenue will then be used to recalculate the VTS reference tariffs for the next regulatory year of the access arrangement period. This approach has been advanced, in previous AER decisions, as the automatic application of a formula required by Rule 87(12).

The annual updating of the return on debt will effect a variation of the reference tariff for the VTS in each year of the access arrangement period. A full access arrangement must include a mechanism for variation of the reference tariff over the course of the access arrangement period, and APA VTS has incorporated the variation of the reference tariff effected by annual

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[152] NGR, Rule 87(12)

updating of the return on debt into the reference tariff variation mechanism of the VTS access arrangement revisions proposal.

7.4.4 *Averaging period*

If the return on debt is to be updated annually, data must be collected and an estimate made of that return close to the start of each regulatory year of the access arrangement period.

APA VTS proposes an averaging period of 20 trading days for the collection of data relevant to calculating an updated return on debt. A specific averaging period for each regulatory year in the access arrangement period (1 January 2018 to 31 December 2022) is set out in Confidential Attachment E.3 to this submission.

7.5 Value of imputation credits

The total revenue from which a revised reference tariff is to be determined is to include, as one of its building blocks, the estimated cost of corporate income tax (Rule 76).

Rule 87A(1) requires that the cost of corporate income tax be estimated for each year of an access arrangement period using the formula:

$ETC_t = ETI_t \times r_t \times (1 - \gamma)$

where ETC_t is the estimated cost of income tax in year t; ETI_t is an estimate of the taxable income for regulatory year t that would be earned by a benchmark efficient entity as a result of the provision of reference services if such an entity, rather than the service provider, operated the business of the service provider; and r_t is the expected statutory income tax rate in year t.

Rule 87A(1) defines γ (gamma) as "the value of imputation credits".

The Rate of Return Guideline proposes estimation of gamma as the product of two parameters. These two parameters are:

- the distribution rate – the proportion of imputation credits generated that is distributed to investors; and

- the value, per dollar to investors, of imputation credits distributed (the utilisation rate, or theta).

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The Rate of Return Guideline proposes a value of gamma of 0.5, which is the product of an estimate of 0.7 for the distribution rate, and an estimate of theta of 0.7.

APA VTS has adopted an estimate for gamma of 0.25 for the VTS access arrangements revisions proposal.

7.5.1 *Estimation of gamma in the AER's recent decisions*

In its recent regulatory decisions, the AER has advised that there is a widely accepted approach to estimating the distribution rate.[153] However, as outlined below, there is no single accepted approach to estimating theta (the utilisation rate).

AER estimation of the distribution rate

The widely accepted approach to estimating the distribution rate uses statistics published by the Australian Taxation Office. The estimate made, and which continues to be made, using those statistics is 0.7. That estimate of the distribution rate has previously been regarded as an estimate arrived at on a reasonable basis, and as representing the best estimate possible in the circumstances. It was the estimate proposed in the Rate of Return Guideline.

Since the Rate of Return Guideline was made and published, the AER has re-examined estimation of the distribution rate. In a number of decisions, the AER has made reference to the views of:

- Associate Professor John Handley, that the estimate of the distribution rate should be made using only the credits generated and distributed by listed entities, resulting in a higher estimate of the distribution rate of 0.8; and

- Dr Martin Lally, who considers that the best estimate of the distribution rate is 0.83, calculated using data for the 20 largest ASX-listed companies.[154]

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[153] See, for example, Australian Energy Regulator, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 4 – Value of imputation credits*, p 4-23

[154] Australian Energy Regulator 2016, *Draft Decision Powerlink transmission determination 2017-22*, Attachment 4, September, p 4-23

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The AER has advised that, when estimating both the distribution rate and the value of distributed imputation credits, consideration must be given to whether the data used should be for all companies and their investors ("all equity"), or only for listed companies and their investors ("only listed equity"). When the distribution rate was estimated on an only listed equity basis, the result was an estimate of 0.75.[155]

AER estimation of theta

The evidence relevant to the estimation of theta (the utilisation rate), the AER advises, includes:

- the proportion of Australian equity held by domestic investors ("equity ownership approach");

- the reported value of credits utilised by investors in Australian Taxation Office (ATO) statistics ("tax statistics"); and

- studies that seek to infer from market prices the value to investors of distributed imputation credits ("implied market value studies").[156]

Each approach is briefly described.

Equity ownership approach

The AER assumes that the utilisation rate for eligible investors – the value, per dollar, of imputation credits distributed to those investors, is 1; the utilisation rate for investors who are ineligible to use the credits is 0. The AER therefore contends that the value-weighted proportion of domestic investors in the Australian equity market is a reasonable estimate of the theta.

This approach to estimation of theta – the equity ownership approach – seems to be the approach on which the AER places most reliance.[157] It has led to a range of 0.38 to 0.55 for the estimate of theta.[158]

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[155] AER 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 4 – Value of imputation credits*, pp 4-31 – 4-33

[156] AER 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 4 – Value of imputation credits*, p 4-24

[157] AER 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 4 – Value of imputation credits*, p 4-28

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Tax statistics

The AER advises that it has had regard to the evidence from tax statistics when considering estimates of theta. Those statistics have indicated an estimate of 0.48.[159] However, the AER has concerns about limitations in the statistics themselves. The AER, therefore, places a degree of reliance on estimation of theta using tax statistics that is less than that placed upon the equity ownership approach.[160]

Implied market value studies

Implied market value studies estimate the value of distributed imputation credits from market prices. Dividend drop off studies are a common type of implied market value study. In dividend drop off studies, the prices of securities with entitlements to dividends are compared with the prices without the dividend entitlements. Econometric techniques are then used to infer the value of the imputation credits attached to the dividends.[161]

These studies, the AER concludes, produce a wide range of estimates for theta – between 0 and 1.[162]

Implied market value studies and, in particular, dividend drop off studies, are the AER contends, subject to limitations arising from the data used, from the econometric techniques employed, and from the need to interpret the results (since only the value of the combined package of dividends and imputation credits can be observed).

The AER is therefore of the view that little reliance can be placed on the results of implied market value studies. The equity ownership approach and

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[158] Australian Energy Regulator 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 4 – Value of imputation credits*, September, Table 4-4

[159] AER 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 4 – Value of imputation credits*, Table 4-3

[160] AER 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 4 – Value of imputation credits*, p 4-37

[161] AER 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 4 – Value of imputation credits*, p 4-39

[162] AER 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 4 – Value of imputation credits*, Table 4-4

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tax statistics provide more direct and simpler evidence; they, and not implied market value studies, should inform estimation of theta.[163]

AER estimation of gamma

A reasonable estimate of the range for gamma, the AER contends in its most recent decisions, is 0.3 to 0.5. [164] From within this range, the AER has chosen an estimate of 0.4, observing that:

- its preferred equity ownership approach to estimation of the utilisation rate indicates a value of gamma between 0.28 and 0.47 when gamma is calculated using matched distribution and utilisation rates for all equity and for only listed equity, respectively;

- tax statistics, on which less reliance is placed, suggest a value of around 0.34 based on a utilisation rate of 0.48 and an economy wide distribution rate of 0.7;

- the evidence from implied market value studies, evidence on which even less reliance is placed, suggests an estimate of gamma between 0 and 0.75, with the results of SFG's dividend drop off study suggesting a value in the range 0.26 to 0.30, which is at the bottom end of the equity ownership approach range of 0.28 to 0.47. [165]

The AER has not reflected the outcome of the February 2016 Australian Competition Tribunal decision (discussed below) in its most recent decision, noting that It considers that the Tribunal erred in reaching its conclusion and that the regulator has sought review of the Tribunals decision in the Federal Court.[166]

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[163] AER 2016, *Draft Decision Powerlink transmission determination 2017-18 to 2021-22, Attachment 4 – Value of imputation credits*, September, pp 4-39

[164] AER 2016, *Draft Decision Powerlink transmission determination 2017-22*, Attachment 4, September, p 4-28

[165] AER 2016, *Draft Decision Powerlink transmission determination 2017-22*, Attachment 4, September, pp 4-28 – 4-31

[166] AER 2016, *Draft Decision Powerlink transmission determination 2017-22*, Attachment 4, September, pp 4-28 – 4-31

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7.5.2 *Tribunal reviews of the AER's approach to estimation of gamma*

The Tribunal has reviewed the estimation of gamma on three occasions in the past year. In each case, the Tribunal examined applications in which service providers contended that an estimate of 0.4 involved error, and that an estimate of gamma 0.25 was to be preferred in accordance with the requirements of the NGR.

In October 2016, in a decision on an application from SA Power Networks, the Tribunal examined arguments advanced by the AER that, in the academic literature, there were different theoretical perspectives on the way in which imputation credits might impact on share prices. In broad terms, one perspective saw the average value of imputation credits as affecting share prices. The other perspective saw share prices as being affected by the value of the credits to the marginal investor. The AER, the Tribunal found, did not err in choosing to adopt an average value perspective, and using methods to estimate gamma (in particular, using the equity ownership approach to estimate theta) which were appropriate to the perspective it had adopted.

In respect of Networks NSW, ActewAGL and Jemena, the AER approached the estimation of gamma in the way outlined in section 7.5.1 above (although with some slightly different values for the component estimates of the distribution rate and theta). In responding to the service providers' applications for merits reviews of the AER's decisions, the Tribunal required (in its decisions handed down on 26 February 2016), that the AER's decisions on the value of imputation credits be set aside.

The Tribunal found:

- in the absence of sufficient explanation for an alternative measure of the distribution rate (a measure using data from only listed equity), it is appropriate to follow past practice (estimation of the distribution rate from data for all equity);[167]

- the equity ownership approach overstates the redemption of distributed imputation credits by eligible investors; it may be useful only as providing

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[167] *Applications by Public Interest Advocacy Centre Ltd and Ausgrid Distribution* [2016] ACompT 1, February 2016, [1106]

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an upper bound which, like the upper bound suggested by tax statistics, can provide a check on other estimates;[168]

- the equity ownership and tax statistics approaches make no attempt to assess the value of imputation credits to shareholders, and ignore the likely existence of factors, such as the 45 day rule, which, across all eligible shareholders, reduce the value of imputation credits to those shareholders below the face value assumed by the AER; the equity ownership and tax statistics approaches are inconsistent with a proper interpretation of the Officer framework underlying clause 6.5.3 of the National Electricity Rules, which is equivalent to Rule 87A of the NGR;[169]

- the equity ownership and tax statistics approaches can only provide upper bounds for an estimate of theta; estimation of theta must, therefore, rely on market studies which best capture the considerations that investors make in determining the worth of imputation credits to them; and[170]

- the best estimate of theta, from an updated SFG study before the Tribunal, was 0.35.[171]

The Tribunal remitted the decisions to the AER, directing the regulator to remake them using an estimated cost of corporate income tax calculated from an estimate of gamma of 0.25.

In March 2016, following these decisions in respect of the New South Wales network service providers, the AER raised the issue of gamma in its application to the Federal Court for broad ranging judicial review of whether the grounds of review were properly established by the service providers, and whether these were had been correctly applied by the Tribunal.

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[168] *Applications by Public Interest Advocacy Centre Ltd and Ausgrid Distribution* [2016] ACompT 1, February 2016, [1093]

[169] *Applications by Public Interest Advocacy Centre Ltd and Ausgrid Distribution* [2016] ACompT 1, February 2016, [1095]; the Tribunal does not refer to Rule 87A but to the equivalent rule 6.5.3 in the National Electricity Rules.

[170] *Applications by Public Interest Advocacy Centre Ltd and Ausgrid Distribution* [2016] ACompT 1, February 2016, [1096]

[171] *Applications by Public Interest Advocacy Centre Ltd and Ausgrid Distribution* [2016] ACompT 1, February 2016, [1103], [1113]

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APA VTS understands that the Federal Court is expected to make a decision in April 2017 (prior to the AER's draft decision on proposed revisions to the VTS access arrangement).

Subsequent to the Tribunal's decisions in respect of the New South Wales service providers, and the AER's application for review to the Federal Court, the estimation of gamma was raised in an application by ATCO Gas Australia Pty Ltd seeking merits review of a decision by the ERA to set gamma at 0.4. The Tribunal's reasoning for its determination, in this case, that gamma should be 0.25, was as follows:

> *684.   The ERA considered the Tribunal's reasons for decision in PIAC and Ausgrid.*
>
> *685.   The ERA accepted that it would undermine the effectiveness of the regulatory regime and would be against the public interest in consistency of decision-making for it to re-argue matters that have recently been considered and decided by the Tribunal in that matter, notwithstanding that aspects of the PIAC and Ausgrid decision relating to the value of imputation credits are currently the subject of an application for judicial review before the Federal Court.*
>
> *686.   For the purpose of this application, and applying the reasons of the Tribunal in PIAC and Ausgrid, the ERA accepted that:*
>
> *(1)   the ERA has made a reviewable error in its decision to apply a gamma of 0.4 in its rate of return determination in the Amended Final Decision; and*
>
> *(2)   the best estimate of gamma on the basis of the material before the ERA at the time of its Amended Final Decision was 0.25.*
>
> *687.   The Tribunal accepts, on the basis of the material before it, that a gamma value of 0.25 should be adopted and that the ERA erred in adopting the alternative figure of 0.4.*[172]

7.5.3   *APA VTS's estimation of gamma*

APA VTS has estimated gamma as the product of the distribution rate and theta.

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172 Application by ATCO Gas Australia Pty Ltd [2016] ACompT 10

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For the distribution rate, APA VTS has used an estimate of 0.7, which has been made from Australian Taxation Office data for all equity, and which has previously been regarded as an estimate arrived at on a reasonable basis, and as representing the best estimate possible in the circumstances. It was the estimate proposed in the Rate of Return Guideline.

For theta, APA VTS has used the estimate of 0.35 from the updated SFG study which was before the initial Tribunal in February 2016.

APA VTS has, therefore, used an estimate of 0.25 (= 0.7 x 0.35) for gamma in the proposed revisions to the VTS Access Arrangement.

APA VTS is of the view that, at the present time, this is best possible estimate of gamma.

In successive decisions since *Energex* in 2011, the Tribunal has determined that gamma should be 0.25. Only in October 2016, has the Tribunal supported a different result.

In using an estimate of 0.25, APA VTS recognises that a Federal Court decision pertaining to gamma is still pending. However, even then, the matter will be open further scrutiny. The academic literature which is the source of the two perspectives discerned by the Tribunal is confined to a small number of papers which warrant more consideration than has currently been given to them.

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8   Operating expenditure

This chapter sets out operating expenditure undertaken in the current access arrangement period and forecast operating expenditure for the forecast access arrangement period, and provides explanations for actual and forecast operating expenditure by reference to the Rules.

The strongest indicator that the incentives are effective is that VTS operating expenditure has remained flat over the current access arrangement period despite operating some of the oldest pipelines in Australia.

8.1   Operating expenditure categories

As defined under Rule 69, operating expenditure for the purposes of price and revenue regulation under the Rules means:

> … *operating, maintenance and other costs and expenditure of a non-capital nature incurred in providing pipeline services and includes expenditure incurred in increasing long-term demand for pipeline services and otherwise developing the market for pipeline services.*

For the purposes of the access arrangement revision proposal APA VTS has one classification for its operating expenditure - operating and maintenance expenditure. Operating and maintenance expenditure includes all operating expenditure with the exception of allowances such as benefit sharing allowance, reset costs and debt raising costs. As such, it encompasses all local APA VTS operating costs and APA Group corporate cost allocation to APA VTS.

8.2   Operating expenditure over the earlier access arrangement period

The operating expenditure approved by the AER in the current access arrangement period is shown in Table 8-1 below.

Table 8-1 also sets out actual and forecast operating expenditure incurred over the current access arrangement period, and compares incurred expenditure to that approved by the AER in its Final Decision.

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Table 8-1 – Comparison of AER Final Decision and actual and estimated operating expenditure for the current access arrangement period ($m nominal)

$m nominal	2013*	2014	2015	2016(e)	2017(f)	Total
AER Forecast	15.1	30.3	32.1	33.7	33.9	**145.1**
Actuals	12.8	26.6	27.2	26.8	28.4	**121.9**
Difference	2.3	3.7	4.9	6.9	5.6	**23.2**

* 2013 is a half year expenditure to match the access arrangement period.

APA VTS's total actual and estimated operating expenditure over the current access arrangement period was $121.6 million. This is below the amount approved by the AER for the current access arrangement period.

Figure 8-1 compares the operating expenditure incurred with the comparable forecast from the AER.

