Business Case – Capital Expenditure (Capex)

Victorian Northern Interconnect Expansion Project

Service Provider: APA VTS Australia (Operations) Pty Limited
Asset: Victorian Transmission System (VTS) (i.e. APA GasNet System as defined under the Service Envelope Agreement (SEA))
Business Case: Number 503

1 Project Approvals

TABLE 1: BUSINESS CASE – PROJECT APPROVALS

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Reviewed By	Daniel Tucci, *Senior Concept Engineer, APA Group*
Approved By	Mark Fothergill, *General Manager Infrastructure Strategy and Engineering, APA Group*

2 Project Overview

TABLE 2: BUSINESS CASE – PROJECT OVERVIEW

Description of Issue/Project	Project justification for the variation to the Gas to Culcairn project and the South West Pipeline (SWP) augmentation, as approved by the AER in the 2013-2017 Access Arrangement Final Decision. The Gas to Culcairn project, now known as the Victorian Northern Interconnect Expansion (VNIE) project, was approved for a 35.4 km 450 mm loop (i.e. Class 600, MAOP 10200 kPa) between Wollert and Clonbinane and a MAOP upgrade from 7400 MPa to 8800 kPa between Euroa and Springhurst. The approved augmentation was to increase the capacity for Culcairn exports by 30 TJ/d. As part of the Gas to Culcairn project, the expansion of the SWP was also approved for a Centaur 4.5 MW compressor at Winchelsea to expand the capacity by 49 TJ/d to bring gas from Iona to Melbourne (and on to Culcairn). The total approved capital expenditure for the project was $85.3 m ($nominal). The approved capex includes $38.7m for the Winchelsea compressor. Shipper demand for new (firm) capacity on the VNIE is shown through firm contracting at Culcairn and into the Moomba to Sydney Pipeline (MSP - the interconnected contract carriage pipeline). Since the start of Access Arrangement 2013-2017 period, APA VTS has contracted significantly more gas exports through Culcairn than anticipated in the proposal and approval process. Demand for firm Culcairn deliveries into the MSP had increased from the initial 46 TJ/d to over 200 TJ/d. Therefore, the augmentation approved by the AER had to be expanded to cater for the increased gas volumes through Culcairn. To meet the needs of shippers for additional firm (year round) capacity at Culcairn, APA VTS undertook full looping of the Wollert to Barnawartha pipeline, that is, increasing the original scope of 35.4 km looping to 259 km. In doing so, APA VTS did not undertake any MAOP upgrades. This is because a MAOP upgrade of any part of the Wollert to Barnawartha Pipeline would have quickly been made redundant once that part of the pipeline was looped. The project also included the relocation of the Wollert B (Centaur), Euroa and Springhurst compressors to the new loop line and upgrade of the Wollert A (Saturn) compressors to provide compression to the existing DN300 Wollert to Barnawartha pipeline. APA VTS had also varied the pipe diameter by laying a smaller 400 mm instead of the approved 450 mm. While a smaller diameter pipeline, the pipe was laid to a higher MAOP standard (i.e. Class 900, MAOP 15300 kPa) to allow flexibility to further increase capacity for gas exports. On the SWP, APA VTS made the decision to increase the size of the compressor from the approved Centaur 50 (4.5 kW) compressor at Winchelsea to a Taurus 60 (5.5 MW) compressor. The reason for the upgrade was to secure more capacity from Iona to Melbourne with increasing shipper demands for gas from Iona. This demand was shown through a fully subscribed AMDQ CC allocation process undertaken by APA. The Centaur 50 was to increase the SWP capacity from 353 TJ/d (uncompressed capacity in 2012) to 414 TJ/d. The upgrade to a Taurus 60 compressor increased the SWP capacity to 429 TJ/d. APA VTS has secured a full AMDQ CC allocation for 429 TJ/d on the SWP, hence a prudent decision.

