Jemena Asset Management Pty Ltd

Options Analysis

Penrith PRS - Facilities Obsolescence

GAS-1435-RP-FA-001

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1. Executive Summary

1.1 Project and Key Drivers

This document provides options for the refurbishment of the Penrith Pressure Regulating Station (**PRS**). Identifying the prudent option to address the obsolescence of crucial equipment in the Penrith PRS will result in eliminating key operational and safety issues, ensuring compliance with regulatory obligations are met and optimising long-run operational costs.

Penrith PRS is a high-pressure gas facility owned and operated by the Jemena Gas Network (JGN). It is located High Street, in a local business area, Penrith, NSW and supplies approximately 45,000 customers. The function of the PRS is to reduce the pressure of natural gas from the Northern Trunk (MAOP 3500kPag) and distributes it to the surrounding secondary networks (MAOP 1,050kPag).

This document provides options for addressing the obsolescence issues at Penrith PRS, identifying the most prudent option to address the key issues required to maintain facility operations and maintain compliance with regulatory obligations.

The key problem statement associated with the Penrith PRS facility is the obsolescence of Electrical and Instrumentation equipment:

- The assets associated with regulating pressure control and monitoring systems at Penrith PRS are obsolete. They are operating well beyond their design lives making it challenging to find spare parts and perform maintenance. A significant portion of the existing components i.e. Transmitters, switches, panels, wiring, distribution boards etc are obsolete and unreliable and require replacement. Manufacturers have stopped producing and supporting those types of equipment, so replacing " like-for-like" is not feasible. In the event of failure, the electronic remote monitoring of the facility could be compromised.

In conjunction with the above problem statement, is the opportunity to address further issues and risks associated with the facility, those being:

- Compliance and Safety– Penrith high-pressure facility was installed and commissioned 23 years ago, and adhered to the standards at the installation time. Current Australian Standards, Regulations and Acts, in particular, with regard to electrical equipment in hazardous areas and electrical earthing have evolved. The current configuration of the station does not align with respect to these evolved standards. This has implications for personnel safety by not addressing these risks.

Three options have been assessed in this document to address the issues and risks thus ensuring the most effective solution is selected to maintain safe operation, compliance and reliability of the asset. Without an adequate solution, there is an untreated risk rating of “SIGNIFICANT”, which is above Jemena’s risk threshold in accordance with the Group Risk Management Manual[1],.

[1] JAA MA 0050 Group Risk Management Manual Risk - Group RM Manual JAA MA0050.pdf

1.2 Credible Options and Recommendations

The credible options and associated estimated costs for this project are presented below.

Table 1-1: Option for the Project

Option	Option Name	Description	CAPEX ($000's, Real 2023)
1	Maintain Status Quo	No E&I equipment is replaced, as a result, all risks continue to increase.	$0
2	Targeted E&I equipment replacement	This option involves analysing and testing all currently installed equipment and finding a suitable replacement, including electrical cabinets, RTU (Remote Terminal Unit) control cabinets, and instrumentation, as well as replacing the remaining equipment with new components.	$1.47M
3	Complete E&I equipment replacement	This option replaces all existing electrical and instrumentation equipment, including wiring, and earthing systems, thus modernising the facility operation through a new design and systematic approach.	$1.15M

Option 3 is the recommended option.

- This option addresses the key problem statement of obsolescence and delivers additional opportunities for improvement. Replacing all the E&I equipment and bringing E&I equipment to current-day standards, addresses the integrity and compliance and safety drivers of this project.

The estimated Gate 1 cost of undertaking the works identified in Option 3 is $1.15M and is planned for practical delivery in CY30. There can be slight variations of the options, but these will be addressed following the project management methodology lifecycle through the next Gates.

2. Introduction

2.1 Purpose

The purpose of this document is to describe credible options and identify the prudent option to address obsolescence issues at the Penrith high pressure facility.

2.2 Objectives

The objectives of this investment are to:

(i) Remove the obsolete E&I equipment.

(ii) Maintain the safe operation of the high pressure facility.

(iii) Maintain the integrity and reliability of the high pressure facility.

(iv) Maintain technical compliance of the facility E&I and earthing systems to Standards, Codes and Regulations.

(v) Prudent expenditure of TOTEX.

