Business Case – Capital Expenditure

VTS Unpiggables

Business Case Number BC259 AA23-27

1 Project Approvals

TABLE 1: BUSINESS CASE – PROJECT APPROVALS

Created By	Adam Newbury	Asset Lifecycle Specialist, Asset Management
Costed By	Colin Yeoh	Victorian Team Lead Project Delivery, Engineering & Planning
Reviewed By	Alan Creffield	Senior Integrity and Corrosion Protection Engineer, Engineering & Planning
Approved By	Daniel Tucci	Victorian Asset Manager, Asset Management

2 Project Overview

TABLE 2: BUSINESS CASE – PROJECT OVERVIEW

Description of Issue/Project

The aim of the unpiggables program is to convert unpiggable pipelines on the Victorian Transmission System to be suitable for pigging. The objective is to improve certainty for calculating remaining life for unpiggable pipelines that do not meet APA acceptable risk tolerance.

Pipeline remaining life is initially calculated using conservative corrosion rate modelling. However, when numerical remaining life thresholds are reached, periodic physical inspection and assessment is required to meet APA integrity policy and ensure continued safe reliable operation.

Inline inspection (pigging) is considered the most efficient method to identify pipeline defects and enable a targeted repair campaign. However (older) pipelines were sometimes constructed without launchers or receivers (i.e. unable to be pigged).

Several of these pipelines have either reached or exceeded a typical inline-inspection interval (typically 10-15 years). Inspection is now required to ensure asset integrity is adequate for continued safe operation.

The objective of this project is to conform with APA pipeline integrity policy and ensure safe reliable operation of the Victorian Transmission System unpiggable pipelines using one of the following actions:

- Modify unpiggable pipelines that do not meet APA acceptable risk tolerances to enable inline inspection
- Pressure reduce or decommission pipelines that are no longer viable to leave in service.

The unpiggables program continues from the current period.

Options Considered

The following options have been considered:

Option 1: Do nothing – ALARP assessment required (continued direct assessment of unpiggable pipelines)

Option 2: Address remaining life uncertainty using APA unpiggable strategy. (Preferred option)

Estimated Cost

AA Period	CY18-CY22	CY23-CY27	CY18-CY27
Total	$27,673,764	$26,798,788	$54,472,552

Relevant Standards

AS2885.6 stipulates that a safety management study shall address the complete pipeline system. Furthermore, it states that threats that are not able to be controlled shall be subject to a risk assessment to be As Low As Reasonably Practicable (ALARP)

Consistency with the National Gas Rules (NGR)	Enabling the inspection of these assets complies with the new capital expenditure criteria in Rule 79 of the NGR because: • it is necessary to maintain and improve the safety of services and maintain the integrity of services (Rules 79(2)(c)(i) and (ii)); and it 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)).
Key Stakeholders	Each pipeline will require differing stakeholder engagement: • Gas distributors • Land and business owners impacted by the project will be consulted for noise, visual, third party encroachment, loss of revenue etc. (e.g. T33 project involved site establishment at Howe Reserve Port Melbourne and associated works along the pipeline which traversed densely zoned areas to South Melbourne Market). Landowner negotiation is also required for most of the unpiggable pipelines that require parcels of land to be purchased to accommodate the pipeline modifications. • Environmental consultation and impact assessments at varying levels depending on the location of the asset (e.g. Newport project involved works within close proximity to the Yarra River and required strict compliance with the Port of Melbourne including large amounts removal of contaminated water and soil). • Cultural Heritage assessments and the identification of culturally significant sites and artefacts, with close interface with Aboriginal elders and relevant leaders. • AER, ESV, AEMO, DELWP, Distribution Businesses (Multinet, AusNet, AGN) and customers impacted and associated at various stages of planning through to execution. Construction contractors, equipment and material suppliers pre-qualified to perform works in compliance with APAs requirements including competitive tender process.
Benefits to Customers and Consumers	Convert unpiggable pipelines will enable more effective inspection of ageing assets and will help to ensure asset integrity and safe operation, especially for assets located in urbanised areas. This will help to maintain reliability of supply to customers and consumers in the VTS.

3 Background and project need

Direct Current Voltage Gradient (DCVG) surveys are commonly used to identify pipeline coating defects. Historically this inspection technique was the main method employed by APA for pipelines not configured for inline inspections (i.e. unpiggable pipelines). As pipelines continue to age, in inline inspection and data analysis make it superior to DCVG as it identifies pipeline corrosion instead of coating defects.

