Jemena Asset Management Pty Ltd

Options Analysis

ALBV Panel Obsolescence - Phase 2

GAS-1299-RP-FA-003

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Table of Contents

1. Executive Summary

1.1 Project and Key Drivers

This document presents options for addressing the obsolescence of Automatic Line Break Valve **(ALBV)** Panels in five (5) existing ALBV's owned and operated by Jemena Gas Networks (JGN). Identifying the prudent option to address the obsolescence of ALBV panels on the high pressure facilities will mitigate key operational and safety risks, maintaining compliance with regulatory obligations and optimising long-term operational costs.

The ALBV Obsolescence Phase 2 Project encompasses five (5) x existing ALBV Facilities;

- Mt Keira ALBV
- Wilton ALBVs
- Horsley Park ALBV
- Hexham ALBV

ALBVs are high-pressure gas facilities owned and operated by JGN. The function of these facilities are to isolate sections of pipeline in cases of emergency as required by AS2885.1.

The key problem statement associated with these ALBV Facilities is the obsolescence of the ALBV panel:

- Functional dependability - the Automatic Line Break Valves panels and associated componentry, including instrumentations, wiring, solenoids and switches are obsolete, unreliable and difficult to maintain. In the event of a pipeline failure, the automatic, remote and electronic operation of the ALBV's could be compromised, leading to loss of containment.

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

- Safety & Compliance – the earthing systems on site are inadequate and pose a safety risk to personnel and equipment. The ALBV Facilities were installed and commissioned 45 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.

- Integrity – the existing small-bore tubing and fittings including sense lines and ALBV panel pipework were found damaged, corroded, painted over and in poor condition. In addition, some of the pressure gauges installed are damaged and not serviceable. The failure of these components may compromise the ability to effectively operate the ALBV in an emergency situation that could potentially result in loss of containment.

Three options have been assessed in this document to address the issues and risks thus ensuring the most effective solution is selected to maintain functional dependability, compliance and safe operation, 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 ($ Real 2023)
1	Maintain Status Quo	ALBV panels, system earthing and associated E&I equipment are not replaced.	$0
2	Replace utilising spare ALBV panels	Replace ALBV panels utilising refurbished spare panels, replace system earthing and all associated E&I equipment, bring the facility to current regulatory standard.	$1.33M
3	Supply and replace with new ALBV panels	Replace ALBV panels with newly procured panels, replace all E&I equipment, including system earthing, bringing the facility to current regulatory standards.	$1.84M

Option 3 is the recommended option.

- This option addresses the key problem statement of functional dependability due to obsolescence and addresses the safety, compliance and integrity secondary drivers of this project by supplying and replacing the ALBV panels with new ALBV panels and associated equipment. This option avoids the limitation of fitness for purpose risk of using the spare panels in Option 2.

The estimated Gate 1 cost of undertaking the works identified in Option 3 is $1.84M and is planned for practical delivery in CY28. 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 ALBV Panel obsolescence issues at the Mt Keira, Wilton, Horsley Park and Hexham ALBV High Pressure Facilities.

2.2 Objectives

The objectives of this investment are to:

(i) Maintain the safe operation of the ALBV's.

(ii) Maintain the functional dependability of the ALBV's.

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

(iv) Provide prudent expenditure of TOTEX.

3. Project Description

3.1 Project Background

The ALBV Panel Obsolescence Project – Phase 2 encompasses five (5) existing Automatic Line Break Valves (ALBV) Facilities owned and operated by Jemena Gas Networks (JGN) at the following locations:

- Mt Keira,
- Wilton,
- Horsley Park and
- Hexham.

See Figures 3.1, 3.2, 3.3 and 3.4 below.