Options Considered	The following options have been considered: Wollert to Barnawartha Looping: Option 1: Looping of the Wollert to Barnawartha Pipeline with 400 mm Class 900 (MAOP 15.3 MPa, initially operating at 10.2 MPa), to deliver additional 150TJ (approx.) at Culcairn. Option 2: Looping and MAOP Upgrade to deliver additional 30TJ at Culcairn (AER Approved Option) Option 3: Looping of the Wollert to Barnawartha Pipeline with 450 mm Class 600 (MAOP 10.2 MPa) pipeline, to deliver additional 150TJ (approx.) at Culcairn. South West Pipeline Expansion Option 1: Installation of a Taurus 60 (5.5 MW) compressor at Winchelsea to deliver additional 64TJ capacity on the SWP Option 2: Installation of a Centaur 50 (4.5 MW) compressor at Winchelsea to deliver an additional 49TJ capacity on the SWP (AER Approved Option)
Proposed Solution	The implemented Solutions are Option 1.
Estimated Cost	**$339.2 million ($nominal)**
Consistency with the National Gas Rules (NGR)	APA VTS considers that the above presented capital project (full looping of the Wollert to Barnawartha Pipeline combined with expansion of the SWP) meets the criteria of Rule 79(2)b, that is the project has achieved a positive net present value, hence the capital expenditure is justified under Rule 79(2)b as conforming for the purpose of its inclusion into the Capital Base of the APA VTS System. APA VTS notes there the original approval of the smaller Gas to Culcairn project was under Rule 79(2)(a), and in doing so approved a level of contribution of economic value from a user of the SWP. This contribution is still relevant, and may be applied to this project to deliver further positive economic value. Consistent with the requirements of Rule 79 of the National Gas Rules, APA VTS considers that the capital expenditure 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 (Rule 79(1)(a)).
Stakeholder Engagement	The stakeholders effected by this project are: ○ Australian Energy Market Operator (AEMO) ○ Shippers requesting capacity

3 Background

3.1 AER Approved Gas to Culcairn Project

The AER approved the Gas to Culcairn Project in Access Arrangement 2013-2017 Final Decision for $85.3 million ($nominal) which was to;

1. Increase export capacity at Culcairn for an additional 30 TJ/d.
2. Increase the South West Pipeline (SWP) capacity from Iona to Melbourne for an additional 49 TJ/d.

The Gas to Culcairn Project comprised the following augmentations on the Wollert to Barnawartha Pipeline and South West Pipeline (SWP):

- Wollert to Barnawartha
    - Wollert to Clonbinane loop (35.4km x 450 mm Class 600 MAOP 10200 kPa).
    - MAOP upgrade from 7400 kPa to 8800 kPa from Euroa to Springhurst Pipeline requiring:
        - Construction of a new pressure regulating station on the Echuca offtake to avoid replacement of the CTMs and 6 city gate stations along that lateral,
        - Relocation of the Euroa PRS regulating station 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 regulator station to avoid replacement of this CTM and city gate station,
        - Replacement of piping, regulators and heaters (city gates) at Benalla, Monsbent, Wangaratta and Wangaratta East.

The augmentation on the Wollert to Barnawartha pipeline would increase the base export capacity from 42 TJ/d (in 2012) to 72 TJ/d.

- South West Pipeline

The AER approved the installation of a Centaur 50 (4.5MW) compressor, which increases the capacity from Iona to Melbourne from the base capacity of 353 TJ/d (uncompressed in 2012) to 414 TJ/d.

The expansions above were supported by demand for incremental capacity advised by the following shippers at that time, as shown in Table 3.1 below:

Table 3.1: Original Forecasted Gas Volumes (Incremental Volumes)

Shipper	Injection (TJ/d)	Delivery Point (TJ/d)		Service Date
Total	**49**	**30**	19	

3.2 Victorian Northern Interconnect Expansion Project

After the Access Arrangement Final Decision was made, APA VTS received further requests for more gas exports through Culcairn. Significant changes in the East Coast gas market such as the commissioning of the three Gladstone LNG plants in Queensland and the demand for Victorian gas in NSW had resulted in an increase in demand for the northern flow of gas from Victoria.

Within a couple of years, contracted Victorian gas into NSW via Culcairn had increased from originally 38 TJ/d to 46 TJ/d (AGL 8 TJ/d).