3. Project Description

3.1 Project Background

Penrith TRS, commissioned in the 2010's is a high-pressure gas facility owned and operated by JGN. It is located on High Street, in a local business area, Penrith, NSW and supplies gas to approximately 45,000 customers. The function of the PRS is to reduce the pressure of natural gas received from the Northern Trunk (MAOP 3,500kPag) and distribute it to the surrounding distribution networks (MAOP 1,050kPag).

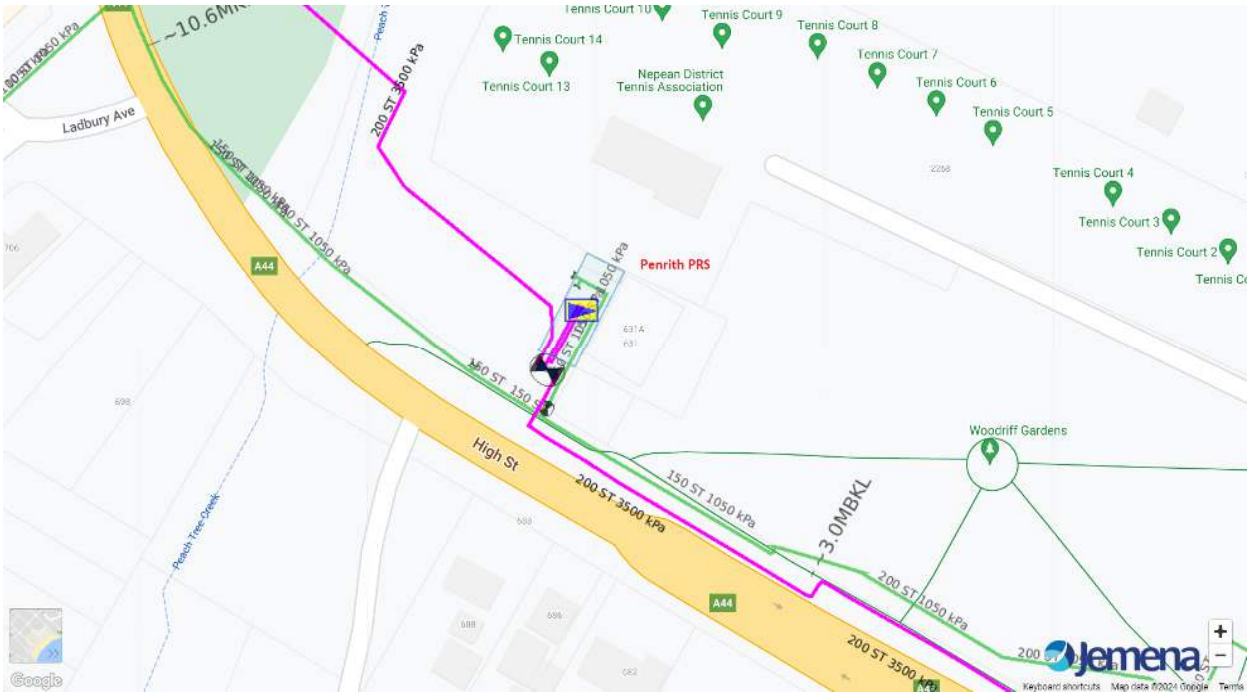

Figure 3-1: Penrith PRS Site Location

Penrith PRS is fitted with two operating runs, a duty and standby. The equipment configuration in each operating run is Meter – Slam Shut - Monitor regulator – Active regulator. Jemena Asset Management has identified Penrith PRS as one of the high-pressure facilities requiring on site E&I equipment obsolescence to be addressed.

3.2 Principal Needs

The key problem statement associated with the Penrith PRS facility is obsolescence of the current E&I installations. As a result, JGN's ability to effectively operate and monitor the facility is at risk.

3.2.1 Electrical and Instrumentation monitoring functionality

The E&I equipment at Penrith PRS was installed with the facility in 2001, operating beyond their design lives making it challenging to find spare parts and perform maintenance. Over their 23 years of operation, these equipment have had their lives extended through periodic maintenance to ensure the facility operates in accordance with functional specifications.

The E&I equipment is obsolete and can no longer be maintained with its original specifications, and thus the facility operation is at risk. In the event of failure, the electronic remote monitoring of the facility could be compromised.