Figure 8-1 – Actual Operating Expenditure compared to AER forecast (nominal $m)
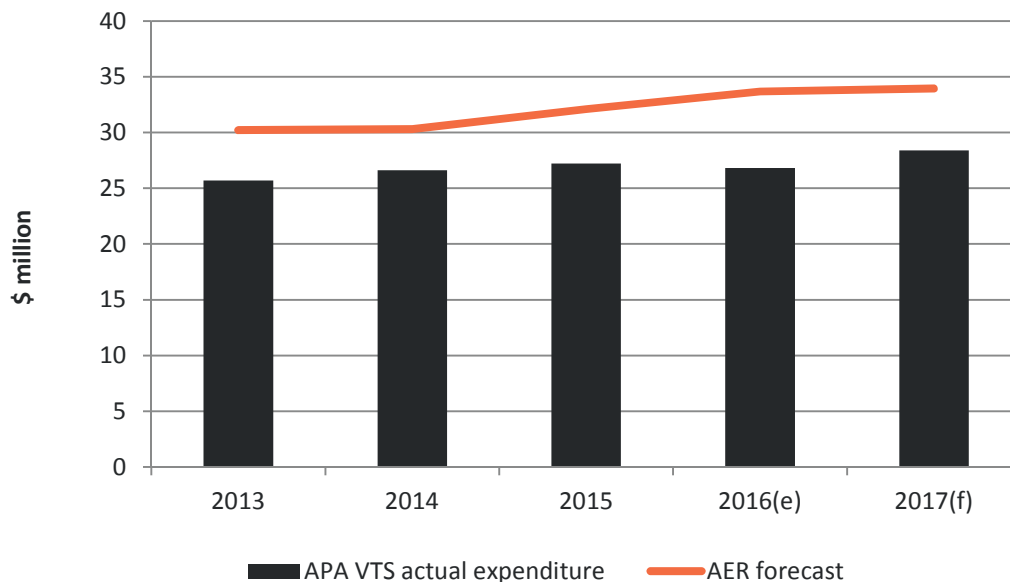
* Full year 2013 figures are included here to assist comparison across years.

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The total operating expenditure for APA VTS has remained very stable across the current access arrangement period. This stability is demonstrated by Figure 8-2 which plots the annual operating expenditure in real dollars.

Figure 8-2 – Total operating expenditure in real dollars (real 2017 $m)
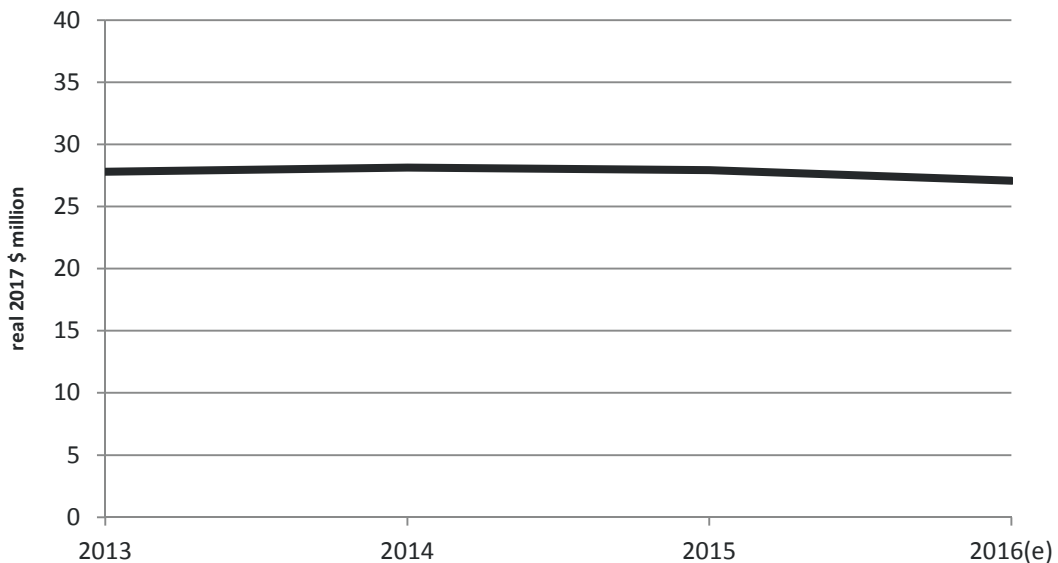
While there has been some increase in the underlying operations and maintenance expenditure there have been offsets from smaller allocations of corporate overheads to the VTS and reduced insurance costs.

8.2.1   *Insurance costs*

APA VTS's insurance costs have fallen over the current access arrangement period, as shown Table 8-2. This is due to fall in the cost of insurance policies for both property and liability. This fall in insurance costs is a result of APA's positive claims history (that is, a low number and cost of claims) due to appropriate and effective management of both APA's assets and insurance policies. APA allocates insurance costs directly to assets based on individual premium allocation rating factors (asset values + revenue for property, revenue for liability).

Table 8-2 – Insurance operating expenditure for VTS (nominal $000)

$000 nominal	2013	2014	2015	2016(e)
Insurance	1,312	894	876	655

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8.2.2   *Corporate overheads*

As noted in section 8.2.3, APA's corporate cost allocation methodology is based on the revenue from its individual assets. As APA's business has grown the proportion of the corporate overheads being allocated to the VTS has shrunk.

As Table 8-3 and Figure 8-4 demonstrate the operating expenditure for corporate overheads has fallen for APA VTS.

Table 8-3 – Corporate operating expenditure allocated to VTS (nominal $m)

$m nominal	2013	2014	2015	2016(e)
Corporate Operating Expenditure	8.1	8.9	7.5	6.4

Figure 8-3 – APA's 2016 corporate overheads allocated to VTS ($m nominal)
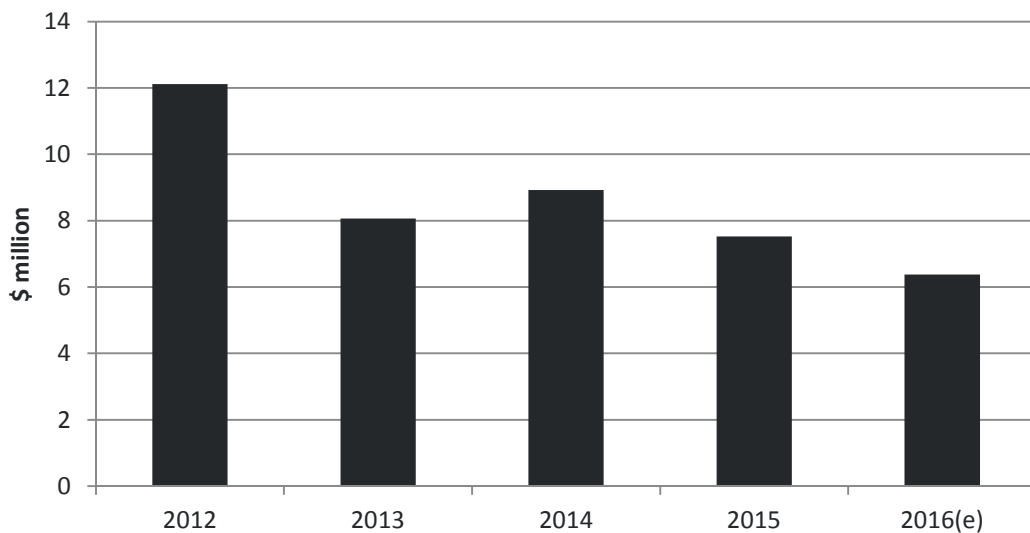
8.2.3   *Corporate overhead allocation methodology*

The APA corporate overhead allocation process starts with the audited corporate overheads as reported in APA's financial accounts. APA allocates corporate overheads to individual pipelines, networks or businesses (assets) using a two stage process:

1. APA allocates those corporate overheads that can be attributed to an asset or class of assets directly to those assets.

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2. Corporate overheads not allocated under step 1 (residual corporate overheads) are allocated to assets APA manages that were not included in step 1. This uses revenue as a cost allocator.

These steps are outlined in more detail below.

Step 1

APA has identified corporate overheads that it can directly allocate to certain assets as a result of the nature of corporate overhead cost and the type of the asset.

The structure of APA corporate means that certain costs incurred at the corporate level are only applicable to certain types of assets. So APA separately allocates:

• Commercial Development costs to non- regulated assets

• Corporate transmission costs to transmission pipelines

• Corporate network costs to network assets

• Corporate power generation costs to power generation assets.

APA has direct charges for overhead costs to Allgas Networks, and Australian Gas Networks. These represent the provision of corporate services directly under these management contracts.

APA owns but does not operate the Wallumbilla Gladstone Pipeline (WGP). Recognising this, APA allocates costs representing treasury costs and accounting related treasury costs and an amount for related costs of these services to the WGP.

Figure 8-4 reconciles the residual corporate costs for allocation with the total corporate costs. This reflects the corporate costs as reported by APA in its audited statutory financial accounts.

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Figure 8-4 – APA's 2016 forecast corporate overheads from financial accounts (nominal $m)
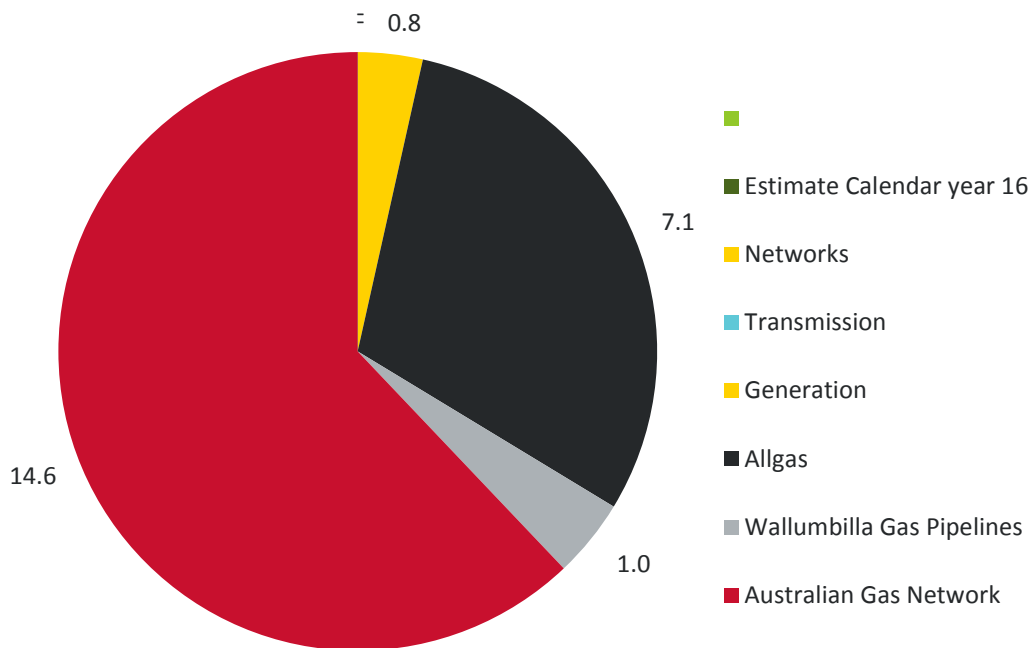
Step 2

APA has ownership stakes in a number of assets that APA does not manage. This is because APA has either:

- A minority shareholding in which the entity provides a return to APA; or

- A majority shareholding but the operations and management are entirely contracted out to an unrelated third party.

These passive investments do not require day to day management by corporate level APA employees. Reflecting this APA excludes these entities from its allocation of residual corporate overheads to individual assets.

As noted in step 1, APA has some specific corporate overhead allocation to specific assets. For this reason APA excludes those assets from the allocation of residual corporate overheads. This does not include those assets where specific costs have been identified as belonging to that class of assets, in

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particular transmission assets are not excluded as a class from the residual corporate overhead allocation.

APA then allocates residual corporate overheads to all remaining assets based on revenue. VTS's revenue is 10.7 per cent of remaining assets total revenue.

APA then takes the transmission corporate costs and allocates them to transmission pipelines based on revenue. In 2016 VTS's revenue is 12.9 per cent of transmission only revenue.

Recognising that this entity also comprises assets not included in providing the reference service, the corporate overheads are then allocated to the VTS reference service based on asset value.

Provisionally in 2016 this resulted in $6.4 million (nominal) in APA corporate overheads being allocated to the VTS reference service.

8.3 Forecast operating expenditure

This section describes the approach that APA VTS took to forecasting operating expenditure.

8.3.1 *Rules for operating expenditure*

Rule 91 specifies that operating 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 operation.*

The AER's discretion under this Rule is limited such that the AER must not withhold its approval of proposed operating expenditure if it is satisfied that the proposal complies with the requirements of the law and is consistent with Rule 91. All forecasts and estimates must also comply with Rule 74.

APA VTS has forecast its operating expenditure to ensure ongoing compliance with its regulatory obligations, in line with the planning and asset management processes and procedures set out in chapter 4. There are no contingency allowances included in the operating expenditure forecast. APA VTS notes that there is a material risk that some estimates will be too low owing to uncertainties in forecasting costs accurately, particularly in the later years of the access arrangement period.

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APA VTS considers that its forecast operating expenditure is consistent with Rule 91 as being prudent and efficient expenditure. APA VTS further considers that its forecast has been arrived at on a reasonable basis and is the best possible in the circumstances, in accordance with Rule 74.

8.4 Forecast methodology

APA VTS has forecast its operating expenditure using a base year approach. The methodology to derive this forecast involves:

- identification of an efficient base year and base year costs; and

- Adjustment for step and scope changes including the removal from the base year of costs that are not indicative of future requirements and adding costs for new expenditures in future years not experienced in the past or embedded in the base year costs.

APA VTS considers that the base year approach is appropriate for APA VTS as it has displayed a stable profile of operating expenditure over recent years, and expects to maintain this profile into the foreseeable future.

Therefore, APA VTS believes that the base year approach will yield the best forecast or estimate possible in the circumstances, as it reflects the actual operating costs of the business.

8.4.1 2016 base year

APA VTS has used its estimated expenditure in 2016 as its base year for determining forecast operating expenditure over the access arrangement period. APA VTS considers that this year is appropriate for this purpose as:

- It will be the most recent completed regulatory year for expenditure and is therefore the most indicative of the current operating expenditure of the business; and

- It is in line with operating expenditure in previous years of the period.

APA VTS is a wholly owned APA Group entity, and there are no operating or management contracts in place impacting forecast operating expenditure. For the avoidance of doubt, there are no related party margins included in historic or forecast expenditure impacting the base year or the operating expenditure forecast.

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APA VTS faces continuous incentives to reduce its operating costs year-on-year.

8.4.2   *Separate forecast items removed from 2016 base year*

The resulting base year operating expenditure costs used for the purposes of forecasting operating expenditure is $25 million (real $2017). This value is compared to actual expenditure in the operating and maintenance category in the other years of the earlier access arrangement period as set out in Figure 8-5 below.

Figure 8-5 – Adjusted base year 2016 operating expenditure compared to other years in the earlier access arrangement period (real 2017 $m)
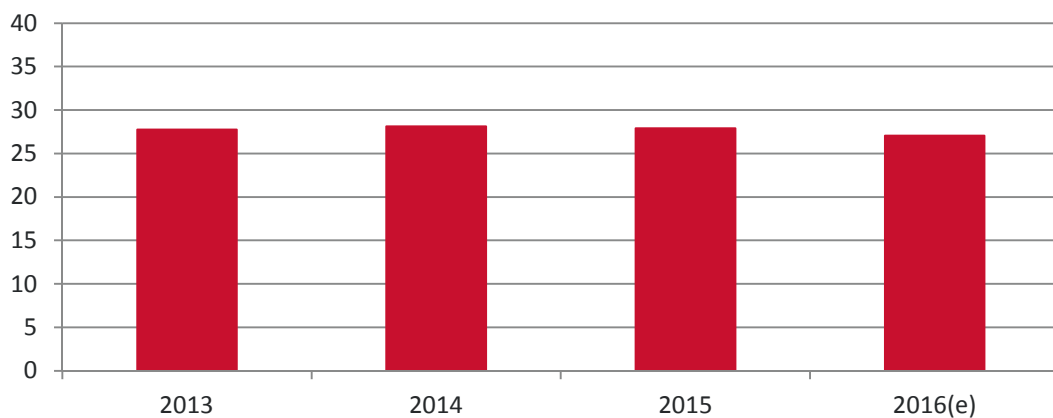
As Figure 8-5 demonstrates APA VTS's operating expenditure has been flat over the current access arrangement period and that 2016 is in line with the previous years' levels of expenditure (if not slightly lower). This is despite an ageing asset base which would be expected to drive higher maintenance costs. The driver of these results is efficiency gains such as the review of maintenance regimes enabled by Maximo that has enabled a more refined focus on reliability centred maintenance practices.

APA VTS is therefore proposing that in real terms the trend for forecast operating expenditure is flat (a zero year on year growth rate) for the forecast access arrangement period.

8.4.3   *Real cost escalation*

For the removal of doubt APA VTS is not proposing any real cost escalation.

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8.4.4 *Separate forecast items removed from 2016 base year*

APA VTS has undertaken a separate forecast of passive linepack and spare pipes, valves and fittings (see section 8.6.3). These are treated as allowances, and added after the derivation of total controllable operating expenditure. This approach is unchanged from the forecasting approach for these elements in the current period.

To avoid double counting items separately forecast, the operating expenditure for these items is removed from the 2016 base year. This means the starting base year operating expenditure prior to step changes, scope changes and separate forecasts is $22.9 million (real $2017).

