Victorian Transmission System
Access Arrangement 2018 – 2022

Further Advice
Regarding Forecast Capex
for
Selected Projects

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Sleeman Consulting

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1. Background

1.1 In January 2017, APA VTS Australia (Operations) Pty Limited (**APA VTS**) submitted to the Australian Energy Regulator (**AER**) an access arrangement proposal for the Victorian Transmission System (**VTS**) for the period from 1 January 2018 to 31 December 2022.

1.2 In July 2017, the AER released its draft decision in respect of APA VTS' access arrangement proposal. The draft decision did not approve forecast capital expenditure (**Capex**) in respect of a number of proposed capital works projects.

1.3 In August 2017, APA VTS submitted a revised access arrangement proposal. The revised proposal responded to the AER's draft decision, in some cases accepting the draft decision and in other cases providing additional information in support of either the original or modified capital works projects.

1.4 I have been asked by the AER to undertake further review of Capex forecasts for selected projects with regard for modifications (if any) to the projects and for the additional information provided by APA VTS.

1.5 The objective of the further review is to investigate whether the proposed Capex is prudent and efficient and, if necessary, make recommendations regarding the level of Capex that might be prudent and efficient. To be allowable for tariff setting purposes, Capex 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. In addition:

a) the overall economic value of the Capex must be positive; or

b) the present value of incremental revenue generated by incurring the Capex must exceed the present value of the Capex itself; or

c) the Capex must be necessary to:

   i) maintain and improve the safety of services; or

   ii) maintain the integrity of services; or

   iii) comply with a regulatory obligation; or

   iv) maintain capacity to meet levels of demand for service existing at the time the Capex is incurred.

1.6 In undertaking the further review I have examined the additional information presented by APA VTS and have participated in a meeting between the AER and APA VTS at which APA VTS presented and explained the additional information.

1.7 My review, and my recommendations to the AER regarding prudent and efficient APA VTS Capex, are set out in the following sections of this Report.

2. Warragul Lateral Expansion

2.1 In its original access arrangement proposal APA VTS proposed to expand, by looping prior to winter 2020, the capacity of the lateral that supplies gas to Warragul. This is a project that had been previously proposed, and approved, but not completed. As a consequence of deferring the project gas supply pressure problems were experienced at Warragul and sub-optimal measures had to be taken to maintain security of gas supply.

2.2 In its draft decision the AER noted that the proposed cost of the Warragul lateral expansion had increased from $2.4m previously approved to $7.4m with much of the increase being attributable to excessive management and commissioning costs, a six-fold increase in land access costs and an unsubstantiated increase in construction costs.

2.3 In its revised access arrangement proposal APA VTS brought forward the expansion requirement from 2020 to 2019 and provided additional information in support of the forecast cost of looping the Warragul lateral.

2.4 The requirement for expansion of capacity to deliver gas to Warragul lateral has already been accepted[1]. The requirement for the expansion to be completed by winter 2019 rather than winter 2020 is also accepted. This change of timing is a direct reflection of gas demand forecasts prepared by the Australian Energy Market Operator (**AEMO**). AEMO has expressed[2] concern regarding the potential for a breach of minimum pressure in the winter of 2019.

2.5 As regards forecast Capex, APA VTS has:

a) provided a detailed explanation of the basis upon which project management and commissioning costs have been estimated, including personnel input requirements.

   On inspection of the information presented I consider it to be fair and reasonable.

b) explained there is a need for acquisition of additional easements (owing to existing easements being too narrow, or to avoid use of road reserves) with the high cost of such easements being reflective of the applicable (urban) land zoning.

   I am satisfied that APA VTS' assessment of land access costs is fair and reasonable.

c) explained that the estimated cost of construction of the looping pipeline is based upon independent contractor quotations that have regard for:

   - the short length of the project, which means fixed costs (like mobilisation) represent a bigger percentage of the overall cost;
   - the need for a long, directionally-drilled crossing of the Princes Highway; and

[1] See section 4.14(i) of Sleeman Consulting's 20 April 2017 report to the AER titled "Review of Forecast Capex for Selected Projects".

[2] See Notice of Threat to System Security issued by AEMO on 10 March 2017.