Figure 3.1 Mt Keira ALBV

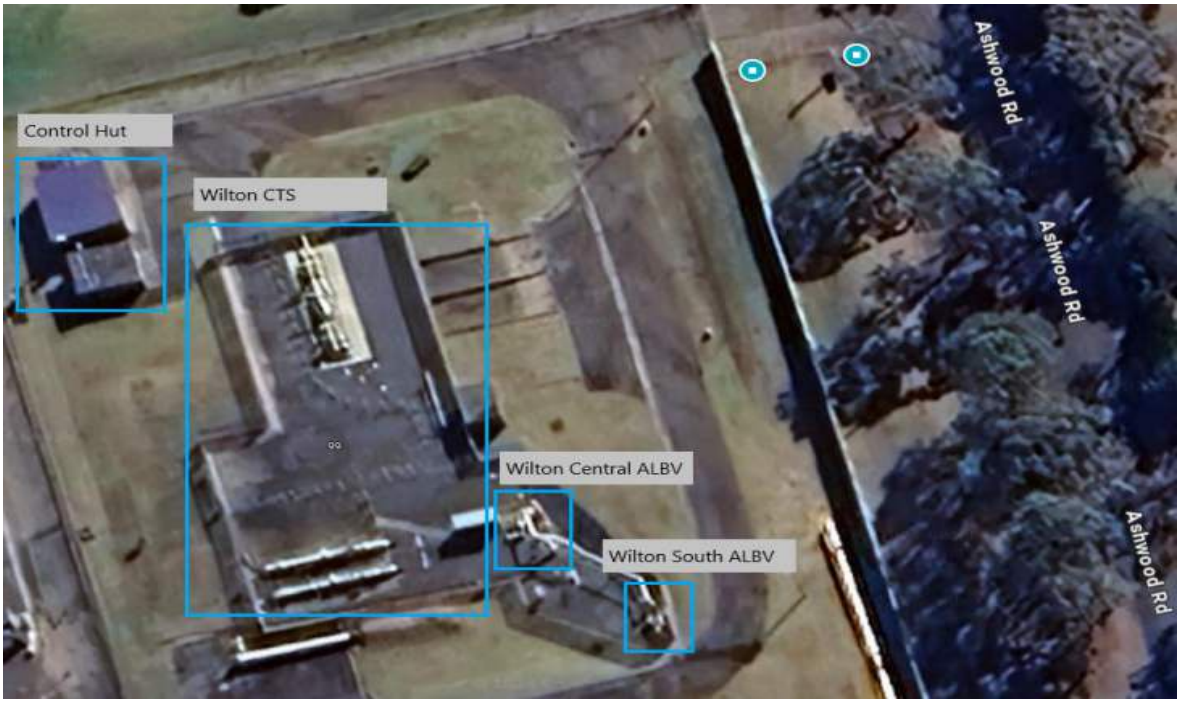


Figure 3.2 Wilton ALBV

Figure 3.3 Horsley Park ALBV

Figure 3.4 Hexham ALBV

These ALBV's are high pressure gas facilities owned and operated by JGN, and are installed on the JGN Trunk pipeline. They serve to isolate sections of pipeline in cases of emergency as required by AS2885.1. The protective isolation function can be operated:

a) Automatically in the event of a significant pressure drop along the pipeline;

b) Remotely by control room operators; and

c) Manually by on-site field technicians.

The current ALBV control panel system was installed around 45 years ago. It has become impractical to maintain as most of the components have passed its design life and are obsolete.

Failure of an ALBV can significantly impact Jemena's capability to control an emergency situation or maintain gas supply. The intent of the ALBV is to isolate the section either side of the loss of containment and therefore limit loss of gas to the contents between two closed ALBV's. Failure of ALBV closure, means the system will rely on the next ALBV up or downstream to operate, which will result in greater volume of gas lost. Hence, it is important to maintain the operational functional dependability of the ALBV High Pressure Facilities.

3.2 Spare Panels

As part of a previous project, JGN procured spare ALBV panels which have been in storage since 2012. Over the years, these panels have remained stored in their original packing, providing some protection from physical damage. However, due to the prolonged storage period, their operability is of concern, particularly in regard to their soft components such as seals, due to degradation over time. To confirm suitability for use, these panels will undergo thorough inspection, refurbishment and pressure testing. This evaluation process is critical to complete prior to installation. Should the panels pass these tests, they will be deployed to replace the existing ones at the designated ALBV locations. If they do not meet the necessary requirements, new panels will need to be sourced. The evaluation is scheduled to occur in CY26, this provides enough time to procure these long lead items should they fail evaluation, while minimising the risk of warehouse damage during storage between evaluation and installation, to panels that pass evaluation.

3.3 Principal Needs

The key problem statement associated with the ALBV Facilities is the obsolescence of the ALBV panel system and the difficulty to further maintain it, the panels are crucial equipment that allows the ALBV to isolate the gas supply during emergencies. As a result, JGN's ability to manage pipeline safety during emergencies, is at risk.

