Evoenergy

Flow Measurement Projects

Options Analysis

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Authorisation

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Owning Functional Area

Business Function Owner	Gas Distribution Asset Management

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1. EXECUTIVE SUMMARY

1.1 PROJECT AND KEY DRIVERS

There are seven high pressure regulating stations on the Canberra high pressure network but only three of them have the capabilities of measuring flow, these are; Watson Custody Transfer Station (**CTS**), Hoskinstown CTS and Hume Primary Regulating Station (**PRS**) stations. This leaves Gungahlin PRS, Phillip PRS, Fyshwick Trunk Regulating Station (**TRS**) and Bungendore Package Offtake Station (**POTS**) with no flow measurement capabilities.

The lack of flow measurements for all stations create limitations in network modelling, operational responses such as emergencies, project planning and reporting on network performance. This ultimately impacts our ability to effectively manage the network and ensure the safety and reliability of our service to customers.

The principal drivers for undertaking this project are:

1. Maintain the safety of the pipeline. Flow measurement data is used in maintenance activities such as pigging, validation digs and emergency response situations, where the gas flowrate needs to be known. This flow data informs welding procedures to ensure the pipelines integrity and in turn safety of customers and the public.

2. Assist investigations in reducing Unaccounted for gas (**UAG**). The installation of flow measurement capabilities at all the major stations, assists in detecting measurement and calculation errors such as meter degradation, meter uncertainty, and the use of operational gas, all contributing factors in the UAG calculations.

3. Ensure reliability of gas to customers. Accurate modelling inputs are vital to assess facility capacity performance. Currently the downstream demand for each of the unmetered PRS and TRS sites need to be calculated in Synergi[1] Gas models based on the station inlet pressures. Due to the configuration of the system, the calculated flow profiles are inaccurate and in some cases impossible to replicate in actual practice. Accurate capacity performance is critical as it informs us when station upgrades are required, or whether stations can be shut down for maintenance, ensuring a reliable gas supply to customers.

4. Meet our reporting obligations. Recent changes imposed by the Australian Energy Market Commission (**AEMC**) under the National Gas Law (**NGL**) require us to report and publish daily flows including all receipts and delivers on its gas transmission assets including the Canberra primary main as per the amended National Gas Rules (**NGR**) (Rule 112(D)(4)).

Overall, this project is needed to meet the service requirements of our customers. Without an adequate solution there is a untreated risk rating of significant which is above Evoenergy's risk threshold and needs to be addressed.

[1] Synergi is our hydraulic gas modelling software.

1.2 CREDIBLE OPTIONS

Option	Option Name	Description	Cost ($000's, Real 2020)
1	Maintain Status Quo	Use current flow metering data (from the three out of seven high pressure facilities) as inputs into Synergi Gas model and calculate parameters.	0
2	Install flow meters on three high pressure facilities (**Recommended Option**)	Install flow meters on the three large pressure facilities that do not currently have them. These include: Fyshwick TRS, Gungahlin PRS and Phillip PRS. Bungendore POTS is a small facility supplying the town solely.	$1,791
3	Install flow meter on one high pressure facility	Install flow meter on Fyshwick TRS and leave the other three facilities without measurement capabilities.	$597

1.3 RECOMMENDATION

Option 2: Install flow meters on three high pressure facilities is the recommended solution costing $1,791 ($000's, Real 2020).

The solution decreases the risk rating from 'significant' to 'low' and ensures accurate flow measurement for planning, operational and emergency purposes. This solution will ensure a safe and reliable gas service is maintained for customers.

1.4 NATIONAL GAS RULES

The proposed solution is consistent with rule 79(1)(a) of the National Gas Rules:

- Prudent – The expenditure is required to maintain gas reliability, safety, and to comply with regulatory obligations.
- Efficient – The cost estimates for this project were developed from actual costs of a similar project that underwent a competitive tender process.
- Consistent with accepted and good industry practice – Sufficient modelling is required to ensure correct asset management practices are maintained. Additional flow meters will determine when further investment is required and assist in effectively managing our aging assets.
- Necessary to achieve the lowest sustainable cost of delivering pipeline services – The proposed project balances the risk of safety, reliability, disruption to community and cost to customers to provide the lowest sustainable cost. The solution proactively addresses a management and planning issue thereby avoiding reactive measures that would cause disruption and harm to our customers.