- cost imposts associated with working in, or close to, road reserves and public space, working around other infrastructure and reinstating infrastructure such as roads or footpaths.

I have considered the information provided by APA VTS and am of the opinion that it substantiates the relatively high unit cost ($250k per inch-km) of the Warragul looing project. Of particular importance in my opinion are the short length of the project, the need for a significant directionally-drilled highway crossing and the zoning/development of the land through which the pipeline will pass.

2.6 I consider APA VTS' proposed Warragul looping project is 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

3. Safety Management – High Consequence Areas

3.1 In its original access arrangement proposal APA VTS proposed the installation of slabbing as a risk mitigation measure above several sections of gas pipeline that are susceptible to rupture in the event of mechanical damage and that are located in areas that have, or are scheduled to become, built-up.

3.2 In its draft decision the AER found that the proposed expenditure on the slabbing program was not conforming Capex. This finding reflected, in particular, the following:

- it would be premature, and therefore inefficient, for the full slabbing program to be carried out immediately; and
- more information was required to confirm that installation of slabbing is the most cost effective risk mitigation measure for the Wollert-Wodonga pipeline.

3.3 In its revised access arrangement proposal APA VTS presented a much reduced slabbing program, as outlined in Table 1.

Table 1: Pipelines Risk Mitigation Measures

Pipeline	Original Proposal	Revised Proposal
Brooklyn-Corio	Slab 9.18 km	Slabbing not required. Pressure can be reduced
Wollert-Wodonga	Slab 13.7 km	Provide for 2 km slabbing
Brooklyn-Lara	Slab 16.6 km	Provide for 7 km slabbing

3.4 I have previously[3] expressed the opinion that the implementation of measures to mitigate against the risk of damage to and rupture of the pipelines identified in Table 1 is necessary to ensure continued compliance with regulatory obligations (ie, the Code). It is therefore not necessary to reassess whether the risk mitigation measures are necessary. It is only necessary to assess the appropriateness of the proposed measures.

[3] See section 2.8 of Sleeman Consulting's 20 April 2017 report to the AER titled "Review of Forecast Capex for Selected Projects".

3.5 Specific observations in relation to each affected pipeline are:

a) Brooklyn-Corio Pipeline

With reconfiguration of the Brooklyn compressor station now proposed, it will be possible to reduce the operating pressure of the Brookly-Corio pipeline and thereby overcome the need for installation of slabbing.

b) Wollert-Wodonga Pipeline

APA VTS has undertaken more detailed review of the timing of prospective urban development activity and its interaction with gas pipeline infrastructure. This has allowed the provision for installation of slabbing to be reduced to 2 km for the period 2018 to 2020.

In the longer term, as unban development continues, it is possible that further slabbing may become necessary. This being the case I consider that the alternative of reducing the operating pressure of the Wollert- Wandong pipeline should continue to be monitored[4]. APA VTS has advised[5] that it will continue to monitor the pressure reduction alternative.

I note however that:

- the pressure reduction alternative is presently higher cost than installation of slabbing; and
- the reduced overall requirement for and therefore cost of slabbing will reduce the potential attractiveness of the pressure reduction alternative.

I consider APA VTS' proposed slabbing program for the Wollert-Wodonga pipeline is 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.

c) Brooklyn-Lara Pipeline

APA VTS has recognised that much of the previously proposed slabbing program for the Brooklyn-Lara pipeline will not be required until after 2022. This has allowed a material reduction in the slabbing program for the period 2018 to 2022.

I have previously accepted[6] that installation of slabbing is the preferred risk mitigation measure for the Brooklyn-Lara pipeline.

APA VTS' revised slabbing program is reflective of highly-likely urban development activity[7] with modest (3 km) provision for commencement of other development during the period. Since there are six other precinct structure plans

4 This alternative is discussed in section 2.7(ii) of Sleeman Consulting's 20 April 2017 report to the AER titled "Review of Forecast Capex for Selected Projects".

5 AER – APA VTS meeting held on 28 August 2017.

6 See section 2.9 of Sleeman Consulting's 20 April 2017 report to the AER titled "Review of Forecast Capex for Selected Projects".