8.4.5 *Step and scope changes*

APA VTS has included a step change for the lease on Docklands office space as set out in the following section.

APA VTS also proposes a number of scope changes associated with expansions to the VTS that are not reflected in the base year.

Southbank Lease and Dandenong Redevelopment

In December 2016 and early 2017 APA relocated some personnel from its city and Dandenong offices to a site in Southbank.

This expenditure represents a step change as it is not included in the estimated operating expenditure for 2016. The expenditure on the lease is consistent with National Gas Rule 91(1) as it represents expenditure that would be incurred by a prudent service provider acting efficiently to achieve the lowest sustainable cost of delivering pipeline services.

This is part of the Dandenong relocation and redevelopment. More details of why the project is warranted is set out in section 5.2.3.

As the lease cost represents part of a project to provide office space for VTS personnel in the most efficient manner possible, and recognising that not all staff at the location provides services to the regulated parts of the VTS, APA VTS has only allocated some of the cost of the lease to the VTS. This cost has been allocated on the same basis as other corporate overheads (see section 8.2.3).

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It is appropriate this expenditure be recovered through tariffs. Otherwise it will be inconsistent with the revenue and pricing principles of the National Gas Law section 24 which requires:

A service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs in—

(a) providing reference services;

Table 8-4 – Southbank lease operating (real 2017 $000)

$m real 2017	2018	2019	2020	2021	2022	Total
Southbank lease	158	158	158	158	158	792

Operating expenditure associated with forecast augmentation capital expenditure

There is some additional operating expenditure that is not reflected in the base year that will result from augmentation capital expenditure projects. This operating expenditure is discussed in more detail below.

Warragul expansion

This project involves looping 4.8 km of pipeline. It is estimated that this will result in additional operating expenditure of $20 thousand per annum. This is because it involves undertaking more of the following activities:

- Easement maintenance

- Third part inspectors

- Right of way erosion correction

- Dial before you dig support

- Aerial patrols

SWP to Anglesea Pipeline

This project involves an extension of 20.2 km of 250 mm pipeline Class 600 transmission pipeline from APA VTS's SWP to Anglesea, operating at MAOP 10200 kPa for the installation of a second City Gate to the Geelong distribution network. The additional activities are similar to those identified with the Warragul looping but the expenditure is higher because the pipeline

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path means a greater volume of activities. The forecast operating cost associated with this project is $90 thousand per annum.

Victorian Northern Interconnect Expansion

The Victorian Northern Interconnect expansion is expected to be completed in 2017. Following its completion there is expected to be an increase in operating expenditure resulting from maintaining the project's asset. This additional expenditure is forecast at $0.3m per annum from 2018 onwards. This involves the ongoing maintenance of the pipeline, compressor and easement.

Western Outer Ring Main easement

This would involve procurement of an easement in advance of the construction of the western outer ring main. There would be a small amount of additional operating expenditure associated with maintenance and protection of the easement land of $25 thousand.

Table 8-5 below sets out the forecast operating expenditure associated with these projects.

Table 8-5 – Operating expenditure associated with forecast capital expenditure (real 2017 $000)

$000 real 2017	2018	2019	2020	2021	2022	Total
Warragul	-	-	-	21	21	**41**
Anglesea	-	90	90	90	90	**358**
VNIE	276	276	276	276	276	**1,381**
WORM Easement	-	-	-	25	25	**51**
Total	**276**	**366**	**366**	**412**	**412**	**1,831**

Access Arrangement Costs

Consistent with its approach in the current access arrangement APA VTS has forecast its access arrangement costs. The forecast is based on the historic costs associated with the preparation and submission of the access arrangement.

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Table 8-6 – Operating expenditure for access arrangement (real 2017 $000)

$000 real 2017	2018	2019	2020	2021	2022	Total
Access arrangement	-	-	-	787	978	1,766

8.5   Total controllable operating expenditure

Total controllable operating expenditure by category (excluding debt raising costs, EBSS additions/deductions, other allowances) over the access arrangement period is set out in Table 8-7 below.

Table 8-7 – Total controllable operating expenditure forecast (excluding debt raising costs and other allowances) (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Operating Expenditure	25.5	25.7	25.8	26.7	27.0	**130.8**

8.6   Allowances to be included in total operating expenditure

8.6.1   *Debt raising costs*

Debt raising costs are transaction costs – such as legal fees, underwriting fees or credit rating fees – incurred by the business to hold, raise or refinance debt. Debt raising costs can either be incorporated in the regulatory framework in calculating the appropriate cost of capital, or can be included in the allowance made for operating costs. APA VTS has included debt raising costs in its operating expenditure projection, in line with the AER's approach. APA VTS has not made any allowance for debt raising costs in deriving the WACC to be applied to the VTS for the access arrangement period.

In calculating debt raising costs, APA VTS has applied the same method and estimates as used by the AER. Debt raising costs have been calculated by the financial model accompanying this submission at Attachment B.2.

8.6.2   *Incentive mechanisms*

APA VTS's current access arrangement includes an Efficiency Benefit Sharing Scheme (EBSS) with a methodology for calculating the efficiency benefit sharing allowance to apply in the forecast period.

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APA VTS has retained this mechanism in the forecast period.

The EBSS applies to operating expenditure and allows APA VTS to retain the benefit (or penalties) for outperformance of its operating expenditure forecasts for a five year period. The calculation of the efficiency benefit for each year is cumulative, that is, benefits in a year accrue only to the extent that the savings in that year are greater than those already identified in prior years. This means that, especially in later years of an access arrangement period, a saving from the originally approved operating and maintenance forecast can still generate a negative efficiency benefit.

APA VTS considers that this incentive scheme is appropriate as it means that it has the same incentive to pursue efficiency yielding strategies, investments or practices in each year of the access arrangement period. This continuous incentive means that the access arrangement period timing has no bearing on the calculation of whether an efficiency improving strategy or investment should be pursued.

APA VTS also notes that the AER states that the operation of the scheme means that it can have more confidence in the base year used for forecasting operating expenditure.[173]

APA VTS maintains that it faces strong incentives to pursue continuous efficiency improvements across its business, regardless of the operation of any incentive sharing scheme. This is because APA VTS is part of a listed business that owns and operates a wide variety of both regulated and unregulated assets. Because of this, APA Group has strong incentives to continually reduce its costs across its entire business. APA VTS benefits from these group-wide commercial incentives for continuous improvement in its operating systems and processes, as well as in its allocation of corporate costs.

The EBSS included at section 8.2 of the earlier access arrangement referred to Table 11.1 of the approved access arrangement information. This table sets out APA VTS's controllable operating expenditure. Importantly, it did not include allowances that are added to the operating expenditure total such as:

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[173] Australian Energy Regulator 2012, *Access Arrangement draft decision: APA GasNet Australian (Operations) Pty Ltd 2013-2017 Part 2 Attachments*, September, pp 231-2

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- Debt raising costs; and

- Allowances for passive linepack and spare fittings inventories.

These costs, however, are part of APA VTS's outturn operating expenditure.

APA VTS has excluded incurred costs in these categories from its outturn expenditure in calculating efficiency benefit increments to apply in the forecast periods. APA VTS notes that this is consistent with the requirement in section 8.2(g)(i) of the access arrangement that actual expenditure be calculated on the same cost categories and methodology as the forecast expenditure.

Applying the formula set out in section 8 of the access arrangement, APA VTS has calculated EBSS carry over amounts as set out in Table 8-8 below.

Table 8-8 – Efficiency carry over (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022
Efficiency carry-over	8.4	4.6	3.5	2.1	-

8.6.3 *Other allowances*

APA VTS maintains two types of inventories related to the VTS. These are passive linepack and spare pipes, valves and fittings required for maintenance and emergency use.

APA VTS is responsible for the provision of the original gas inventory in its pipeline system. This gas is purchased from the Victorian wholesale gas market whenever a new pipeline is commissioned. A base volume of gas is required in the pipeline system to enable the system to operate. This gas remains the property of APA VTS.

The provision of this passive linepack gas is part of the investment in a new pipeline but it is not a depreciable asset and is, theoretically, recoverable (at least in part) when a pipeline is eventually decommissioned.

This linepack is calculated and valued at the price of gas in the Victorian wholesale gas market when it is purchased. It is then valued, in line with previous practice, at that original purchase price as escalated at CPI.

APA VTS maintains sets of pipe sections, valves and fittings for use in maintenance and emergency situations. This is required as, even where items

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may be standard, the time for procurement and delivery is often too long to allow this to be the norm especially in an emergency situation. These inventories need to cover all of the various sizes and types found in APA VTS's pipeline system.

Due to the large number of individual items within this inventory, APA VTS does not have a detailed valuation, however, the total value of the inventory amounts to approximately 0.23 per cent of the VTS regulatory asset base. These items are not depreciated until installed.

As both of these inventories represent an investment by APA VTS in the pipeline system a return on these assets is included in the allowed revenue. APA VTS proposes to retain the methodology used in preceding access arrangement periods to calculate this allowance. There is no depreciation allowance for inventories.

8.7   Total operating expenditure including allowances

Table 8-9 below is a summary table showing total operating costs, including controllable operating costs described above, as well as all allowances.

Table 8-9 – Total operating expenditure including allowances (real 2017 $m)

$m real 2017	2018	2019	2020	2021	2022	Total
Controllable operating expenditure	25.5	25.7	25.8	26.7	27.0	**129.9**
Debt raising costs	0.1	0.1	0.1	0.1	0.1	**0.3**
EBSS adjustments	8.4	4.6	3.5	2.1	-	**18.6**
Other allowances	2.4	2.4	2.5	2.6	2.6	**12.4**
Total	36.3	32.9	31.9	31.4	29.6	**162.2**

Figure 8-6 below compares forecast operating expenditure with the same categories of expenditure in the current period.

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Figure 8-6 – Total operating expenditure historic and forecast (real 2017 $m)
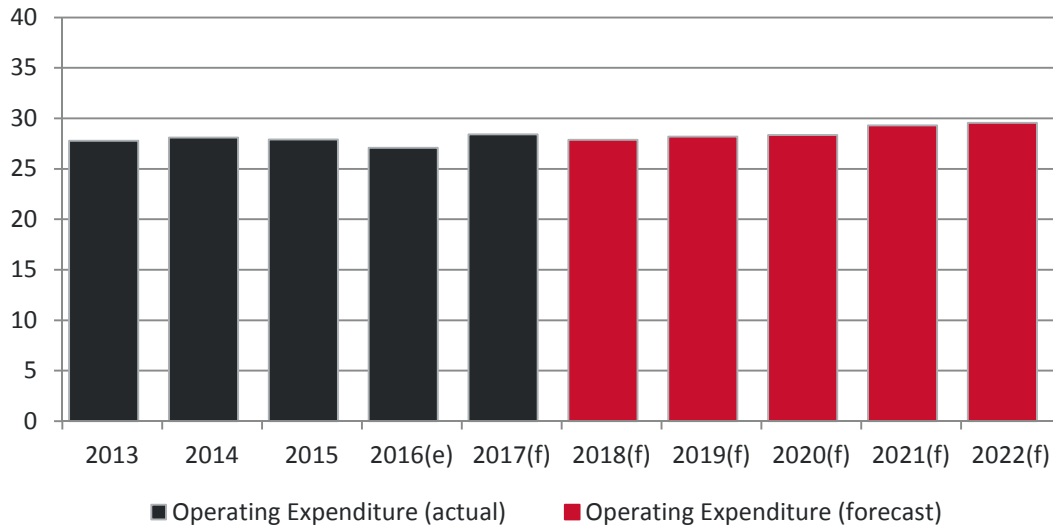
As can be seen from the graph, total operating expenditure over the forecast period is in line with that in the earlier period. This reflects the largely recurring nature of operating expenditure.

APA VTS considers that its forecast operating expenditure for the access arrangement period satisfies the requirements under Rule 91 that it be expenditure that 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.

Forecasts have been arrived at on a reasonable basis, using the best available information applying to the business and the pipeline.

8.8   Material contracts

Attachment D.3 (confidential) provides the details of all material contracts for outsourced services above $1million.

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9   Total revenue

Rule 76 requires the total revenue to be derived according to a building block approach:

76   Total revenue

Total revenue is to be determined for each regulatory year of the access arrangement period using the building block approach in which the building blocks are:

a.   a return on the projected capital base for the year (See Divisions 4 and 5);

and

b.   depreciation on the projected capital base for the year (See Division 6);

and

c.   if applicable – the estimated cost of corporate income tax for the year;

and

d.   increments or decrements for the year resulting from the operation of an incentive mechanism to encourage gains in efficiency (See Division 9);

and

e.   a forecast of operating expenditure for the year (See Division 7).

The considerations relevant to each of the building blocks are discussed in the relevant sections above. This section summarises those building blocks to present the total revenue requirement.

9.1   Return on capital

The return on the projected capital base is calculated as the regulatory asset base multiplied by the weighted average cost of capital, as shown in Table 9-1 below.

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Table 9-1 – Return on capital (nominal $m)

$m nominal	2018	2019	2020	2021	2022
Regulated asset base	1007.3	1059.1	1082.6	1088.2	1085.4
WACC	7.88%	7.88%	7.88%	7.88%	7.88%
Return on Capital	79.4	83.5	85.3	85.8	85.5

9.2 Return of capital

The forecast straight line depreciation over the access arrangement period is discussed in section 6.2.5. To calculate the amount of regulatory depreciation applicable to the revenue requirement, the amount of indexation of the capital base must be subtracted from the straight line depreciation. The indexation of the capital base is discussed in section 6.2.6.

Together, these two amounts combine to derive the forecast regulatory depreciation as shown in Table 9-2.

Table 9-2 – Forecast depreciation over the access arrangement period (nominal $m)

$m nominal	2018	2019	2020	2021	2022
Straight line depreciation	37.7	41.3	44.6	46.7	42.3
Indexation	20.1	21.2	21.7	21.8	21.7
Regulatory depreciation	17.5	20.1	22.9	24.9	20.6

9.2.1 Depreciation for opening capital base for next access arrangement period

As set out in the section 3.8 of the proposed revised access arrangement, APA VTS proposes that the depreciation schedule for establishing the opening capital base as at 1 January 2023 will be based on forecast capital expenditure.

9.3 Corporate income tax

Corporate income tax is calculated in the financial model accompanying this submission at Attachment B.2. This calculation reflects tax depreciation of

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the tax asset base, as discussed in section 6.4. There are no tax losses to be recognised for regulatory purposes.

9.3.1 *Allowance for corporate income tax*

As discussed in section 6.4, for the purposes of this access arrangement, APA VTS has adopted a post tax approach, in line with the requirements of the Rules. APA VTS's corporate income tax allowance is set out in Table 9-3 below.

Table 9-3 – Forecast corporate tax allowance (nominal $m)

$m nominal	2018	2019	2020	2021	2022
Corporate tax allowance	4.8	5.1	5.3	5.7	3.8

There are minor differences in approach between the capitalisation of costs for regulatory purposes and tax purposes. While some items of major maintenance activity (for example, pigging) are capitalised and amortised over short periods for regulatory purposes, these items are expensed for tax purposes.

9.4 Operating expenditure

Forecast operating expenditure is discussed in chapter 8. Table 9-4 below includes the effect of the Efficiency Benefit Sharing Scheme as discussed in section 8.6.2.

Table 9-4 – Operating expenditure (nominal $m)

$m nominal	2018	2019	2020	2021	2022
Operating expenditure	34.8	31.7	31.3	31.3	29.9

9.5 Total revenue requirement

In summary, these components derive the total revenue requirement, as shown in Table 9-5.

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Table 9-5 – Total revenue requirement (nominal $m)

$m nominal	2018	2019	2020	2021	2022
Return on capital	79.4	83.5	85.3	85.8	85.5
Return of capital	17.5	20.1	22.9	24.9	20.6
plus operating and maintenance	34.8	31.7	31.3	31.3	29.9
plus revenue adjustments	0.0	0.0	0.0	0.0	0.0
plus net tax allowance	4.8	5.1	5.3	5.7	3.8
Building block revenue requirement	**136.5**	**140.5**	**144.9**	**147.6**	**139.8**
Smoothed revenue requirement	**121.9**	**131.8**	**142.5**	**154.0**	**166.5**

(smoothed revenue requirement from Price Control Model)

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10   Revenue allocation and tariffs

This chapter explains the basis and derivation of pipeline tariffs, including the allocation of total revenue and costs to pipeline services and the reference tariff variation mechanism.

10.1   Total revenue requirement

The total revenue requirements derived from the building blocks approach is set out in Table 10-1 below.

Table 10-1 – Revenue requirement (nominal $m)

$m nominal	2018	2019	2020	2021	2022
Revenue requirement	136.5	140.5	144.9	147.6	139.8

The present value of this revenue requirement stream, discounted at the WACC of 7.88 per cent, is $ 567.3 million.

10.1.1   Revenue equalisation and X-factors

The revenue requirements as outlined in Table 10-1 above varies year by year according to differing operating and other requirements over the course of the access arrangement period. In order to present a smooth price path, Rule 92(2) requires a smoothed revenue path to be derived, in present value terms.