Culcairn export demands increased from 46 TJ/d to 118 TJ by 2015. A year later, the demand requirements increased again to 148 - 158 TJ/d. By 2017, the export demands were over 200 TJ/d.

Also, at the start of the VNIE project, the physical Culcairn export capacity was 42 TJ/d. Export capacity at Culcairn was revised from originally 46 TJ/d to 42 TJ/d due to increase in forecasted VTS system demand north of Springhurst.[1] The VNIE project also compensated for that 4 TJ/d reduction in export capacity caused by system growth.

The original scope approved by the AER for a 30 TJ/d expansion was no longer sufficient. Due to the increased scope of the Gas to Culcairn Project, the project was subsequently renamed as the Victorian Northern Interconnect Expansion (VNIE) project.

As highlighted to the APA's previous business case for the "Gas to Culcairn" project,[2] the long term strategy to increase Culcairn exports was a staged looping of the Wollert to Barnawartha pipeline. The looping would be extended with each tranche of gas demand.

For the VNIE project, the looping of the Wollert to Barnawartha Pipeline was conducted progressively, with the timing of each stage within 1-2 years, with the final stage (full loop) expected to be completed in February-March 2017.[3]

[1] AEMO 2013, Victorian Gas Planning Report, pp 28, 34

[2] APA GasNet 2012, Gas to Culcairn Project Business Case submitted for the Access Arrangement 2013-2017, Nov

3.2.1 South West Pipeline Augmentation

The South West Pipeline uncompressed capacity was 353 TJ/d in 2012. Since then, the SWP capacity had been up-rated to 367 TJ/d due to revised demand profiles in the VTS by AEMO. This meant that there was 17 TJ/d spare capacity on the SWP which could be utilised prior to expansion.

The AER had approved Winchelsea as the site for the installation of a single Centaur 50 (4.5 MW) compressor unit which would increase the SWP capacity to 414 TJ/d.

However after the Final Decision, APA decided to upgrade the size of the compressor to a Taurus T60 compressor due to increased shipper requests for AMDQ on the SWP. A Taurus T60 would increase the SWP capacity to 429 TJ/d at an incremental cost.

Table 3.3 below details the shipper AMDQ on the SWP, showing AMDQ commitments in 2012, those anticipated (and accommodated) at the time of the AER final decision, and then the ultimate AMDQ commitments. Note that this shows that some shippers did not ultimately contract for the volumes that they sought prior to the AER final decision, and some shippers' demand increased.

Table 3.3: Shippers MDQ after AA Final Decision

Shipper	SWP AMDQ (TJ/d) 2012	Incremental TJ/d (AA 2013-2017)	Incremental TJ/d (Actual/Current)
Total	353	49	76

The decision to increase the compressor size was a prudent one as the shippers have currently taken up all the available AMDQ on the SWP.

4 Risk Assessment

Construction. The project is of routine nature to APA VTS. The risk is mainly related to factors that are outside APA VTS control, particularly land heritage issues and delays due to weather conditions.

Technical. All construction work would be completed by technically proven contractors, to APA VTS's engineering design and specifications. All of the construction process was overseen by APA VTS.

Operation. The pipeline and associated facilities will be operated in accordance with APA VTS's standard management practices for assets of this type. APA VTS has a suitably qualified and experienced workforce in Victoria to perform this type of operation.

Regulatory. This investment complies with Rule 79(2)b, and therefore is conforming capital expenditure.

5 Options Considered

Several options were considered, which include:

[3] Augmentation requirements on the Young to Culcairn pipeline on the Moomba Sydney Pipeline were considered as part of the planning analyses, but are outside the scope of this business case and do not form part of the APA VTS System.

5.1 Option 1 – Looping with DN400 Class 900 (Selected)

With the significant increase in export demands through Culcairn, the full looping of the Wollert to Barnawartha pipeline was the only option available to meet the demand. Remaining decisions related to pipe size and class. APA VTS selected a pipe size of DN400 which would provide a total capacity of 201 TJ/d when the pipeline was fully looped.