APA proceeded with investigating inline inspection feasibility for unpiggable pipelines. APA started by conducting a national investigation to identify pipelines not configured for inline inspection (pigging). APA then conducted risk assessment of each unpiggable pipeline. This allowed APA to understand the unmitigated, target and residual risks of each individual unpiggable pipeline. APA then developed an unpiggables strategy to select the best mitigating action for each unpiggable pipeline instance.

During the national investigation, 17 unpiggable pipelines were identified on the Victorian Transmission System. For these assets inline inspections are not able to be used to confirm pipeline condition and remaining life. Of these, two pipelines have been converted to piggable (T33 and T64), these are shown in grey font in table 3 below.

Currently, the remaining 15 unpiggable pipelines would require periodic DCVG survey to locate pipeline coating defects, the faults located are then excavated and directly inspected and assessed and repaired where required. However, DCVG surveys only identify coating defects and not corrosion. Predominantly corrosion does not occur where there are detected coating defects from DCVG surveys. Corrosion initiates at locations where coating has lost adherence to the steel and not fallen off. This type of failure is called Cathodic Protection shielding and is unlikely to be detected by DCVG surveys. Due to the limitations of DCVG surveys, the actual pipeline condition and remaining life is uncertain and does not meet the As Low As Reasonably Practicably (ALARP) principle.

The unpiggable pipelines are listed below in table 3 and are sorted by year of construction with the exception of Pakenham which has three sections with different construction years.

TABLE 3: GEOGRAPHIC LOCATION & SUMMARY

T No.	Pipeline Name	Section Name	Const. [Year]	Length [km]	Ø [mm]
T15	D'nong/W. Melb	Regent St (Oakleigh)	1969	0.8	200
T37	Longfd/D-nong	Tyres/Maryvale	1972	5.4	150
T38	Pakenham Lats	Pakenham/KooweeRup Rd MS	1972	0.5	80
T38	Pakenham Lats	Pakenham/Nth of Freeway	2005	0.7	150
T116	Pakenham Lats	Pakenham: Freeway/KooweeRup Rd MS	2010	0.5	150
T44	Morwell/ D'nong "Lurgi"	Larder/Warragul	1975	4.8	100
T74	K Park/Wollert	Keon Park/Wollert	1976	0.24	600
T33	S. Port Melb/B'klyn	S. Port Melb/Brooklyn	1977	1.6	750
T32	Morwell/ D'nong "Lurgi"	Clyde Nth: Pound Rd - Tuckers Rd	1977	2	100
T1.1	Morwell/ D'nong "Lurgi"	Jeeralang Supply	1978	0.4	300
T64	S. Port Melb/B'klyn	Newport Power Station CTM	1980	1	450
T65	D'nong/Princes Hwy	Princes Hwy/Henty Str	1981	0.2	500
T88	VTS W Ltls	Laverton/Coogee	1993	1.6	150
T89	S. Port Melb/B'klyn	Bay St/Unichema	1994	0.4	150
T102	Somerton	O'Hern's Rd / Somerton PS	2005	3.4	250
T109	VTS SW Latls	Iluka Minerals (Hamilton)	2006	1.1	100
T110	VTS W Ltls	Snowy Hydro Power Plant Supply	2008	1.6	350
			1986.947	26.24	266.477
			Average Construction [Year]	Total Length [km]	Average Diameter [mm]

A leak from an unpiggable pipeline due to an undetected fault would have result in disruptions for users of the system and AEMO. Duration and severity of the constraint would depend on the nature of the problem, the pipeline location, demand, etc. Subject to the pipeline affected, customers including gas distributors (AGN, AusNet and Multinet etc), Power Stations (Newport, Snowy Hydro, Somerton etc.) as well as other businesses (Maryvale Paper Mill etc.), landowners and community in the vicinity of the pipeline would face disruptions until the issue has been resolved.

The problems associated with unpiggable pipelines:

1. For each of these pipelines, the pipeline condition and remaining life is uncertain as it cannot be pigged without modification and must rely on the direct assessment methodology.

2. There is potential for leakage if unidentified faults are not pre-emptively identified and repaired.

3. The pipeline condition uncertainty also elevates the risk ranking to moderate (and on some pipelines high), if no action is taken to perform integrity assessments an ALARP assessment will be required.