Applying a WACC of 7.88 per cent, the smoothed revenue requirements that would derive the same net present value of cash flows is outlined in Table 10-2 below.

Table 10-2 – Smoothed revenue requirement (nominal $m)

$m nominal	2018	2019	2020	2021	2022
Smoothed revenue requirement	121.9	131.8	142.5	154.0	166.5

The revenue path is then translated, reflecting changes in demand requirements, into a price path in a CPI-X format. This derives the high-level movement of tariffs in each year of the access arrangement period based

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on a defined starting point. The starting point for tariffs is set in Schedule A of the revised access arrangement. Proposed X-factors to apply in each year of the access arrangement period are set out in Table 10-3 below.

APA VTS has chosen to apply a glide path for tariffs so that the forecast increase in revenue for the forecast period does not lead to an abrupt change in tariffs for VTS users.

Table 10-3 – X-factors

	2019	**2020**	**2021**	**2022**
X-factors	-6.0%	-6.0%	-6.0%	-6.0%

10.2   Revenue and cost allocation to services

Rule 93(2) requires costs to be allocated between reference and other services as follows:

(a)   Costs directly attributable to reference services are to be allocated to those services;

(b)   Costs directly attributable to pipeline services that are not reference services are to be allocated to those services; and

(c)   Other costs are to be allocated between reference and other services on a basis (which must be consistent with the revenue and pricing principles) determined or approved by the AER.

Revenue is to be allocated between reference and other services in the same ratio in which costs are allocated between reference and other services.

As set out in section 2.1 above, APA VTS offers a single service, the reference service, which is the tariffed transmission service. As a result, all costs associated with the VTS are allocated to this service.

10.3   Derivation of tariffs

10.3.1   Overview of proposed changes to tariff approach

The following sections include detailed descriptions of how tariffs are derived, and in particular how costs are allocated to tariffs.

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APA VTS does not propose substantive changes to the tariff approach. All changes proposed for the forecast access arrangement period are consistent with principles approved by the AER in respect of the current period, or are driven by changes in shipper behaviour. These changes are listed below, and described in more detail in the relevant following sections.

- Variation of the allocation of rolled out costs to the SWP to 21.5 per cent, applying the same principles as applied by the AER in the earlier period; and

- Allocation of forecast expenditure to expand the westbound capacity of the SWP to the existing WUGS refill charge.

10.3.2   *Rules requirements*

Rule 95(1) requires that a tariff for a reference service be developed:

(a)   To generate from the provision of each reference service the portion of total revenue referable to that reference service; and

(b)   As far as reasonably practicable consistently with paragraph (a), to generate from the user, or the class of users, to which the reference service is provided, the portion of total revenue referable to providing the reference service to the particular user or class of users.

As APA VTS only proposes to offer one reference service, Rule 95(2), which relates to the allocation of revenue between reference services, does not apply.

Rule 95(3) requires that the portion of total revenue referable to providing a reference service to a particular user or class of users is determined as follows:

(a)   costs directly attributable to supplying the user or class of users are to be allocated to the relevant user or class; and

(b)   other costs are to be allocated between the user or class of users and other users or classes of users on a basis (which must be consistent with the revenue and pricing principles) determined or approved by the AER.

This is a limited discretion Rule.

10.3.3   Implications of the DWGM structure

APA VTS operates under the unique DWGM structure. All other transmission pipelines in Australia operate under a contract carriage model. This has a number of important implications as follows:

- As the DWGM allocates pipeline capacity by the operation of the bidding process for gas, tariffs are necessarily flow based, as market participants cannot reserve capacity under contract for their exclusive use;

- The setting of tariffs must be based on a forecast of the gas flow paths. However, since APA VTS operates under an incentive-based regulatory model the tariffs, once set, cannot be altered to suit changed circumstances; and

- To the extent that the actual flow paths differ from the forecast, the cost allocation outcomes to customers (and the revenue received by APA VTS) will not be as was intended. This can occur even where the total forecast is accurate, but the expectation of where gas will be sourced differs materially from the forecast.[174]

The variability of flow patterns within the DWGM by virtue of specific market outcomes suggests that it is not appropriate to require too rigid an application of the cost-reflective tariff principles to the reference tariff. A cost allocation done in hindsight with full knowledge of where gas actually flowed will be different from that which is forecast. This further suggests that the tariff design for the VTS can only be a compromise between a range of potentially conflicting principles.

10.3.4   Relevant pricing principles

Rule 72(1)(j) requires APA VTS to describe any pricing principles employed in designed tariffs. APA VTS considers that the following principles, which it applies in its tariff design for the VTS, are consistent with the rule requirements for tariff design, and with the revenue and pricing principles.

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[174] Note that this does not occur under a contract carriage model, as the user contracts for capacity in a pipeline over a given flow path, and its charges are related to that pre-specified path.

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A key driver of tariff design is efficiency, in terms of the promotion of efficiency in:

- Customers' usage of the pipeline system - transmission prices should, where possible, signal to system users the economic costs of use of the system, and promote maximum utilisation of the system;

- The operation and maintenance of the pipeline system - transmission prices should be consistent with the efficient operation and maintenance of the pipeline system and minimise the costs of the service requested by users;

- Investment in system augmentation - transmission prices should signal efficient new investment in the pipeline system;

- Simplicity and predictability – enabling users to identify the cost impact of their usage decisions, and ensuring administration costs are not excessive and barriers to entry are minimised;

- Robustness, in light of possible changes to the future development of the pipeline system, and changes in demand and supply patterns; and

- Price stability - avoiding unnecessarily large price shocks at subsequent reviews.

Some of these criteria are necessarily conflicting, for example the relationship between cost reflectivity in tariffs relating to a complex system, and simplicity and price stability. Principles of cost reflectivity can at times come at the expense of price stability, and vice versa.

The AER assessed the overall tariff design (which is unchanged in this revision proposal) as part of its assessment of the 2013-2017 access arrangement revision proposal. In its draft decision the AER concluded that "the level of complexity in the design and structure of the proposed tariff is an appropriate balance of cost reflectivity and complexity".[175] APA VTS submits that its overall tariff design remains consistent with Rule 95.

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[175] Australian Energy Regulator 2012, *Access Arrangement draft decision: APA GasNet Australia (Operations) Pty Ltd 2013-2017 Part 2 Attachments*, September, p 279

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10.3.5 *Identification and allocation to user classes*

Rule 95(1) requires that tariffs generate revenue from particular users or a class of users. Rule 95(3) requires that the revenue to be allocated to particular users or a class of users is in line with the costs of supplying those users or a class of users. These rules therefore require the identification of users or classes of users to which drive specific costs.

Separation of tariffs into injection and withdrawal tariffs

Under the DWGM, market participants can operate solely as injecting parties, or as withdrawing parties. It is therefore appropriate to identify injectors and withdrawers as potentially separate classes of users, and derive tariffs for injection into the system, and for withdrawal from the system, separately.

This ensures that an 'injecting only' user does not bear costs associated with withdrawal from the system, and vice versa.

Total revenue is allocated to injection and withdrawal assets with 19 per cent of 2018 revenue allocated to injection tariffs, and the remainder to withdrawal tariffs.

Allocation of costs to injection zones

There are five injection zones supplying the VTS:

- Longford
- Port Campbell
- Pakenham
- Dandenong
- Culcairn

There is a separate injection tariff for each injection zone which relates to the costs of the relevant injection pipeline. The injection charge recovers the costs of the injection pipeline.

To signal peak use to market participants (which drives expansion costs), the injection charge is levied on the ten peak injection days over the winter at each injection zone. The injection charge is levied on the injector.

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A smoother payment schedule is provided to users whereby injection charges are forecast annually for each injector and levied monthly on a sculpted profile. An injection charge 'wash-up' is performed after September each year when the actual peak days are known.

Allocation of costs to withdrawal zones

The withdrawal charge recovers the cost of transmission from the injection pipeline to the user.

The system is divided into withdrawal zones, where a charge is levied on the withdrawing user. The cost of transmission through the withdrawal zones is based on a forecast of physical flows. Gas is assumed to have followed the forecast physical path even if it was injected at a different injection point.

Costs are allocated to 1 in 2 winter peak flows and annual flows in the ratio of 52.5 per cent to peak and 47.5 per cent to annual. These allocations were changed for the earlier access arrangement period, and remain at the approved revised level for the forecast access arrangement period.[176]

Withdrawals are charged within 25 withdrawal zones unchanged from the earlier access arrangement period. Within each withdrawal zone there are up to three tariff classes. These tariff classes are Tariff-D and Tariff-V which are supplemented in some circumstances by a cross system tariff. There are two specific withdrawal zones servicing storage facilities which have only one tariff class being the refill tariff.

The withdrawal charge is levied on the actual flows each month (an 'anytime' charge). A different withdrawal charge applies to each tariff class.

10.3.6   *Cost allocation to specific tariff classes and tariffs*

This section describes how costs are allocated to specific off-takes and tariff classes.

Costs are grouped into categories and allocated as shown in Table 10-4 below. These allocations seek to directly attribute costs to specific zones where appropriate, and to apply non-allocatable costs across all zones so as not to distort shipper decisions on the use of the system.

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[176] AER 2012, *Access Arrangement draft decision: APA GasNet 2013-2017 Part 2*, p 291

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Table 10-4 – Cost allocation method by cost category

Cost category	Allocation method
System assets (return on and of capital, tax liability) (excluding the rolled out SWP and Interconnect assets)	Physical path
Direct operating costs	Physical path
SWP residual costs	Direct to zone
Cost rolled-in under system-wide benefits (Interconnect assets)	Postage stamp
Interconnect zone residual costs	Direct to zone
Non-system assets (return on and of assets)	Postage stamp
General & administrative operating costs	Postage stamp
Return on working capital	Postage stamp
Benefit sharing allowance and first carry over amount	Postage stamp
Capital raising costs	Physical path (system assets), postage stamp (non-system assets)
Debt raising costs	Postage stamp

Physical path cost allocation

The aim of this cost allocation procedure is to allocate costs to each user in proportion to that user's use of the transmission system assets. Therefore, a user who uses a short section of the system will, in general, pay a lower amount for using the system than a user who uses a longer section of the system.

The specific assets that are used by a user are determined by the physical path taken by the gas flow from the relevant injection zone to the user's off-take. The relevant injection zone for each off-take is determined by a process of allocating the forecast injection volumes from each injection point to the off-takes based on the physical flow dynamics of the system, until the injection volumes have been exhausted. The majority of the system

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is assumed to be supplied from Longford, since this is where the greatest volumes are injected. To the extent that the injection volume forecast is changed, the physical paths will also change.

The transmission system has been divided into 29 pipeline segments, determined by the points at which pipeline diameter changes. Certain pipeline segments are associated with compressors and in-line system regulators. The cost that is associated with each asset segment is determined by a procedure that avoids vintage[177] effects, as follows:

- The total return on and return of assets is determined for all of the pipeline, regulator and compressor assets separately.

- This cost is allocated amongst the pipeline segments and compressors according to the Optimised Replacement Cost (ORC) of each asset within its asset class.

- The direct pipeline operating costs are allocated to each pipeline segment according to the pipeline length. Compressor and regulator operating costs are allocated to each unit directly.

- This procedure effectively disregards the vintage of each asset. It also means that refurbishments of the system are allocated across the entire system rather than to specific zones (however, capacity augmentations are allocated to the associated pipeline segment). This procedure is intended to reflect the principle that the tariff for a segment of pipeline should be related to its service potential, and not to its age.

Allocations to peak and annual flows

The physical path allocation procedure described above allocates the cost of each pipeline segment to users according to the use made of that pipeline segment. Therefore it is necessary to define what is meant by 'use' of the pipeline segment.

The aim of allocating costs on the use of the pipeline is to send an appropriate price signal to each user, to enable that user to respond to the

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[177] The allocation is not impacted by the age of the asset as there is no element of depreciation in determining the proportional allocation of costs to pipeline segments

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correct economic signal, and to ensure that each user is paying its share of the opportunity cost of each asset.

The VTS is characterised by injection pipelines that can become constrained, a relatively unconstrained hub where flows can vary depending on the pattern of injection, and low volume laterals off the hub.

The allocation between peak and annual flows in the current access arrangement allocated 52.5 per cent of costs to the peak flows. This was reduced from the previous period (where it was 55.55 per cent). There are reasonable arguments to reduce this ratio even further given the unconstrained nature of most VTS pipelines, but this would have the effect of making significant changes in the tariff relativities between high and low load factor customers. APA VTS has not proposed any further change to this ratio in the forecast period, and APA VTS has allocated costs on the injection pipeline based on the peak flows and allocated costs on the remainder of the system in the ratio of 47.5 per cent to annual flows and 52.5 per cent to peak flows (generating an average peak allocation of approximately 60 per cent).

Cost allocation to off-takes within pipeline segments

Within individual pipeline segments, direct costs are allocated to off-takes on the basis of the volumes and distances (TJ-km) within the zone for outflows at each off-take and for flows through the zone. This allocation is done for both peak and annual flows in the ratios discussed above.

The costs are then allocated to each tariff class within a zone in the following way.

- A rate ($/TJ/km) is derived for both peak and annual supply at each off-take based on the TJ-km for both peak and annual flows within the zone to each off-take and through the zone.

- A forecast is made of the Tariff-V and Tariff-D loads at each off-take, and the separate components of peak and annual flows within each tariff class.

- The peak and annual rates are applied to the associated components of the Tariff-D and Tariff-V loads at each off-take, to derive the costs to be allocated to these tariff classes at each off-take.

- The costs within withdrawal zones are aggregated for each tariff class to the zonal level. The total costs within the injection pipelines are aggregated to generate the total injection pipeline cost.

South West Pipeline

A separate regime applies to the SWP. The cost allocation for the SWP was approved by the ACCC for the second access arrangement period. The ACCC acknowledged that the SWP provided both direct benefits of connecting a new gas source (both the Lochard Underground storage facility and new production) to the VTS and system wide benefits of inter basin competition in the wholesale gas market and enhanced system security in the event of supply disruption. The ACCC approved a cost allocation for the SWP consisting of a 50 per cent allocation directly to the injection pipeline and 50 per cent to be allocated to the VTS as a whole on a postage stamp basis.

The AER's final decision for the current access arrangement period approved a change to this allocation to take account of investment and throughput on the SWP. APA VTS had proposed a higher allocation to the SWP (75 per cent), but the AER rejected this allocation and instead decided that the Port Campbell injection tariff be set in relation to the Longford injection tariff, with the allocation of rolled out costs not to exceed 50 per cent.[178]

In applying these considerations to final tariffs, the final allocation of rolled out costs to the SWP in the current period was 41.5 per cent.

APA VTS has applied the same considerations to setting the SWP tariff in the forecast period. To achieve an injection tariff that is commensurate with the Longford injection tariff, the proposed allocation of rolled out costs is 21.5 per cent.

Culcairn withdrawal tariffs

APA VTS is forecasting significant increases in gas flows between the VTS and the NSW transmission system over the forecast period. This is largely due to a significant expansion program in the earlier period (discussed in detail in 0) driven by shipper needs for increased firm (year round) capacity for gas

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[178] AER 2012, *Access Arrangement draft decision: APA GasNet 2013-2017 Part 2,* p 299

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sourced in Victoria to supply NSW domestic and industrial customers, and augment Queensland LNG export requirements.

Indirect cost allocation

The indirect costs are the costs associated with the non-system assets (return on and of capital), the return on working capital, and general and administrative operating costs. In line with the existing tariff model, these costs will be allocated to all withdrawals on a per GJ basis.

This approach is consistent with Rule 95(3)(b) that requires costs that are not directly attributable to a particular user or class of user to be allocated on a basis that is consistent with the revenue and pricing principles. APA VTS considers that using the postage stamp approach for these costs is consistent with the revenue and pricing principles as it provides for the recovery of efficient costs incurred in providing the reference service, and is non-discriminatory. APA VTS also notes that the approach has been accepted in the current period, and is widely used.

Where a prudent discount is required, APA VTS has only allocated indirect costs to the extent that the tariff is competitive with the bypass option. In addition, where tariff changes from the current tariffs arising from the changes in system gas flows compared with those in the earlier access arrangement period would be excessive, APA VTS has adjusted indirect cost allocation to dampen those effects. This is to prevent tariff shock.

Interconnect and Springhurst compressor

The Interconnect assets were approved by the ACCC in April 2000 to be rolled-in to the VTS capital base under the test in section 8.16(b)(ii) of the Code (often called the system-wide benefits test). The relevant assets are:

- the bulk of the Interconnect Pipeline (93 per cent);

- the Springhurst Compressor; and

- the regulators at Wandong, Barnawartha, Wollert and Ballan.

- the remaining 7 per cent of the cost of the Interconnect Pipeline is treated as a direct asset recovery for the Culcairn injection tariff.

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The ACCC's original approval permitted APA VTS to charge for the 93 per cent of these assets under a postage-stamp tariff on all withdrawals from the system, with the exception of the Western Transmission System.

