Business Case – Capital Expenditure

VTS Facility Pipework Integrity

Business Case Number BC329 AA23-27

1 Project Approvals

TABLE 1: BUSINESS CASE – PROJECT APPROVALS

Created By	Adam Newbury Damian Lynch Stephen Otto	Asset Lifecycle Specialist, Asset Management Team Lead Inspection, Engineering & Planning Facilities Integrity Engineer, Engineering & Planning
Costed By	Prasoon Premachandran	Victorian Team Lead Project Delivery, Engineering & Planning
Reviewed By	Damian Lynch	Team Lead Inspection, Engineering & Planning
Approved By	Daniel Tucci	Victorian Asset Manager, Asset Management

2 Project Overview

Description of Issue/Project	Facility pipework remaining life is confirmed with periodic physical assessment to meet APA integrity policy and ensure continued safe reliable operation. The integrity of unpiggable buried piping and above ground insulted piping cannot be easily determined. For such buried and insulated facility pipework where no simple assessment methods exist, excavation (digs) and insulation removal, combined with visual inspection and non-destructive testing (NDT) are generally considered the most efficient method to identify facility pipework faults and enable a targeted repair campaign. The aim of this project is to ensure compliance with APA integrity policy and maintain the facility pipework to a safe and dependable standard. The objective of this project is to schedule physical condition verification assessments 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.

TABLE 2: BUSINESS CASE – PROJECT OVERVIEW

Options Considered	The following options have been considered: Option 1: Do nothing – ALARP assessment required Option 2: Assess facility pipework to fixed schedule Option 3: Assess facility pipework to RBI schedule (Preferred)		
Estimated Cost	CY18-CY22	**CY23-CY27**	CY18-CY27
	$1,858,000	**$9,290,000**	$11,148,000
Consistency with the National Gas Rules (NGR)	Periodic 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)).		
Stakeholder Engagement	Each facility may require differing stakeholder engagement; • Landowners impacted by the project will be consulted for noise, visual, third party encroachment etc. • AER, AEMO, Stakeholders and Consumers are consulted in the round table presentations.		

3 Background

Facilities Integrity Team is responsible for the 2 yearly external (above ground) and 4 yearly internal (buried) facility pipework inspection regimes. These are executed according to the following documents;

- APA 320-PL-AM-0092 Integrity Management Plan – Pressure Piping
- APA 320-GD-OM-0035 Pressure Pipework Guideline

The Pressure Pipework Guideline outlines the requirements of the regimes including visual inspection, NDT & dig ups, and insulation removal. This approach is consistent with the time based assessment approach of AS 3788.

Problem:

The Victorian Transmission System has 117 facilities with insulation and 303 facilities with buried pipework not configured for inline inspections (i.e. unpiggable), therefore periodic assessments are required to confirm pipework condition and remaining life. These sections of pipework require cladding removal and or excavation to expose the facility pipework which is then assessed using non-destructive testing, after this the identified faults are repaired before the pipework is recoated and accordingly reinsulated or reburied.

Affected Stakeholders:

APA and AEMO would be adversely impacted should an unpiggable section of facility pipework leak due to an undetected fault, duration and severity of the constraint would be dependent on the nature of the problem and the pipework location and demand etc. Customers/landowners and community in the vicinity of the pipeline would face disruptions until the issue has been resolved.

Impact:

1. For each of these sections of insulated or buried pipework the pipe condition and remaining life is uncertain as it cannot be pigged.

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

3. The facility pipework condition uncertainty elevates the risk ranking to moderate, if no action is taken to perform integrity assessments an ALARP assessment will be required but would be difficult to achieve without compliance to the APA integrity policy.

4. Generally without certainty of the asset condition, to mitigate numerically modelled risk predictions APA would be forced to move to increase leak monitoring and potentially implement MOP reductions.

Successful solution 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?
These insulated and buried pipework sections were designed and constructed without inline inspection capability which is common for facility insulated and buried pipework, integrity inspections are generally not required for the first 20 years of operation or numerical corrosion modelling predicts end of life.