Noting that the AER has approved a DN450 Class 600 (MAOP 10.2 MPa), APA VTS selected the smaller DN400 diameter pipeline for the looping as it was sufficient to meet the expected Culcairn export demands. The pipeline was also laid to Class 900 (MAOP 15.3 MPa) but operated at 10.2 MPa. With Class 900 pipe, there would be flexibility in the future to increase the capacity beyond 201 TJ/d by increasing the operating pressure via additional compression at Wollert.

The looping of the Wollert to Barnawartha was conducted in three stages to meet the shipper export demands.

The project faced several challenges with land heritage issues and delays due to weather. As the timeline was tight to complete each stage, APA VTS determined the sequence of looping which would best maximise the capacity for Culcairn exports.

Attachments 1 and 2 provide schematics of the VNIE project and its staging. Attachment 3 shows the VNIE staging and corresponding capacity.

5.2 Option 2 – Solution with MAOP Upgrade

APA VTS had originally proposed a looping only option without any MAOP Upgrade for the 30 TJ/d expansion in the 2013-2017 Access Arrangement. APA VTS had envisaged that the looping would be extended in the near future with increasing demand for Culcairn exports. Hence a MAOP upgrade along Euroa to Springhurst (7400 kPa to 8800 kPa) would not be efficient in the longer term. However, the AER's Technical consultant had reviewed APA VTS's proposal and recommended the MAOP upgrade in conjunction with partial looping as the more cost effective solution to which would meet the immediately identifiable 30 TJ/d increase in Culcairn exports. APA VTS adopted this proposal in its revised proposal and it was accepted by the AER in the Final Decision.

However, APA VTS did not proceed with the MAOP upgrade in the VNIE project as the significant increase in demand for capacity at Culcairn that emerged soon after the final decision required a larger scope of augmentation. The proposed MAOP upgrades would have become redundant once the full loop between Wollert to Barnawartha was constructed. With the full loop in operation, the existing DN300 Wollert to Barnawartha pipeline would not need the capacity of the MAOP upgrades because the additional Culcairn flows would be supported by the new loop line. The short periods between VNIE stages also did not provide any benefit for MAOP upgrades along the pipeline for developing incremental capacity.

Therefore, MAOP upgrades as part of the solution is not considered technically feasible or prudent.

5.3 Option 3: Looping with DN450 Class 600

The approved Gas to Culcairn project involved use of a DN450 Class 600 pipeline . At the time of construction, and in light of the significant additional demand for capacity, APA VTS had conducted assessment of both a DN400 and DN450 pipeline to determine the more efficient pipe size for the full looping of the Wollert to Barnawartha pipeline.

The difference in cost and capacity of the two pipe sizes are as follows;

- The DN450 Class 600 pipeline would deliver a higher export capacity. The export capacity for the DN450 is 209 TJ/d, that is, 8 TJ/d higher than the DN400 pipe.
- Cost estimates showed DN450 comparable (less than 1%) to a DN400 pipe.
- With the short periods between the VNIE stages, the effect of a shorter loop length with a larger DN450 pipe did not provide any benefit in terms of staging. The overall project objective was to complete the full loop as soon as possible to meet the Culcairn export demand.

Taking into account the factors above, the DN400 Class 900 (MAOP 15.3) was selected because it has the flexibility to increase capacity with higher operating pressure achieved by more compression at Wollert. The DN450 is limited for future expansion as it can only operate up to 10.2 MPa.

5.4 South West Pipeline

The AER approved a Centaur 50 (4.5 MW) compressor at Winchelsea for a cost estimate of $38.6 million. The compressor was to increase the South West Pipeline capacity by 49 TJ/d to meet known shipper demands, as detailed in Table 3.3.

A Centaur 50 would increase the South West Pipeline to 414 TJ/d. However, APA VTS made the decision to install a larger Taurus 60 (5.5 MW) unit at Winchelsea for an incremental cost. With high compression power, the SWP pipeline capacity increased to 429 TJ/d[4] (refer Attachment 4, Reference 3).

Comparison of the capacity and cost of the Centaur 50 and Taurus 60 compressor are shown in Table 5.2 below.