4. Generally, without certainty of the asset condition, to mitigate numerically modelled risk predictions, APA would be forced to move to implement Maximum Operating Pressure (MOP) reductions and increase leak monitoring. In this case APA would not be able to maintain capacity to meet gas demand.

Converting pipelines to be piggable will enable physical condition verification which will identify risks and allow the actual condition to be known and managed accordingly. This will in turn improve certainty of remaining life and related supply confidence.

Timing of the issue

For how long has the issue existed?
For the VTS, the identified unpiggable pipelines were designed and constructed without inline inspection capability which was common for assets in earlier periods (construction dates range from 1969 to 2008). However in 2019, APA conducted a national risk assessment relating to the potential of a loss of containment due to the unknown condition of the pipeline. A portion of unpiggable pipelines did not meet APA's acceptable risk tolerance and therefore resulted a project to intelligently pig these pipelines.

Why are we proposing to address the issue now?
Several of these pipelines have either reached or exceeded a typical inline-inspection interval (typically 10-15 years depending on the pipeline), many of which are located in high-risk urbanised areas and/or have strategic importance related to security of supply (e.g. Newport and Snowy Hydro power stations). Inspection is now required to ensure asset integrity is adequate for continued safe operation. In addition, APA has conducted risk assessments on the newer assets and identified condition uncertainty so these have been added to the unpiggable project scope.

Have we commenced the project in the current period?
The unpiggables project commenced in the current access arrangement period, this business case has been created retrospectively for project transparency which includes the completion of 2 converted pipelines T33 and T64. The project was approved as part of a smaller unpiggable pipelines scope in the integrity business case (Business Case 259) during the 2018-2022 Access Arrangement. However, in 2019 a comprehensive risk assessment identified additional unpiggable pipelines. As a result of the risk assessment undertaken of unpiggable pipelines, the actual expenditure for the unpiggables program in the current period has exceeded the 2017 forecast in the AER's final decision.

Will this issue take longer to rectify than just the next AA period?
It is anticipated that this program will be completed before end of 2027 so will not be subject to funding in the next AA period (2028-2032).

Are there any relevant technical standards that apply to this issue?
AS2885.3 Section 6.6.1 stipulates that we consider the use of inline inspection

AS2885.6 stipulates that a safety management study shall address the complete pipeline system. Furthermore, it states that threats that are not able to be controlled shall be subject to a risk assessment and be shown to be As Low As Reasonably Practicable (ALARP).

Have we done anything in the current period to rectify this issue/in relation to this project?
The unpiggable pipelines program is in flight with two pipelines converted and inspected, these are T-33: Port Melbourne to South Melbourne section and T-64 Newport. For the remainder of the listed (unpiggables) pipelines, early investigations including engineering has commenced or is being finalised.

Has the AER approved any expenditure in relation to this issue/project before?
Yes, originally it was part of the integrity business case submitted during the previous 2018-2022 Access Arrangement period. After an internal risk assessment in 2019 identified additional unpiggable scope, a separate unpiggables business case was created to explain and justify the urgent program of work.

If the work has been approved by the AER previously, have we conducted this work?
Yes, work has been executed and due to the 2019 risk assessment additional scope has been identified and progressed.

If so, what has been the outcome? How successful has the work been in addressing the issue?
The 2019 risk assessment identified the unpiggable assets requiring condition assessment, projects have been initiated to reduce the risks. Converting a pipeline retrospectively is an expensive process but several pipelines have already been successfully converted and pigged.

4 Risk Assessment

For a worst case scenario of metal-loss corrosion and damage it could be assumed that if the inline inspection is inadequate (or not carried out), that unknown corrosion could grow and ultimately develop to the point of failure. For unpiggable assets this option involves continuing to operate the unpiggable pipeline as is with no inline inspection condition assessment and instead rely on numerical modelling for remaining life predictions and DCVG surveys to identify coating defects. If this scenario were to eventuate it is a significant failure mode with potential for; fatality of persons in the vicinity, constrained gas supply, media coverage and regulatory action.

For the purpose of the risk assessment, a period of 20 years has been utilised for the frequency (Remote) reflecting a significant period for an existing defect to grow to be capable of the worst case failure scenario. However, health and safety risk uses a frequency period of 50 years due to the lower likelihood of persons being in the vicinity during a failure event that then results in fatalities.