The project solution complies with the new capital expenditure criteria rules 79(2)(c)(i)-(iii), due to the following reasons:

79(2)(i-ii) Maintain and improve the safety and integrity of services: The safety and integrity of the high pressure pipelines will be improved with accurate modelling of the flowrates in the pipeline, this informs welding procedures. Flowrates are critical to understanding the welding parameters needed to make the pipeline safe and hold its integrity.

79(2)(iii) To comply with a regulatory obligation: The AEMC require hourly flow data at relevant entry and exit points where a meter is present to be published.

2. PROJECT BACKGROUND AND KEY DRIVERS

2.1 PROJECT BACKGROUND

Figure 1, shows there are seven high pressure regulating stations on the Canberra and broader Evoenergy network but only three of them have the capabilities of measuring accurate flow data, these sites include; Watson CTS, Hoskinstown CTS and Hume PRS. The other four sites of Gungahlin PRS, Phillip PRS, Fyshwick TRS and Bungendore POTS were not installed with flow measuring capabilities at the time of construction due to an assessment determining them non-critical.

Previous assessments for installing flowmeters at the time of construction deemed it not critical as;

- There was no requirement for reporting,
- The operational functionalities of the high pressure network were thought to be simple and the flows could be back calculated. This is not possible due to offtakes to Bungendore and the pipeline acting as a storage bottle.
- Simple forecasting with the projection of the gas consumption and uptake known. Historically, gas has been consistent and steady growth where assumptions did not vary significantly.

Flow meters are important infrastructure for the operation, reporting and future planning of the network. They allow engineers to assess the flowrates of the station for future planning analysis and provide an on-demand response to emergency situations. The position of having flow meters has now changed so that the benefits outweigh the overall cost. This is because –

- Aging assets require continual monitoring and checks to ensure the integrity of the pipeline is maintained i.e. corrosion does not create leaks or put the safety of our customers, employees and the public at risk. These maintenance activities include; pigging, integrity digs and infrastructure shutdowns during emergencies.
- Changing market and the uncertainty in planning. The ACT government have committed to reducing carbon emissions and the projection of gas consumption is no longer simple to forecast. The complexity of forecasting usage means there is risk the AS2885[2] facility upgrades are completed either before or after they are required, making for an inefficient expense that will ultimately cost customers. During these upgrades the capacity of the station is also assessed and if the station capacity is unknown then there is a risk of poor supply.
- Evoenergy's reporting obligations have changed. This is a part of the Australian Energy Market Commission (**AEMC**) changes to the **NGR** (Rule 112(D)(4)) where they require Evoenergy to report and publish daily flows including all receipts and deliveries on its gas transmission assets. These changes were brought in July 2019.

[2] AS2885 Australian & New Zealand Standard for high pressure facilities and pipelines