Similar to the AER decision in respect of the allocation of rolled out costs for the SWP, in its 2012 draft decision the AER rejected APA VTS's proposal to increase the direct allocation of rolled out costs to the Interconnect from 7 per cent to 25 per cent. The AER instead required that the Culcairn injection tariff be set to be consistent with the prevailing tariff, but not to exceed the Longford Injection tariff.[179] This led to a direct allocation to the Interconnect of 24 per cent in the current period. APA VTS has maintained this allocation of rolled out costs in the access arrangement period.

Benefit Sharing Allowance and First Carry Over Amount

The Benefit Sharing Allowance and First Carry Over Amount (FCA) carry-over are costs which are associated with activities during the earlier access arrangement period, but which can be carried forward into the forecast access arrangement period.

The FCA is associated with the difference between the forecast revenue for the last year of the earlier access arrangement period and the estimate of that revenue available at the time of submission of the revision proposal and, possibly, limitations on the ability to increase tariffs each year in order to recover the target NPV for the earlier access arrangement period.

The Benefit Sharing Allowance is a recognition of savings in operating costs made during the earlier access arrangement period which are shared with users in the following period.

The NGR do not specifically include an allocation process for these costs. APA VTS has allocated these costs to withdrawals on a postage stamp basis, in line with other indirect costs.

Cross system flows

There are no backhaul tariffs for flows against the predominant (forecast) flows on injection pipelines. However, without some specific tariff mechanism, a flow from Longford to Iona would only attract the Longford

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[179] AER 2012, *AER APA GasNet Draft Decision*, p 299

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injection charge plus the local withdrawal charge on the South West Pipeline. Similarly, a flow from Iona to Longford would only attract the Port Campbell injection charge plus the local withdrawal charges off the Longford pipeline.

APA VTS proposes to continue to levy an additional charge for carriage through the Metro zone, for withdrawals off the injection pipelines which are linked to injections at an unrelated injection point. This charge, the cross system charge, is calculated as the Metro zone tariff discounted for the indirect cost allocations (which are already recovered from the withdrawal zones).

Cost allocation of new assets to zones

APA VTS has constructed a number of new assets in the current period. Consistent with the AER's draft decision in 2012 (and confirmed in its final decision)[180], APA VTS has allocated these costs to zones as follows:

- Winchelsea compressor to South West injection pipeline;

- Expansion of the Victorian Northern Interconnect to the relevant asset groups along the pipeline;

- Warragul expansion to the Lurgi tariff zone; and

- The SWP to Anglesea Pipeline to the Geelong zone.

APA VTS considers that these allocations deliver a 'user pays' allocation of these expansion costs, in line with the requirements of Rule 95(3).

10.3.7   *Charging parameters*

Background

As the VTS operates under a market carriage system, there is no concept of buying the capacity of a pipeline as occurs in a contract carriage regime. In addition, under the Victorian wholesale gas market which operates in conjunction with market carriage, there is no concept of point to point carriage of gas. Rather, all gas injected into the system is pooled and then delivered from that pool. A consequence of this combination is that shippers

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[180] AER 2012, *AER APA GasNet Draft Decision, Part 2*, pp 282-3

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of gas on the VTS do not need to be in balance over any time period. There is scope for market participants who solely inject or solely withdraw from the system.

The tariff design is built upon the concept that gas is supplied from injection pipelines into a hub, from where it is distributed to users within withdrawal zones. The injection charges are not linked to the withdrawal charges (except where a matched rebate is offered). The transmission tariffs are calculated on the assumption that gas will flow along the forecast physical paths into the hub and then from the hub to the withdrawal zones.

Withdrawal zones

The withdrawing parameters for withdrawals under the current tariff are set out in Table 10-5 below.

The result of the Victorian market structure is that APA VTS has little choice but to charge for use of the VTS through charging for actual gas flows. Thus, APA VTS charges on the basis of measured withdrawals. The measured withdrawals are grouped into a number of zones for which withdrawal tariffs are derived.

Withdrawing customers are classified into Tariff-V (volume metered) and Tariff-D (daily metered) customers. This classification allows different levels of peak-related and commodity-related costs to be allocated to Tariff-V and Tariff-D customers, who generally have significantly different peak load factors. The separation of users into two tariff classes permits a more cost reflective allocation of direct costs to users.

Tariff-D customers are those customers with annual loads in excess of 10TJ. All others are Tariff-V. Note that Tariff-D customers can be directly connected to the transmission system, or can be connected to the distribution system. There are also specific tariff classes for cross system flows and for refill of storage facilities.

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Table 10-5 – Charging parameters for withdrawals

Withdrawal zone tariff	Charging parameter
Tariff-D	Daily flows from the zone for each GJ.
Tariff-V	Daily flows from the zone for each GJ.
Cross System	Daily flows from the relevant zones sourced from injection zones across the VTS for each GJ.
Refill	Daily flows from the relevant zones for each GJ.

Injection pipelines

The current charging parameters for use of the injection pipelines under the current tariff are set out in Table 10-6 below.

Table 10-6 – Charging parameters for injections

Withdrawal zone tariff	Charging parameter
Longford injection zone	Ten day peak injections over winter.
	Matched rebate at Latrobe, Maryvale, West Gippsland, Tyers and Lurgi zones.
Pakenham Injection Zone	Ten day peak injections over winter.
Pt Campbell Injection Zone	Ten day peak injections over winter.
	Matched rebate at SWP and WTS zones.
Culcairn Injection Zone	Ten day peak injections over winter.
	Matched rebate at Interconnect zone.

The injection charges are calculated to recover the cost of the injection pipeline from the peak flows carried through the pipeline. To the extent that injections are not carried the whole length of the pipeline, a matched rebate is offered.

Under the design, the Longford charge applies only to flows in the "predominant" flow direction, as forecast at the commencement of the first access arrangement period. A similar methodology is applied to the SWP.

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APA VTS intends to maintain the same design for the injection pipelines, based on:

- peak flow charges;

- charges initially set based on forecast flows; and

- matched rebates where the injection pipeline is only partially utilised.

The injection charges for each injection pipeline for the access arrangement period are described in the following sections.

Longford injection charging parameter

The Longford injection charge will be levied on the ten peak day injections into the pipeline over the winter period (June-September, inclusive).

Note that the new injection point, TasHub (the connection to the Tasmanian Gas Pipeline was commissioned in 2016) is within the Longford injection zone and therefore attracts the Longford injection tariff.

Withdrawals made in the Latrobe, Maryvale, Tyers or Lurgi zones which are matched to Longford injections will receive a matched rebate based on the shorter transmission distance on the injection pipeline.

Port Campbell injection charging parameter

The Port Campbell injection charge will be levied on the ten peak day flows through the Iona-Lara pipeline over the winter period (June-September, inclusive). These flows will be calculated from the total injections made within the Port Campbell surrounds, less the withdrawals from the Western Transmission System or other off-takes at or in the vicinity of Port Campbell.

The charge will not be levied on injections in the Port Campbell Zone which are matched to withdrawals taken from the Western Zone or from the vicinity of Iona.

A rebate will be given on the injection charge for withdrawals from the South West withdrawal zone where the withdrawal can be matched to an injection at Port Campbell.

Culcairn injection charging parameter

The Culcairn injection charge will be levied on the ten peak day injections into the pipeline over the winter period (June-September, inclusive).

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Off-takes on the Interconnect Pipeline will receive a rebate on the injection charge.

In addition, a matched rebate will be offered on the withdrawal zone tariffs for withdrawals in the Wodonga, North Hume, and Murray Valley zones, where these withdrawals are matched to injections at Culcairn. This rebate reflects the lower cost of transportation to these zones from Culcairn via Barnawartha.

10.3.8   Tariff classes

Tariff-V and Tariff-D

As described above, APA VTS will charge a differential withdrawal tariff in relation to Tariff-V and Tariff-D customers to reflect the significantly different load factors for these customer classes.

Storage refill

There are two storage facilities in the VTS – Dandenong LNG and the Lochard Underground Storage Facility at Iona. While both provide storage, these facilities are used differently within the DWGM. The Iona storage facility is generally used throughout the winter period to supplement supply into the VTS. The Dandenong LNG facility has a smaller capacity and is used primarily for peak shaving.

For both facilities, gas is generally withdrawn from storage at high rates during the peak periods when alternative supplies are inadequate. Refill is undertaken at a slow rate during off-peak or non-congested periods. Because of the historic exclusively off-peak nature of storage refill, this activity has not imposed significant costs on the system, and storage refill for both facilities has been charged at a nominal level, starting at 5 cents/GJ at the start of the current period, escalated by CPI across the period.

A further reason for the nominal charging approach is that storage is an interim holding point between the supply point and the final customer, rather than a delivery location in its own right. In this respect, the refill charge does not attract a cross system charge as it is expected that, once gas is reinjected into the VTS from Iona it will attract full injection and withdrawal charges. For this reason, the refill charge and associated revenue is excluded from the price control model – it is not counted within system withdrawal volumes as to do so would double count those withdrawals.

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Further, storage provides a benefit since it provides a competitive source of peak gas supply and additional security for the system. The requirement for storage refill is also dependent on the amount of supply required from storage to meet peak demand. This is, in turn, dependent on winter weather extremes. These dependencies make forecasting of refill demand extremely uncertain.

As set out in section 5.3.1 above, westbound flows on the SWP to refill the Iona facility are becoming constrained, and APA VTS has proposed an expansion project to address this constraint.[181] Notwithstanding this development, the other factors that suggest that is appropriate to apply a nominal charging approach for refill remain relevant.

APA VTS is of the view that users of the storage facility that are driving the need for westbound expansion of the SWP should bear the costs of expansion. To achieve this outcome, APA VTS has calculated the revenue allowance associated with the SWP expansion project and derived an incremental tariff by dividing this revenue amount with forecast annual volumes. This delivers an incremental tariff of 2.5 cents/GJ relating to this expansion.[182]

APA VTS proposes to add this amount to the current Iona storage refill tariff, and to remove the commensurate revenue amount from total revenue recoverable under the Price Control Model. This maintains the previous approach where refill volumes and revenue are excluded from the price control model, but ensures recovery of the expansion only from users of the Iona facility.

The approach described above means that the Iona storage refill tariff and the Dandenong refill tariff are no longer aligned. The Dandenong LNG refill service tariff has been retained at its historic level of 5.4 cents/GJ. The base Iona refill service has similarly been maintained at 5.4 cents/GJ, but now also has the incremental charge associated with the SWP expansion project

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[181] Note that refills into the Dandenong facility remain off-peak and are not driving congestion in the system.

[182] APA VTS has provided this simple model at an attachment to the submission at Attachment B.10

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added. These leads to a proposed tariff for the Iona refill service of 7.9 cents/GJ.

APA VTS proposes to retain the Dandenong LNG refill and WUGS refill tariffs outside of the price control model, and not to apply an X-factor to these charges.

South West Pipeline – incremental pricing

As discussed in section 10.3.6 above, the South West Pipeline tariff (eastbound) is set such that 21.5 per cent of the direct costs of the pipeline are allocated to all users of the system. This is because the asset provides a system-wide benefit to users, and was originally approved on this basis (the former system-wide benefits test under the Code).

Injections into the South West Pipeline are made at the Western Underground Storage facility at Iona, which has sufficient installed compressor power to inject gas at the maximum allowable operating pressure of the Iona-Lara pipeline of 10 MPa, and the SEA Gas and Otway Gas project injection points. These connection points access gas from the new fields developed offshore from Port Campbell as well as the Iona storage facility.

APA VTS will levy the injection tariff on any injections made in the Port Campbell Injection Zone, where the gas is directed along the South West Pipeline towards Lara and Brooklyn.

Where the gas is directed to the Western Transmission System, (that is, where the injections are matched to withdrawals in the Western system) or off-takes adjacent to Port Campbell, no injection charge will be levied.

The Port Campbell injection tariff is derived by applying a CPI-X tariff path to the charging parameter for the Port Campbell injection zone. The initial tariff is set so that the NPV of the tariff revenues equates to the NPV of the levelised revenue requirement for the SWP.

An allowance is made for revenues from Colac on the Iona-Lara pipeline, which will receive a matched rebate owing to its location on the pipeline.

As described above in section 10.3.7, a matched rebate will be offered for injections which do not flow along the Iona-Lara pipeline, that is, gas that is delivered to the Western zone.

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Interconnect pipeline – incremental pricing

The Interconnect Pipeline carries gas from the Culcairn injection point to Barnawartha, where it joins the North Hume and Wodonga zones.

The allocation of direct costs for the Interconnect Pipeline tariff has been maintained at its current level of 76 per cent allocated to all users of the system. This is because the asset provides a system-wide benefit to users, and was originally approved on this basis (the former system-wide benefits test under the Code) – see section 10.3.6 for details.

The allocated costs of the Interconnect Pipeline are recovered entirely from the Culcairn Injection Tariff. The injection tariff path is derived by applying a CPI-X tariff to the charging parameter for the Culcairn Injection Point. The initial tariff is set so that the NPV of the tariff revenues equates to the NPV of the residual Interconnect revenue requirement.

Off-takes on the Interconnect Pipeline are given a rebate on the injection charge if the injections are matched to the withdrawals.

10.3.9   Tariff zones

Retain existing zones

Withdrawal tariff zones are defined in order to simplify the implementation and administration of the transmission tariff. APA VTS is not aware of any concerns in the market about the current extent and coverage of the existing tariff zones, including the prudent discounts applied to certain bypass opportunities in the vicinity of injection points.

In the interests of consistency and stability across access arrangement periods, APA VTS proposes to maintain the current tariff zones.

Metro South East zone

Gas from the Yolla field is processed at the Lang Lang Plant of Bass Gas and injected into the VTS at the Pakenham injection zone.

APA VTS previously identified that proponents of this project would have the opportunity to bypass the main VTS pipeline between Pakenham and Dandenong, and connect directly to the large distribution off-takes at Dandenong (thereby avoiding both the VTS and the AEMO spot market).

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Therefore, APA VTS offers a prudent discount by defining a new zone at Dandenong (Metro SE) where a bypass tariff would apply to matched injections at Pakenham. The Pakenham injection tariff is set at a discount on the Longford injection tariff commensurate with the distance between Pakenham and Dandenong. This tariff structure for Pakenham injections was previously approved by the ACCC to take effect when the Bass Gas project commenced injections into the VTS.

West Gippsland zone

Currently there are no off-takes on the main pipeline between the Latrobe and Metro zones. However, in the event that a connection is made in the future, a published tariff will be defined for this zone. This tariff has been set as the average of the LaTrobe and Lurgi Zone tariffs reflecting the zone's position within the VTS.

Warnambool and Koroit

The Western Transmission System was covered by a separate access arrangement until 2003. From 2003 the separate access arrangement was merged with the VTS access arrangement and the Western Transmission Systems is designated the 'Western zone'. The Western zone serves five towns along the length of the pipeline, and carries a volume of approximately 5PJ/year.

With the construction of the SEA Gas pipeline which is installed within the same easement as the Western Transmission System for part of its length passing the towns of Warrnambool and Koroit currently served by the Western zone a bypass opportunity was available at these towns. APA VTS offered a prudent discount from 2004 as described below. APA VTS has defined new zones for the two at-risk towns excised from the Western zone.

There has been no change in circumstances for supply to these towns since approval of the earlier access arrangement. The general increases in the level of AEMO tariffs over time means that the level of tariff available to APA VTS to meet the bypass tariff is now quite low but still generally at or above the short run marginal cost of supply.[183] Despite this development, it would

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[183] Australian Energy Market Operator 2016, *Declared Wholesale Gas Market & Full Retail contestability Final Budget and Fees: 2016-17*, May, p 6

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appear that there is little appetite for a bypass project at the current tariff level for these towns so APA VTS proposes that the current tariffs continue to apply subject to ongoing escalation.

Zone definition

A withdrawal zone is defined by reference to the transmission pipelines and the associated connection points that constitute the zone. The gas that flows from the off-takes on those pipelines is charged at the published zonal tariff. If a new withdrawal connection point is made within one of these zones, then withdrawals at that off-take will also be charged that zonal tariff.

The connection points that constitute each zone are described in Schedule C of the access arrangement included with this access arrangement revision proposal.

10.3.10   *Prudent discounts*

Rule 96 specifies the conditions under which a prudent discount may be offered to users or classes of users. Prudent discounts can be proposed and approved at any time (they are not related to the access arrangement period), and APA VTS has three prudent discounts in place in the current period.

APA VTS considers that the original justifications for these discounts remain valid, and has retained them in the forecast period, having escalated them for CPI.

Methodology

Rule 96 contemplates a situation where a user can obtain a lower cost service from a bypass pipeline than from the reference tariff on the regulated pipeline system. In these circumstances it may be appropriate to offer a discount to the user in order to retain their (albeit reduced) contribution to revenue on the regulated pipeline. A discount is deemed to be prudent if, in the situation where the at-risk user is retained at a discounted tariff, the reference tariff calculated for all other users is lower than the reference tariff calculated without the at-risk user's contribution. In other words, a discount is prudent if other users are better off with the at-risk user on the system rather than off the system, even though the at-risk user pays a discounted tariff.