TABLE 4: RISK RATING

Risk Area	Consequence	Likelihood	Residual
Health and Safety	Fatality arising from systemic failure of APA safety or multiple fatalities of employees and contractors or members of the public	Remote [every 50yrs]	Moderate
Environment	One or a combination of the following consequences: - onsite and impacting > 1 ha - able to be remediated easily - impact continues for <1 yr.	Remote [every 20yrs]	Negligible
Operational Capability	Unplanned interruption of ≥ 1 day but < 1 month to the delivery of firm services	Remote [every 20yrs]	Low
People	Some impact on Business unit engagement / rising complaints or breach levels / some staff turnover	Remote [every 20yrs]	Low
Compliance	Non-compliance with a contractual/legal obligation(s) - results in litigation	Remote [every 20yrs]	Low
Reputation & Customer	Sustained adverse national: - media articles on APA - viral social media Multiple negative reports by financial analysts	Remote [every 20yrs]	Low

Financial	$16M - $30M (estimated asset remediation and lost revenue cost)	Remote [every 20yrs]	Negligible
Residual Risk Rating			Moderate

5 Identification and Assessment of Options

5.1 Identification of options

TABLE 5: SUMMARY OF COST/BENEFIT ANALYSIS

Option	Description	CY18-CY22	CY23-CY27	CY18-CY27
Option 1	Do nothing – ALARP assessment required (continued direct assessment of unpiggable pipelines)	Indeterminate	Indeterminate	Indeterminate
Option 2	Convert unpiggable pipelines to enable pigging to address remaining life uncertainty (recommended option)	$27,673,764	$26,798,788	$54,472,552

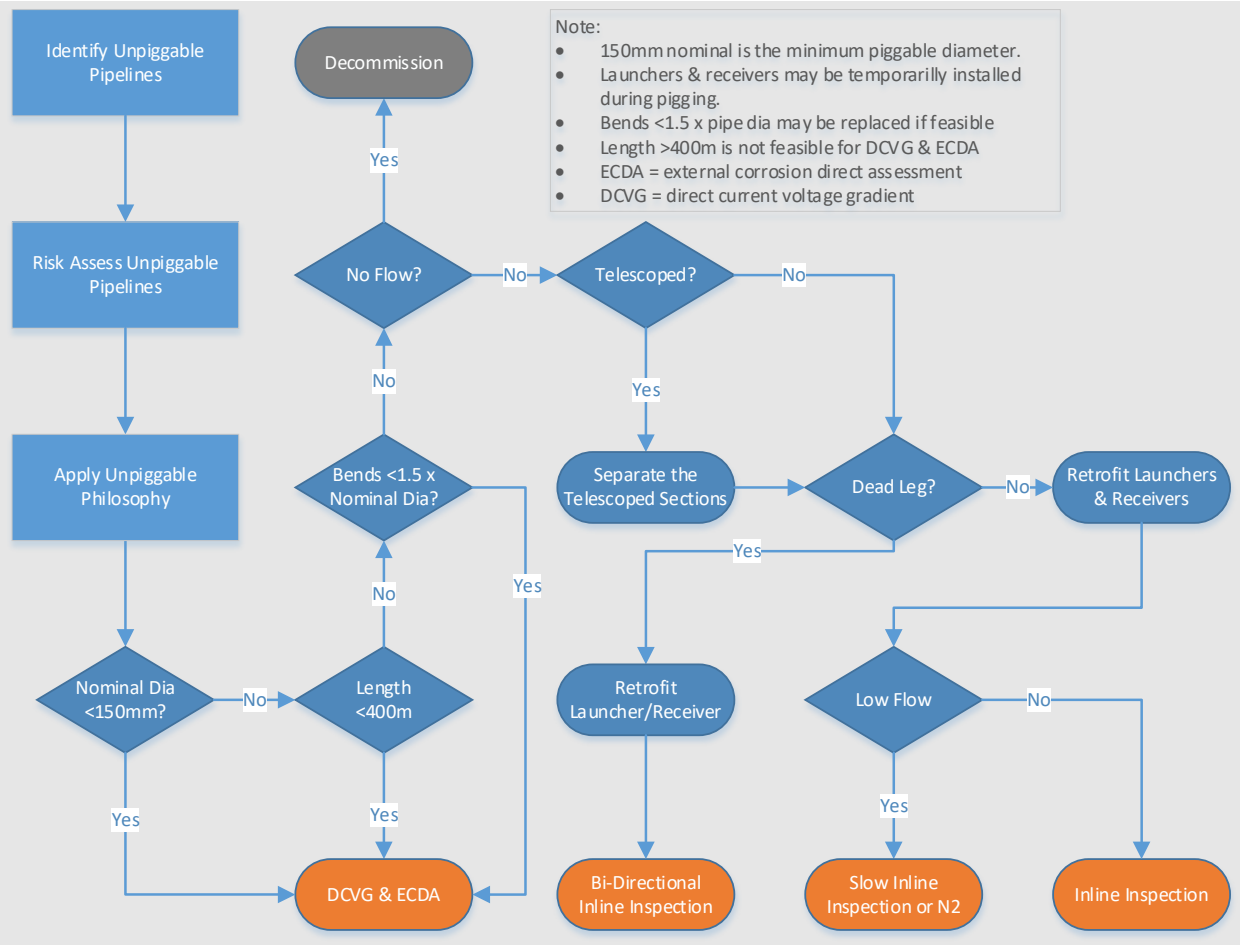
5.1.1 Option 1 – Do Nothing – ALARP assessment required