3.3.1 ALBV functional dependability

The five (5) ALBV control panels were installed in 1977 and have already passed their design life. The failure of these control panels will compromise the ability of Jemena Gas Network to effectively control the operation of the ALBV's, particularly in an emergency situation that could result in loss of containment.

The equipment is difficult to maintain in its current state, which could lead to functional failure of the valves, and will not be able to isolate the pipeline.

3.4 Secondary Considerations

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

3.4.1 Compliance & Safety

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 facility does not align with respect to these evolved standards. This has implications for personnel safety:

- The earthing systems installed on-site pose a safety risk to personnel and equipment. For example the ALBV has no Insulating Joint (**IJ**) between the pipe and valve, therefore, to achieve Cathodic Protection (**CP**), the earthing has been removed. Administrative controls are in place to prevent technicians from being exposed the safety risk of an electric shock.

3.4.2 Integrity

ALBV small bore tubing and fittings including sense lines and control panel pipework, and other non-stainless-steel components were found to be damaged, corroded and in poor condition and pose an integrity risk during maintenance activities. Also, the pressure gauges installed are damaged and not serviceable and need to be replaced. The E&I equipment of ALBV's are past their design life and are also obsolete. This includes the E&I equipment and wiring.

3.5 Assumptions

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

Table 3-1: Assumptions and Implications

No.	Description	Implication	Criticality
1	Electrical work will be performed on the live asset. To ensure continuity of gas supply during the works, the bypass will be opened.	It is a requirement that a decommissioning / commissioning plan be developed before construction, outlining the sequence of tasks with all mitigation measures derived from a risk assessment, and any other relevant safety studies.	High
2	All work will be completed by competent and experienced contractors. They will be supported by Zinfra Network Services (ZNS) technicians.	It is a requirement that contractors have the required electrical certifications and all hazardous area competencies to ensure compliance and objectives are achieved.	High
3	All estimated costs including Opex and Capex are at the desktop level using historical costs with other similar projects as the basis but progressing through the normal project management methodology gating process.	Costs can vary depending on the detailed scope of works, resourcing and third-party costs until financial investment decisions are available.	Medium
4	Spare panels are not fit for purpose and procurement of new panels are required.	The spare panels will be evaluated in CY26 and used if functional dependability is proven. If spare panels are not fit for purpose the chosen option provides for the purchase of new ALBV panels in accordance with long lead item timeframes.	High

4. Credible Options

The obsolescence of the ALBV Panels at Mt Keira, Wilton, Horsley Park and Hexham was investigated in this options analysis document, and the following three (3) options were identified and evaluated:

- Option 1: Maintain Status Quo,
- Option 2: Replace utilising the spare panels and
- Option 3: Supply and replace new panels.

All options are explained in detail below.

4.1 Option 1: Maintain Status Quo

4.1.1 Scope

In this option, all components on the ALBV's at Mt Keira, Wilton, Horsley Park and Hexham are left as they are with no works carried out.

4.1.2 Benefits

This option incurs no additional CAPEX.

4.1.3 Limitations

This option does not address any of the project drivers:

- ALBV panel system obsolescence poses facility functional dependability, safety, compliance and integrity risks.
- Continued degradation of earthing poses worker safety risk as electrical system faults will not be diverted to ground
- E&I equipment obsolescence increasing maintenance difficulty.
- Long run operating costs will increase through escalating corrective maintenance.
- Existing risks identified including aged small bore tubing and fittings i.e. sense lines and ALBV panel pipework and other non-stainless-steel components or damaged parts i.e. pressure gauges remains untreated.

4.1.4 Summary

Neither the control panel nor the E&I equipment are replaced, as a result, all risks continue to increase. All the critical systems are obsolete 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 functional dependability, safety, compliance and integrity.

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

4.2 Option 2: Replace utilising spare ALBV panels

4.2.1 Scope

This option replaces the ALBV panels, earthing and E&I equipment, by using spare panels and the associated components. As mentioned above, the spare ALBV panels require inspection, refurbishment and pressure testing evaluation before installation on site. The estimated budget for Option 2 of the ALBV Obsolescence – Phase 2 allows for the evaluation of the spare ALBV panels and associated components.