3.3 Secondary Considerations

In addition to the above there is a requirement to address further issues and risks associated with the facility, those being:

3.3.1 Compliance and Safety

Penrith high-pressure facility was installed and commissioned 23 years ago, and adhered to the standards at that time. Australian Standards, Regulations and Acts, have evolved since the facility was commissioned. Specifically, Australian Standards for Hazardous Areas (**HZ**) - AS60079:2022 and the Electrical wiring rules - AS3000:2018. The current configuration of the station does not align with respect to these evolved standards. This has implications for personnel safety:

- Current electrical switch boards do not have a Residual Current Device (**RCD**) to switch off the supply of electricity immediately when electricity is leaking to earth, which potentially could harm personnel.
- The on-site earthing systems pose a safety risk to personnel and equipment due to wear and tear, which has compromised their full functionality and may cause them to malfunction. The standard from IEEE recommends earth-to-ground resistance of less than 5 ohms, however, the current site measurement is above that threshold. Currently, administrative controls are in place to prevent technicians from being exposed to this safety hazard.

3.4 Assumptions

Assumptions that apply to this project are outlined in Table 3-1. All assumptions where possible are to be verified before proceeding with the works described in this options analysis.

Table 3-1: Assumptions and Implications

No.	Description	Implication	Criticality
1	The Penrith PRS Facility does not require shutdown for any period to perform the works.	If it is recommended that Penrith PRS needs to be shut down to enable this project, this would not cause a constraint in the supply of gas to the downstream secondary network.	Low
2	The capital program has funds available for the scope of this project's preferred option.	If there is not sufficient funds for this project, the status quo facility operating configuration and its associated risks will remain in the business.	High
3	The Project will utilise competent resources.	The availability of competent resources would impact the project timeline.	High
4	All estimated costs including Opex and Capex are at the desktop level using historical costs with other similar projects as the basis	Costs can vary depending on the detailed scope of works, resourcing, and contractor costs until financial investment decision costs are available.	Medium

4. Credible Options

The following options were identified:

- Option 1: Maintain Status Quo
- Option 2: Targeted E&I equipment replacement
- Option 3: Complete E&I equipment replacement

All options are explained in detail below.

4.1 Option 1: Maintain Status Quo

4.1.1 Scope

Maintains the 23 year old operating configuration. No E&I equipment is replaced, and as a result all risks continue to increase.

4.1.2 Benefits

This option incurs no additional CAPEX.

4.1.3 Limitations

This option does not address any of the project drivers:

- E&I equipment obsolescence increasing maintenance difficulty.
- Continued degradation of earthing system poses worker safety risk as electrical system faults will not be diverted to ground.
- Long-run operating costs will continue to increase through escalating corrective maintenance.

4.1.4 Summary

No E&I equipment is replaced, as a result all risks continue to increase. A number of critical systems are outdated and no longer readily available in the market, either as OEM (Original Equipment Manufacturer) parts or generic alternatives. Given the difficulty to source replacement parts, it is becoming increasingly challenging to maintain the facility's integrity and reliability.

The overall risk rating will remain at "**SIGNIFICANT"**.

4.2 Option 2: Targeted E&I equipment replacement

4.2.1 Scope

In this option, only obsolete and not fit for purpose E&I equipment is replaced to meet reliability, integrity and safety requirements, this includes the following items:

- Retrofit all Electrical cabinets and RTU Control cabinets on-site with compliant wiring and equipment;
- Retrofit all instrumentations and gauges;
- Replace all Steel Wired Armoured (**SWA**) wires;
- Replace all Intrinsically Safe (**I.S**) barriers with new Isolators for better performance and protection;
- Retrofit field Junction Box to marshal all cabling;
- Retrofit new AC and DC distribution system;
- Replace new 24VDC (Volts Direct Current) batteries;
- Update and build new Hazardous Dossiers for the site and redo I.S. calculation for each I.S. loop approved vendor.
- Replace the Earthing system.

4.2.2 Benefits

This option addresses all of the project drivers:

- Addresses facility obsolescence and maintains functional operability.
- Employs engineering controls to manage the threat to personnel and public safety as opposed to administrative controls.
- Maintain technical compliance of the facility to the evolved Standards, Codes and Regulations including AS60079:2022, and AS3000:2018 thus compliant with the Electricity (Consumer Safety) Act 2004 and the Electricity (Consumer Safety) Regulation 2006.
- All E&I defects and obsolescence will be mitigated, with no escalation in OPEX to maintain an acceptable risk level.