This option involves continuing to operate the unpiggable pipeline as is with no inline inspection condition assessment and instead rely on numerical modelling for remaining life predictions and DCVG surveys to identify coating defects.

APA pipeline integrity engineers recommend this as non-viable option due to the risk ranking remaining at moderate for this option. . In addition, an ALARP assessment would be required to allow continued operation. Option 1 Do nothing option does not meet the principle to reduce the risk level to As Low as Reasonably Practicable and does not align with good industry practice.

5.1.2 Option 2 - Convert unpiggable pipelines to enable pigging

Using the APA unpiggable pipeline strategy, the appropriate course of action is selected and executed for each unpiggable pipeline. This strategy is outlined below in a simplified flow chart that explains the approach applied.



Based on the APA unpiggable pipeline program presented in table 3 the 17 unpiggable Victorian Transmission System pipelines have been assessed, the remedial actions applied. The execution status of the unpiggables program is outlined in table 6 below and is grouped by the selected action.

TABLE 6: UNPIGGABLE PIPELINE ACTION & STATUS SUMMARY

T No	Pipeline Name	Section Name	Action	Status
T64	S. Port Melb/B'klyn	Newport Power Station CTM	Convert to Piggable	Complete
T33	S. Port Melb/B'klyn	Port Melb to South Melb	Convert to Piggable	Complete
T89	Bay St to Unichema	Bay St to Unichema	Decommission	2022
T110	VTS W Ltls	Snowy Hydro Power Plant Supply	Convert to Piggable	2022
T37	Longfd/D-nong	Tyres/Maryvale	Convert to Piggable	2023
T116	Pakenham Lats	Pakenham: Freeway/KooweeRup Rd MS	Convert to Piggable	2024
T38	Pakenham Lats	Pakenham/Nth of Freeway	Convert to Piggable	2024

T38	Pakenham Lats	Pakenham/KooweeRup Rd MS	Action TBC* (assuming converting to piggable)	2024
T102	Somerton	O'Hern's Rd / Somerton PS	Convert to Piggable	2025
T88	Laverton to Coogee	Laverton to Coogee	Action TBC* (assuming converting to piggable)	Timing TBC (2023-27)
T15	D'nong/W. Melb	Princes Highway to Regent St	Decommission / install new offtake and CTM	Timing TBC (2023-27)
T65	D'nong/Princes Hwy	Princes Hwy/Henty Str	DCVG/ECDA	Out of Scope
T74	K Park/Wollert	Keon Park/Wollert	DCVG/ECDA	Out of Scope
T1.1	Morwell/ D'nong "Lurgi"	Jeeralang Supply	DCVG/ECDA	Out of Scope
T109	VTS SW Latls	Iluka Minerals (Hamilton)	DCVG/ECDA	Out of Scope
T32	Morwell/ D'nong "Lurgi"	Clyde Nth: Pound Rd - Tuckers Rd	DCVG/ECDA	Out of Scope
T44	Morwell/ D'nong "Lurgi"	Larder/Warragul	DCVG/ECDA	Out of Scope

*Pipelines are subject to supply contract negotiations so have been marked as 'Action TBC'

Why are we proposing this volume?
These are the Victorian Transmission System pipelines that have been identified as unpiggable.

