Business Case – Capital Expenditure

Type B Compliance
Business Case Number 271

1 Project Approvals

TABLE 1: BUSINESS CASE – PROJECT APPROVALS

Prepared By	*Scott O'Regan, Pipeline Engineer, APA Group*
Reviewed By	Anthony Jones, *Pipeline and Asset Management Engineer, APA Group*
Approved By	Craig Bonar, *Manager East Coast Grid Engineering, APA Group*

2 Project Overview

TABLE 2: BUSINESS CASE – PROJECT OVERVIEW

Description of Issue/Project	Energy Safe Victoria (ESV) is the regulatory authority for all gas transmission pipelines (in Victoria) downstream of the gas production plants. These pipelines are managed via safety cases under Section 37 of the Gas Safety Act 1997 (GSA). APA has received instruction from the Safety Case regulator (ESV) that gas fired appliances are required to comply with AS3814. (See Appendix for email from ESV). APA operates about 34 Type B appliances (compressors, heaters and generators) constructed from about 1977. Brief summary of the background of the issue/project including: • Most of the Type B Appliances that are over 7 years old do not comply with AS3814 • Compliance with AS3814 affects the safety and integrity of gas fired appliances • If any of the non-compliant existing equipment is damaged (especially on the older equipment), a like for like replacement of existing equipment is unlikely due to the parts no longer being available. This would trigger an unplanned full upgrade of the affected appliance, which could take months to achieve and result in reduced flows and potential customer curtailments. • Successful solution will: Upgrade the appliances to comply with AS3814 as required by ESV.
Options Considered	The following options have been considered: 1. Option 1: Do Nothing Option: Do not comply with AS3814 and the ESV requirements and in the event of a failure of a piece of equipment rectify any problems A.S.A.P. (Customer curtailments unlikely) 2. Option 2: Complete the AS3814 audits on the affected appliances and then perform a risk assessment on each non-compliance to assess if the risk is ALARP (As Low As Reasonably Practicable) or whether it is necessary to rectify the non-compliance due to unacceptable risk. 3. Option 3: Complete the AS3814 audits on the affected appliances and rectify all non-compliances (regardless of cost and risk) 4. Option 4: Replace all old Heaters, Gas Generators and Compressors with new, compliant equipment (Highest cost option)
Estimated Cost	$1,083,593

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 affected by this project are. • Australian Energy Market Operator (AEMO) • Energy Safe Victoria (ESV)

3 Background

The current situation is that APA VTS has several newer Type B appliances (or older upgraded appliances) that mostly comply with the new AS3814-2015 Australian Standard and require minimal upgrades, which include:

- Compressor units; Brooklyn CS (Unit 12), Wollert CS (Units 4 & 5), and Euroa CS (Unit 1)
- Water Bath Heaters; APM Maryvale, Dandenong Terminal Station and Wandong
- Gas Engine Alternators; Longford, Wollert, and Brooklyn

However many of the appliances are still only compliant to the standard in the year which they were installed (or previously upgraded), which include;

- Compressor Units; Brooklyn (Units 8, 9, 10 & 11), Springhurst CS (Unit 1), Iona (Units 1 & 2), Wollert (Units 1, 2 & 3) & Gooding (Units 1-4 upgraded in 2012, however still requires an upgrade to the unit fuel gas isolation valves)
- Water Bath Heaters; Lara, Illuka, Wollert, Brooklyn Lara Pipeline (Units 1 & 2) and Brooklyn Corio Pipeline (Units 1 & 2)

Brooklyn Compressor Units Type B Compliance has been added to “204 Business Case BCS 8,9,10,11 upgrade” and have been excluded from this business case.

Gooding Compressor Units Type B Compliance has been added to “207 Business Case GCS Process and Valve upgrades” and have been excluded from this business case.

The Springhurst Compressor Unit Type B Compliance is included in this business case.

Most of the Type B Appliances do not comply with AS3814-2015 (Industrial and commercial gas-fired appliances). The audits have identified where the appliances are not meeting the Australian Standard.

Compliance with AS3814 affects the safety of gas fired appliances, their users and ultimately the ongoing supply of natural gas to the end users.

Many of the old appliances do not comply with AS3814 which increases the risk of fires on and within the packages, or increases the consequences of a fire. If any of the noncompliant existing equipment is damaged (especially on the older equipment), a like for like replacement of existing equipment is unlikely due to the parts no longer being available. This would trigger a full upgrade of the affected appliance (requiring full compliance with AS3814), which could take months to achieve and result in reduced flows and potential customer curtailments.

