evoenergy

Appendix 3.7: Bungendore POTS – facilities obsolescence

Options analysis

Access Arrangement Information

ACT and Queanbeyan-Palerang gas network 2026–31

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Jemena Asset Management Pty Ltd

Options Analysis

Bungendore POTS - Facilities Obsolescence

GAS-4000-RP-FA-011

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1. Executive Summary

1.1 Project and Key Drivers

This document provides options for the refurbishment of Bungendore POTS (**POTS**)**.** Identifying the prudent option to address the obsolescence of crucial equipment in the facility will mitigate key operational and safety issues, ensuring compliance with regulatory obligations are met while optimising long-run operational costs.

Bungendore POTS is a high-pressure gas facility owned by Evoenergy and operated by Jemena. The function of this facility is to reduce the pressure of natural gas received from the Hoskinstown Custody Transfer Station (**CTS**) and distribute it to the township of Bungendore, supplying gas to approximately 1,300 customers, including the HQ Joint Operations Command for the Department of Defence.

The key problem statement associated with Bungendore POTS is the obsolescence of Electrical and Instrumentation equipment, and frequent operation below the minimum outlet temperature of the facility:

- The assets associated with regulating pressure control and monitoring systems at Bungendore POTS 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.
- The POTS features a Water Bath Heater (WBH) connected to the inlet of the station. However, the WBH has been out of service since 2020 due to a fault in the Burner Management System which could not be repaired. Catalytic heating was deployed as an alternative solution upon retirement of the WBH. However, the outlet gas temperature has routinely fallen below the minimum design limit, introducing risks to the integrity of mechanical equipment and pipework downstream of the station.

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 – Bungendore POTS, was installed and commissioned 17 years ago, and adhered to the standards at the time of installation. 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].

1.2 Credible Options and Recommendations

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

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

Table 1-1: Option for the Project

Option	Option Name	Description	CAPEX (Real 2024)
1	Maintain Status Quo	No mechanical or E&I equipment is replaced, as a result all risks continue to increase.	$0.00M
2	Targeted E&I Equipment Replacement and Additional Catalytic heaters installation	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. An additional four pipeline catalytic heaters will be installed at the inlet to maintain gas temperature within safe operating limits.	$1.80M
3	Complete E&I Equipment Replacement and Additional Catalytic heaters installation	Replace all electrical and instrumentation systems, wiring, earthing and associated systems, bringing the facility to international industry convention. An additional four pipeline catalytic heaters will be installed at the inlet to maintain gas temperature within safe operating limits.	$1.65M

Option 3 is the recommended option.

- This option addresses the key problem statement of obsolescence and maintaining acceptable operating temperatures. These risks will be mitigated by installing additional Catalytic heaters, and replacing the existing E&I equipment to ensure compliance to current standards, improving reliability, whilst reducing likelihood of equipment failure by returning to safe operating limits.

The estimated Gate 1 cost of undertaking the works identified in Option 3 is $1.65M and is planned for practical delivery in CY27. 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 and inlet gas heating issue at Bungendore POTS.

2.2 Objectives

The objectives of this investment are to:

(i) Remove the obsolete E&I equipment.

(ii) Ensure outlet gas temperature is maintained within safe operating limits under all process conditions.

(iii) Maintain the safe operation of the high-pressure facility.

(iv) Maintain the integrity and reliability of the high-pressure facility equipment.

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

(vi) Prudent expenditure of TOTEX.

3. Project Description

3.1 Project Background

Bungendore POTS, commissioned in 2007, is a high-pressure gas facility owned by Evoenergy and managed by Jemena Gas Networks (**JGN**). It is located in a shared fenced compound with the Hoskinstown Custody Transfer Station (**CTS**) on Plains Rd, Hoskinstown, NSW (see Figure 1). The function of the POTS is to regulate the pressure of natural gas received from Hoskinstown CTS at a maximum design pressure of 14,900kPag down to 250kPag. The facility supplies gas to approximately 1,300 customers within the township of Bungendore, including the HQ Joint Operations Command for the Department of Defence.

