Business Case – Capital Expenditure

Remote CP Monitoring

Business Case Number 241

1 Project Approvals

TABLE 1: BUSINESS CASE – PROJECT APPROVALS

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Approved By	Craig Bonar, *Manager East Coast Grid Engineering, APA Group*

2 Project Overview

TABLE 2: BUSINESS CASE – PROJECT OVERVIEW

Description of Issue/Project	The Cathodic Protection system requires significant maintenance activities. These are dominated by monthly inspections of the numerous CP units scattered across the state of Victoria. This project is to replace the CP units with units capable of sending data to the APA SCADA system to implement a remotely monitored solution, removing the need for monthly inspections and enable real time monitoring with sufficient alarms to identify inadequate pipeline protection.
Options Considered	The following options have been considered: 1. Option 1: Do Nothing Option 2. Option 2: Remotely monitor all CP Units only 3. Option 3: Remotely monitor all CP Units and Test Points
Estimated Cost	$814,880
Consistency with the National Gas Rules (NGR)	The capital expenditure 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	Stakeholders effected by this project are: • Victorian Electrolysis Committee • Landowners

3 Background

All of the 2,200 km of pipeline that is 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 in favour to the pipeline. The result is anode replacement on depletion and a pipeline with corrosion induced metal loss minimized.

A buried ferrous material with CP is called a structure. The performance of the CP system is directly affected by other structures and natural phenomenon, and listed in AS2832.1 a sample of these are:

- Stray currents from third party pipelines and cables that are CP protected
- Stray currents from railways (electric)
- Latent soil conditions (pH, degree of aeration, dissolved salts)
- Telluric effects (altering of the earth's magnetic field due to the sun)
- Soil conductivity (rainfall, water table movement)

The CP system creates an electrical circuit that utilizes the conductivity of the soil, thus the resistivity of the surrounding soil also affects the performance. Resistivity changes with soil moisture at pipeline depth, thus in periods of prolonged drought the CP performance can be reduced.

Given the complex CP operating environment of long interconnected pipelines, the only appropriate technique in ensuring CP performance is to routinely monitor the system. The Australian Standard 2832.1 mandates the minimum testing frequency.

In the past this technique has been considered acceptable. However there are some deficiencies with this approach:

- Transient loss of protection is not detected unless the occurrence is aligned with an inspection, such as telluric or stray current activity
- Equipment failure or anode depletion is not detected until the next inspection
- Reverse polarity (the pipeline becomes the sacrificial anode) is not detected until the next inspection
- The cost of each inspection is dominated by travel costs
- Unknown events such as stray currents leading to repeated transient loss of protection are not normally detected

The digital technology advancements in the recent decades have reduced the size, cost and increased the performance and reliability of remote monitoring systems. In the past, these systems have only been economically justified when the location of CP units has been in extremely remote areas. Today small, robust, battery powered devices using wireless technology are available for a significantly reduced cost to the past. These units can use the mobile telecommunications network that is more available and reliable in rural areas than in the past and where many CP units are often located.

The use of portable digital monitoring enables a large reduction in travel costs for the life of the unit, whilst increasing data quality.

The VTS has approximately 70 CP units and 1000 test points.

4 Risk Assessment

The risks that dominate the existing system are reverse polarity. The effect of reverse polarity on a pipeline will result in corrosion wherever there is a coating defect. This will likely reduce the asset life by more than 5 years for every month that the reverse polarity occurs, depending on the coating integrity and the input voltage and current.

TABLE 3: RISK RATING

Risk Area	Risk Level
Health and Safety	**Low**
Environment	**Low**
Operational	**Moderate**

Customers	**Low**
Reputation	**Low**
Compliance	**Moderate**
Financial	**Moderate**
Final Untreated Risk Rating	**Moderate**

5 Options Considered

5.1 Option 1 – Do Nothing

The Do Nothing option is to permit the current approach of time based inspections to continue.

5.1.1 Cost/Benefit Analysis

The cost of this option is primarily two aspects:

- Continuing to use maintenance personnel to travel long distances to perform a maintenance activity of very short duration.