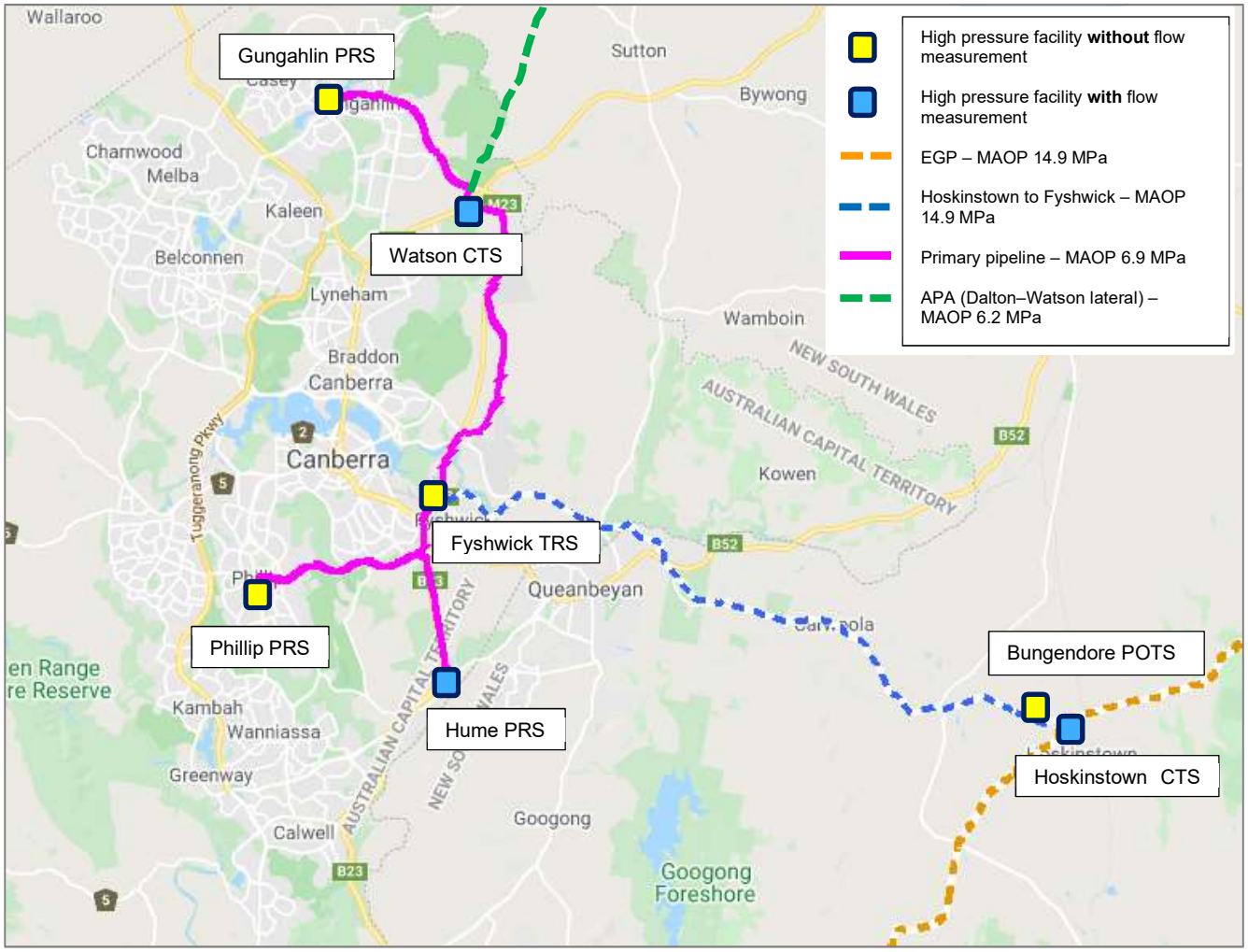


Figure 1: Canberra high pressure facilities

2.2 IDENTIFIED NEED

The identified need is to install flow measurement capabilities at the sites of Gungahlin PRS, Phillip PRS and Fyshwick TRS to ensure we:

1. Have the ability to carry out maintenance works such as pigging, validation and integrity digs.

    a. Pigging: It is our requirement as an operator to run an in-line inspection tool known as ILI or a 'pig' to measure the wall thickness of our high pressure pipelines. This ensures the integrity of the pipe is not compromised due to corrosion or third party damage (contact by construction machinery). The velocity of gas needs to be known to allow for adequate planning of pigging activities. Unknown flowrates may result in the pig travelling too fast or too slow and may require the operation to be completed multiple times.

b. Construction: The velocity and flows within the pipeline are required to develop accurate welding procedures to ensure the safe construction of additional pipes, valves and bypasses on 'live gas' [3] pipelines.

c. Validation and integrity digs: The velocity of the gas needs to be known for planning purposes to determine emergency response for suspected large corrosion defects and mechanical clamping procedures. Velocity information enables welding procedures to be developed along with thickness of the pipe, pipe rating and material to ensure the welds hold their integrity for the life of the pipeline. Inaccurate and unknown flowrates may put our customers and the public at risk as the pipe may not hold structural integrity while the pipe is brought back to operating pressure[4].