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An important consideration in relation to prudent discounts is the additional charge levied by AEMO on all withdrawals. A bypass pipeline from a new injection point will avoid the AEMO gas market, and hence the AEMO fees and charges. In addition, the customer will not pay uplift charges and linepack account costs. Furthermore, the supply could be firm, and would not be subject to the risk of curtailment under the Rules if an emergency or constraint arose on the APA VTS system. For these reasons a user might perceive a lower risk and more certain costs by constructing a bypass pipeline. This would increase the attractiveness of the bypass beyond the "vanilla" transmission costs and AEMO charges.

Since the start of the current access arrangement period, AEMO has changed its tariffs for managing the gas market, and merged its former tariff-V and tariff-D market charges. Along with a trend to higher fees overall, this merging has seen a significant increase in the AEMO charge to Tariff-D customers, as shown in Figure 10-1 below reproduced from AEMO's most recent fee report.[184] This has an effect on the net tariffs APA VTS can charge in response to a bypass risk.

Figure 10-1 – DWGM projected fees

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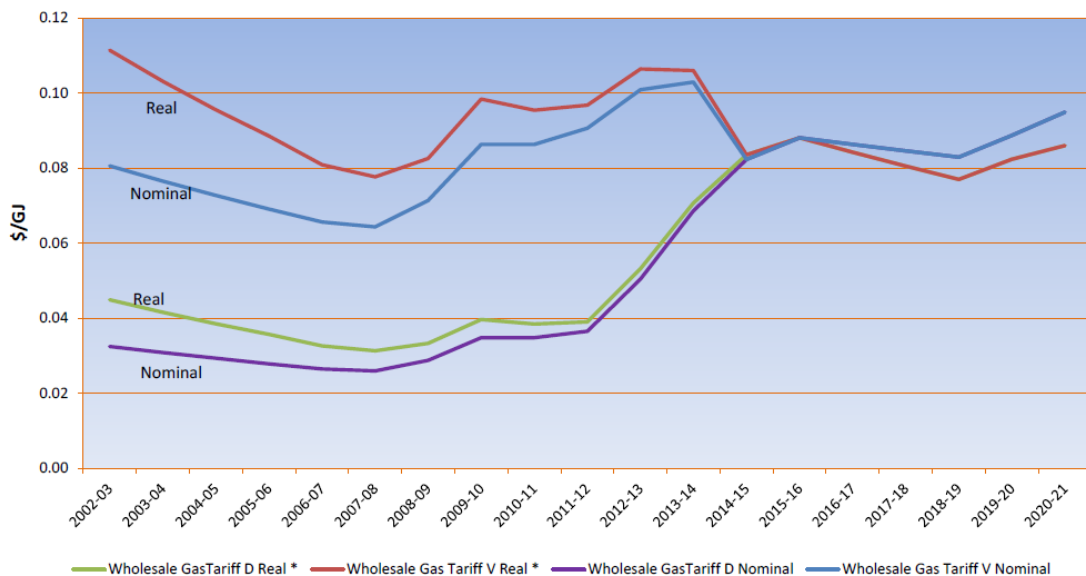
[184] AEMO 2016, *Declared Wholesale Gas Market & Full Retail contestability Final Budget and Fees: 2016-17* p 6

Maryvale zone discount

The Maryvale Zone services the Paperlinx plant. There is only one offtake in the zone. The only physical VTS asset within the withdrawal zone is the short lateral to the Maryvale plant.

This customer must pay the Longford injection charge (discounted to reflect the lower transportation distance) plus a withdrawal charge that recovers the cost of the zonal assets and a contribution to overheads.

It is relatively straight-forward to construct a bypass pipeline from Longford to Maryvale. For the 2008-12 access arrangement period, APA VTS designed and costed such a bypass pipeline, and calculated an estimate of the bypass tariff.

Based on this analysis, APA VTS proposed a discounted tariff (including both injection and withdrawal charges) for the 2008-12 access arrangement period which was approved by the ACCC. The circumstances have not changed, except for the increase in the AEMO tariff noted above. APA VTS proposes to continue the discounted tariff at the same rate, escalated for CPI in the forecast period.

Western zone discount

The bypass risk in the Western zone arises from the SEA Gas Pipeline which parallels the VTS between the towns of Warrnambool and Koroit. Calculations were made in respect of the 2008-12 access arrangement revision process confirmed that discounted tariffs at both Warrnambool and Koroit were required to offset the risk of connection of those systems to the SEA Gas pipeline. These calculations showed that the required discounts were prudent. These calculations were updated for the 2013-17 access arrangement period.

The significant increase in AEMO charges compared with those at the earlier review has resulted in bypass tariffs that are below the long term but above the short term costs. Nevertheless, APA VTS proposes to retain discounted tariffs at both Allansford (Warrnambool offtake) and Koroit from the earlier period, escalated for CPI, rather than further discount the tariffs in these zones.

Dandenong bypass tariff

In the submission for the second access arrangement period, APA VTS provided evidence that a bypass risk existed between the Dandenong offtake of the VTS and Pakenham, where gas was to be injected into the VTS from the Bass Gas production facility.

This facility was expected to inject approximately 20 PJ/annum at a high load factor. In the event that a bypass was constructed, this gas could be used to displace gas supply from Longford through the VTS.

The bypass tariff is implemented as an Injection Tariff at Pakenham and a discounted Withdrawal Tariff in the Metro south east zone.

The Injection Tariff is determined as a proportion of the Longford Injection Tariff, pro-rated by distance from Pakenham to Dandenong.

The calculation of the prudent discount for Pakenham injections has been maintained for the access arrangement period, escalated for CPI.

APA VTS proposes to continue these tariffs.

10.4   Impact on domestic and small business consumers

In this section APA VTS discusses the impact of its proposed tariffs (and changes to those tariffs) on domestic retail consumers.

Domestic and business consumers are served by their retailers, who acquire gas supply and transportation services on their behalf. Retail tariffs are therefore an amalgamation of upstream gas supply costs, VTS gas transmission costs, gas distribution costs (through their local distribution business) and retail costs and retailer margin.

As Victoria has a number of retailers providing retail gas services across all the distribution business zones (each with their own tariffs), there would be a myriad of tariffs against which to test the impact of changes in the transmission system tariff. However, as discussed below, the transmission tariff is a very small component of the total retail tariff. Accordingly APA VTS has demonstrated the impact of changes to its tariffs against two examples of retail tariffs to end use customers, and two examples of retail tariffs to small business customers, as shown in Tab 14 of the Regulatory Information Notice lodged with this access arrangement submission (Attachment B.1).

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In order to demonstrate the impact of movements in the APA VTS tariff, it is necessary to estimate the annual delivered gas cost and average annualised tariff for domestic consumers, and compare to the posted VTS tariff.

In this analysis, APA VTS has assumed that the domestic consumer uses 60GJ (60,000 MJ) of gas per year, 45GJ of which is consumed over the 4 colder winter months, and 15GJ of which is consumed over the 8 warmer summer months. The analysis has been based on published residential and business retail tariffs for the AGL Saver tariff[185] for the Geelong and Metro South East zones, respectively.

Applying these published retail tariffs, the average annualised retail tariff is compared to the VTS transmission tariff, as outlined below:

Table 10-7 – Impact of VTS tariffs on retail consumer bills

	Residential	Business
Average annualised cost of gas per GJ	$21.175	$15.550
Sample APA VTS transmission tariff per GJ	$0.4386	$0.4386
Transmission as a proportion of retail tariff	**2.1%**	**2.8%**

As can be seen from the above analysis, the cost of VTS gas transmission accounts for only about 2 per cent of the total retail cost to domestic and small business consumers. By way of example of the scope of potential impact of a change in the transmission tariff, a 10 per cent change in VTS tariffs would therefore result in a 0.2 per cent change in end user retail costs.

A residential consumer using 60 GJ of gas per year would expect to be billed approximately $1,270 per year for retail gas costs. A 10 per cent change in VTS tariffs would therefore result in a 0.2 per cent change in retail costs, or approximately $2.50 per year.

A small business customer using 500 GJ of gas per year can expect to pay approximately $7,775 per year for its gas supply, of which approximately 2.4

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[185] This analysis assumes that retail tariffs are relatively competitive.

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per cent will be made up of the VTS transmission tariffs. A 10 per cent increase in VTS tariffs would result in a 0.25 per cent increase in costs, or approximately $18.50 per year.

Detailed calculations supporting this analysis can be found in Tab 14 of the Regulatory Information Notice lodged with this access arrangement submission (Attachment B.1).

10.5   Reference tariff variation

In deciding whether a particular reference tariff adjustment mechanism is appropriate, the AER must have regard to:[186]

- the need for efficient tariff structures;

- the possible effects of the tariff variation mechanism on administrative costs of the AER, the service provider, and users and potential users;

- the regulatory arrangements applicable in the earlier access arrangement; and

- the desirability of consistency between regulatory arrangements for similar services, both within and beyond the relevant jurisdiction.

APA VTS proposes to retain its two existing reference tariff variation mechanisms in the access arrangement:[187]

- a Scheduled Reference Tariff Variation Mechanism - which applies in respect of each Year of the Access Arrangement Period; and

- a Cost Pass-through Reference Tariff Variation Mechanism - under which APA VTS may seek to vary the Reference Tariffs as a result of a Cost Pass-through Event.

APA VTS submits that its proposed reference tariff variation mechanism is consistent with the requirements of Rule 97 as it retains the elements previously approved by the AER under Rule 97 for the APA VTS system, with

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[186] Rule 97(3)

[187] Note that APA VTS has shortened the names of these mechanisms for easier referral. This has led to some consequential changes to headings and definitions in the access arrangement.

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revisions in line with the recently approved Amadeus Gas Pipeline access arrangement.

10.5.1 *Scheduled Reference Tariff Variation Mechanism*

Operation of the Scheduled Reference Tariff Variation Mechanism

The Scheduled Reference Tariff Variation Mechanism operates to annually adjust the tariffs for the remainder of the access arrangement period such that the combination of actual and forecast tariffs when applied to the actual and forecast gas volumes will generate a forecast revenue stream with the same net present value as the original revenue requirement. The original revenue requirement is itself adjusted for changes in circumstances through the course of the access arrangement period including:

- any carry over from the earlier access arrangement period;

- weather-related changes to gas volumes;

- amounts passed through under the Cost Pass-through Reference Tariff Variation Mechanism;

- annual updating of the return on debt; and

- annual updating of forecast inflation.

The formula for the Scheduled Reference Tariff Variation Mechanism is set out in Schedule D of the access arrangement.

The formula can be viewed as applying, in the following way, in each regulatory year of the access arrangement period:

- the net present value of the revenue forecast for the access arrangement period is compared with the revenue that the service provider is allowed to earn in accordance with the scheme of the regulatory regime of the NGR;

- if the net present value of the forecast revenue is less than the net present value of revenue allowed, the reference tariffs can be varied for the next year of the access arrangement period, subject to limitations on the extent of variation set by the price path factor, X, and the maximum allowable variation in individual tariff components (Y = 2.0 per cent);

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- before this comparison is carried out, and the reference tariffs are varied, the revenue allowed under the regulatory regime is adjusted in five ways (to yield the adjusted target revenue ATR); the target revenue is adjusted:

    o for any change in the return on debt consequent upon annual updating of the trailing average estimate of that return used in reference tariff determination;

    o for any change in the forecast of inflation which is used in reference tariff determination (see section 10.5.3 below);

    o for any change in the volume of gas withdrawn from the VTS; the forecast volume of gas withdrawn from the VTS in each regulatory year is adjusted using the actual volume withdrawn which is, itself, corrected for the effects of variations in that year's weather (see section 3.1.1 above) from the standard conditions assumed for forecasting (leading to the weather adjusted actual volume WAAV);

    o for any AER approved pass through of costs from a cost pass-through event; and

    o if relevant, for any carry forward amount correcting for differences between forecast and actual revenues during the preceding access arrangement period;

- for the purpose of making the comparison of the forecast revenue with the target revenue (adjusted in the ways noted above), both the forecast revenue and the target revenue are restated in real December 2017 dollars; and the net present values which are to be compared are calculated using real discount rates.

Scheduled tariff variation now differs in two main ways from variation under the previously approved tariff variation mechanism. Scheduled tariff variation now incorporates into the reference tariffs, through a change in adjusted target revenue, the effects of annual updating of:

- the return on debt; and

- forecast inflation.

APA VTS notes that the formula for scheduled reference tariff variation has also been modified by removal of the components which give effect to the

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4.5 year duration of the earlier access arrangement period. There is now no initial half year to be taken into account in tariff variation. This modification does not involve any change in the principles underpinning the scheduled reference tariff variation mechanism.

Process for varying tariffs under the Scheduled Reference Tariff Variation Mechanism

APA VTS has not materially changed the process for varying tariffs under the Scheduled Reference Tariff Variation Mechanism as set out in the applicable access arrangement for the earlier access arrangement period.

The process still provides for the submission of proposed revised tariffs at least 50 business days before they are due to come into effect. The informal process adopted in the earlier period, whereby an initial proposal provided to the AER at 50 business days was then updated when September CPI figures were released, has been avoided by a change making the applicable CPI the CPI for the June quarter.

APA VTS has relocated the text describing the scheduled reference tariff variation process to follow the description of the mechanism itself in the access arrangement. APA VTS considers that this assists in the readability of the access arrangement.

APA VTS considers that the proposed Scheduled Reference Tariff Variation Mechanism is consistent with the requirements of Rule 97, as it retains the elements previously approved by the AER under Rule 97 for the APA VTS system, with revisions in line with the recently approved Amadeus Gas Pipeline access arrangement.

10.5.2 *Cost Pass-through Reference Tariff Variation Mechanism*

Rule 97(1)(c) specifically allows a service provider to include in its access arrangement a mechanism that allows the reference tariff to vary as a result of a cost pass-through for a defined event. APA VTS proposes to include a cost pass-through reference tariff variation mechanism in the access arrangement to ensure APA VTS can reflect incremental costs resulting from unforeseen or uncontrollable events in the reference tariff. APA VTS considers that this is consistent with Rule 97(3)(a) in that it ensures efficient tariff structures that reflect efficient costs incurred by the service provider, even where these costs cannot be reasonably forecast.

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Process for varying tariffs under the Cost Pass-through Reference Tariff Variation Mechanism

The access arrangement in place in the earlier access arrangement period effectively included a process with two steps:

- an assessment of whether a cost pass through event has occurred, by reference to a number of factors and the definitions of events set out in the access arrangement; and

- if a pass through event has occurred, an assessment of appropriate costs to be passed through.

APA VTS does not believe that the factors included in the current access arrangement in section 4.7.2(a)-(f) are consistent with the NGR. The factors set out extra considerations for the AER in determining whether to approve proposed costs as a result of a cost pass through event.

When approving a cost pass through event claim (a relevant AER economic regulatory function or power), the NGL requires that the AER "exercise its function or power in a manner that will or is likely to contribute to the achievement of the national gas objective".[188] Further, the AER must take into account the revenue and pricing principles when making an access determination relating to a rate or charge for a pipeline service.[189]

APA VTS considers these are the only relevant considerations in relation to the approval (or not) of a cost pass through amount, and, as they apply by the operation of the NGL, they are unnecessary to state in the access arrangement. In particular, the national gas objective and revenue and pricing principles provide for consideration of whether costs are related to the reference service, and are efficient and prudent. APA VTS has therefore removed these factors from the proposed revised access arrangement.

Further changes to clause 4.7.3 involve adopting text previously approved by the AER in respect of the Amadeus Gas Pipeline that describes the application of the materially threshold.

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[188] National Gas Law section 28(1)(a)

[189] National Gas Law section 28(2)(a)(ii)

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Cost pass through event definitions

APA VTS proposes the following cost pass through events in the access arrangement:

- a carbon cost event;

- an insurance Cap event;

- an insurer credit risk event;

- a natural disaster event;

- a new gas market structure development event;

- a regulatory change event;

- a service standard event;

- a tax change event; and

- a terrorism event.

But for one new event, this list is identical to that included in the earlier access arrangement and, with the exception of the carbon cost event, is identical to that recently approved by the AER in respect of the Amadeus Gas Pipeline access arrangement.[190]

APA VTS has revised the definition of the Carbon cost event to update the event, for example by removing reference to specific legislation. The event is intended to have the same focus, that is to pick up any change to legislation or other instrument that will impose a mechanism designed or intended to reduce or manage carbon emissions, or to otherwise reduce or manage greenhouse gas emissions, and which in doing so imposes a cost on APA VTS during the period.

APA VTS has also proposed a new cost pass through event that is related to the potential development and imposition of a new market structure and approach to capacity allocation in Victoria.