The operational cost of performing the Do Nothing option is shown in Table 3:

TABLE 3: DO NOTHING OPERATIONAL COST

Unit	Description	Annual Cost	
CPU	Bimonthly inspections	**$54,720**	
Test Point	Six monthly potential surveys	**$145,920**	

- The potential for undetected reverse polarity to reduce asset life by approximately five years per month. To determine the cost of this, assuming a replacement value of $2m/km and a minimum of 100km with an asset life of 100 years, equates to an accelerated depreciation of $10m per event.

5.2 Option 2 – Remotely Monitor CP Units only

The proposed solution is to replace all CP equipment that requires high frequency inspections, these are Cathodic Protection Units.

5.2.1 Cost/Benefit Analysis

The cost advantage of this approach is the travel time will be largely reduced, however the six monthly potential surveys will still need to be conducted as all of the test points on a structure must be assessed at the same time. These surveys require a 20-24 hour intensive measurement with data loggers. This process requires technicians to place the data loggers, then stay overnight in rural location, only to collect the loggers the following day.

The result is these loggers will only be beneficial for 10 out of the 12 monthly inspections per year. In addition, the potential surveys are travel intensive inspections will still need to be conducted.

5.3 Summary of Cost/Benefit Analysis

The section should include a general overview of how the options compare and identify any options are not technically feasible.

TABLE 4: SUMMARY OF COST/BENEFIT ANALYSIS

Option	Benefits (Risk Reduction)	Costs
Option 1	Do Nothing	$10m
Option 2	Remotely Monitor CP Units only	$180,000
Option 3	Remotely monitor CP Units and Test Points	$814,880

5.4 Proposed Solution

5.4.1 Replace all CPU and selected Test Points with Remotely Monitored Units

This option is to apply remote monitoring of all CP equipment including test points. There are approximately 1,000 test points that are assessed every six months and 70 CPUs every month or bimonthly.

The six monthly test point [potential] survey is a controlled test where all the test points on a given structure are assessed within a short period of time to ascertain CP condition. The benefits of remote monitoring the test points is that the survey can be conducted at precisely the same time, improving data quality to a level not yet achieved. In addition, the structure can be monitored almost continuously.

The cost breakdown of this solution is shown in Table 5

TABLE 5: REMOTELY CONTROLLED DATA LOGGERS CAPITAL EXPENDITURE

Unit	Description	Cost to Procure and Install	Quantity Required
CPU	CPU Monitor with multiple inputs and alarms	**$1700**	70
Test Point	Remote Monitored data logger with single input	**$500**	1000

A total installation cost of this project is anticipated to be $814,880 including integration into the SCADA system to improve alarm management and data retention.

5.4.2 Why are we proposing this solution?

This option further reduces operational expenditure by eliminating the six-month potential survey and the monthly/bimonthly CP unit inspections.

The cost of the CP inspections is approaching $200,000 per year.

The remotely monitored units will require some maintenance costs for occasional failure and data transmission fees at $5 per unit per month, approximately $64,000 per year.

The data will be viewed and reported from a third party web based portal. However, APA needs the data to be owned by APA thus an interface to enable the data to be uploaded into the APA SCADA historian will cost approximately $30,000 and will be a once off cost.

A net present value analysis based only on maintenance cost reduction, data transmission costs, three-year battery replacement but excludes risk reduction benefits demonstrates a positive result of over $100,000.

When the risk reductions from reverse polarity and data quality are considered, this project is clearly prudent from a cost and safety perspective over the short and long term.

5.4.3 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 personnel and is of a nature that a prudent service provider would incur.
- Efficient – The equipment that will be purchased will be specifically designed for the purpose. 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 reverse polarity 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 costs of operation to as low as reasonably practicable and maintaining safety and reliability of supply.

5.4.4 Forecast Cost Breakdown

The following cost summary is based on recent unit costs from suppliers.

Device	Unit Cost Installed	Quantity
CPU	$1,700	70
Test Point	$500	1000

Total Project Cost including project management, software interfaces and other costs is: $814,880