Of these 17 unpiggable pipelines:

- Seven have been confirmed suitable for conversion. To date, two have been converted, three are pending and two are subject to stakeholder negotiation outcomes.
- Six have been confirmed as not suited to conversion (out of scope) so will not be modified, these will continue with standard DCVG surveys.
- Two are being decommissioned as they have no supply contract.
- Two remain with action to be confirmed, subject to customer negotiation outcomes the appropriate course of action will be selected and executed.

5.1.3 Assessment of Options

Option 1 Do nothing is not preferred. Due to the ALARP requirement for this option it was rated not credible as it would lead to MOP (Maximum operating pressure) reductions and potentially end of life decommissioning. If MOP were applied VTS to meet gas demand in peak periods. Option 1 is not consistent with good industry practice.

Option 1 will maintain (or worsen over time) the 'moderate' risk rating and this is not acceptable to APA's risk appetite.

Option 2 is the preferred option. The benefits of this option include:

- Provides a transparent decision process that justifies the selected action.
- Provides the best balance of risk reduction and cost.
- Meets ALARP requirements.
- Improves certainty of the remaining life on these pipelines.
- Ensures APA continue to operate in a safe and reliable manner.

What are the costs/risks involved with this option?

- There are technical risks associated with this option, e.g. when retrofitting inline inspection components onto existing assets, however these are considered during the design process and having completed several conversions on the Victorian Transmission System APA is well placed to complete the work.
- Costs are difficult to predict when converting or decommissioning existing pipelines, however learnings to date are being applied to ensure the estimates are as accurate as possible.

6 Consistency with the National Gas Rules

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

Prudent
The unpiggables program will enable more effective inspection of ageing assets and will help to ensure asset integrity and safe operation, especially for assets located in urbanised areas. This will help to reduce the risk of loss of containment of currently unpiggables pipelines and enhance reliability of supply to customers and consumers in the VTS. The program will improve the safety of services for customers and personnel .The program aligns with the ALARP principle and is consistent with good industry practice and is of a nature that a prudent service provider would incur.

Efficient
The selection of the appropriate action for each asset uses a consistent and transparent decision process that balances risk, operating context and pipeline features to ensure that the best solution is implemented. Progress to date 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
ILI is a proven technology used worldwide for demonstrating pipeline integrity. Direct Assessment is accepted as good industry practice where ILI is not practical. The program aligns with AS2885.6 which stipulates that a safety management study shall address the complete pipeline system. Furthermore, it states that threats that are not able to be controlled shall be subject to a risk assessment to be As Low As Reasonably Practicable.

To achieve the lowest sustainable cost of delivering pipeline services
ILI is the most cost effective solution for managing pipeline integrity. The proposed option to convert pipelines to enable inline inspection where feasible addresses integrity risk for assets with high failure consequences.

7 Forecast Cost Breakdown

Costs per pipeline

APA has completed several unpiggable conversion projects and now has accumulated learnings on likely costs. Early estimates failed to consider soil contamination, subsidence, flooding, adjacent assets (and related asset owner

supervision costs), land procurement and numerous other expenses that were discovered during the preparation and delivery of the unpiggable projects completed to date.

Costs per pipeline conversion vary depending on size complexity and can range from $3 million to $7.5 million. Pricing to date indicates that it would cost approximately $2 million to decommission a pipeline.

Costs of a comparable projects recently completed have been used to provide forecasts on the remaining scope.

Volume

A national risk assessment was conducted in 2019 to identify and prioritise the conversion of APA unpiggable pipelines. 17 Victorian Transmission Pipelines were identified.

Status

In 2017 the AER final decision included a $6 million allocation in the pipeline integrity business case to convert several pipelines to piggable. The unpiggables program commenced 2018 and following the national review of unpiggable pipelines in 2019, the decision was made to increase the scope of the pipeline integrity program. The program will continue into 2025 with several remaining projects with action to be confirmed.

Consolidated actual and forecast costs for the unpiggable pipeline portfolio including cost categories are provided in Table 7.