7 Namely, the Tameit Plains precinct structure plan.

overlapping 16.5 km of the length of the Brooklyn-Lara pipeline, the 3 km provision is not unreasonable.

I consider APA VTS' proposed slabbing program for the Brooklyn-Lara pipeline is 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.

4. Pipeline Integrity Management

4.1 In its original access arrangement proposal APA VTS proposed Capex of $6.2m for modifications to three pipelines to enable inline inspection (**ILI**) of those pipelines.

4.2 In its draft decision the AER accepted that ILI techniques are preferable to direct assessment techniques for determining pipeline condition, but noted that APA VTS had not provided information (such as a cost-benefit analysis) to demonstrate that the overall economic value of the proposed Capex was positive. It was also noted that, in the case of the Truganina to Plumpton pipeline, the pipeline modification work would be rendered unnecessary through completion of the Western Outer Ring Main (**WORM**) project.

4.3 In its revised access arrangement proposal APA VTS provided the following information:

a) Truganina to Plumpton pipeline

APA VTS accepted that development of the WORM means modifications to allow ILI are no longer required;

b) James Street pipeline

APA VTS has clarified a number of factors in relation to the James Street pipeline, including:

- the potential, devastating consequences of failure of the pipeline which runs through a high-consequence area and, for part of its length, is beneath James Street;
- the expected remaining (32 year) life of the pipeline;

APA VTS has also made reference to 'risk mitigation', a factor that, for the following reason, I consider to be of major importance in the case of a pipeline, such as the James Street pipeline, located in a high-consequence area. ILI techniques afford a high level of confidence (almost certainty) regarding the condition of a pipeline, whereas direct assessment techniques can only afford some statistical level of confidence[8] regarding the condition of the pipeline. In circumstances where the consequences of pipeline failure are serious

[8] For example, 95% confidence that conditions observed through sampling (ie dig-ups) are representative of the overall condition of the pipeline. While the level of confidence can be increased through additional sampling the actual condition of the pipeline along its entire length will remain unknown.

(conceivably involving fatality) it is my opinion that a prudent service provider should reduce risks to as low as is reasonably possible.

I have no doubt that a cost-benefit analysis of the nature previously presented[9] would, if modified to include risk-weighted consequences, demonstrate that modification of the James Street pipeline to allow ILI is of positive value.

I consider APA VTS' proposed modification of the James street pipeline to allow ILI is 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.

c) Tyers to Maryvale pipeline

APA VTS advised that the Capex requirement for modification of the Tyers to Maryvale pipeline has been marginally reduced (from $802k to $668k).

APA VTS also advised that a direct current voltage gradient survey was carried out on the Tyers to Maryvale pipeline in June 2017, identifying 53 defects. It is my opinion that, in the absence of further information to determine the nature of each of these defects, it would be prudent that they be excavated and inspected.

Having regard for the information set out above, I have revised the cost-benefit analysis[10] for modification of the Tyers to Maryvale pipeline to allow ILI. The revised assessment is set out in Table 2.

Table 2: Cost Benefit Analysis – Tyers to Maryvale Pipeline

ILI Modification Cost	$668k
ILI Survey Cost (*10 yearly*)	$404k
DCVG Survey Cost (*5 yearly*)	$41k
Avoided Dig-up Cost (year 1)	$1,484k
Avoided Dig-up Costs[11] (*year 2 on*)	$280k
NPV, unindexed pre-tax[12] at 3% at 5% at 8%	 $4,132k $3,492k $2,792k

Table 2 demonstrates that modification of the Tyers to Maryvale pipeline to allow ILI is beneficial even without consideration of the risk-weighted consequences of failure of the pipeline.

I consider APA VTS' proposed modification of the Tyers to Maryvale pipeline to allow ILI is such as would be incurred by a prudent service provider acting

9 See Table 3 of Sleeman Consulting's 20 April 2017 report to the AER titled "Review of Forecast Capex for Selected Projects".

10 An indicative cost-benefit analysis was presented as Table 3 in Sleeman Consulting's 20 April 2017 report to the AER titled "Review of Forecast Capex for Selected Projects".

11 Dig-ups have been provided for at a rate of 1 per kilometre, with minimum of 2 per pipeline, and a cost of $28,000 per inspection, based upon information provided in APA VTS Business Case 257, 258, 259. It has been conservatively assumed that dig-ups will take place annually.