The scope includes the following:

- Inspection, refurbishment and pressure testing evaluation of spare ALBV panels.
- Replacement of obsolete Pressure Safety Valve (PSV) on the Gas Bottle Cylinder with spare components.
- Replacement of the small-bore tubing and fittings that are damaged, corroded and painted over, including sense lines and control panel pipework with new stainless steel parts.
- Replacement of the limit switches and solenoids.
- Replacement of the field junction box with a new pole-mounted junction box.
- Replacement of other aged and obsolete electrical and instrumentation equipment and wiring.
- Installation of a new functional earthing system.

4.2.2 Benefits

This option addresses all of the project drivers:

- Addresses ALBV panel obsolescence and provides functional dependability.
- Employs engineering controls to manage the threat to personnel and public safety associated with earthing systems, as opposed to administrative controls.
- Addresses the integrity risks associated with the damaged small bore tubing and fittings and other non-stainless-steel components and damaged parts.
- Maintain technical compliance of the facility to the evolved Standards, Codes and Regulations including AS 60079, AS3000 thus compliant with the Electricity (Consumer Safety) Act 2004 and the Electricity (Consumer Safety) Regulation 2006.
- Lowest cost replacement option.

4.2.3 Limitations

The limitations of this option are:

- There is a risk that the spare panels are not suitable for installation once evaluation is completed, leading to additional costs and extended schedules due to the long lead times (more than 7 months) to procure new panels.
- Protection of suitable panels is required to minimise any damage between evaluation and installation.

4.2.4 Summary

This option will address all project drivers for ALBV panel obsolescence including functional dependability, safety and compliance of earthing systems and integrity.

This option is not recommended due to the unknown functional dependability of the spare panels. Until the spare panels are evaluated and deemed suitable this option carries a high risk of incurring additional costs and experiencing extended lead times to procure new ALBV panels, if the spare ALBV panels are deemed unusable.

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

4.3 Option 3: Supply and replace with new ALBV panels

4.3.1 Scope

This option involves the supply of new ALBV panels and replacement of the existing ALBV panels along with all associated electrical, instrumentation, and earthing components.

The scope includes the following:

- Supply and installation of new ALBV panels
- Supply and installation of new and current Pressure Safety Valve (PSV) on the Gas Bottle Cylinder.
- Supply and replace small bore tubing and fittings that are damaged, corroded and painted over, including sense lines and ALBV panel pipework with new non-stainless-steel components.
- Supply and replacement of the limit switches and solenoids.
- Supply and replace the field junction box with a new pole-mounted junction box.
- Supply and replacement of other aged and obsolete electrical and instrumentation equipment and wiring.
- Supply and installation of a new functional earthing system.

4.3.2 Benefits

This option addresses all the project drivers:

- Addresses ALBV panel obsolescence and provides functional dependability.
- Employs engineering controls to manage the threat to personnel and public safety associated with earthing systems, as opposed to administrative controls.
- Addresses the integrity risks associated with the damaged small bore tubing and fittings and other non-stainless-steel components and damaged parts.
- Maintain technical compliance of the facility to the evolved Standards, Codes and Regulations including AS 60079, AS3000 thus compliant with the Electricity (Consumer Safety) Act 2004 and the Electricity (Consumer Safety) Regulation 2006.

4.3.3 Limitations

The limitation of this option is that it requires material CAPEX investment.

4.3.4 Summary

This option will address all project drivers for ALBV panel obsolescence including functional dependability, safety and compliance of earthing systems and integrity.

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	Replace utilising the spare ALBV panels	Supply and replace with new ALBV panels
Description	No mechanical or E&I equipment are replaced, as a result all risks continue to increase.	• Replace ALBV panels with spare panels stored in warehouse, all E&I equipment, including Earthing.	• Supply and replacement of ALBV panel system with new, all E&I equipment, including Earthing.
Benefits	Nil CAPEX	• Maintain the safe operation of the ALBVs. • Maintain the functional dependability of the asset. • Maintain technical compliance of the facility to Standards, Codes and Regulations. • Lowest CAPEX cost replacement option • Maintain ongoing OPEX at historical levels	• Maintain the safe operation of the ALBVs. • Maintain the functional dependability of the asset. • Maintain technical compliance of the facility to Standards, Codes and Regulations • Maintain ongoing OPEX at historical levels
Limitations	• ALBV obsolescence poses facility functional dependability risk and inhibits maintenance • E&I equipment obsolescence increasing maintenance difficulty. • Escalating OPEX • Personnel safety risks remain.	• The spare ALBV panels need to be sent to an external contractor for evaluation as the project progresses to the next phases, which carries a risk of additional costs and extended time for procurement of new panels if found to be unusable.	• High CAPEX investment, although less risk than Option 2.
Treated Risk Rating	SIGNIFICANT	LOW	LOW
CAPEX Cost Estimate[2]	$0	$1.33M	$1.84M
OPEX Estimate[3]	Escalating to $0.123M per year average OPEX	$0.039M per year average OPEX	$0.039M per year average OPEX
TOTEX Estimate (per 10 years)	$1.23M	$1.72M	$2.23M
Recommended Order of Preference	3 Unacceptable (Risk remains Significant, ongoing functional dependability, safety & integrity issues)	2 Not Recommended	**1** **Recommended**