TABLE 7: CONSOLIDATED Project Cost Estimate

Consolidated Costs	CY18-CY22	CY23-CY27	CY18-CY27
Internal Labour	$9,394,884	$4,423,131	$13,818,015
Materials	$3,529,837	$2,450,098	$5,979,935
Contracted Labour	$14,460,328	$19,915,559	$34,375,887
Other Costs	$288,714	$10,000	$298,714
Total	$27,673,764	**$26,798,788**	$54,472,552

Actual and forecast costs for the unpiggable pipeline portfolio including cost categories are provided in Table 8.

Table 8: Project Cost Estimate

Port - South Melbourne (Nitrogen)	CY18-CY22	CY23-CY27	CY18-CY27	Notes
Internal Labour	$1,991,631	$0	$1,991,631	
Materials	$1,006,350	$0	$1,006,350	
Contracted Labour	$4,595,782	$0	$4,595,782	
Other Costs	$0	$0	$0	
Total	**$7,593,762**	**$0**	**$7,593,762**	(1)
Port - South Melbourne (Conventional)	**CY18-CY22**	**CY23-CY27**	**CY18-CY27**	**Notes**
Internal Labour	$648,234	$0	$648,234	
Materials	$327,546	$0	$327,546	
Contracted Labour	$1,495,830	$0	$1,495,830	
Other Costs	$0	$0	$0	

Total	**$2,471,609**	**$0**	**$2,471,609**	(1)
Newport	**CY18-CY22**	**CY23-CY27**	**CY18-CY27**	**Notes**
Internal Labour	$2,404,000	$0	$2,404,000	
Materials	$710,149	$0	$710,149	
Contracted Labour	$4,770,000	$0	$4,770,000	
Other Costs	$0	$0	$0	
Total	**$7,884,149**	**$0**	**$7,884,149**	(1)
Snowy Hydro	**CY18-CY22**	**CY23-CY27**	**CY18-CY27**	**Notes**
Internal Labour	$1,167,518	$0	$1,167,518	
Materials	$690,653	$0	$690,653	
Contracted Labour	$2,431,148	$233,536	$2,664,684	
Other Costs	$0	$0	$0	
Total	**$4,289,319**	**$233,536**	**$4,522,855**	(2)
Maryvale	**CY18-CY22**	**CY23-CY27**	**CY18-CY27**	**Notes**
Internal Labour	$781,226	$880,000	$1,661,226	
Materials	$751,487	$200,000	$951,487	
Contracted Labour	$350,570	$2,200,000	$2,550,570	
Other Costs	$25,000		$25,000	
Total	**$1,908,283**	**$3,280,000**	**$5,188,283**	(3)
Oakleigh	**CY18-CY22**	**CY23-CY27**	**CY18-CY27**	**Notes**
Internal Labour	$626,367	$1,105,305	$1,731,672	
Materials	$2,736	$934,200	$936,936	
Contracted Labour	$395,220	$7,014,386	$7,409,606	
Other Costs	$0	$0	$0	
Total	**$1,024,323**	**$9,053,891**	**$10,078,214**	(3) & (4)
Bay St, Port Melb	**CY18-CY22**	**CY23-CY27**	**CY18-CY27**	**Notes**
Internal Labour	$382,038	$69,587	$451,625	
Materials	$33,128	$5,000	$38,128	
Contracted Labour	$51,550	$971,943	$1,023,493	
Other Costs	$0	$0	$0	
Total	**$466,716**	**$1,046,530**	**$1,513,246**	(3)
Pakenham	**CY18-CY22**	**CY23-CY27**	**CY18-CY27**	**Notes**
Internal Labour	$711,945	$860,873	$1,572,818	
Materials	$88	$293,000	$293,088	
Contracted Labour	$329,620	$3,249,107	$3,578,727	
Other Costs	$263,714	$10,000	$273,714	
Total	**$1,305,367**	**$4,412,980**	**$5,718,347**	(5)
Somerton	**CY18-CY22**	**CY23-CY27**	**CY18-CY27**	**Notes**
Internal Labour	$297,592	$903,103	$1,200,695	
Materials	$2,701	$538,898	$541,599	
Contracted Labour	$34,299	$2,392,587	$2,426,886	
Other Costs	$0	$0	$0	
Total	**$334,592**	**$3,834,588**	**$4,169,180**	(6)
Laverton / Coogee	**CY18-CY22**	**CY23-CY27**	**CY18-CY27**	**Notes**
Internal Labour	$384,334	$604,263	$988,597	
Materials	$5,000	$479,000	$484,000	
Contracted Labour	$6,310	$3,854,000	$3,860,310	
Other Costs	$0	$0	$0	
Total	**$395,644**	**$4,937,263**	**$5,332,907**	(6)