Why are we proposing to address the issue now?
The targeted facilities piping coating systems have in general reached end of serviceable life to the point that active corrosion is now detected during routine inspections and maintenance. Where coating failure occurs on buried or insulated piping, accelerated corrosion can occur due to the environmental conditions (CP shielding and wet insulation). Physical inspection is now required to ensure any remedial works are carried out and asset integrity is adequate for continued safe operation.

Have we commenced the project in the current period?
Facility pipework assessments have been conducted by local teams and the records located offer limited detail. More recently a national approach has been applied to facilities integrity which is similar to that for pipeline integrity.

Will this issue take longer to rectify than just the next AA period?
This should be considered a preventative maintenance program and as such will continue for the life of each facility.

Are there any relevant technical standards that apply to this issue?
AS2885 and AS3788 are the applicable standard for facility pipework.

TABLE 2: GEOGRAPHIC LOCATION / TECHNICAL DETAILS:

Site type	Quantity
Complex	6
Intermediate	111
Simple	146
Cathodic protection	40
	303

General:

Have we done anything in the current period to rectify this issue/in relation to this project?
Inspections have been conducted but the facilities integrity team have recently developed a more in-depth national strategy to perform more thorough inspections of buried pipework.

Has the AER approved any expenditure in relation to this issue/project before?
Yes, however previously this was treated as a major expenditure job (MEJ) so was not submitted as part of the CAPEX budget.

If the work has been approved by the AER previously, have we conducted this work?
APA manage the work, but contractors are utilised for excavation and non-destructive testing.

If not, why not?
Not applicable

If so, what has been the outcome? How successful has the work been in addressing the issue?
The work has been a success as it helps to ensure that facility pipework incidents are avoided and the assets at the facilities remain available.

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. This 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 3: 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 Options Considered

Costs for each option are provided in table 4, as is often the case the costs are indeterminate for the do nothing option as ALARP requirements cannot be met. Costs for fixed and RBI schedule would be similar, however the benefit realised from the RBI approach is that it uses priority to schedule inspections.

TABLE 4: SUMMARY OF COST/BENEFIT ANALYSIS

Option	Benefits (Risk Reduction)	Costs
Option 1	Do nothing – ALARP assessment required	Indeterminate
Option 2	Assess facility insulated and buried pipework to fixed schedule	$30M +
Option 3:	Assess facility insulated and buried pipework to RBI schedule	$11,148,000. Final RBI schedule and costing can only be determined once sufficient data is collected.

5.1 Option 1: Do Nothing – ALARP assessment required

This option involves continuing to operate the facility without periodic inspection involving insulation removal and digups of the effected pipework and instead rely on numerical modelling for remaining life predictions.

APA facilities integrity engineers recommend this as non-viable due to the risk ranking remaining at Extreme for this option (i.e. above APA risk appetite). In addition, an ALARP assessment would be required to allow continued operation and it would be difficult to state that we are meeting our objective to reduce the risk level to as low as reasonably practicable.

5.1.1 Cost/Benefit Analysis

What are the costs/risks involved with doing nothing or deferring the project?
No additional costs beyond what we incur currently, however the solution is not-viable due to the ALARP requirement.

What are the benefits of doing nothing?
The only benefit of doing nothing is initial cost savings, however this is insignificant if considering ALARP requirement.

Due to the ALARP requirement for this option it was rated as non-viable as it would lead to MOP reductions and potentially end of life decommissioning.

5.2 Option 2: Assess facility insulated and buried pipework to fixed schedule

Schedule physical inspection of APA facility insulated and unpiggable pipework as per the facilities Piping Integrity management Plan. This approach ensures all assets get a four yearly inspection of buried pipework and 5 yearly inspection of insulated pipework regardless of risk, asset criticality or pipework condition.

5.2.1 Cost/Benefit Analysis

Cost/Benefit Analysis

What are the benefits of this option?

- This approach does comply with AS3788 and APA facilities integrity policy.
- All piping will be inspected regardless of risk or condition.