2. Assist investigations in reducing Unaccounted for gas (**UAG**). The installation of flow measurement capabilities at all the stations, assists in detecting measurement and calculation errors such as meter degradation, meter uncertainty, and the use of operational gas, all contributing factors in the UAG calculations

3. Obtain accurate flow data to assess station duty and pipeline capacity performance for the purpose of network modelling, validation and planning of AS2885 facility upgrades. There are additional benefits of having flow visibility at all stations with increased knowledge for network modelling and monitoring of asset performance. At the moment we do not have accurate data available to assess the station duty and pipeline capacity performance. For example, to ensure reliability of supply we need to accurately forecast the impacts of Molongo new estate development.

4. Meet Evoenergy's reporting obligations as part of the AEMC through the NGR as they require Evoenergy to report and publish daily flows including all receipts and deliveries on its gas transmission assets.

2.3 PROJECT DRIVERS AND OBLIGATIONS

Listed below are the project drivers and obligations for carrying out this project:

a. Safety:
   i. Accurate flowrate data ensures correct welding procedures are created for construction works on the pipeline (emergency or hot taps for additional works). If the welding procedures are inaccurate, then the structural integrity of the pipe can be compromised and impact safety.

b. Reliability:
   i. Assists with doing maintenance on the network such as integrity digs, pigging (Licence 29 and Canberra Primary Main), facility shutdowns, emergencies and contingency (disaster) plans.
   ii. In an emergency situation, it is important to understand the impact on the network and how best to respond. With a known flowrate, the engineering team will know the immediate impacts of the incident and can respond in a more timely manner. This may have positive impacts on customer gas supply and prevent losses in gas.

c. Compliance and obligations:
   i. Reporting obligations as part of the changes to NGR Rule 112D(4).

Without an adequate solution there is a untreated risk rating of 'significant' which is above Evoenergy's risk threshold and needs to be addressed. The risk assessment can be found in Appendix A.

[3] Live gas refers to gas pipelines that operate at nominal pressures while construction onto the pipeline can still occur.

[4] In emergency repair situations, the pipeline pressure is often reduced significantly to enable safe and effective repair on the pipelines before being slowly brought back to operating pressure.

3. CREDIBLE OPTIONS

The following options were identified and explained in more detail below :

- Option 1: Maintain Status Quo
- Option 2: Install gas flow meters on three major stations: Gungahlin PRS, Phillip PRS and Fyshwick TRS
- Option 3: Install gas flow meters on one station: Fyshwick TRS

3.1 OPTIONS ANALYSIS

3.1.1 OPTION 1: MAINTAIN STATUS QUO

The configuration is to remain the same with no flow meters installed on the three major high pressure facilities. Asset information would be used from the flow metering data at Hoskinstown CTS, Hume PRS and Watson CTS to predict flowrate and station capacities at the other stations of Fyshwick TRS, Gungahlin PRS and Phillip PRS.

The flows at the unknown high pressure facilities cannot be accurately back calculated due to the transient nature of the pipeline 'the bottle'. The operation of the high pressure pipelines is such that Hoskinstown's flowrate is not reflective of Fyshwick's TRS flowrate. This is because the pipeline between the two stations will only pass gas into the Fyshwick's facility when the pipeline is at maximum capacity or when there is sufficient demand from the PRS facilities.

This option would have a capital cost of $0.

Benefits

1. **No capital expenditure**: The cost of upgrading the facilities to include flow meters will be removed, resulting in a cost saving to the customer.

Disadvantages

1. **Synergi[5] model inaccuracies**: Each year we validate our Synergi gas models to the pressures and flowrates we had been seeing in the previous year. This ensures accurate and up to date information on the networks performance. If this information is incomplete, gaps can open for errors and mismanagement of the network.

2. **Operational and maintenance procedures**: An integral part of producing welding and maintenance procedures is the input of flowrate. As discussed in Section 2.2, if the flowrate is not accurately determined, then errors can be created in welding procedures, placing risk on the integrity of the pipeline and ultimately, risk to the public and customers. This is particularly important for the integrity projects of pigging and validation digs as they confirm the condition of the pipe is acceptable and ensures the safety and longevity of the services we provide customers.

