# Business Case – Capital Expenditure

# Type B Compliance

## Business Case Number BC271 AA23-27

## 1 Project Approvals

| TABLE 1: BUSINESS CASE – PROJECT APPROVALS | | |
|---|---|---|
| **Created By** | Adam Newbury<br>Adam Clegg | Asset Lifecycle Specialist, Asset Management<br>Rotating Engineer, Engineering & Planning |
| **Cost Updated By** | Adam Newbury | Victorian Team Lead Project Delivery, Engineering & Planning |
| **Reviewed By** | Atif Jabbar | Senior Facilities IE Engineer, Engineering & Planning |
| **Approved By** | Daniel Tucci | Victorian Asset Manager, Asset Management |

## 2 Project Overview

Project resubmitted – ongoing program of work

| TABLE 2: BUSINESS CASE – PROJECT OVERVIEW | |
|---|---|
| **Description of Issue/Project** | **APA has received instruction from the Safety Case regulator, Energy Safe Victoria (ESV) that gas fired appliances are required to comply with AS3814 (See Appendix for email from ESV).**<br>**APA operates about 34 Type B appliances (compressors, heaters and generators) constructed from 1977 onwards and have identified the following issues;**<br>• **Most Type B Appliances over 7 years old would not currently comply with AS3814**<br>• **Compliance with AS3814 can impact safety and integrity of gas fired appliances**<br>• **If a noncompliant Type B appliance component fails, an (unplanned) full upgrade of the affected appliance to Type B compliance is required.**<br>**Successful solution will:**<br>• **Upgrade the appliances to comply with AS3814 and ESV requirements**.<br>**This is an ongoing program of work.** |
| **Options Considered** | **The following options have been considered:**<br>**Option 1: Do Nothing**<br>**Option 2: Replace all old heaters, gas generators and compressors with new, compliant equipment**<br>**Option 3: Complete the AS3814 audits on the affected appliances and rectify non-compliances. (Preferred)** |
| **Estimated Cost** | **$1,960,000** |
| **Relevant Standards** | **Australian Standard 3814** Industrial and commercial gas-fired appliances, which provides the minimum requirements for the design, construction and safe operation of Type B appliances. Energy Safe Victoria provides a directive to APA VTS to comply with AS 3814 (Appendix A). |

| | |
|---|---|
| **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:**<br>• **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**<br>• **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)).** |
| **Key Stakeholders** | **Stakeholders affected by this project are.**<br>• **Australian Energy Market Operator (AEMO)**<br>• **Energy Safe Victoria (ESV)** |
| **Benefits to Customers and Consumers** | Compliance with AS3814 will improve the safety of gas fired appliances. This will improve reliability and security of supply for customers and consumers. |

# 3 Background and Project Need

APA has a national strategy to identify and resolve Type B Appliances not currently compliant with AS3814-2018 Industrial and commercial gas-fired appliances requirements. The successful solution will make the compressors safe to operate and reduce the risk of incidents by upgrading the appliances to comply with the latest revision of the AS3814 standard and Energy Safe Victoria (ESV) requirements.

As part of this national initiative, Victorian Transmission System Type B appliances have received high level reviews to assess the level of modification required to be Type B compliant. To address the identified Type B non-compliance issues, a prioritised Type B compliance upgrade program has commenced.

The findings of the Type B review including approximate upgrade effort, recommended remedial action and timing details (including progress to date) are provided in table 3.