4.2.3 Limitations

The limitations of this option are:

- Availability of internal and external resources.
- Retrofitting new equipment into existing cabinets increases construction phase duration, not enabling cost and time efficiency.
- Highest upfront total investment .

4.2.4 Summary

Although this option addresses all project drivers, it incurs in a higher CAPEX cost as it involves the targeted replacement of the aging and obsolete E & I equipment as well as retrofitting new components in the system. Retrofitting is a more complex and lengthy option than “ready to install” solutions.

This option reduces the overall risk rating from **SIGNIFICANT to LOW**.

4.3 Option 3 Complete E&I equipment replacement

4.3.1 Scope

In this option, all E&I equipment are replaced to meet the specification, these include:

- Replace all Electrical cabinets and RTU Control cabinets on-site with compliant wiring and equipment;
- Replace all instrumentations and gauges;
- Replace all SWA wires;
- Replace all I.S. barriers with new Isolators for better performance and protection;
- Replace field Junction Box to marshal all cabling;
- Replace new AC and DC distribution system;
- Replace new 24VDC batteries;
- Update and build new Hazardous Dossiers for the site and redo I.S. calculation for each I.S. loop approved vendor;
- Replace all earthing systems.

4.3.2 Benefits

This option addresses all the project drivers:

- Addresses facility obsolescence and maintains functional operability.
- Employs engineering controls to manage the threat to personnel and public safety as opposed to administrative controls.
- Maintain technical compliance of the facility to the evolved Standards, Codes and Regulations including AS60079, and AS3000 thus compliant with the Electricity (Consumer Safety) Act 2004 and the Electricity (Consumer Safety) Regulation 2006.
- All E&I defects and obsolescence are eliminated, maintaining an acceptable risk level. It reduces maintenance costs due to reduction in failure rate.

4.3.3 Limitations

Although less than option 2, this option also requires CAPEX investment. By replacing the entire E&I system the supplier would provide a packaged ‘ready to install’ solution that will not require reviewing or retrofitting. This option provides a quicker time-to-resolution and a simpler approach.

4.3.4 Summary

This option will address all project drivers including facility function operation requirements, hazardous area and electrical safety concerns. It also maintains the efficient functionality of the facility and minimises the long-run OPEX.

This option reduces the overall risk rating from **SIGNIFICANT to LOW.**

4.4 Comparison of Options

Table 4-1: Options Summary Table

Criteria	Option 1	Option 2	Option 3
Option	Maintain Status Quo	Targeted E&I equipment replacement	Complete E&I equipment replacement
Description	No E&I equipment is replaced, as a result, all risks continue to increase.	This option involves analysing and testing all currently installed equipment and finding a suitable replacement, including upgrading electrical cabinets, RTU (Remote Terminal Unit) control cabinets, and instrumentation, as well as replacing the remaining equipment with new components.	This option replaces all existing electrical and instrumentation equipment, including wiring, and earthing systems, thus modernising the facility operation through a new design and systematic approach.
Benefits	Nil CAPEX	• Maintain the safe operation of the high pressure facility • Maintain the reliability and integrity of the high pressure facility • Maintain technical compliance of the facility to Standards, Codes and Regulations • Maintain ongoing OPEX at historical levels	• Maintain the safe operation of the high pressure facility • Maintain the reliability and integrity of the high pressure facility • Maintain technical compliance of the facility to Standards, Codes and Regulations • Maintain ongoing OPEX at historical levels • Low CAPEX
Limitations	• E&I equipment obsolescence increasing maintenance difficulty. • Escalating OPEX • Personnel safety risks remain.	• Highest cost option (30-40% more expensive to retrofit) • Challenges to retrofit (high complexity) • Longer site time, increasing costs • Resource availability • High CAPEX	• High CAPEX investment, although less than Option 2 • Resource availability
Treated Risk Rating	SIGNIFICANT	LOW	LOW
CAPEX Cost Estimate[2]	$0	$1.47M	$1.15M
OPEX Estimate[3]	$0.64M over 10 years OPEX, escalating	$0.363M over 10 years OPEX	$0.32M over 10 years OPEX
TOTEX Estimate (per 10 years)	$0.64M	$1.85M	$1.47M
Recommended Order of Preference	3 Unacceptable (Risk remains Significant, ongoing safety & reliability issues)	2 Not Recommended	**1** **Recommended/Preferred Option**

[2] Gate 1 PEM Estimate for both options.

[3] Based on actual Opex estimate for the Penrith facility for the year RY23 and increased maintenance and call outs.