3. **Facility stations upgrades**. Using predictive measures on the pipelines facilities can have adverse effects by causing inefficient investments such as carrying out facility upgrades either too early or late.

4. **Not meeting reporting obligations**: The gaps in our reporting data would remain and we would be unable to meet our reporting requirements under NGR Rule 112D(5).

[5] Synergi is our hydraulic gas modelling software.

3.1.2 OPTION 2: INSTALL GAS FLOW METERS ON THE THREE MAJOR REMAINING STATIONS: GUNGAHLIN PRS, PHILLIP PRS AND FYSHWICK TRS

The facilities of Gungahlin, Phillip and Fyshwick are to be installed with flow meters.

This option would have a capital cost of $1.791M (Real, $2020)

Benefits

1. **Synergi model accuracies**: If all flowrates are captured at our high pressure facilities then it would be possible to ensure accurate gas modelling. This information could be used for a large range of applications such a planning, projects, maintenance and reporting.

2. **Operational and maintenance procedures**: Live and historical data of flows would accurately determine flowrates passing through our high pressure pipelines. This information is crucial for the development of working procedures such as welding. It will ensure the integrity of the pipelines are maintained and in turn the safety of our customers and the public.

3. **Facility stations upgrades**. The efficiency of investment will improve as we can accurately forecast when important facility upgrades are required. This ensures the cost to the customer is only passed on when we truly need the upgrade.

4. **Meeting reporting obligations**: The gaps in our reporting data would be resolved and we would be able to meet our reporting requirements under NGR Rule 112D(5).

Disadvantages

1. **Capital costs:** The project will cost the customer $1.791M.

2. **Construction difficulties**: There may be insufficient room for flow meters to be installed. In this case the flow meter would have to be installed outside the facility resulting with an additional cost.

3.1.3 OPTION 3: INSTALL GAS FLOW METERS ON ONE STATION: FYSHWICK TRS

In this option, we could install one flow meter on the Fyshwick TRS site. This would enable visibility of flow entering the primary pipeline at specific times and removes one variable from the three high pressure sites. To determine flows at Phillip and Gungahlin, flows would have to be back calculated and assumptions made on quantity of gas passing through them and in the flowrate in the Primary pipeline.

By installing one flow meter you are a removing one variable however, assumptions are still required and does not provide accurate flow rate information.

This option would have a capital cost of $0.597M (Real, $2020)

Benefits

1. **Capital costs:** The capital costs are reduced compared to Option 2.

2. **Synergi model accuracies**: Creating a Synergi model with one less unknown would be of higher benefit. The error in accuracy for flowrates would be lower and more reliable than having no additional flowmeters.

3. **Operational and maintenance procedures**: These procedures will be more accurate than having no flowmeters at all stations.

4. **Facility stations upgrades**. The efficiency of investment will improve for Fyshwick as we can accurately forecast when its facility upgrade is required. This ensures the cost to the customer is only passed on when we truly need the upgrade.

Disadvantages

1. **Synergi model accuracies**: A flowmeter at Fyshwick would remove one variable however, assumptions would still have to be made at Philip and Gungahlin for modelling purposes. The information obtained could still have errors are affect asset management practices such a planning, projects, maintenance and reporting.

2. **Operational and maintenance procedures**: Live and historical data of flows could be extract from Fyshwick and feed the model however, there would still be an element of error. The resulting inaccurate models may misinform working procedures such as welding and impact safety of our customers and the public.

3. **Facility stations upgrades**. The efficiency of investment will decrease for Phillip and Gungahlin as we cannot accurately forecast when its facility upgrade is required. This may in turn put unnecessary costs on the customer.

4. **Meeting reporting obligations**: The gaps in our reporting data would remain and we would be unable to meet our reporting requirements under NGR Rule 112D(5).