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[190] Australian Energy Regulator 2016, *Final Decision Amadeus Gas Pipeline Access Arrangement 2016 to 2021 Attachment 11 – Reference tariff variation mechanism*, May section 11.4.2

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As described in section 1.6 above, there is currently underway a review into the Declared Wholesale Gas Market. The AEMC has released a draft final report which recommended significant change to the DWGM through the imposition of a new 'virtual hub' model with contractual entry/exit rights for capacity. These recommendations have not yet been considered in detail by the COAG Energy Council, however the proposed market structure did receive in principle support at the August 2016 COAG Energy Council meeting.[191]

It is anticipated that the Victorian Government, and the COAG Energy Council, will make a policy decision on whether to develop new market arrangements in Victoria in 2017. If they do decide to develop new arrangements, there will be a significant period of policy and market development, including drafting and passage of new legislation, development or new market rules, procedures and arrangements, as well as the need to develop and test new market systems. It is also expected that there will be a trial period for the market before the new market arrangements (if agreed) are ultimately enacted.

During the lead up to the commencement of new market arrangements, APA VTS would expect to incur significant costs. As the service provider of the transmission system, new market arrangements are likely to require investment in new systems as well as the development of new procedures. In addition, the process of developing new market arrangements, in particular through representation on working groups and panels, is likely to be drawn out and costly for APA VTS. Indeed, this process can be expected to run for several years.

These costs cannot be adequately forecast for the access arrangement period. Not only has no policy decision been made to proceed with developing or implementing new market arrangements, the scope of changes, if they are developed, are not currently known. Further, it is unlikely that they will be known before the access arrangement starts, even if a policy decision is made in early 2017 to develop new arrangements. This is because it is the detail of requirements for new systems, procedures and

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[191] COAG Energy Council 2016, *Gas Market Reform Package Appendix A – Energy Council response to ACCC and AEMC's reports*, August

arrangements that drive costs, and these are only likely to be considered and confirmed late in the development process.

APA VTS considers that the efficiently and prudently incurred costs associated with the development and implementation of new market arrangements in Victoria should be able to be passed through during the access arrangement period. This includes costs incurred in the development of new systems, process and procedures made necessary by a decision to develop a new gas market structure, which includes costs incurred prior to a decision to implement the new market arrangements, or the start of the new arrangements themselves. On this basis APA VTS proposed a new event: a new gas market structure development event. The definition is as follows:

> *New gas market structure development event—means as event whereby:*
>
> a. *a decision is made to develop and/or implement a new gas market structure in Victoria; and*
>
> b. *Service Provider incurs costs in developing and/or implementing systems, processes and procedures made necessary by the decision to develop and/or implement a new gas market structure.*
>
> *Costs to be passed through are limited to prudent and efficient costs for the development and/or implementation of systems, processes and procedures made necessary by the decision to develop and/or implement a new gas market structure in Victoria.*

The AER set out a number of criteria for considering proposed cost pass through events in its draft decision with respect to the Amadeus Gas Pipeline[192]:

- the event is not covered by any other category;

- the nature and type of event can be clearly identified; and

- the service provider has limited ability to prevent or mitigate the event.

APA VTS considers that its proposed new gas market structure development event meets these criteria.

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[192] Australian Energy Regulator 2015, *Draft Decision: Amadeus Gas Pipeline Access Arrangement 2016 to 2021: Attachment 11 – Reference tariff variation mechanism*, November, p 11-18

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APA VTS considers that the types of costs described above in relation to developing systems, processes and procedures made necessary because of the decision to develop new market arrangements in Victoria would be incurred before the commencement of the new market arrangements (that is, before the enactment of most legislation, rules or procedures). They would therefore be incurred before the formal trigger for cost pass through under a regulatory change event. As a result, it is unclear they that would qualify for pass through under a regulatory change event.

Further, the new arrangements are likely to impose *new* obligations (for example an auction for allocation of pipeline capacity), rather than be a *change* in obligation. This is another area where the regulatory change event does not appear applicable. APA VTS's proposed new gas market structure development event therefore does not appear to be covered by any other cost pass through event.

In respect of the second consideration, APA VTS considers that the event can be clearly identified and defined. APA VTS has modelled its proposed change in market structure development costs pass through event on the existing Insurance Cap event in the access arrangement. This event has a number of preconditions for an event to be considered to have happened. This is relevant to the proposed cost pass through event, in that it requires both a policy decision to proceed with the development of new arrangements, and costs to be incurred in implementing that decision.

On the final consideration, APA VTS does not have the ability to mitigate or prevent the costs. The decision to proceed with a new market structure that will drive these costs rests with the COAG Energy Council. Further, APA VTS will be but one stakeholder in the process of developing the new market arrangements. While APA VTS will be involved in the process and provide submissions and advice on the market arrangement, the ultimate decisions on policy, legislation, rules, procedures and necessary systems will be made by others and will need to meet the needs of all market participants. As such, APA VTS will not have the ability to effectively mitigate or prevent decisions that lead to the need to incur development and implementation costs for systems, processes and procedures.

In respect of the other existing cost pass through events, APA VTS has revised the definitions to reflect those approved by the AER for the Amadeus Gas Pipeline access arrangement. APA VTS considers that this satisfies Rule 97(3)

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in respect of consistency across regimes and administrative simplicity that lowers costs, while also ensuring that APA VTS has reasonable opportunity to recover its efficient costs in providing reference services.[193]

Additional minor changes to the reference tariff variation mechanism

In addition, minor changes in the access arrangement have been made as follows:

- Change the names of the tariff variation mechanisms;

- Reflect the move from the fourth to the fifth access arrangement period; and

- Adopt some minor changes in phrasing consistent with the recently approved Amadeus Gas Pipeline access arrangement.

10.5.3   *Adjusting for differences between forecast and actual inflation*

In section 6.1 of this submission, APA VTS explained why the use of a forecast of inflation for reference tariff determination, and subsequent use of actual inflation in the roll forward model, was likely to result in over or under recovery of investment in a pipeline system, and to reference tariffs which were either lower or higher than should have been the case. APA VTS proposes to reduce the impact of this problem in the future by annually updating the forecast of inflation during an access arrangement period. The way in which this updating of inflation is to be carried out, using the post-tax revenue model, and as part of the Scheduled Reference Tariff Variation Mechanism, is explained in the paragraphs which follow.

Modification of the post-tax revenue model to allow updating the forecast of inflation

The annual updating of the forecast of inflation can be given effect through some relatively minor modifications to the post-tax revenue model used for total revenue determination for the VTS.

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[193] National Gas Law s. 24

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APA VTS notes that, although it uses the AER's post tax revenue model for determining the VTS total revenue, there is, in the NGR, no regulatory requirement compelling its use of that model. In the gas access regime, in contrast to the regime of the National Electricity Law and the National Electricity Rules, there are no requirements for the AER's consultation on a post-tax revenue model, for the regulator's subsequent preparation and publication of such a model, and for service provider use of the published model. If, in gas, the post-tax revenue model is adopted by a service provider for the purpose of total revenue determination, no regulatory requirements preclude modification of the model by a particular service provider: there are no regulatory requirements which preclude APA VTS from modifying the post-tax revenue model to allow forecast inflation to vary during an access arrangement period.

The AER's post tax revenue model now incorporates the functionality required for annually updating the return on debt and for determining the effect of the updated return on total revenue and on reference tariffs (via updated X factors). APA VTS simply proposes to include forecast inflation in the updating mechanism.

In the current version of the AER's post-tax revenue model, the inflation forecast in cell G424 of the worksheet *PTRM input* is transferred to row 6 of the *Assets* worksheet, where it is used to calculate indexed straight line depreciation, and to index the capital base. These calculations can be made, with an updated forecast of inflation, by removing the link to input cell G424 and replacing it with links to a new series of inflation forecasts to be provided as inputs in the worksheet *PTRM inputs*.

The input of the new series of inflation forecasts can be via the currently empty cells of row 431 in the *PTRM input* worksheet, as shown in Figure 10-2 below. [194] As these cells are currently empty, there is no need to insert a new row, and to risk compromising the integrity of the model.

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[194] The illustrative screen shots in this section are taken from the post-tax revenue model lodged with this submission.

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Figure 10-2 – Proposed post-tax revenue model: PTRM Input worksheet

	ABCD	E	F	G	H	I	J	K
422	**Cost of Capital**							
423				2018-22				
424	Inflation Rate - WACC	f		2.00%				
425	Return on Equity	Re		8.50%				
426	Value of Imputation Credits (gamma)	γ		25%				
427	Proportion of Debt Funding	D/V		60%				
428								
429				2018	2019	2020	2021	2022
430	Trailing Average Portfolio Return on Debt			7.47%				
431	Inflation rate - Assets			2.00%	2.00%	2.00%	2.00%	2.00%
432								
433				The trailing average portfolio return on debt and out turn inflation must be entered				

The inflation forecast in *PTRM input* cells G431:K431 would be linked, year by year, to the row 6 of the *Assets* worksheet, as shown below:

Figure 10-3 – Proposed link from PTRM input to Assets

G6		fx	='PTRM input'!G431					
	A	B	C	D	E	F	G	H	I	J	K
4		**Year**					2017	2018	2019	2020	2021	2022
5												
6		Inflation Assumption (CPI % increase)						2.00%	2.00%	2.00%	2.00%	2.00%
7		Cumulative Inflation Index (CPI end period)					100.0%	102.0%	104.0%	106.1%	108.2%	110.4%

Updating the forecast of inflation

Over the access arrangement period, the inflation figures in row 431 of the PTRM Input worksheet would be progressively updated in a way similar to the updating of the return on debt in row 430.

In each year preceding the year for which the reference tariffs are to be varied, the forecast of inflation from the previous year (or, in the case of the first regulatory year of the access arrangement period, the forecast from the post-tax revenue model used to determine the initial revised reference tariffs for the period), is replaced by actual inflation for that year. The actual inflation (measured as the year-on-year change in the June quarter CPI for the year preceding the year for which reference tariffs are to be varied) would also be the forecast of inflation required, in the post-tax revenue model, for the remainder of the access arrangement period.

Varying the Reference Tariffs

The annual updating of the forecast of inflation will change the total revenue in subsequent years of the access arrangement period. This change in total revenue, to be calculated using the AER-approved post-tax revenue model, can then be incorporated in Revised Reference tariffs for the VTS for the next

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regulatory year in accordance with the proposed Scheduled Reference Tarff Variation Mechanism.

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A Information required by the NGR and AER RIN

A.1 Index of information

This index of information provides cross-references to the documents that make up APA VTS's revised access arrangement proposal, providing the location of information submitted in compliance with the National Gas Rules or the AER Regulatory Information Notice.

Table A.1 – Index of information

Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN template					
RIN 1.1	Provide the information required in each regulatory template in the Microsoft Excel workbook attached at Appendix A completed in accordance with this Notice.				B.1
Basis of information					
RIN 1.2 (a)	Provide all financial information on a calendar year basis (with the exception of the 2013 calendar year) and set out whether the information is actual information, estimated information or forecast information.		All financial tables in AAI	All financial tables in submission	All financial tables in template
RIN 1.2 (a)	For information in the nature of a forecast or estimate provide a statement of the basis of the forecast or estimate.			Where relevant in submission	
RIN 1.2(b)	Provide all financial information on a calendar year basis (with the exception of the 2013 calendar year) and set out the units of measurement for parameters or values used to derive or infer values		All financial tables in AAI	All financial tables in submission	All financial tables in template
NGR 73(2)	The basis on which financial information is provided must be stated in the access arrangement information.		All financial tables in AAI	All financial tables in submission	All financial tables in template

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 1.2(c)	Provide all financial information on a calendar year basis (with the exception of the 2013 calendar year) and set out whether the information is expressed in nominal, real or another basis and include the base year of information where relevant.		All financial tables in AAI	All financial tables in submission	All financial tables in RIN at B.1
General					
RIN 1.5	Provide any calculations used to convert real to nominal dollars or nominal to real dollars for the purposes of providing the information required under RIN 1.3 and 1.4			B.4 & B.6	B.1
RIN 1.6	Provide an explanation should capital and operating expenditure provided in the regulatory templates be materially different to information previously submitted to the AER such as via annually submitted RINs.				
RIN 1.7	In the relevant regulatory template, report any change and the materiality of that change where any method of allocation under RIN 1.6 changes over time.				
RIN 1.8(a)	Where historical information provided in the regulatory templates has previously been reported to the AER this information must reconcile with the previously provided information				
RIN 1.8(b)	Where historical information provided in the regulatory templates has previously been reported to the AER explain why the information does not reconcile with the previously provided information				
RIN 1.9(a)	For each change identified in the response to RIN 1.8 explain the nature of and the reasons for the variation				
RIN 1.9(b)	For each change identified in the response to RIN 1.8 quantify the effect of the variation on the annual Regulatory Information Notice for the relevant regulatory year.				

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 1.10	Provide information required in the regulatory templates in accordance with the instructions				B.1
RIN 1.11(a)	Provide a table that references each response to a section in this Schedule 1 and where it is provided in or as part of the access arrangement proposal			A.1	
RIN 1.11(b)	Provide a table or chart that references each document provided in or as part of the access arrangement proposal and its relationship to other documents provided.			A.2	
RIN 1.13	If APA VTS wishes to make a claim for confidentiality over any information, provide the details of that claim in accordance with the requirements of the AER's Confidentiality Guideline, as if it extended and applied to that claim for confidentiality			A.5 & A.6	
RIN 1.15	Confirm, in writing, that APA VTS consents to the AER disclosing all other APA VTS information on the AER website			Submission cover letter	
Contents of an access arrangement					
NGR 48(1)(a)	A full access arrangement must identify the pipeline to which the access arrangement relates and include a reference to a website at which a description of the pipeline can be inspected	1.3	1	1.5.2	
NGR 48(1)(b)	A full access arrangement must describe the pipeline services the service provider proposes to offer to provide by means of the pipeline	2.2	10.1	2.1	
NGR 48(1)(c)	A full access arrangement must specify the reference services	2.2	10.1	2.1	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
NGR 48(1)(d)	A full access arrangement must specify for each reference service (i) The reference tariff (ii) the other terms and conditions on which the reference service will be provided	2.3 & Schedule A			
NGR 48(1)(e)	A full access arrangement must if the access arrangement is to contain queuing requirements – set out the queuing requirements	6.1			
NGR 48(1)(f)	A full access arrangement must set out the capacity trading requirements	5.1			
NGR 48(1)(g)	A full access arrangement must set out the extension and expansion requirements	7		2.2.3	
NGR 48(1)(h)	A full access arrangement must state the terms and conditions for changing receipt and delivery points	5.2			
NGR 48(1)(i)	A full access arrangement must if there is to be a review submission date – state the review submission date and the revision commencement date	1.5		2.2.2	
Demand					
NGR 72(1)(a)(iii)	The AAI for a full access arrangement must include usage of the pipeline over the earlier access arrangement period showing: (A) minimum, maximum and average demand for each receipt or delivery point; and (B) user numbers for each receipt or delivery point;		4	3.1	B.1
RIN 2.1	Provide details of the key drivers behind the demand forecasts			3.2.1	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 2.2	Explain and outline the methodology that has been used to support the demand forecasts, including the key assumptions and inputs that have been used and how demand for pipeline services is differentiated			3.2.1	
RIN 2.3	Explain how the demand forecasts have been used to develop the service provider's capital expenditure and operating expenditure forecasts			5.3.1	
RIN 2.4	Explain any trends of demand and volumes over the previous access arrangement period and current access arrangement period.			3.1.1 & 3.2.1	
Pipeline capacity and utilisation					
NGR 72(1)(d)	The AAI for a full access arrangement must include to the extent it is practicable to forecast pipeline capacity and utilisation of pipeline capacity over the access arrangement period, a forecast of pipeline capacity and utilisation of pipeline capacity over that period and the basis on which the forecast has been derived		4	3.2.3	B.1
RIN 3.1	Provide details of the key drivers behind the forecasts of pipeline capacity and utilisation			3.2.3	
RIN 3.2	Explain and outline the methodology, including key assumptions and inputs used to prepare the forecasts of pipeline capacity and utilisation			3.2.3	
RIN 3.3	Explain how the pipeline capacity and utilisation forecasts have been used to develop the service provider's capital expenditure and operating expenditure forecasts			3.2.3 & 5.3.1	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 3.4	Explain any trends of pipeline capacity and utilisation over the earlier access arrangement period and current access arrangement period.			3.1.3	
Building block revenue					
Capital expenditure					
NGR 72(1)(a)(i)	The AAI for a full access arrangement must include capital expenditure (by asset class) over the earlier access arrangement period		2.1	5.2	B.1
NGR 72(1)(b)	The AAI for a full access arrangement must include how the capital base is arrived at and, if the access arrangement period commences at the end of an earlier access arrangement period, a demonstration of how the capital base increased or diminished over the previous access arrangement period		3.1	6.2	
NGR 72(1)(c)	The AAI for a full access arrangement must include the projected capital base over the access arrangement period, including: (i) a forecast of conforming capital expenditure for the period and the basis for the forecast; and (ii) a forecast of depreciation for the period including a demonstration of how the forecast is derived on the basis of the proposed depreciation method;		3.2	6.3	
RIN 4.1(a)(i)	Forecast conforming capital expenditure in the current access arrangement period, describe and explain the nature of material forecast capital expenditure proposed in each asset class or capital expenditure category			5.3 & B.4	B.1