5. Recommendation

5.1 Recommended Solution

The recommended solution is Option 3 – Complete E&I equipment replacement at a current CAPEX cost of $1.15M at Gate 1.

This option targets all the objectives of the project by replacing all the E&I equipment and Earthing systems.

Practical completion of this project is targeted for CY30.

5.2 Overall Benefits of Option 3

This option addresses all the project drivers:

- This option will mitigate the risk of obsolescence of E&I equipment by replacing all, thereby optimising long-run OPEX costs.
- Maintain the safe operation of the high pressure facility.
- Maintain the reliability and integrity of the high pressure facility.
- Lower CAPEX investment compared to option 2.
- Maintain the facility compliance with the *Electricity (Consumer Safety) Act 2004* and the *Electricity (Consumer Safety) Regulation 2006.*

This option reduces the overall risk rating from **SIGNIFICANT** to **LOW.**

5.3 Cost Breakdown

Item	Project Estimate ($M)
Labour	$0.25M
Material	$0.03M
Subcontractor	$0.39M
Risk	$0.15M
Overheads	$0.33M
Total	$1.15M

Appendix A – Reference Documents

Document number	Title
GAS-1435-DW-PD-001	PENRITH PRS P&I DIAGRAM
B1-377-944	PENRITH PRS INTERLOCK ELECTRICAL SCHEMATIC
A3-PP-073	PENRITH PRS SINGLE LINE DIAGRAM
A3-PP-073	PENRITH PRS CABLE SCHEDULE
AI-PP-0335	PENRITH PRS GENERAL ARRANGEMENT

Appendix B – Risk Assessment

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 Group Risk Manual JAA MA 0050 Revision 10 (06/06/2023).

UNTREATED IMPACT / CONSEQUENCES						UNTREATED RISK SUMMARY		
Contributing Factors/ Scenario	Financial	Safety	Operational	Regulatory & Compliance	Comments	Consequence (Highest Impact)	Likelihood	Risk Level
• Obsolescence of equipment leading to failure due to unavailable spares, vendor support. • E&I and earthing systems obsolescence lead to personnel safety risk	Serious	Serious	Serious	Serious	• The assets are obsolete and operating well beyond their design lives making it challenging to find spare parts and perform maintenance. • Without an adequate solution, there are untreated risks of adequate earthing and bonding; and E&I installations. These may cause personnel concerns.	Serious	Likely	SIGNIFICANT

PREFERRED OPTION – Risk assessment summary				TREATED RISK SUMMARY		
Preferred Option/Treated risk	**Cost**	**Benefit**	**Key Mitigations**	**Consequence**	**Likelihood**	**Risk Level**
Option 3	**$ 1.15M**	• Maintain the safe operation of the high pressure facility • Maintain the reliability and integrity of the high pressure facility • Maintain technical compliance of the facility to Standards, Codes and Regulations	• Reduces personnel safety risks due to earthing systems • Maintains compliance of all Electrical and Instrumentation equipment in hazardous areas • Maintains reliability of facility operation	Serious	Rare	LOW

Appendix C – National Gas Rules

Option 3: “Complete E&I equipment replacement” has been chosen as the recommended option to fulfil the objectives of this project. The implementation of this project complies with the new capital expenditure criteria rules 79 (1) and 79(2)(c)(i)-(iii).

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

- Prudent – Three options have been considered and the selected option reduces the overall risk associated with the obsolescence of the E&I equipment. This is consistent with what would be expected of a prudent operator.
- Efficient – The cost estimates for this project were developed from actual costs of a similar project that followed the Jemena Procurement Policy.
- Consistent with accepted industry practice – The proposed solution aligns with industry standards and it is required to maintain compliance with regulatory obligations and personnel safety.

The project is also consistent with rule 79 (2)(c), because it is necessary to:

- Maintain the safety of services (79(2)(c)(i)) by reducing the risk of obsolete equipment on high pressure facilities from “Significant” to “Low”.
- Maintain the integrity of service (79(2)(c)(ii)) by improving E&I equipment functionality and maintaining compliance.
- Maintain compliance with a regulatory obligation (79(2)(c)(iii)) - Jemena is required by the *Electricity (Consumer Safety) Act 2004* – Section 31 and the *Electricity (Consumer Safety) Regulation 2006*, to comply with AS/NZS3000 and AS/NZS60079.