TOTAL	**$27,673,764**	**$26,798,788**	**$54,472,552**

Notes:

(1) Actual Cost - Project complete

(2) Project in progress, ±10% cost accuracy

(3) Project in progress, includes +20% cost allowance

(4) Cost based on proceeding with decommissioning pipeline and installing a new offtake, CTM, Regulator Station and connection into the distribution network.
Costs are high due to significant work within the Princes Highway Road Reserve.

(5) Project in progress, ±30% cost accuracy

(6) Assumes that the Pig Trap Installation will proceed following concept stage.

8 Acronyms

Acronym	Definition/Description
AEMO	Australian Energy Market Operator
AGA	Australian gas association – Type B compliance governing body
API	American Petroleum Institute – publisher of standards
CHAZOP	Control system HAZOP – study of the control system functions to identify logic vulnerabilities
ESD	Emergency shutdown – control system-initiated shutdown designed to prevent incident escalation if operating parameters are breached
ESV	Energy Safe Victoria
HAZOP	Hazard and operability study
HMI	Human machine interface
ILI	Inline inspection – pipeline internal inspection
OEM	Original Equipment Manufacturer
RA	Risk Assessment
RBI	Risk Based Inspection – a process used to prioritise maintenance or inspection activities based on risk of failure.
SIL	Safety Integrity Level – an assessment used to rank control systems by their ability to fail safely
SMS	Safety Management Study
VTS	Victorian Transmission System

9 Appendix

Appendix A – Risk Assessment

The below documents for the unpiggable pipelines project were created as part of the project and prioritisation process:

1. 19156-REG-P-0001 Unpiggable Pipelines Risk Reduction Program rev0.4 – Risk assessment workshop for unpiggable pipelines.
2. RISK-RANKING OF UN-PIGGABLE PIPELINES - Entire portfolio of unpiggable assets with high level prioritisation applied.
3. INTEGRITY MANAGEMENT OF NON-PIGGABLE PIPELINES – Audit & Risk Management Committee Meeting 20/11/2018

Appendix B – Access Arrangement / AER Context

This section explains "what changed" (internally/externally) since the 2018-2022 Access Arrangement submission approval and justifies the need for inline inspections for unpiggable pipelines.

1. Asset Engineering re-structure - centralised integrity and national focus

   The overall risk of pipelines in high consequence areas were considered nationally (consequence is Catastrophic on rupture, Major on Leak). AS2885 stipulates we must show that;

   - the probability of a rupture is hypothetical AND prove ALARP
   - the probability of a leak is only Hypothetical or prove that it is Remote (AND prove ALARP)

2. Change in APA's risk appetite: Enterprise Risk and new corporate risk matrix.

   It addresses (in more detail than AS2885) the aspects of;

   - Our social licence to operate (with respect to media and social media)
   - Our credit-worthiness with those who would fund our growth (strategy)
   - Any incident on an APA pipeline (in a HCA) will make the news and social media.
   - Any incident on an APA pipeline (in a HCA) will be recorded in the annual reports of the investment bankers who fund our growth.

3. Changes in intelligent pigging technology:

   Inline inspection identifies all features that need to be inspected or monitored, whereas DCVG only locates coating damage and as such may miss features that require intervention. The improved resolution with recent advances in inline inspection technology revealed issues that wouldn't be revealed by DCVG alone. Therefore pigging has become the only reliable way to detect some pipeline threats.

4. AS2885 SMS 2016 and ALARP Report – 320-RP-AM-0245

   Intermediate threat assessed in the 2016 SMS for "unpiggable pipeline sections – coating damage or disbondment of coating, resulting in corrosion, leading to loss of supply".

   Leak failure assessed as Unlikely with Severe consequence (security of supply category), which results in an Intermediate risk ranking.

   Test Case example: Per the LOPA assessments in the appendix of the 2016 SMS report, construction of pig trap facilities on the Somerton lateral (T102) reduces the likelihood of the risk of failure due to corrosion from 4×10^{-3} (unlikely) to 2×10^{-5} (remote).