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.1(a)(ii)	Forecast conforming capital expenditure in the current access arrangement period, identify and explain the materiality threshold used to determine material forecast capital expenditure.			5.3	
RIN 4.1(a)(iii)	Forecast conforming capital expenditure in the current access arrangement period, identify the location of the proposed forecast capital expenditure.			5.3, D.1 & D.2	
RIN 4.1(a)(iv)	Forecast conforming capital expenditure in the current access arrangement period, provide: (1) relevant internal decision making documents including but not limited to business cases, feasibility studies, forecast demand studies and internal reports and the date of board resolution/management decisions relating to approval of the forecast capital expenditure; and (2) other internal or external documentation or models to justify the forecast conforming capital expenditure.			NA	
RIN 4.1(a)(v)	Forecast conforming capital expenditure in the current access arrangement period, explain whether the forecast conforming capital expenditure is to be funded by parties other than the asset owner.			6.3	
RIN 4.1(a)(vi)	Forecast conforming capital expenditure in the current access arrangement period, provide details of contractual agreements with parties where capital contributions are made by users to new capital expenditure pursuant to rule 82.			6.3	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.1(a)(vii)	Forecast conforming capital expenditure in the current access arrangement period, if Rule 79(2)(a) is relied on to justify new capital expenditure, provide: (1) a quantitative analysis which demonstrates how the capital expenditure is justifiable under Rule 79(2)(a); and (2) an outline of the nature and quantification of the economic value that directly accrues to the service provider, gas producer, users and end users to address Rule 79(3).			NA	
RIN 4.1(a)(viii)	Forecast conforming capital expenditure in the current access arrangement period, if Rule 79(2)(b) is relied on to justify new capital expenditure, provide a quantitative analysis that demonstrates the capital expenditure is justifiable under Rule 79(2)(b).			B.5	
RIN 4.1(a)(ix)	Forecast conforming capital expenditure in the current access arrangement period, if Rules 79(2)(c)(i)-79(2)(c)(iii) are relied on to justify new capital expenditure, as relevant: (1) identify the statutory obligation or technical requirement and the relevant authority or body enforcing the obligation or requirement; (2) explain how the forecast capital expenditure satisfies the relevant statutory obligation or technical requirement; and (3) provide supporting technical or other external or internal reports about how the forecast capital expenditure complies with the relevant statutory obligation or technical requirement.			5.3, D.1, D.2, D.3	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.1(a)(x)	Forecast conforming capital expenditure in the current access arrangement period, if Rule 79(2)(c)(iv) is relied on to justify new capital expenditure (1) quantify and explain the change in demand for existing services necessitating the new capital expenditure; and (2) provide reports or other information and documentation that supports how the forecast capital expenditure will meet the increase in demand for existing services.			D.2.1	
RIN 4.1(b)(i)	Capital expenditure that is not conforming in the current access arrangement period, if the speculative capital expenditure account has increased at a rate different to the rate of return implicit in a reference tariff: (1) identify the differences in rates; and (2) explain why.			NA	
RIN 4.1(b)(ii)	Capital expenditure that is not conforming in the current access arrangement period, identify the mechanism (if required by Rule 82(3)) which prevents the service provider from benefitting, through increased revenue, from the user's contribution to the capital base.	NA		2.2.5	
NGR 85(1)	A full access arrangement may include (and the AER may require it to include) a mechanism to ensure that assets that cease to contribute in any way to the delivery of pipeline services (redundant assets) are removed from the capital base.	NA			
RIN 4.1(c)(i)	Capital redundancy policy in the current access arrangement period, if a mechanism to remove redundant assets is not proposed, explain why with reference to the relevant rules	NA		2.2.4	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.1(c)(ii)	Capital redundancy policy in the current access arrangement period, provide an explanation for whether and how APA VTS considers the requirements of s. 79 of the NGR are met for any amounts added to or deducted from the opening capital base: (1) from the speculative capital expenditure account; (2) for the reuse of redundant assets; (3) for redundant assets.			NA	
Depreciation					
RIN 4.1(d)(i)	Identify each change to standard asset lives for existing asset classes from the previous determination. Explain the reason(s) for the change and provide relevant supporting information.			NA	
RIN 4.1(d)(ii)	For each proposed new asset class, explain the reason(s) for using these new asset classes and provide relevant supporting information on their proposed standard asset lives.			NA	
RIN 4.1(d)(iii)	If existing asset classes from the previous determination are proposed to be removed and their residual values to be reallocated to other asset classes, explain the reason(s) for the change and provide relevant supporting information. This should include a demonstration of the materiality of the change on the forecast depreciation allowance.			NA	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
NGR 90(1)&(2)	A full access arrangement must contain provisions governing the calculation of depreciation for establishing the opening capital base for the next access arrangement period after the one to which the access arrangement currently relates. The provisions must resolve whether depreciation of the capital base is to be based on forecast or actual capital expenditure	3.8		9.2.1	
RIN 4.1(d)(iv)	Describe the method used to depreciate existing asset classes as at 1 January 2018 (the start of the forthcoming access arrangement period) and provide supporting calculations	3.8		9.2.1	
Rate of return					
NGR 72(1)(g)	The AAI for a full access arrangement must include the proposed return on equity, return on debt and allowed rate of return, for each regulatory year of the access arrangement period, in accordance with rule 87, including any departure from the methodologies set out in the rate of return guidelines and the reasons for that departure		7	7	B.1
NGR 72(1)(ga)	The AAI for a full access arrangement must include the proposed formula (if any) that is to be applied in accordance with rule 87(12)		7	7	
Tax					
NGR 72(1)(h)	The AAI for a full access arrangement must include the estimated cost of corporate income tax calculated in accordance with rule 87A, including the proposed value of imputation credits referred to in that rule		7 & 8	7 & 9.3	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.2(a)	Provide APA VTS's calculation of the estimated cost of corporate income tax for the next access arrangement period using APA VTS's post-tax revenue model.		8	9.3	
RIN 4.2(b)	Provide a demonstration that the calculation referred to in (a) complies with the NGR.			9.3	
RIN 4.2(c)	If APA VTS proposes to change the underlying methods in its post-tax revenue model compared with the approved post-tax revenue model for the previous access arrangement proposal for the calculations referred to in (a), describe the reasons for the changes.			9.3	
RIN 4.2(d)	Identify any changes to tax depreciation rates for existing asset classes approved for the previous access arrangement proposal. Explain the reason/s for the change and provide relevant supporting information, including identifying tax laws governing depreciation for tax purposes.			9.3	
RIN 4.2(e)	Describe the method used to calculate the tax depreciation rates as at 1 January 2018 and provide supporting calculations, if the approach differs from that in the approved roll forward model for the previous access arrangement proposal.			9.3	
RIN 4.2(f)	Provide APA VTS's calculation of the tax asset base for each regulatory year of the current access arrangement period and next access arrangement period using APA VTS's roll forward model.			9.3	
RIN 4.2(g)	If APA VTS proposes to change the underlying methods in its post-tax revenue model compared with the approved post-tax revenue model for the previous access arrangement proposal for the calculations referred to in (f) describe the reasons for the changes.			9.3	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.2(h)	Identify any differences in the capitalisation of expenditure for regulatory accounting purposes and tax accounting purposes. Provide reasons and supporting calculations to reconcile any differences between the two forms of accounts.			9.3	
Incentive mechanism					
NGR 98(1)	A full access arrangement may include (and the AER may require it to include) one or more incentive mechanisms to encourage efficiency in the provision of services by the service provider.	8.2			
NGR 72(1)(i)	The AAI for a full access arrangement must include, if an incentive mechanism operated for the previous access arrangement period—the proposed carry-over of increments for efficiency gains or decrements for efficiency losses in the previous access arrangement period and a demonstration of how allowance is to be made for any such increments or decrements		9	8.6	B.1 & B.6
RIN 4.3(a)(i)	Existing incentive mechanism in the previous access arrangement period, for each incentive mechanism which applied in the previous access arrangement period, provide an outline of how it operates			8.6	
RIN 4.3(a)(ii)	Existing incentive mechanism in the previous access arrangement period, for each incentive mechanism which applied in the previous access arrangement period, explain the increments for efficiency gains and decrements for efficiency losses that have occurred in the previous access arrangement period and the relevant carryover amounts in the current access arrangement period		9	8.6	B.1

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.3(a)(iii)	Existing incentive mechanism in the previous access arrangement period, for each incentive mechanism which applied in the previous access arrangement period, provide relevant supporting analyses or reports.				B.1 & B.6
NGR 72(1)(l)	The AAI for a full access arrangement must include the service provider's rationale for any proposed incentive mechanism		11	8.6	
RIN 4.3(b)(i)	Proposed incentive mechanism in the access arrangement period, for each incentive mechanism proposed in the access arrangement period, provide an outline of how it operates			8.6	
RIN 4.3(b)(ii)	Proposed incentive mechanism in the access arrangement period, for each incentive mechanism proposed in the access arrangement period, explain its rationale including how it is intended to encourage efficiency of the provision of services and is consistent with the revenue and pricing principles			8.6	
RIN 4.3(b)(iii)	Proposed incentive mechanism in the access arrangement period, for each incentive mechanism proposed in the access arrangement period, provide relevant supporting analyses or reports.		NA	NA	
Operating expenditure					
NGR 72(1)(a)(ii)	The AAI for a full access arrangement must include operating expenditure (by category) over the earlier access arrangement period		2.2	8.2	B.1
NGR 72(1)(e)	The AAI for a full access arrangement must include a forecast of operating expenditure over the access arrangement period and the basis on which the forecast has been derived		5	8.3	B.1 & B.6

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.4(a)(i)	Provide an outline and explanation of the change in operating expenditure categories between the earlier access arrangement period and the access arrangement period			NA	
RIN 4.4(a)(i)	Provide a description and explanation of the nature of material forecast operating expenditure in each operating expenditure category which: (1) outlines changes to the operations of the pipeline from the earlier access arrangement period that have resulted in material changes to operating expenditure category and total operating expenditure in the access arrangement period; and (2) identifies the materiality threshold used to determine the material forecast operating expenditure.			8.3	
NGR 72(1)(f)	The AAI for a full access arrangement must include the key performance indicators to be used by the service provider to support expenditure to be incurred over the access arrangement period		6		
External service provision					
RIN 4.5(a)	For each service provided by another party that contributes in a material way to the provision of the pipeline service(s) and is included in forecast operating expenditure and capital expenditure, provide the name of the external party and contract			D.6	
RIN 4.5(b)	For each service provided by another party that contributes in a material way to the provision of the pipeline service(s) and is included in forecast operating expenditure and capital expenditure, provide details of how the contract was awarded (for example, by competitive tender)			D.6	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.5(c)	For each service provided by another party that contributes in a material way to the provision of the pipeline service(s) and is included in forecast operating expenditure and capital expenditure, provide details of fees and charges and a description of the goods or services provided			D.6	
RIN 4.5(d)	For each service provided by another party that contributes in a material way to the provision of the pipeline service(s) and is included in forecast operating expenditure and capital expenditure, provide the commencement date and term of the contract			D.6	
RIN 4.5(e)	For each service provided by another party that contributes in a material way to the provision of the pipeline service(s) and is included in forecast operating expenditure and capital expenditure, provide reasons why the functions were outsourced			D.6	
RIN 4.5(f)	For each service provided by another party that contributes in a material way to the provision of the pipeline service(s) and is included in forecast operating expenditure and capital expenditure, provide details of the relationships with the party or parties named in 4.7(a) and the service provider including if a party to the contract is an associate of any of the service providers of the pipeline			D.6	
RIN 4.5(g)	For each service provided by another party that contributes in a material way to the provision of the pipeline service(s) and is included in forecast operating expenditure and capital expenditure, provide an explanation of the materiality measure used			D.6	
Tariffs					

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
NGR 72(1)(j)	The AAI for a full access arrangement must include the proposed approach to the setting of tariffs including: (i) the suggested basis of reference tariffs, including the method used to allocate costs and a demonstration of the relationship between costs and tariffs; and (ii) a description of any pricing principles employed but not otherwise disclosed under this rule		10	10	
NGR 72(1)(m)	The AAI for a full access arrangement must include the total revenue to be derived from pipeline services for each regulatory year of the access arrangement period		12	10.1	
RIN 4.6(a)(i)	Total revenue allocation: provide an outline of the nature of the allocation method used to allocate cost pools to reference and other services and provide analysis and information to support this allocation			10.2	
RIN 4.6(a)(ii)	Total revenue allocation: if relevant, for rebateable services, provide a description of the mechanism that the service provider will use to apply an appropriate portion of the revenue generated from the sale of rebateable services to price rebates (or refunds) to users of reference services.				
RIN 4.6(b)(i)	Tariffs- transmission pipelines: For each reference service and for each user or class of users for a reference service for transmission pipelines, outline the nature of: (1) costs directly attributable to each reference service (2) other costs that are attributable to reference services (3) where relevant outline the costs directly attributable and other costs attributable for the user or class of users and other users or classes of users.			10.2	

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.6(b)(ii)	Tariffs- transmission pipelines: explain and provide information about, the cost allocation method outlined in 4.8(a)(i)			10.2	
NGR 72(1)(k)	The AAI for a full access arrangement must include the service provider's rationale for any proposed reference tariff variation mechanism		10.4	10.5	
NGR 92(1)	A full access arrangement must include a mechanism (a reference tariff variation mechanism) for variation of a reference tariff over the course of an access arrangement period.	4.6			
RIN 4.6(c)(i)	For each tariff variation mechanism, outline the proposed reference tariff variation mechanism and the basis for any parameters used in the mechanism	4.6		10.5	
RIN 4.6(c)(ii)	For each tariff variation mechanism, outline how the reference tariff mechanism gives the AER adequate oversight or powers of approval over variation of the reference tariff (Rule 97(4)).	4.6		10.5	
RIN 4.6(d)(i)	For each cost pass through mechanism, define and describe each cost pass through event	4.6.3	10.4	10.5	
RIN 4.6(d)(ii)	For each cost pass through mechanism, explain how each cost pass through event is relevant to a building block component in Rule 76 and is either foreseen or unforeseen and the costs of the event are uncontrollable and therefore cannot be included in forecasts for total revenue			10.5	
RIN 4.6(d)(iii)	For each cost pass through mechanism, outline how the cost pass through mechanism gives the AER adequate oversight or powers of approval over variation of the reference tariff (Rule 97(4))			10.5	
Customer bill impacts					

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Source	Requirement	AA reference	AAI reference	Submission	RIN template
RIN 4.7(a)	Using the regulatory template, provide APA VTS's estimate of the impact of its proposal on typical residential and small business customers' gas bills.			NA	NA
RIN 4.6(b)	If APA VTS proposes an alternative method to estimate the impact of its proposal on typical customer bills, provide the alternative calculations, and describe the method and underlying assumptions used.			10.4	B.1, tab 4
Models and reports					
RIN 4.8(c)(i)	Provide relevant models and user manuals: include financial models including, but not limited to, tariff, revenue, cost allocation and demand forecasts, along with user manuals that underlie and support the access arrangement proposal and access arrangement information.			Attachment B	
RIN 4.8(c)(ii)	Provide relevant consultants' reports, including: (1) copies of consultants' or external expert reports relied on to support or justify the access arrangement proposal; and (2) terms of reference for each consultant's or external expert reports relied on identified in 2.7.1(b)(I).			C.1, D.3 & E.1	

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A.2   **Submission Document Map – Public**

A.3   **Rob Wheals' Statutory Declaration – Public**

A.4   **Consumer Engagement Plan – Public**

A.5   **Confidentiality claims – Public**

A.6   **Confidentiality statistics – Public**

These are provided as separate documents

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B RIN Templates and supporting financial models

B.1 Completed RIN templates – Public

B.2 Post Tax Revenue Model – Public

B.3 Roll Forward Model – Public

B.4 Capital expenditure model – Public

B.5 Net Present Value calculations – Public

B.6 Operating expenditure model – Public

B.7 Tariff model – Confidential

B.8 Price Control Model – Confidential

B.9 Prudent Discount calculations – Confidential

B.10 Iona refill tariff calculation – Public

All provided as separate files

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C Demand and asset utilisation

C.1 Frontier Economics, Victorian GPG forecasts – Public

D   Key asset management and planning documents

D.1   APA VTS Asset Management Plan – Confidential

Public version provided with confidential detail redacted

D.2   Capital expenditure business cases

D.2.1   Growth capital expenditure business cases

D.2.2   SIB capital expenditure business cases

D.2.3   Non-system capital expenditure business cases

D.3   GPA Engineering, Commentary report: Victorian networks urban encroachment business case review – Public

D.4   APA Enterprise Risk Management Plan – Confidential

D.5   APA VTS Safety Case – Public

D.6   List of outsourced expenditure – Confidential

These documents are supplemented by the resource documents pack provided with the submission

All provided as separate documents

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E   Rate of return documents

E.1   Frontier Economics: An equity beta estimate for Australian energy network businesses – Public

E.2   Return on debt calculation - Public

E.3   Rate of return averaging periods - Confidential

Provided as separate documents

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