3.2 COMPARISON OF OPTIONS

A full risk assessment for each option is provided in Appendix A: Network Risk Assessment Summary

Table 1 : Options Comparison

Criteria	Option 1	Option 2	Option 3
Option description	Maintain Status Quo	Install flowmeters at the three major high pressure gas facilities: Fyshwick TRS, Phillip PRS and Gungahlin PRS	Install flowmeters at the Fyshwick TRS facility
Drivers	Low cost	- Accurate information for Synergi validations and modelling purposes - Accurate inputs into work procedures especially for welding procedures - Forecasts the exact period in which a high pressure facility requires an upgrade	- Forecasting and accuracy of modelling improves over Option 1 - Improvement of welding procedure inputs over Option 1 - Forecasts the exact period in which a high pressure upgrade is required for Fyshwick TRS
Complies with NGR	No	Yes	No
Treated Risk Ranking[6]	Significant	Low	Moderate
Cost Estimate[7] (CAPEX, $000's, Real 2020)	$0	$1.79M	$0.597M
Net Present Value (NPV[8], $000's, Real 2020)	–	- $1.748M	- $0.570M
Options Analysis	○ Doesn't address the issue	● Fully addresses the issue	◑ Partially addresses the problem
Recommended order of preference for options	3	1	2

6 Refer to Appendix A Risk Assessment Summary

7 Refer to the 3 individual cost estimates from the Project Estimation Models (PEM)

8 See Appendix B for NPV model extract

4. RECOMMENDATION

4.1 RECOMMENDED SOLUTION

Option 2 is the recommended solution. Although it is more expensive, the costs outweigh the benefits due to the following –

- Increased understanding of the network to develop accurate Synergi gas models that is a source of many applications such as planning, maintenance, operation and emergencies;
- Greater accuracy in operational and maintenance procedures, the most important being the welding procedure. Accurate flowrate data will ensure welds on the pipe are to the correct specification and ensure the safety of our customers and the public;
- Assist investigations in reducing UAG. The installation of flow measurement capabilities at all the major stations, assists in detecting measurement and calculation errors;
- Any future investments or downgrades in our facilities will be efficiently spent to ensuring optimisation of facility operations when required;
- We are able to fulfil our reporting obligations under NGR Rule 112(D).

4.2 COST DETAILS

The cost methodology for the recommended option was obtained using the Project Estimation Model (**PEM**) for all three facility sites.

Table 4-1: Project Cost Estimation

Item	Project Estimate ($000's, Real 2020)
Materials	468
Contractor Costs	936
Jemena Internal Labour	135
Total Direct Costs	**1,539**
Project Risk Allocation	252
Total Project Estimate	**1,791**

5. TERMS AND DEFINITIONS

Term	Definition
AEMC	Australian Energy Market Commission
AS2885	Australian Standard: 2885
CTS	Custody Transfer Station
EGP	Eastern Gas Pipeline
ILI	Inline Inspection
I&E	Instrument and Equipment
MAOP	Maximum Allowable Operating Pressure
NGL	National Gas Law
NGR	National Gas Rules
PEM	Project Estimation Model
POTS	Package Off Take Station
PRS	Primary Regulating Station
Synergi	Hydraulic Modelling Software
TRS	Trunk Regulating Station
UAG	Unaccounted for gas

6. REFERENCES

6.1 INTERNAL

- JAA MA 0050 Group Risk Management Manual Revision 8 : 6th June 2018

  http://ecms/otcs/cs.exe/link/295482907

6.2 EXTERNAL

- National Gas Rules Version 55

  https://www.aemc.gov.au/sites/default/files/2020-06/NGR%20v55%20full.pdf

- Gas Network Service and Access Information - Evoenergy

  https://www.evoenergy.com.au/-/media/evoenergy/documents/gas/gas-network-access-and-service-information-july-2019.pdf?la=en&hash=D8AB36FCF77D913D5DC7583629FB924A30A3A8EF

- AS 2885.0:2018 Pipelines – Gas and liquid petroleum – General requirements
- AS/NZS 2885.1:2018 Pipelines – Gas and Liquid Petroleum Part 1: Design and Construction

APPENDIX A : RISK ASSESSMENT SUMMARY

A risk assessment was conducted to determine the level of risk severity of the untreated risk. The table below shows the summary of results and then the treated risk summary for each option. The risk assessment was undertaken in accordance with the Evoenergy Risk Management Manual JAA MA 0050 Revision 8 (06/06/2018).