**TABLE 3:** BUSINESS CASE – PROJECT OVERVIEW

| Appliance Type | Location | Description (Unit) | Extent of Upgrade Anticipated | Required Action | Upgrade Timing |
|---|---|---|---|---|---|
| Gas Engine Alternator | Longford | Unit 1 | Minimal | Replace with Diesel Engine Alternator | 2012* |
| Gas Engine Alternator | Brooklyn | Unit 1 | Minimal | Replace with Diesel Engine Alternator | 2015* |
| Gas Engine Alternator | Wollert | Unit 1 | Minimal | Replace with Diesel Engine Alternator | 2022* |
| Gas Engine Alternator | Gooding | Unit 1 | Minimal | Replace with Diesel Engine Alternator | 2022-2023* |
| Compressor | Brooklyn | Units 8, 9, 10 & 11 | Substantial | Assess & upgrade as required | 2022 |
| Compressor | Iona | Units 1 & 2 | Substantial | Assess & upgrade as required | 2024 |
| Compressor | Springhurst | Unit 1 | Substantial | Assess & upgrade as required | 2024 |
| Compressor | Wollert | Units 1, 2 & 3 | Substantial | Assess & upgrade as required | 2025 |
| Compressor | Gooding | Units 1, 2, 3 & 4 | Moderate<br><br><br>Substantial | Install unit fuel gas isolation upgrades +<br>Assess & upgrade as required<br>Apply Type B upgrades | 2026<br><br><br>2012^ |
| Water Bath Heater | Brooklyn Corio Pipeline | Units 1 & 2 | Moderate | Assess & upgrade as required | 2026 |

| | | | | | |
|---|---|---|---|---|---|
| Water Bath Heater | Brooklyn Lara Pipeline | Units 1 & 2 | Moderate | Assess & upgrade as required | 2026 |
| Water Bath Heater | Illuka | Unit 1 | Moderate | Assess & upgrade as required | 2026 |
| Water Bath Heater | Lara | Unit 1 | Moderate | Assess & upgrade as required | 2026 |
| Water Bath Heater | Wollert | Unit 1 | Moderate | Assess & upgrade as required | 2026 |
| Water Bath Heater | APM Maryvale | Unit 1 | Minimal | Assess & upgrade as required | CY28-CY32 |
| Compressor | Brooklyn | Unit 12 | Minimal | Assess & upgrade as required | CY28-CY32 |
| Water Bath Heater | Dandenong Terminal Station | Unit 1 | Minimal | Assess & upgrade as required | CY28-CY32 |
| Compressor | Euroa | Unit 1 | Minimal | Assess & upgrade as required | CY28-CY32 |
| Water Bath Heater | Wandong | Unit 1 | Minimal | Assess & upgrade as required | CY28-CY32 |
| Compressor | Wollert | Unit 4 & 5 | Minimal | Assess & upgrade as required | CY28-CY32 |

*Type B upgrade completed or non-compliance resolved by decommissioning the Type B appliance.

# 4 Risk Assessment

APA VTS is required to comply with directives from ESV. Non-compliance risk scenarios considered most likely are:

- Operating Capability. Capacity impacts after noncompliant Type B appliance requires unplanned compliance assessment and remedial actions. This is considered the most probable scenario.
- Health and Safety. Noncompliant appliance component fails and exposes ignition source. Gas detection, forced ventilation and control system protections make this unlikely.
- Compliance. ESV mandate immediate Type B audits and order noncompliant appliances remain out of service until compliance assessment and remedial actions are completed. As APA is addressing Type B compliance issues this seems unlikely unless the previous scenario occurs and the protections fail.

**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 Identification and Assessment of Options

## 5.1 Identification of Options

**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.

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

**Option 2: New for old replacement of 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 scope of this option 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 this option is $100 million based on recent installations of similar equipment.

**Option 3: Complete the AS3814 audits on the affected appliances and rectify non-compliances**

This approach is to address all non-compliances to latest revision of AS3814 and then periodically review and resolve future non-compliances.

## 5.2 Assessment of Options

A summary of the options is shown in the following table.

**TABLE 4:** SUMMARY

| Option | Benefits (Risk Reduction) | Costs |
|---|---|---|
| Option 1 | Do Nothing | - |
| Option 2 | Replace old Compressors and Water bath heaters with new equivalent compliant equipment | **$100,000,000 (Estimated)** |
| Option 3 | Upgrade all non-compliances to AS3814 (out of the Type B audit) | **$1,960,000** |

Option 1 Do Nothing is a run-to-failure approach and is not an acceptable risk for these types of assets. Option 1 could risk compliance / enforcement action being taken by Energy Safe Victoria.

Generally a noncompliant Type B appliance will increase the probability of fires, or increase the consequences in the event 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 the latest revision of AS3814), which could take months to achieve and result in reduced flows and potential customer curtailments.

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 does not operate heater and compressor stations or their significant components to failure. Option 1 is not a practicable option.