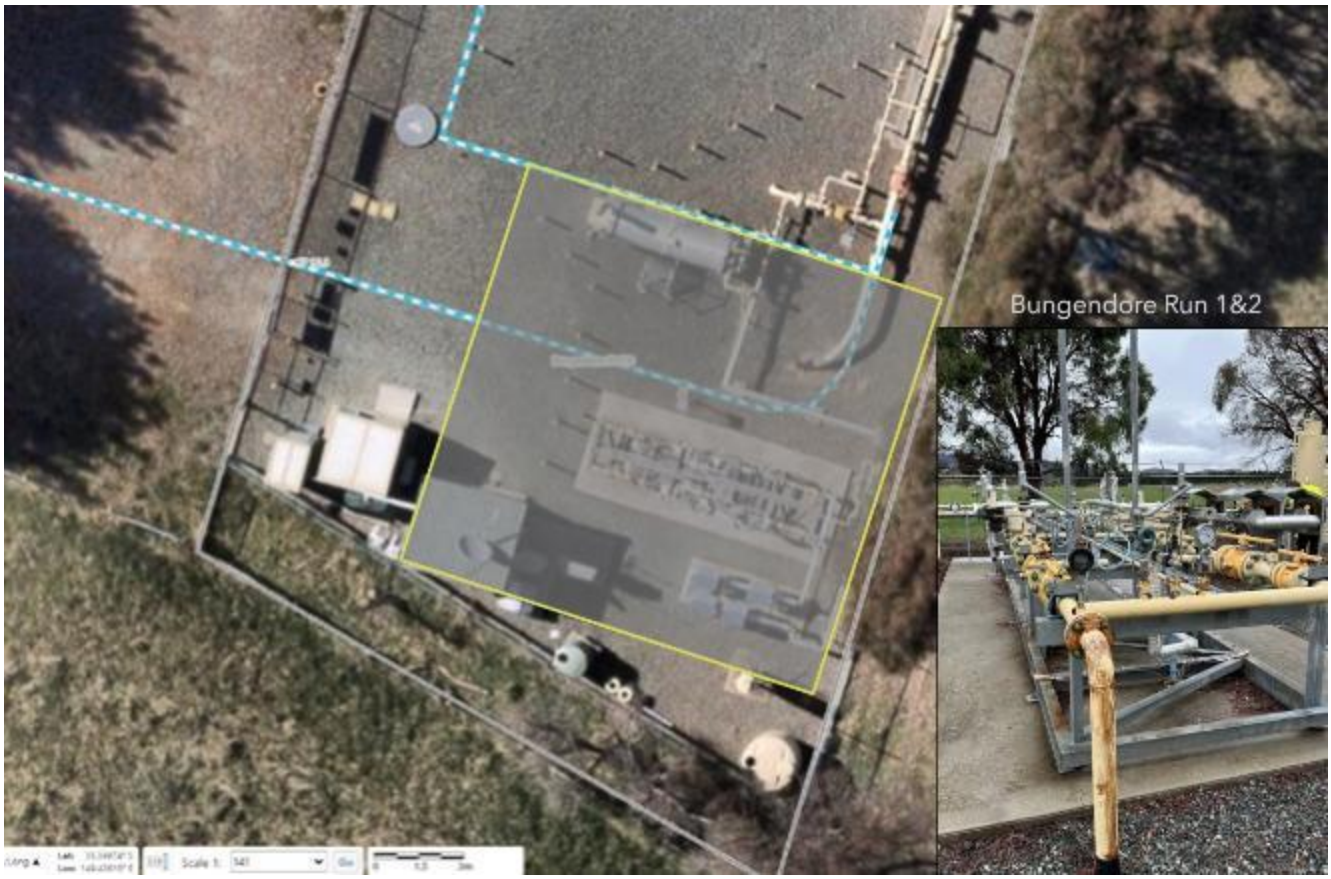

Figure 3-1: Bungendore POTS Site Location

Bungendore POTS has two runs configured in a duty/stand-by setup, with each run consisting of a mainline filter, slam shut valve, a monitor regulator, an active regulator, and a non-return valve. The facility inlet also has a water bath heater (WBH) that has been isolated and non-operational since 2020 due to an unresolvable fault. Four pipeline catalytic heaters were installed at the time of the WBH isolation to provide pre-heating requirements in lieu of the non-operational WBH.

Jemena Asset Management has identified Bungendore POTS as one of the high-pressure facilities requiring on site E&I equipment obsolescence and outlet gas temperature issues to be addressed.