What are the costs/risks involved with this option?

- No prioritisation of inspections based on risk increases risk of piping failure before inspection is achieved.
- Findings and results will take longer to achieve due to the additional work required.
- Unnecessary over inspection of pipework (poor use of resources, inefficient use of funds, significant increase in cost).

Therefore, this option is not deemed optimal.

5.3 Option 3: Assess facility insulated and buried pipework to RBI schedule – recommended option

Where appropriate, the 5 yearly insulated piping and 4 yearly buried pipework inspection timing can be refined based on assessment of variables such as pre-existing damage to underground infrastructure, current insulation condition, piping operating data, assets age, condition uncertainty (risk) and resource or asset availability. The APA facilities integrity team consider variables holistically and apply a risk-based inspection methodology that not only ensures asset reliability but also guarantees APA can demonstrate compliance.

5.3.1 Cost/Benefit Analysis

The RBI approach efficiently identifies and targets sites that require the dig up based on a Risk Assessment / Risk Based Inspection approach.
Substantial cost savings can be realised with this approach but more importantly, locations that have the highest risk of failure or the greater consequences should a failure occur are the ones that get prioritised which makes the actual savings difficult to quantify.

Why are we proposing this volume?
These are the 303 Victorian Transmission System facilities that require regular physical assessment to remain complaint with AS3788 and in line with APA facilities integrity policy.

Cost/Benefit Analysis

What are the benefits of this option?

- 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 facilities.
- Ensures APA continue to operate in a safe and reliable manner.

What are the costs/risks involved with this option?

- The risks of this option are low, basically it is a more intelligent way of doing what we must do to remain complaint.
- Costs are difficult to predict as there are many variables in place, however the approach taken has been to apply a fixed budget of $1,858,000 per calendar year noting that this will be an ongoing program of work.

5.3.2 Consistency with the National Gas Rules

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

- Prudent – The expenditure is necessary in order to maintain and improve the safety of services and maintain the integrity of services to customers and personnel and is of a nature that a prudent service provider would incur.
- Efficient – The selection of the appropriate timing for each facility 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 inspection 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 – RBI and physical inspection are proven tools used worldwide for prioritising and assuring buried pipework integrity. To achieve the lowest sustainable cost of delivering pipeline services – RBI is the most cost-effective solution and a common approach for integrity programs. The proposed option uses a combination of risk assessment and RBI to prioritise the facilities and in doing so reduces cost and addresses integrity risk for assets with high failure consequences.

5.3.3 Forecast Cost Breakdown

Unit rate $265,000 per month for 7 months of the year. This estimate represents 8 digups, 30 metres of cladding removal, inspection, coating works, and reinstatement, at 1 site per month.

Cost determined:

Historic digups costs - Ballarat City Gate site – 15 x 1m excavator digups and coating refurbishment = $150,000 total due to time savings in mobilisation and utilisation. Digups will be longer and extend deeper than for 1m length, inspection assessments will be more comprehensive and collect NDT data for RBI, resulting in predicted unit rate increase.

Previous SIB quote for $33,600 for each 30m section at compressor stations used for this proposal. Considering not all insulation that is removed will need to be replaced the unit cost per month has been reduced to 25K.

What is this unit rate based on and why? (i.e. how is the unit rate justified?, is it efficient?)

- Competitive tender rates based on previous small scale digup project tendering.

Volume:

Volume is based on VTS sites proposed RBI strategy. Minimal to Nil data exists for unpiggable station piping and insulated piping. Initial digups will be the highest risk (oldest sites, poorest pipeline coating, CP effectiveness, Risk profile based on proximity to high density residential and industrial/commercial areas, higher production and supply importance sites). Insulation removal inspections will be opportunistically co-ordinated for execution at the same time as digup work at a site to optimise inspection and coating contractors and mobilisation costs.

Works can only occur during warmer (non-winter) period where conditions for digging and coating works are suitable. This will reduce the risk of delay costs and workmanship issues (excavation flooding risk, coating temperatures above 10 degree minimum). For this reason Southern VTS digups and insulation work will be limited to Jan Feb March November December, and Northern VTS work can extend into April and October. No work is expected May though to September.