Table 5.2: Capacity and Cost Estimate of SWP Compressor Options

Compressor	Incremental Capacity to SWP (TJ/day)[1]	Total SWP Capacity (TJ/d)	Cost Estimate ($M)
Winchelsea T60	76	429	$40.3[2]
Winchelsea C50 (AER Approved)	61	414	37.0 ($2012)

Note:

1. Incremental to base SWP capacity (without compression) of 353 TJ/day. Uncompressed capacity was revised by AEMO to 367 TJ/d based on more up to date demand profiles on the SWP (refer Attachment 4, Reference 2).
2. Total project cost including Capex spent in previous Access period.

APA VTS has managed to secure all 76 TJ/d incremental AMDQ on the SWP, as shown in Table 3.3, hence justifying the installation of the larger compressor.

5.5 Summary of Cost/Benefit Analysis

The cost/benefits of the expanded VNIE project (full looping of the Wollert to Barnawartha Pipeline) and Winchelsea Compressor are outlined in the table below.

TABLE 5.3: SUMMARY OF COST/BENEFIT ANALYSIS

Option	Benefits (Risk Reduction)	Costs
Wollert to Barnawartha Pipeline Looping		
Option 1: Looping with 16 inch pipeline (Class 900)	Selected Option Provide capacity for 201 TJ/d. Class 900 pipeline provide flexibility to further increase pipeline capacity beyond 201 TJ/d.	$298.9 m (total project cost)
Option 2: MAOP Update	Nil	N/A

[4] AEMO 2015, Victorian Gas Planning Review p 29

Option 3: Looping with 18 inch pipeline (Class 600)	Provides 209 TJ/d capacity. Technically feasible option but does not provide flexibility for further growth.	Less than 1% of Option 1[1]

Note:

1. Cost estimates conducted in 2012 showed DN400 Class 900 at $267.8 m and DN450 Class 600 at $266.0 m, that is less than $2m between options.

Option	Benefits (Risk Reduction)	Costs
Winchelsea Compressor		
Option 1: Taurus 60 (5.5 MW)	Selected Option SWP capacity 429 TJ/d. All AMDQ taken up by shippers.	$40.3 m (total project cost)
Option 2: Centaur 50 (4.5 MW)	Provides a lower SWP capacity of 414 TJ/d.	$37 m ($2012)

5.5.1 Operating Cost

Annual expenditure to operate and maintain the pipeline after expansion has been estimated to be $0.32m/yr. This operating expenditure increase is estimated as incremental expenditure to the base opex and will form a scope change to the APA System opex budgets as these costs are not incurred until the looping is complete, which is after the base year.

The requirement for conforming capital expenditure specified in Rule 79(1) is that the capital expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

APA has systems and procedures guiding the development the capital projects from Concept through to the Delivery phase. For most capital projects over $1m, design and procurement will be carried in-house and the delivery/construction phase will be tendered. If there is a constraint in resources, then the design and procurement could also be tendered out under an EPC (Engineering Procurement Construction) Process. APA has preferred third party partners who are drawn upon to supplement any shortfall in engineering resources.

5.5.2 Consistency with the National Gas Rules

Rule 79(2)

The requirements for justification of conforming capital expenditure specified in Rule 79(2) are as follows:

The capital expenditure must be justifiable on one of the following grounds;

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 integrity of services, or

iii. To comply with regulatory obligation or requirement, or

iv. To maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or

d. The capital expenditure is an aggregate amount divisible into two parts, one referable to incremental services and the other referable to a purpose referred to in paragraph "c", and the former is justifiable under paragraph "b" and the latter under paragraph "c".

APA considers that the above presented capital project meets the criteria of Rule 79(2)b, that is the project has achieved a positive net present value, hence the capital expenditure is justified under Rule 79(2)b as conforming for the purpose of its inclusion into the Capital Base of the APA VTS System.