3.2 Principal Needs

The key problem statement associated with the Bungendore POTS is obsolescence of the current E&I installations and outlet gas temperature issue. As a result, JGN's ability to maintain facility operation is at risk.

3.2.1 Electrical and Instrumentation monitoring functionality

The E&I equipment at Bungendore POTS was installed with the facility in 2007, operating beyond their design lives making it challenging to find spare parts and perform maintenance. Over their 17 years of operation, this equipment has 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.

3.2.2 Low outlet gas temperature

The current pressure reduction at Bungendore POTS will result in approximately a 40-degree Celsius temperature drop due to the Joule-Thompson effect; therefore, an adequate inlet gas heating solution is required to ensure the outlet gas temperature is maintained above the allowable limit.

A water bath heater (**WBH**) was originally installed at Bungendore POTS for gas preheating. It was taken out of service in 2020 due to a fault in the packaged Burner Management System which could not be easily repaired. Consequently, four catalytic heaters were installed on the station inlet pipework.

With the four catalytic heaters in place, the outlet temperature at Bungendore POTS has routinely fallen below the minimum operating temperature of the station during the 2024 winter period. This has the potential to cause failure of equipment downstream of the regulators, including steel and polyethylene (**PE**) piping, resulting in a loss of containment. Exceedingly low temperatures may also cause hydrocarbon dropouts, resulting in blockage and failure of regulators.

Without an inlet heating solution capable of maintaining outlet temperature within safe operating limits, there is a potential for loss of supply to the downstream network, whether it be through equipment failure or loss of containment.

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 & Safety

Bungendore high-pressure facility was installed and commissioned 17 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. Additionally, there are no equal potential bonding for the pipe and CAT skid. 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 Bungendore POTS does not require shutdown for any period to perform the works.	If it is recommended that Bungendore POTS needs to be shut down to enable this project, this would cause a constraint in the supply of gas to the downstream network.	High
2	The capital program has funds available for the scope of this project's preferred option.	If there are 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 and/or cost to acquire competent resources.	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 and Additional Catalytic heaters installation
- Option 3: Complete E&I equipment replacement and Additional Catalytic heaters installation

All options are explained in detail below.

4.1 Option 1: Maintain Status Quo

4.1.1 Scope

Retains the 17-year-old operating configuration. No mechanical or E&I equipment are 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:

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

4.1.4 Summary

No mechanical or 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.

Risk of low temperature integrity failure resulting in equipment failure or loss of containment leading to supply disruption is not mitigated.

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

4.2 Option 2: Targeted E&I equipment replacement and Additional Catalytic heater installation

4.2.1 Scope

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

- Extend the concrete footing near the inlet pipework to the facility;
- Install four pipeline catalytic heaters on the inlet piping to maintain the required gas temperature;
- Extend and connect the fuel gas lines to the installed catalytic heaters;
- Install weather shields over the additional catalytic heaters;
- 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:

- Outlet gas temperature will be maintained within safe operating limits under all process conditions.
- Employs engineering controls to manage integrity threats 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 1971(ACT) and the Electricity (Consumer Safety) Regulation 2004 (ACT).
- 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 a high 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 and Additional Catalytic Heater installation

4.3.1 Scope

In this option, additional catalytic heaters are installed and all E&I equipment is replaced to meet the specification, these include:

- Extend the concrete footing near the inlet pipework to the facility;
- Install four pipeline catalytic heaters on the inlet piping to maintain the required gas temperature;
- Extend and connect the fuel gas lines to the installed catalytic heaters;
- Install weather shields over the additional catalytic heaters;
- 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:

- Outlet gas temperature will be maintained within safe operating limits under all process conditions.
- Employs engineering controls to manage integrity threats 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 1971 (ACT) and the Electricity (Consumer Safety) Regulation 2004 (ACT).
- All E&I defects and obsolescence are eliminated, maintaining an acceptable risk level. It reduces maintenance costs due to reduction in failure rate.
- 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.

4.3.3 Limitations

Although less than option 2, this option also requires CAPEX investment.