A successful solution will make the compressors safe to operate and reduce the risk of incidents by upgrading the appliances to comply with AS3814-2015 as required by ESV.

The Wandong Water Bath Heater (WBH) was originally installed at Brooklyn and underwent significant upgrades to insure it complies with AS3814 when it was relocated so doesn’t require upgrading at the present time. The Lara

WBH is the same age and model as the old Wandong heater and has had minor upgrades to the metering skid in the past. The Lara WBH will require additional minor modifications to comply with AS3814. The WBH at Illuka, Wollert, BLP and BCP will also require minor upgrades.

The audit of all of the Type B Appliances began in 2015 and will be completed by the end of 2016. The audit will also include a risk assessment of all non-compliances to determine if it is consistent with the requirement for ALARP or if there is a requirement to rectify the non-compliance.

The current AS3814 Australian Standard was updated in 2015 (previously in 2009) and references AS ISO 21789:2014 Gas Turbine Applications - Safety and AS/NZS 5601.1:2013 Gas installations (Part 1: General installations). ESV also have Gas Information Sheet No.07 in 2013 which clarifies the responsibilities for the installation of high pressure gas installations in excess of 200 kPa in consumer premises. ESV have since sent an email dated 20-Feb-12 where they have advised that they expect all equipment in this category to comply with AS3814 applied retrospectively where equipment controls are upgraded.

The AER has previously approved $861k in the 2013 – 2017 Access Arrangement to conduct this work.

- APA has begun the Type B audits and is expected to spend $215k by the end of the 2013-2017 access arrangement.

- It has been determined that the original $861k estimated is inadequate to bring all Appliances into compliance with AS3814. Two associated projects are the installation of new heaters at APM Maryvale in 2014 (as part of a full station upgrade), and a current project to upgrade Wollert units 1, 2 and 3 by the end of 2016 (Est. $600k).

4 Risk Assessment

The following failure modes expected from the current condition of the Compressor units:

- Control system failure leading to inability to operate for an extended period
- Failure of exhaust stack and other balance of plant leading to inability to operate for an extended period
- Failure to apply current standards to heavily modified equipment
- Direct emissions from power gas system for turbine starts
- No hazardous area assessment completed for piping/equipment operating between 200kPa and 1050kPa.
- No Automatic fuel gas isolation and venting that could lead to gas leaks within the enclosures.

TABLE 3: RISK RATING

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

5 Options Considered

5.1 Option 1 – Do Nothing

- The Do Nothing option is to permit the appliances to degrade until failure or until detected and deemed inoperative. The result will be long delays until plant can be reinstated and this will cause capacity shortfalls in the Victorian Transmission System.

- The plant failure has other risks that are difficult to quantify however the consequences on security of supply would be unacceptable. For the reasons outlined above in relation to delays and possible curtailments APA VTS does not operate heater & compressor stations or their significant components to failure.

5.1.1 Cost/Benefit Analysis

- The benefits of this option are to delay the inevitable capital replacement. There will be additional costs if the replacements are not planned (as a result of failure). These additional costs are the costs to expedite a solution; this usually requires paying a premium for components and resources, in addition to the cost of the supply shortfall.

- There are significant efficiencies in delivering this package of work with one effort. All of the work requires shutdown of each unit and synergies are gained during shutdowns with project management, procurement, supervision, equipment hire and engineering management.

5.2 Option 2 –New for old replacement of some heaters and compressors

- This approach is to completely replace the older water bath heaters and compressor units with new units. This approach will remove the uplift costs of design and construction associated in a brownfield environment and will achieve reduced operational cost, risk and capital expenditure profile for at least 15 years.

- The exact scope of this option is undefined however it would include the replacement of Iona Reciprocal compressors and coolers, Lara Water Bath Heater, Wollert Compressor Units 1, 2 & 3. This option would also require replacement/removal of old buildings, interstage headers and large bore valves which is likely to require redesign, creating significant cost changes

- The lowest expected cost of Option #2 is approximately $100m, based on recent experience.

5.2.1 Cost/Benefit Analysis

- The benefits of this option are

    - The new compressors can be optimised and operate to full Class 600 pressure with headers that can accept this pressure. There would also be reduced operating and maintenance costs as the efficiency of new compressors is significantly better and the units can be configured to match the current system requirements.

    - The new compressors can be staged correctly for future flow and pressure requirements leading to more efficient use of these assets

    - The new compressors will be dry seal, reducing the amount of oil that is currently injected into pipeline system (Wollert Units 1, 2 & 3)

    - New coolers at Iona sized to meet the current flowrate requirements to increase the availability of the station.

