Business Case – Capital Expenditure

GCS Process & Valve upgrades

Business Case Number 207

1 Project Approvals

TABLE 1: BUSINESS CASE – PROJECT APPROVALS

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2 Project Overview

TABLE 2: BUSINESS CASE – PROJECT OVERVIEW

Description of Issue/Project	The Gooding Compressor Station requires the following upgrades: • Unit discharge check valves • Unit Vent valves • Turbine oil reservoir and automatic fill system
Options Considered	The following options have been considered: 1. Option 1: Do Nothing Option 2. Option 2: No alternative identified 3. Option 3: Upgrade of process valves and oil system
Estimated Cost	$1,247,934 (escalated)
Consistency with the National Gas Rules (NGR)	The replacement of these assets complies with the new capital expenditure criteria in Rule 79 of the NGR because: • it is necessary to maintain and improve the safety of services and maintain the integrity of services (Rules 79(2)(c)(i) and (ii)); and • it is such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services (Rule 79(1)(a)).
Stakeholder Engagement	Stakeholders effected by this project are: • Gas Market • Transmission operators

3 Background

The Gooding Compressor Station (GCS) was constructed in the late 1970's and is located east of Melbourne and is used to move gas from Longford to the city and northern areas. The station has a critical ongoing role in the Victorian transmission system and the station will continue to operate for the foreseeable future.

The station has had many upgrades in the last few years including compressor controls, station and unit isolation valves and actuator replacement.

Reverse Flow Protection:

Each compressor unit has a check valve installed on the discharge side immediately upstream of the discharge isolation valve. The check valve prevents potential back flow of process gas during startup and shutdown.

The valves are the originally installed 500mm Class 600 John valve with a hydraulic damper. The hydraulic dampeners on those valves were slowing the valves closing at shutdown, resulting in surge events and backflow to the compressors. As a result those dampeners were removed approximately 30 years ago and since then those valves would slam close at shutdown. There is concern that those flaps could be fatigued over the years and may break off, resulting in reverse flow and debris that could cause significant damages to compressor units.

The station manifold has a 750mm check valve of same type. This may also need to be replaced.

Station Safety System:

The existing safety system is Triconex based and was installed circa 1998, the software and safety systems have been modified with various projects since installation, processors were upgraded to new revisions during 2010. The safety system is due for a full review, assessment and possible upgrade to ensure ongoing suitability for the safe and reliable operation of the compressor station. This assessment will include full review of safety functions, control programs and hardware.

Unit Vent Valves:

Each unit has a vent valve and check valve to ensure each unit can be depressurized after shutdown. Each valve has a double acting actuator with positioner and limit switches. These valves, actuators and check valves are the originally installed valves have performed thousands of cycles and are reaching end of life. Replacement is necessary during this planning period and is more efficient if they are replaced as a package of work as they are in very close proximity and similar condition. Replacement of only the actuators is not possible as new actuators will exceed MAST limits on the existing valve and is not a technically acceptable solution.

Unit Fuel Gas Isolation and Vent Valves:

Currently there is a common actuated fuel gas Isolation and vent valve for the four Gooding Compressor units. In order to comply with AS3814 an upgrade of the fuel gas system is required for each compressor with AGA certified SSOV's including emergency shut off valves for each unit and relocation of the Fuel gas header from inside the compressor hall to outside the compressor hall. Each individual unit is also required to have actuated vent valves connected to the station vent in order to vent the individual fuel gas run when not in service (Currently venting of the fuel gas occurs only during a station Emergency Shutdown (ESD).

Turbine Oil Reservoir and Autofill:

The compressors have been upgraded to dry seal from wet seal. In the past the wet seals consumed reasonably large quantities of lubrication oil compared to other equipment. The station has a gas pressurized oil fill system to each non-pressurized unit oil tank. This allowed larger volumes of oil to be stored centrally and then delivered to each unit as required. Oil consumption is currently very low as such the oil in the central storage system reaches shelf life prior to use. This demolition of the oil delivery system removes the risk of old unused oil entering the unit oil tank and removes the maintenance intensive pressure vessel, pressure safety valve, pressure control valves, level control and switches and other valves, pipework and civil supports.

A restart with cold lube oil is causing vibration issues on startup and requires the compressor to then run on idle until oil is warm enough. The addition of a lube oil heater in the oil reservoir will remove the vibration issue at startup and reduce corrective maintenance.

Instrument Air:

The station has instrument air installed however that project did not extend the scope to convert all equipment from instrument air from instrument gas. The unit valves and actuators which use instrument gas are being replaced in

2016 and will use instrument air. The remaining small bore actuators can be converted to instrument air for minimal cost. During normal operation the instrument gas system vents gas directly to atmosphere which effects carbon emissions and can create explosive environments temporarily in proximity of the vent. Conversion to instrument air eliminates the safety and environmental hazard.