4.3.4 Summary

This option will address all project drivers including facility function requirements, outlet gas temperature being maintained within safe operating limits under all process conditions, hazardous area and electrical safety concerns. It also optimises the operation of the facility and maintains 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 and Additional Catalytic heaters installation	Complete E&I equipment replacement and Additional Catalytic heaters installation
Description	No mechanical or 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. An additional four Catalytic heaters will be installed.	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. An additional four Catalytic heaters will be installed.
Benefits	Nil CAPEX	• Outlet gas temperature is within safe operating limits • 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	• Outlet gas temperature within safe operating limits • 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
Limitations	• Outlet gas temperature is not maintained within safe operating limits. • 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	$1.8M	$1.65M
OPEX Estimate[3]	$0.65M over 10 years OPEX, escalating	$0.35M over 10 years OPEX	$0.30M over 10 years OPEX
TOTEX Estimate (per 10 years)	$0.65M	$2.15M	$1.95M
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] Actual Opex estimate for the Bungendore facility for the year RY23.

5. Recommendation

5.1 Recommended Solution

The recommended solution is Option 3 – Complete E&I equipment replacement and at a current CAPEX cost of $1.65M at Gate 1.

This option targets all the objectives of the project by replacing all the E&I equipment, Earthing systems and installing four additional Catalytic heaters.

Practical completion of this project is targeted for CY27.

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.
- Maintains the safe operation of the high-pressure facility.
- Maintain the reliability and integrity of the high-pressure facility.
- Outlet gas temperature stays within safe operating limits by installing four additional Catalytic heaters on the inlet gas pipeline.
- Lower CAPEX investment compared to Option 2.
- Maintain the facility compliance with the Electricity (Consumer Safety) Act 1971 (ACT) and the Electricity (Consumer Safety) Regulation 2004 (ACT).
- This option reduces the overall risk rating from **SIGNIFICANT** to **LOW**.

5.3 Cost Breakdown

Item	Project Estimate ($M)
Labour	$0.44M
Material	$0.41M
Subcontractor	$0.50M
Risk	$0.22M
Overheads	$0.08M
Total	$1.65M

Appendix A – Reference Documents

Document number	Title
GAS-4000-DW-PD-001	BUNGENDORE POTS P&ID
A1-TP-2033	GENERAL ARRANGEMENT
A1-TP-2080	FIELD CONTROL PANEL LAYOUT
A1-TP-2081	BUNGENDORE POTS- SLD
A1-TP-2082	CABLE BLOCK DIAGRAM
A1-TP-2083	TERMINATION DIAGRAM
A1-TP-2091	ELECTRICAL EQUIPMENT LAYOUT
A1-TP-2092	EARTHING BLOCK DIAGRAM
A1-TP-2099	BUNGENDORE POTS HAZARDOUS AREA LAYOUT

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 leading to personnel safety risk. • Low temperature gas causing equipment failure/loss of containment leading to loss of gas supply to customers.	Serious	Serious	Serious	Serious	• Operational: The assets are obsolete and operating well beyond their design lives making it challenging to find spare parts and perform maintenance. • Safety: Without an adequate solution, there are untreated risks of adequate earthing and bonding; and E&I installations. These may cause personnel and public safety concerns. • OPERATIONAL: Serious - Potential loss of supply to approximately 1,300 customers.	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 - Complete E&I Equipment Replacement and Additional Catalytic heater installation	$1.65M	• Safe operation of the high-pressure facility • Improved reliability and integrity of the high-pressure facility • Technical compliance of the facility to Standards, Codes and Regulations • Optimised long-term OPEX costs. • Outlet gas temperature stays within safe operating limits	• Replacement of all E&I and earthing systems • Reduced probability of equipment failure from low temperature integrity risks.	Serious	Rare	LOW

Appendix C – National Gas Rules

Option 3 - Complete E&I Equipment Replacement and Additional Catalytic heater installation 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 E&I equipment at the facility to an acceptable level in the long term. 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 mitigating the risk level of obsolete equipment on high pressure facilities from “SIGNIFICANT” to “LOW”
- Maintain the integrity of service (79(2)(c)(ii)) by improving the facility functionality and maintaining compliance.
- Comply with a regulatory obligation (79(2)(c)(iii)) - Jemena is required by the Electricity Safety Act 1971(ACT) and the Electricity Safety Regulation 2004 (ACT), to comply with AS/NZS3000 and AS/NZS60079 in ensuring the safety and compliance of its E&I installations on high-pressure facilities.