Rule 79(1)

Consistent with the requirements of Rule 79 of the National Gas Rules, APA VTS considers that the capital expenditure is:

- Prudent – The expenditure is necessary to meet increased demand within the VTS for firm year round capacity for gas to enter NSW at Culcairn, and the project is NPV positive – it delivers a net benefit to users of the system as the revenue expected to be earned from the expansion exceeds costs of construction.
- Efficient –The field work will be carried out by the external contractor that has been used to date, who has demonstrated specific expertise in completing the installation of the facilities in a safe and cost effective manner. The expenditure can therefore be considered consistent with the expenditure that a prudent service provider acting efficiently would incur.
- Consistent with accepted and good industry practice –The sustainable delivery of services includes reducing risks to as low as reasonably practicable and maintaining reliability of supply.
- To achieve the lowest sustainable cost of delivering pipeline services – The option chosen meets the needs of shippers using least cost options with consideration of long term demand.

5.5.3 Cost Breakdown

The capital and operating costs for VNIE Project (as detailed in Option1) is detailed in the Table below in nominal dollars. Note: The costs incurred for the project are shown below.

TABLE 5.4: CAPEX/OPEX SPLIT

Wollert to Barnawartha Pipeline Looping	Previous AA Period 1 Jan 2013 – 30 June 2013	Half Year 1 July 2013 – Dec 2013	Calendar Year 2014	Calendar Year 2015	2016 (includes actual and forecast)	2017 (forecast)	Total Current AA Period	Total Project Cost
Capex ($m)	2.0	4.0	85.6	72.0	92.1	43.1	**296.9**	**298.9**
Opex ($m)	0	0	0	0	0	0.32[1]	**0.32**	**0.32**
Total ($m)	**2.0**	**4.0**	**85.6**	**72.0**	**92.1**	**43.4**	**297.2**	**299.2**

Note:
1. Forecast increase in OPEX for VNIE project when completed is $ 0.32 m/yr.

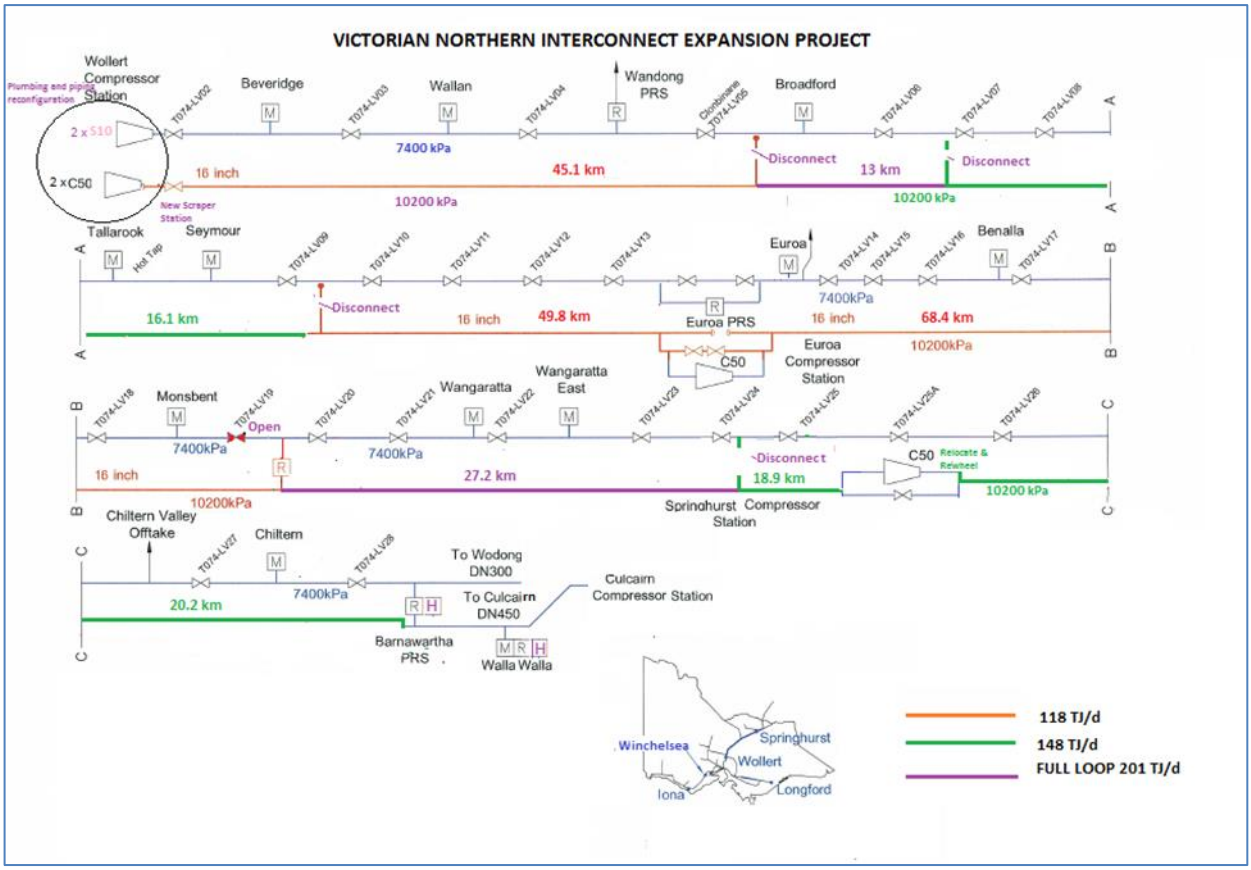
Winchelsea Compressor	Previous AA Period 1 Jan 2013 – 30 June 2013	Half Year 1 July 2013 – Dec 2013	Calendar Year 2014	Calendar Year 2015	2016 (includes actual and forecast)	2017 (forecast)	Total Current AA Period	Total Project Cost
Capex ($m)	3.1	8.1	26.6	2.5	0.001	-	**37.2**	**40.3**
Opex ($m)	0	0	0	0.125[2]	0.25[3]	0.25	**0.63**	**0.63**
Total ($m)	**3.1**	**8.1**	**26.6**	**2.6**	**0.25**	**0.25**	**37.8**	**40.9**