Assumptions:

100% excavation and insulation removal will not occur. Sampling methodology based on likelihood of defects will be used. Results will be dynamically applied to determine full extent of assessment and refurbishment required.
Any findings requiring further excavation and assessment will need to be considered and planned based on these results.
Extension of the digups may occur during this program at each monthly site depending on the risk any defects or data present at the time.

TABLE 5: PROJECT COST ESTIMATE,

		CY18-CY22	**CY23-CY27**	CY18-CY27
Internal Labour		$378,000	**$1,890,000**	$2,268,000
Materials		$70,000	**$350,000**	$420,000
Other Costs		$150,000	**$750,000**	$900,000
	Excavation	*$210,000*	***$1,050,000***	*$1,260,000*

Contracted Labour	***Insulation***	*$175,000*	***$875,000***	*$1,050,000*
	Inspection and NDT	*$140,000*	***$700,000***	*$840,000*
	Recoating	*$735,000*	***$3,675,000***	*$4,410,000*
	Total	$1,260,000	**$6,300,000**	$7,560,000
Total		$1,858,000	**$9,290,000**	$11,148,000

Project cost estimate breakdown provided in table 5 assumes modest buried pipework coating faults and pipework features requiring repair. Actual locations to be targeted during the CY23-CY27 period are being finalised currently.

6 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

7 Appendix

Appendix A: Inspection Schedule

TABLE 6: SITE INSPECTION SCHEDULE

Year	Month and Site	Site types and cost
2022	• Jan - Brooklyn CS • Feb - Wollert CS • Mar - Dore Rd • April - Euroa CS • Oct - Springhurst CS • Nov - Gooding CS • Dec - Iona	Complex – compressor stations and 1 x intermediate site $1,858,000
2023	• Jan - Corio • Feb - Lara SWP • Mar - Lara • April - Shepparton • Oct - Wangaratta • TBA - MLV sites x 4 – on same pipeline • TBA - MLV sites x 4 – on same pipeline	Intermediate Sites x 5 MLV sites x 8 $1,858,000
2024	• Jan - Dandenong TS/CG • Feb - Winchelsea CS – New Site • TBA - Intermediate sites x 3 • TBA - MLV sites x 8 – (2 pipelines, 4 site per pipeline)	Intermediate Sites x 4 Compressor Station x 1 MLV sites x 4 $1,858,000
2025	• TBA - Intermediate sites x 5 • TBA - MLV sites x 8 – (2 pipelines, 4 site per pipeline)	Intermediate Sites x 5 MLV sites x 4 $1,858,000
2026	• TBA - Intermediate sites x 5 • TBA - MLV sites x 8 – (2 pipelines, 4 site per pipeline)	Intermediate Sites x 5 MLV sites x 4 $1,858,000
2027	• TBA - Intermediate sites x 5 • TBA - MLV sites x 8 – (2 pipelines, 4 site per pipeline)	Intermediate Sites x 5 MLV sites x 4 $1,858,000

Appendix B: Examples of Facilities Corrosion

TABLE 7: TYPICAL CORROSION EXAMPLES WHERE MITIGATION IS REQUIRED

BURIED PIPING AND AIR GROUND INTERFACE CORROSION

Left: Typical MLV site valve bypass piping corroded. Right: Piping HDPE sleeve failing at transition in subsurface pit.

Left: Example of syphon valve corrosion where buried piping transition has failed (middle – close view) and Right: radiography to determine corrosion losses.

INSULATED PIPING CORROSION

Insulation / cladding failure showing water ingress point.

Cladding and insulation partially removed (from above photo) showing coating failure and active corrosion requiring repair.

Left: Example of insulation at Dore Rd site where gaps in cladding at top instruments/nozzles allow water ingress on sweating lines.
Right: Example of cladding with evidence of water ingress and corrosion at a bottom drain nozzle.