The risks of this option are an overall reduction in power capability, turndown and ability to have backup compressors to permit station maintenance. The cost of design and construction in a brown field environment usually costs 15-20% more than similar equipment in a green field environment.

5.3 Option 3 –Rectify all Non-compliances to AS3814 regardless of risk rating

- This approach is to replace all non-compliances to AS3814 to make them risk rated low regardless of whether it can currently be considered ALARP.
- This option includes replacing existing non-compliant hazardous area equipment with compliant hazardous area equipment that is within 0.5m of and pressure piping that is between 200kPa and 1050kPa for all Water bath heaters and Gas Engine Alternators.
- This is a valid approach, however could lead to a significant expenditure that does not increase the safety or lower the risk and is estimated to cost approximately $100k more than the recommended option.

5.4 Summary of Cost/Benefit Analysis

The section should include a general overview of how the options compare and identify any options are not technically feasible.

TABLE 4: SUMMARY OF COST/BENEFIT ANALYSIS

Option	Benefits (Risk Reduction)	Costs
Option 1	Do Nothing	Indeterminate
Option 2	Replace old Compressors and Water bath heaters with new equivalent compliant equipment	Up to $100m
Option 3	Upgrade all non-compliances to AS3814 (out of the Type B Audit) regardless or risk	$1.2m
Option 4	Upgrade only the non-compliances to AS3814 (out of the Type B Audit) that cannot demonstrate ALARP	$1,083,593

5.5 Upgrade only the non-compliances to AS3814 (out of the Type B Audit) that cannot demonstrate ALARP

As part of the Type B Compliance Audit currently in progress any non-compliance is to undergo a risk assessment workshop to determine what the current residual risk of the non-compliance is and determine whether it satisfies the ALARP test or is unacceptable and requires rectification. This will mean that only the non-compliances that affect safety or reliability will be rectified with the remaining risks to be rectified at a future day (preferably when an upgrade to the equipment is required).

5.5.1 The current projects identified as requiring rectification:

a. Hazardous area assessment by a H Class Inspector of all piping between 200kPa and 1050kPa (Gooding, Longford, Dandenong Terminal Station Heater).

b. Installation of new equipment/piping and fittings on Water Bath Heaters due to end of life / rusting pipe/fittings etc.

c. Upgrade the Wollert Gas Engine Alternator enclosure to include a gas detector, Actuated SSOV (Safety Shut Off Valve) and Actuate Vent valve and replace corroded piping and fittings

d. Upgrade of Springhurst and Iona Compressor Station Control system including; Actuated unit SSOV's & Vent valves, F& G Detection and Room Ventilation Upgrades.

e. Addition of Actuated Control Valve on Iona Compressor Station cooler bypasses (one for each unit). While this is not a Type B compliance issue, it has been added to this business case as it was identified as being the highest reliability risk and would be performed in conjunction with the controls upgrade to reduce costs.

5.5.2 Why are we proposing this solution?

The justifications for the recommended projects are:

- The current AS3814 Australian Standard was updated in 2015 and references AS ISO 21789:2014 Gas turbine applications-safety and AS/NZS 5601.1:2013 Gas installations (Part 1: General installations). ESV also have Gas Information Sheet No.07 in 2013 which clarifies the responsibilities for the installation of high pressure gas installations in excess of 200kPa in consumer premises.

- ESV have sent an email dated 20-Feb-12 where they have advised that they expect all equipment in this category to comply with AS3814 applied retrospectively where equipment controls are upgraded.

- The controls at Iona Compressor station are no longer supported by the manufacturer and have reached end of life. If they fail APA may be unable to source suitable replacement parts resulting in lengthy equipment outages & potential curtailments.

- Iona Compressor station currently keeps tripping on days of high temperature due to the station coolers being undersized. Controlling the cooler bypass valve to achieve a desired outlet temperature will minimise pressure drop across the coolers while ensuring the units do not trip on High High temperature (resulting in a potential loss of supply)

5.5.3 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 services and maintain the integrity of services to customers and personnel and is of a nature that a prudent service provider would incur.
- Efficient – The field work will be carried out by the external contractor that has been used to date, who has demonstrated specific expertise in completing the installation of the facilities in a safe and cost effective manner. The expenditure is being undertaken consistent with the APA procurement policy. The expenditure can therefore be considered consistent with the expenditure that a prudent service provider acting efficiently would incur.
- Consistent with accepted and good industry practice – Addressing the risks associated with inferior safety design and replacing 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.

