Business Case – Capital Expenditure

CP Replacement

Business Case Number BC244 AA23-27

1 Project Approvals

TABLE 1: BUSINESS CASE – PROJECT APPROVALS

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Reviewed By	Alan Creffield	Senior Integrity and Corrosion Protection, 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 cathodic protection system is comprised of many components. Over time these components fail, deplete or require augmentation. This business case is the supporting evidence for the capex investment to replace and upgrade CP systems. CP systems are needed to maintain the integrity of the 2,200km of buried transmission pipeline. Cathodic protection is an ongoing program of work.
Options Considered	The following options have been considered: 1. Option 1: Do Nothing 2. Option 2: Replace and upgrade the cathodic protection system
Estimated Cost	$1,162,322
Relevant Standards	Australian Standard (AS) 2832.1 Cathodic Protection of Metals: Pipes and Cables. AS 2885.3 Pipelines: Gas and Liquid Petroleum Operations and Maintenance. AS3000: Electrical Installations.
Consistency with the National Gas Rules (NGR)	The replacement 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	The stakeholders directly affected by this program are: • Energy Safe Victoria via the Electrolysis Committee • Landowners • Other owners of underground structures

Benefits to Customers and Consumers	

3 Background and Project Need

The 2,200 km of pipelines comprising the Victorian Transmission System (VTS) are made of steel, coated and buried. All of these pipelines are protected from corrosion using coating system and cathodic protection. The cathodic protection (CP) system can be monitored and tested to indicate performance of the system.

In simple terms, the CP system is designed to create an electrical circuit with a pipeline and an anodic material to ensure that the anode corrodes rather than the pipeline. As a result, a CP system reduces the likelihood of corrosion occurring at coating defects.

The following table shows the main CP asset classes and their expected life and thus replacement rate.

TABLE 3: EXPECTED LIFE OF COMPONENTS

	Quantity	Expected Life	Replacement Rate per year
CP/TR/Impressed Current Units	63	15-20 years	3
Anode Bed	63	25-30 years	On failure, typically 2 per year
Test Point	2,000	50 years	On failure, typically 5 per year

A licence condition to operate pipelines in Victoria is the adherence to Australian Standard 2832.1 Cathodic Protection of Metals: Pipes and Cables and 2885.3 Pipelines: Gas and Liquid Petroleum Operations and Maintenance. To enable compliance with these standards the CP system must be designed by competent personnel and operated with a high level of reliability. Overtime the CP equipment fails and it must be replaced to enable compliance with these standards.

The CP equipment that is electrified by 240V power must also be in compliance with AS3000: Electrical Installations. Where an individual component fails and must be replaced then the current standard applies to the entire installation. Older installations were constructed to the standard in place at that time and are no longer compliant with the current standard. This can require replacement of existing equipment when individual components fail as, instead of simply repairing the component, the entire installation must be upgraded to comply with AS3000 requirements.

4 Risk Assessment

The purpose of the CP system is to prevent corrosion from occuring on the exterior surface of the pipe. Without adequate replacement and upgrade of the CP system, corrosion induced metal loss is highly likely.

TABLE 4: RISK RATING

Risk Area	Risk Level
Health and Safety	**Low**
Environment	**Low**
Operational	**Medium**
Customers	**Low**

Reputation	**Medium**
Compliance	**Medium**
Financial	**Low**
Final Untreated Risk Rating	**Medium**

The result of extensive corrosion induced metal loss is defects, (potentially widespread along the length of pipeline), that will require remediation by excavation and cost substantially more than the cost of CP augmentation and replacement.

5 Options Considered

TABLE 5: SUMMARY

Option	Description	Costs
Option 1	Do Nothing	Loss of pipeline life, loss of pipeline licence to operate
Option 2	Replace and upgrade CP system as required	$1,162,322

5.1 Option 1 – Do Nothing

The Do Nothing option is to permit the CP system to fail. This will result in anode beds depleting, CP units not delivering sufficient power, and the eventual pipeline corrosion and non-compliance to AS2832.1.

The detriment of the Do Nothing option is the potential for corrosion of the pipeline. Rectifying the corrosion will cost significantly more than cathodic protection.

Option 1 is not technically acceptable, nor permitted within the Pipeline Licence. It is not prudent nor consistent with good practice.

5.2 Option 2 Replacement and upgrade CP system

Option 2 addresses the need to continually maintain the CP system in line with Australian Standard (AS) 2832.1 Cathodic Protection of Metals: Pipes and Cables, AS 2885.3 Pipelines: Gas and Liquid Petroleum Operations and Maintenance; and AS3000: Electrical Installations.

The expected life of each CP component is shown in Table 3 with their expected replacement rates are also shown. A defective or failed component is identified during periodic inspections. All VTS CP systems are remotely monitored, therefore, upon failure an assessment can be conducted to determine whether repair or replacement is required.

A potential survey can also trigger the installation of new CP units, new test points, replacement of anode beds or the upgrade of a unit from low to higher power setting. This strategy has been implemented for many years.

Option 2 is the only credible and practicable option.

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 expenditure is necessary in order to maintain and improve the safety of services and maintain the integrity of services to customers and is of a nature that a prudent service provider would incur. The program aligns with Australian Standard (AS) 2832.1 Cathodic Protection of Metals: Pipes and Cables, AS 2885.3 Pipelines: Gas and Liquid Petroleum Operations and Maintenance; and AS3000: Electrical Installations.
- Efficient – The works will be subject to APA's procurement policy. 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 – Addressing the risks associated with the cathodic protection system failure and replacing assets that have reached the end of their useful life is accepted as good industry practice. In addition, the reduction of risk to as low as reasonably practicable in a manner that balances cost and risk is consistent with Australian Standard AS2885.
- To achieve the lowest sustainable cost of delivering pipeline services – The sustainable delivery of services includes reducing risks to as low as reasonably practicable and maintaining reliability of supply.

7 Forecast Cost Breakdown

Assumption that unit rate per CP Unit replacement is similar despite geographic location disparity.

The quantity of anode beds and CP Units and their expected life leads to a replacement rate as shown in Table 3.

TABLE 6: PROJECT COST ESTIMATE,

	Total
Internal Labour	$254,258
Materials	$605,454
Contracted Labour	$302,610
Other Costs	$0
Total	**$1,162,322**

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