UNTREATED IMPACT/CONSEQUENCES								UNTREATED RISK SUMMARY		
Contributing Factors/ Scenario	Strategic	Financial	Safety	Operational	Regulatory & Compliance	Reputation	Comments	Consequence (Highest Impact)	Likelihood	Risk Level
Option 1- Maintain Status Quo	Minor	Minor	Serious	Serious	Serious	Minor	**S**: Strategically we would not be able to future plan for the network. **F**: Financial implications for customer as investments in the facilities of unknown flowrates may be carried out before or after the optimal time **S**: Higher error models that predict flowrates could have large safety implications such as incorrectly informing welding procedures. This in turn will effect the integrity of the pipe and safety of the customers and public **O**: Maintenance activities such as pigging and integrity digs will be impacted with incorrect flowrates. Impacting the work being carried out. Pigging runs may have to carried out multiple times, taking up resources and money. **R&C**: We would not be able to meet the reporting requirements of the NGR impacting our ability to comply. **R**: Our reputation for being 'good practice' asset managers would be impacted due to inaccurate information for planning, reporting, emergency response and project work	Serious	Likely	Significant

PREFERRED OPTION – Risk assessment summary				TREATED RISK SUMMARY		
Preferred Option/Treated risk	Cost	Benefit	Key Mitigations	Consequence	Likelihood	Risk Level
Option 2 – Install flowmeters at all three major high pressure facilities	$1.791M	○ **S**: Strategically we would be able to future plan ○ **F**: Accurately forecast when further investment is required at the facility ○ **S**: Accurate flowrates will inform welding procedures and operational activities improving the overall safety of the pipeline ○ **O:** Maintenance activities such as pigging and integrity digs will be correctly planned for and limit the need to repeat unnecessary pigging runs ○ **R&C**: We would be able to meet the reporting requirements of the NGR ○ **R:** Maintain a good reputation as we are able to accurately manage the network	- Improved safety - Accurate welding, operational and maintenance procedures. - Ability to fully meet the reporting requirements of the NGR	Minor	Unlikely	Low
Option 3 – Install flowmeters at Fyshwick TRS only	$0.597M	○ **S**: Strategically we would be able to future plan for Fyshwick station ○ **F**: Accurately forecast when further investment is required at Fyshwick ○ **S**: Accurate flowrates will inform welding procedures and operational activities improving (more than Option 1) the overall safety of the pipeline. Some error remains due to the two other high pressure facilities not using flowmeters ○ **O:** Maintenance activities such as pigging and integrity digs will be correctly planned for and limit the need to repeat unnecessary pigging runs ○ **R&C**: We would be able to meet some of the reporting requirements of the NGR	- Improved safety (over Option 1), some risk still remains - More accurate (over Option 1) welding, operational and maintenance procedures. - Ability to meet some reporting requirements under the NGR	Minor	Possible	Moderate

APPENDIX B : NPV MODEL

Below is the screenshot of the 'Options Comparison' tab of the NPV model : ***Evoenergy – NPV Model – Flow Measurement Projects.xlsx***

Flow Measurement Projects
Option Comparison

Legend: Input | External link | Internal link | Drop-down

Year	2,021	2,022	2,023	2,024	2,025	2,026
Count	1	2	3	4	5	6

Sheet Navigator

Sheet purpose | Option Comparison - Option Comparison

Summary- NPV Calculation

NPV	Source	Unit	Basis	Timing	NPV	RY21	RY22	RY23	RY24	RY25	RY26
Maintain Status Quo	NPV Calc|Option-1	dollars	Real 2020	n/a	-	-	-	-	-	-	-
Install Flow Meters at Fyshwick, Gungahlin and Phillip Stations	NPV Calc|Option-2	dollars	Real 2020	n/a	- 1,748,479	- 604,071	- 582,355	- 562,052	-	-	-
Install Flow Meters only at Fyshwick	NPV Calc|Option-3	dollars	Real 2020	n/a	- 569,595	- 6,036	- 17,085	- 546,474	-	-	-