Note:
2. Actual OPEX incurred in 2015 was from April – Dec 2015.
3. Actual OPEX incurred in 2016 was $0.21 m from Jan – Oct 2016. Forecasted to $0.25 m/yr.

Total PROJECT	Previous AA Period 1 Jan 2013 – 30 June 2013	Half Year 1 July 2013 – Dec 2013	Calendar Year 2014	Calendar Year 2015	2016 (includes actual and forecast)	2017 (forecast)	Total Current AA Period	Total Project Cost
Capex ($m)	5.1	12.1	112.2	74.5	92.1	43.1	**334.0**	**339.2**
Opex ($m)	0	0	0	0.125	0.25	0.57	**0.95**	**0.95**
Total ($m)	**5.1**	**12.1**	**112.2**	**74.6**	**92.3**	**43.7**	**335.0**	**340.1**

Attachment 1– MAP showing VNIE Project

Attachment 2 - Schematic of the Staged VNIE Project



Attachment 3 – VNIE Staging and Capacity

The table below shows the capacity of each stage of the VNIE and the corresponding increase in export capacity.

Stage	Loop Name	Section	Commissioned Date	Export Capacity (TJ/d)
Prior to VNIE				42
1	Loop 1	Wollert to Wandong	4/08/2014	57
	Part Loop 2 & Loop 4	Euroa to Glenrowan	2/04/2015	62
	Part Loop 2 & Loop 3	Mangalore to Euroa	23/04/2015	98
	Loop 5	Wandong to Broadford	19/06/2015	109
	Install Regulator	Glenrowan PRS	21/08/2015	118
2	Loop 6B	Tallarook to Mangalore	28/09/2016	148
	Loop 7A & 7C	Wangaratta Nth to Barnawartha	14/10/2016	
3	Loop 6A	Broadford to Tallarook	Scheduled Feb-March 2017	201
	Loop 7B	Glenrowan to Wangaratta Nth		

In Stage 1, as each loop was completed, the incremental export capacity was released to the market by AEMO. In Stage 2, due to the short timing between the completion of loops 6B and 7A-7C, the export capacity was increased at the completion of that stage. The third and final stage of the VNIE project will complete the full looping of the Wollert to Barnawartha pipeline.