Option 2 involves the replacing old Compressors and water bath heaters with new equivalent compliant equipment at a cost of $100 million. The benefits of this option are

- Class 300 compressor units would be replaced with new compressors units and pipework configured for Class 600 pressure.
- new compressors would be supplied with the modern supported control systems that operate more efficiently and have superior protections and monitoring capabilities.
- new compressors would be staged correctly for future flow and pressure requirements leading to more efficient use of these assets
- new compressors will be dry seal, which would prevent seal oil entering pipelines downstream of compressors
- new coolers at Iona would be sized to meet the current flowrate requirements to increase the availability of the station.

The disadvantages of this option are

- Cost of this option is high compared to upgrade
- Replacing assets that are still functional but require minor expenditure to become Type B compliant would not be prudent spending.

Option 2 is not the preferred option due to the high cost relative to Option 3.

Option 3 involves upgrading all non-compliances to AS3814 (out of the Type B audit).

The benefits of this option are:

- All AS3814 compliance issues will be resolved.
- In terms of cost, this is the most feasible and practicable option as it meets ALARP requirements and addresses non-compliances.
- 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.

The disadvantages of this option:

- Renewing appliances which could have been in service for over 40 years when replacement might be a more cost effective long term solution. (noting however that in light of Victorian Government Net Zero target, APA VTS is proposing accelerated depreciation of VTS assets). Therefore renewal is a more prudent option.
- Cost uncertainty with Type B upgrades due to the likes of control system, hazardous area and other improvements being triggered to achieve a compatible and compliant solution.

# 6 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. Meeting Energy Safety Victoria directive to comply with AS 3814 is prudent.
- Efficient. Renewal is a more cost effective option compared to replacement in light of Victorian Government's Net Zero target. The program is being undertaken consistent with the APA procurement policy. The field work will be carried out by external contractors who have experience and have demonstrated specific expertise in completing the installation of the facilities in a safe and cost effective manner. 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.

# 7 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. The cost estimate provided in table 5 is based on average costs for Type B compliance upgrades being installed at Brooklyn compressor station currently.

**TABLE 5:** PROJECT COST ESTIMATE,

| Cost | Total |
|---|---|
| Internal Labour | $100,000 |
| Materials | $900,000 |
| Contracted Labour | $800,000 |
| Other Costs | $160,000 |
| **Total** | $1,960,000 |

| Type B appliance Type | Est. Cost Each | CY23-CY27 Est. |
|---|---|---|
| Type B Assessment (21) | $10,000 | $210,000 |
| Waterbath (7) | $50,000 | $350,000 |
| Compressor (14) | $100,000 | $1,400,000 |
| | Total | $1,960,000 |

# 8 Acronyms

| Acronym | Definition/Description |
|---|---|
| AEMO | Australian Energy Market Operator |
| AGA | Australian gas association – Type B compliance governing body |
| API | American Petroleum Institute – publisher of standards |
| CHAZOP | Control system HAZOP – study of the control system functions to identify logic vulnerabilities |
| ESD | Emergency shutdown – control system-initiated shutdown designed to prevent incident escalation if operating parameters are breached |
| ESV | Energy Safe Victoria |
| HAZOP | Hazard and operability study |
| HMI | Human machine interface |
| ILI | Inline inspection – pipeline internal inspection |
| OEM | Original Equipment Manufacturer |
| RA | Risk Assessment |
| RBI | Risk Based Inspection – a process used to prioritise maintenance or inspection activities based on risk of failure. |

| | |
|---|---|
| **SIL** | Safety Integrity Level – an assessment used to rank control systems by their ability to fail safely |
| **SMS** | Safety Management Study |
| **VTS** | Victorian Transmission System |

## Appendix A – Energy Safe Victoria Correspondence

[redacted]

One of our inspectors, [redacted] 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".*

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

Regards

[redacted]
Energy Safe Victoria
Level 3, Building 2
4 Riverside Quay, Southbank 3006
[redacted]

**From:**
**To:**
**Cc:**
**Subject:** RE: AS3814 - Modification to Type B appliances
**Date:** Monday, 20 February 2012 8:15:55 AM

Dear

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 or myself know a.s.a.p. and we will see what we can arrange at the earliest opportunity to accommodate all.

With regards,

energysafe VICTORIA

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