Selected Option	**Install Flow Meters only at Fyshwick**	- 569,595

Incremental NPV for each option in comparison to Option-1 (Maintain Status Quo)

Incremental NPV	Source	Unit	Basis	Timing	Incremental NPV in comparison to base case/maintain status quo option
Maintain Status Quo	Calculated	dollars	Real 2020	n/a	-
Install Flow Meters at Fyshwick, Gungahlin and Phillip Stations	Calculated	dollars	Real 2020	n/a	- 1,748,479
Install Flow Meters only at Fyshwick	Calculated	dollars	Real 2020	n/a	- 569,595

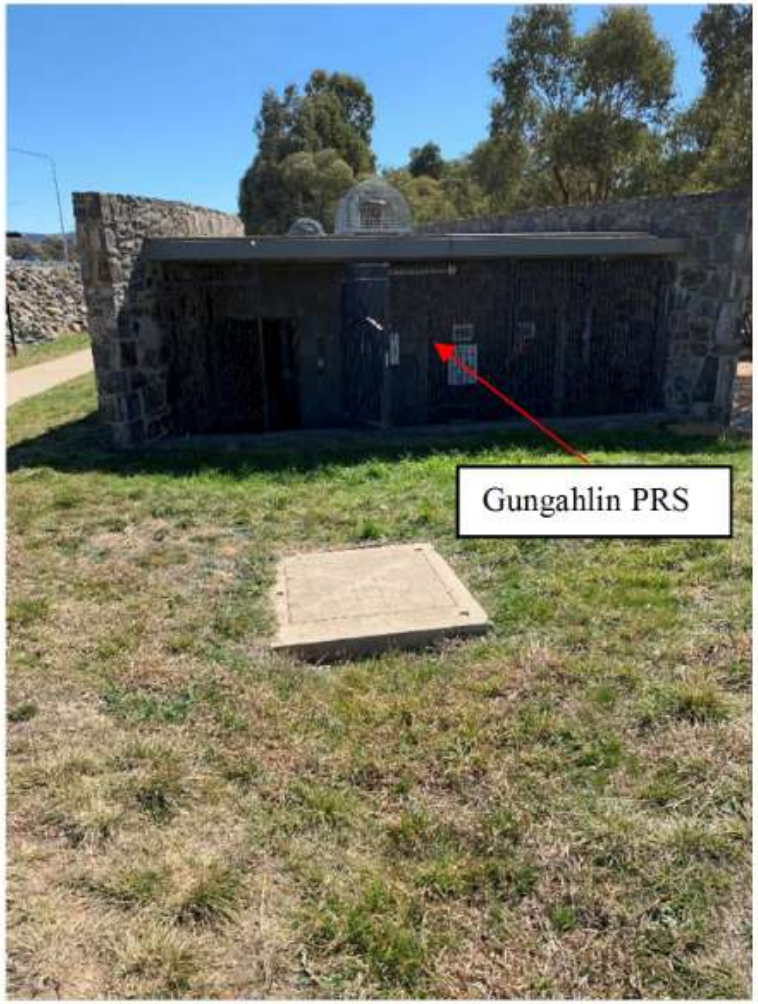
APPENDIX C : SAMPLE SCOPE DETAILS

Gungalin PRS

Work has already begun on Gungalin PRS to determine the scope requirements to install flow meters. This project is currently up to Project Mandate stage where a field technicians and engineers attended the site to conduct a field assessment. A few of the specific scope findings are listed below –

- Possibility for the flowmeter to be installed on the common outlet pipe in a new spool above or below the ground.
- Gungahlin PRS can be shutdown during the summer period from October to March (inclusive). This is to be confirmed with capacity planning team when planning for the works to be carried out.

Very limited space to install the met inside the PRS enclosure. If install ir the enclosure, accuracy of the meter be affected and the accuracy won't b known until the meter is installed. It also affect the operation of the PRS regulator


Gungahlin PRS


Possible location for new flow meters