12 I have based this assessment upon 20 years. I recognise it is possible a different time frame may be

efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

5. Pigging

5.1 In its original access arrangement proposal APA VTS provided for Capex of $3.0m to be incurred in 2017 for ILI of the Dandenong to Morwell pipeline.

5.2 In its draft decision the AER did not allow for the forecast cost of ILI of the Dandenong to Morwell pipeline to be included in the opening capital base. This was because the forecast cost was well above the previously budgeted cost for the ILI activity, and appeared inconsistent with the cost of similar works on other pipelines.

5.3 In its revised access arrangement proposal APA VTS has advised that the estimated Capex for ILI of the Dandenong to Morwell pipeline has been revised to $2.0m and clarified that the ILI programme is to be carried out using an electro-magnetic acoustic transducer (**EMAT**) equipped inspection tool.

5.4 I note that EMAT equipped ILI is also proposed[13] for the Brookjlyn to Corio, Dandenong to West Melbourne, South Melbourne to Brooklyn and Lomgford to Dandenong pipelines. The estimated Capex for ILI of the Dandenong to Morwell pipeline is consistent with the estimated Capex for EMAT equipped ILI of these other pipelines.

5.5 I also note that:

- the timing of the proposed ILI programme for the Dandenong to Morwell pipeline is consistent with both the APA Group's Technical Policy for inline inspection of transmission pressure pipelines and with good industry practice, in that it is ten years since ILI of the pipeline was last carried out; and

- the Dandenong to Morwell pipeline is the oldest pipeline within the Victorian Transmission System, having been constructed in the mid-1950's. In my opinion it is prudent that EMAT equipped ILI be undertaken in order to comprehensively assess the condition of the pipeline and to ascertain whether there is cracking of the pipeline. The EMAT equipped inspection tool is undoubtedly the preferred means for achieving this[14].

5.6 For the reasons set out above, I consider the Capex associated with APA VTS' proposed ILI of the Dandenong to Morwell pipeline is 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.

6. Turbine Overhauls

6.1 In its original access arrangement proposal APA VTS provided for Capex of $4.8m for overhaul of gas turbine engines on Wollert compressor units 4 and 5 and Gooding compressor unit 3.

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[13] See Business Case 257, 258, 259 "Pipeline Integrity", APA, undated.

[14] A useful overview of EMAT technology is available at: https://www.pipeliner.com.au/2016/03/16/crack-detection-in-gas-pipelines/

6.2 In its draft decision the AER determined that the cost of overhaul of gas turbine engines should be treated as an operating expense [15]rather than as Capex. A key consideration of the AER was that overhaul of the gas turbine engines was characterised by APA VTS as a routine maintenance activity.

6.3 In its revised access arrangement proposal APA VTS has explained that the term 'turbine overhaul' is inaccurate since, in reality, the entire gas turbine engine is removed and replaced by a zero-hour exchange unit[16]. APA VTS considers that the cost of the 'turbine overhaul' should be treated as Capex.

6.4 In my opinion the approach adopted by APA VTS (that is, replacement of the gas turbine engine with an exchange unit) is consistent with, and is typical of, good industry practice.

6.5 Based upon desktop research I consider APA VTS's estimated turbine overhaul cost ($4.8m for replacement of three units) to be reasonable.

6.6 I am unable to provide a definitive opinion as to whether the cost of the turbine overhaul should be treated as an operating expense or as Capex. Factors that may be relevant in this decision include:

- The need for overhaul (ie replacement) of gas turbine engines is routine in that it is necessary at defined intervals to ensure ongoing integrity of services;
- The interval between overhauls is dependent upon the 'equivalent operating hours' of the gas turbine engine. Starting and stopping an engine adds equivalent hours over and above the actual running time.
- The exchange unit will typically be upgraded (to latest specification and performance) and will be zero-houred with full warranty.

[15] See page 6-28 of the AER's draft decision.

[16] Somewhat confusingly, APA VTS has suggested the key components of a compressor are the turbine and the engine. I believe a better description is that the key components are the compressor (which compresses gas in the pipeline) and the gas turbine engine (which drives the compressor).