4 Risk Assessment

TABLE 3: RISK RATING

Risk Area	Risk Level
Health and Safety	**Low**
Environment	**Low**
Operational	**Moderate**
Customers	**Moderate**
Reputation	**Moderate**
Compliance	**Moderate**
Financial	**Moderate**
Final Untreated Risk Rating	**Moderate**

The risk from not upgrading the unit check valves:

Security of supply: The potential damage caused by a surge will be sufficient to put a compressor offline until repairs can be made. If a surge event causing damage occurs, it is likely that dependence on compression is high due to cold weather and alternative supplies are limited.

Safety: The ongoing replacement of loading (ball) valves due to seat damage from surge has some inherent risks to personnel. These risks can be avoided if the valve does not fail.

The risk from not upgrading the check and vent valves:

Operational: These valves have reached end of life and will eventually fail completely rendering the unit inoperative for substantial period of time until replacements can be met. However, if the valves fail and create a process control failure, the compressor unit may incur significant damage due to over-pressurisation or reverse flow. Such conditions are not acceptable for process plant and prevention is required.

5 Options Considered

5.1 Option 1 – Do Nothing

- The Do Nothing option will risk damage to compressor due to fast stop trips, potential reverse flow and venting failures.
- The ongoing replacement of loading valves due to seat damage and other turbine and compressor damage.
- The ongoing management of hazards from instrument gas venting, pressurised oil delivery system and a pressure vessel.

5.1.1 Cost/Benefit Analysis

- The timely replacement of the process and valve systems will permit efficient project implementation. To react to individual unit failures will cost more overall.

5.2 Summary of Cost/Benefit Analysis

TABLE 4: SUMMARY OF COST/BENEFIT ANALYSIS

Option	Benefits (Risk Reduction)	Costs
Option 1	Do Nothing	Indeterminate
Option 2	No other technical solution identified	
Option 3	Perform valve upgrade	$1,247,934

5.3 Proposed Solution – Process and Valve Upgrade

5.3.1 What is the Proposed Solution?

As discussed above, the proposed solution is to install, control logic and replace the discharge check and vent valve arrangement and the oil reservoir and autofill system alteration and demolition.

5.3.2 Why are we proposing this solution?

The check valves, vent valves and oil system have reached the end of their useful life and require replacement. Failure to do so will likely cause failure during start up or shut down. These transient events are where process safety is the most difficult to control and requires as a minimum, sound functioning valves.

The vibration issues on the compressors due to cold lube oil may lead to early fatigue and additional maintenance requirements if not resolved.

Upgrade of the fuel gas header, isolation and venting valves in order to comply with AS3814.

The cost of maintaining assets that are no longer required is inefficient and preventable. The removal of the oil autofill system will reduce operational costs.

5.3.3 Consistency with the National Gas Rules

Consistent with the requirements of Rule 79 of the National Gas Rules, APA considers that the capital expenditure is:

- Prudent – The expenditure is necessary in order to maintain and improve the safety of rotating plant and is of a nature that a prudent service provider would incur.
- Efficient – APA has standard designs and preferred supplier arrangements for valves of this nature. APA has significant experience with this compressor station and others similar. The expenditure can therefore be considered consistent with the expenditure that a prudent service provider acting efficiently would incur. All expenditure will be consistent with the APA procurement policy.
- Consistent with accepted and good industry practice – Addressing the risks associated with the process plant failure and replacing safety critical assets that have reached the end of their useful life is accepted as good industry practice. In addition, the reduction of risk to as low as reasonably practicable in a manner that balances cost and risk is consistent with Australian Standard AS2885.
- To achieve the lowest sustainable cost of delivering pipeline services – The sustainable delivery of services includes reducing risks to as low as reasonably practicable and maintaining reliability of supply by preventing failure of a significant source of pipeline capacity.

5.3.4 Forecast Cost Breakdown

Quoted prices:

Gooding Unit check valves, 20” at $62,000ea, four are required.

Gooding Station check valve, 30” at $93,600.

Additional costs of freight, packaging and documentation brings the cost of the check valves to $400,320 USD.

Removal of existing fuel gas header inside the compressor hall and replacement of manual isolation valves on each of the fuel gas skids with AGA certified valves. Fabrication and installation of a new fuel gas header (outside the compressor hall) with four individual unit actuated SSOV (Safety Shut Off Valve) and actuate vent valves (connected to the station vent). ($600k)

Upgrade of the lube oil system to include lube oil heater ($150k)

Upgrade Solar Turbotronics to include the new SSOV’s and prepare SIL & HAZOP Studies ($70k)

TABLE 5: PROJECT COST ESTIMATE, ESCALATED

Project	Cost
GCS compressor unit vent valves & actuators replacement	$147,128
GCS unit discharge and station manifold check valves replacement	$1,005,539
GCS Decomm & removal of turbine oil reservoir & auto fill system	$95,267
Total	**$1,247,934**