[2] Gate 1 PEM Estimate for both options.

[3] Opex estimate is an assumption based on increased maintenance and call outs for the 3 ALBVs.

5. Recommendation

5.1 Recommended Solution

The recommended solution is Option 3 – Supply and replace with new ALBV panels at a current CAPEX cost of $1.84M at Gate 1.

This option targets all the objectives of the project by replacing the obsolete ALBV panels and associated obsolete and redundant equipment including E&I equipment and earthing system, with newly procured ALBV panels and associated equipment.

Practical completion of this project is targeted for CY28.

5.2 Overall Benefits of Option 3

This option addresses all the project drivers:

- Addresses ALBV panel obsolescence and maintains functional dependability.
- Employs engineering controls to manage the threat to personnel and public safety associated with earthing systems, as opposed to administrative controls.
- Addresses the integrity risks associated with the damaged small bore tubing and fittings and other non-stainless-steel components and damaged parts.
- Maintain technical compliance of the facility to the evolved Standards, Codes and Regulations including AS 60079, AS3000 thus compliant with the Electricity (Consumer Safety) Act 2004 and the Electricity (Consumer Safety) Regulation 2006.
- All E&I defects and obsolescence will be eliminated, with no escalation in OPEX to maintain acceptable risk level.

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

5.3 Cost Breakdown

Item	Project Estimate ($M)
Labour	$0.39M
Material	$0.65M
Subcontractor	$0.02M
Risk	$0.24M
Overheads	$0.54M
Total	$1.84M

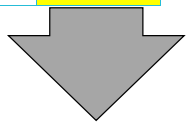
Appendix A – Reference Documents

Document Number	Revision	Document Title
GAS-1276-DW-PD-001	A	Automatic Line Break Valve Hexham Piping and Instrument Diagram
GAS-1070-DW-PD-002	A	Automatic Line Break Valve Horsley Park Piping and Instrument Diagram
GAS-1010-DW-PD-002	A	Automatic Line Break Valve Wilton South Piping and Instrument Diagram
GAS-1015-DW-PD-002	A	Automatic Line Break Valve Wilton Central Piping and Instrument Diagram
GAS-1110-DW-PD-002	A	Automatic Line Break Valve Mt Keira Piping and Instrument Diagram

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 ALBV panels can lead to failure of ALBV and in an emergency situation that could potentially result in loss of containment. • E&I and earthing systems obsolescence lead to personnel safety risk	Serious	Serious	Serious	Serious	• The assets are obsolete and operating well beyond its design lives making it challenging to find spare parts and perform maintenance. • Without an adequate solution, there are untreated risks of inadequate earthing system; and E&I equipment. These may cause personnel safety issues.	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	**$ 1.84M**	• Maintain the safe operation of ALBVs. • Maintain ALBV functional dependability. • Maintain technical compliance of the facility to Standards, Codes and Regulations.	• Mitigates loss of containment during pipeline emergency. • Maintains compliance of all Electrical and Instrumentation equipment in hazardous areas. • Mitigates the risks due to inadequate earthing systems and avoids causes of personal safety and equipment safety.	Serious	Rare	Low

Appendix C – National Gas Rules

Option 3: “Supply and replace with new ALBV panels” 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 ALBV panels. 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 necessary 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.
- Maintain the integrity of service (79(2)(c)(ii)) by improving equipment functionality and maintaining compliance on high pressure facilities.
- 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 in ensuring the safety and compliance of its E&I equipment on high pressure facilities.