5.5.4 Forecast Cost Breakdown

Each station requires an individual cost estimate. Each station has different fuel gas arrangements and site specific difficulties regarding space, venting systems and building penetrations.

TABLE 5: PROJECT COST ESTIMATE,

	Total
Internal Labour	$256,423
Materials	$322,692
Contracted Labour	$504,478
Other Costs	$0
Total	**$1,083,593**

Appendix A – Energy Safe Victoria Correspondence

Alan,

One of our inspectors, Peter Ryan has had a good look at the ISO 21789 standard and has commented as below:

"ISO 21789 appears to be a very comprehensive standard addressing many aspects of turbine safety not covered by AS 3814. It appears to be non- prescriptive and based on risk assessment procedures. AS 3814 section 5.8 Stationary gas engines and turbines is very similar to ISO 21789 clause 5.10.5.1 under the heading "gas fuel systems."

AS 3814 clause 5.8.1 General in part states" Gas fired turbines that comply with the requirements of ISO 21789 may be deemed by a technical regulator to meet the intent of this standard".

ISO 21789 does not appear to comply with the requirements of AS 3814 clause 2.26.3, Requirements for a programmable electronic system (PES).

I believe that any turbine installed in Victoria which complies with the requirements of ISO 21789 should also comply with the relevant sections of AS 3814, being mindful that much of the valve train, flame proving and flame failure requirements appear to be identical.

Any turbine being installed in Victoria should be submitted in accordance with schedule 9 of the Gas Safety (Gas Installation) Regulations2008.
The requirements set out in AS 3814 clause 2.26.3 should form part of the submission.

AS 3814 and ISO 21789 appear to complement each other however ISO 21789 does not appear to be appropriate as a standalone standard in regard to gas safety".

Peter has said you can contact him to have a further discussion if required, see attached contact. Hope this clarifies the situation.

Regards

Andrew Jones
Manager Gas Infrastructure
Energy Safe Victoria
Level 3, Building 2
4 Riverside Quay, Southbank 3006
☎: +61 3 9203 9729 ☎: Mob 0417 557 843
🖷: +61 3 9686 2197 ✉: ajones@esv.vic.gov.au

From: Bill Holden
To: Burt, Alan
Cc: Graeme Cook; Darren TILLEY; Ignazio Cannizzo; Bonar, Craig; Callar, Geoff
Subject: RE: AS3814 - Modification to Type B appliances
Date: Monday, 20 February 2012 8:15:55 AM

Dear Alan,

Thank you for your response below.

Any plant change is a critical activity from both safety and operability viewpoints and it is important that as per your Safety Case, risk management process is applied to this particular project to assist with specific decisions or to manage recognised risk areas in order to achieve risk being reduced to ALARP.

You quite correctly point out that "*GSA s44 would seem to permit the field equipment to remain at the existing level of risk, whereas AS3814 ambiguously requires the appliance to be upgraded ..... ISO21789 unambiguously sets out the requirements for the fail-safe design of the complete package*." and as I stated in my email (also below), AS 3814 Clause 5.8.1 states that the requirements of ISO 21789 may be deemed by ESV to meet the intent of AS 3184.

To clarify, while GSA s44 reads that field equipment can remain at the existing level of risk, this does not negate APA's risk management obligation to achieve risk being reduced to ALARP. Consequently, it is not simply an issue of there being a compliance trigger as distinct from a change management risk assessment trigger.

From a Safety Case perspective as well, it is not ESV's intention to deem that the requirements of ISO 21789 meet the intent of AS 3184 or not.

ESV would rather see that APA has considered all of the requirements of both standards as relevant to their proposed scope of work and that they have determined whether the work as proposed will ensure that once completed, risk remains at ALARP.

As mentioned in my earlier email, it is my belief that this is most easily determined by adopting a compliance matrix, identifying gaps and then making sure that these are picked up and addressed in a formal HAZOP. However, as APA has articulated how it deals with risk management in its Safety Case, I only offer this as a suggestion.

I note your timing of 24 Feb and am conscious of the fact that this issue needs to progress quickly. Hopefully, you now have sufficient clarification in order to do so.

However, should you feel that you would still like to meet to discuss this further, then please let either Graeme or myself know a.s.a.p. and we will see what we can arrange at the earliest opportunity to accommodate all.

With regards,

W. Holden
Manager Gas Infrastructure Safety
energysafe VICTORIA

Energy Safe Victoria
Level 5, Building 2
4 Riverside Quay
Southbank VIC 3006