Substation Asbestos Removal Business Case

energex

Executive Summary

Energex has made a commitment to the workers, contractors and the public for its buildings and facilities to be asbestos free by 2030. This is being achieved by proactively minimising the risk of asbestos exposure to workers, contractors and the public, through eliminating asbestos from our buildings, facilities and plant where reasonably practicable. While this is occurring, Energex manages the asbestos hazard and risk through ongoing identification, evaluation, training, the use of Safe Work Method Statements (SWMS) and monitoring of the condition of in-situ asbestos.

For the 2020-25 regulatory control period, Energex intends to manage and execute an $8 million program that will provide a structured and risk-based approach to the removal, management and control of building product Asbestos Containing Materials (ACM) within the substation network.

The intent of an Energex substation asbestos removal program is to ensure that all relevant legislation and compliance obligations consistent with the presence of ACM are met, as well as undertaking the appropriate and necessary measures to ensure the health and safety of employees.

In addition to meeting legislative compliance obligations and minimising the asbestos risk to employees and contractors, this business case also assesses a number of options that have been appraised through an economic analysis. The implementation of a proactive and targeted program to remove the building material ACM at Energex substations is the preferred option yielded from the economic analysis, with a net present value of approximately $0.469M and a benefit-cost ratio of 1.09. This option has also been assessed for sensitivity across a number of scenarios involving the increase in costs and reduction in assessed economic benefits. Through this sensitivity assessment, the option of executing a targeted building material ACM removal program has been evaluated as the preferred option under the majority of scenarios.

Contents

1 Introduction

Energex has made a commitment to the workers, contractors and the public for its buildings and facilities to be asbestos free by 2030. This is being achieved by pro-actively minimising the risk of asbestos exposure to workers, contractors and the public, through eliminating asbestos from our buildings, facilities and plant where reasonably practicable. While this is occurring, Energex manages the asbestos hazard and risk through ongoing identification, evaluation, training, the use of Safe Work Method Statements (SWMS) and monitoring of the condition of in-situ asbestos.

Energex has a structured, risk-based approach to the removal, management and control of Asbestos Containing Materials (ACM) within the substation network. The intent of an Energex substation asbestos removal program is to ensure that all relevant legislation and compliance obligations consistent with the presence of ACM are met, and Energex is undertaking necessary measures to ensure the health and safety of employees.

1.1 Purpose of document

The purpose of this document is to outline the justification for the proposed expenditure associated with the planned removal of building ACM in substations in the Energex network via a managed program to be completed by the year 2025, noting that the full program continues until 2030. This is a business case document and has been developed for the purposes of seeking funding for the required investment in coordination with the Energex Revised Regulatory Proposal to the AER for the 2020-25 regulatory control period.

1.2 Scope of document

The scope of this forecast expenditure includes all building material-related ACM within Energex substations that will be replaced on a site-by-site basis under the following scenarios:

- Proactive replacement as a stand-alone project at a given site, where no other projects will be undertaken at a site within the 2020-25 regulatory control period.
- Proactive replacement at a given site, where another project will be undertaken at a site within the 2020-25 regulatory control period.

There are also small quantities of asset-related ACM that exist within Energex substation network assets such as washers, gaskets, insulating boards in low-voltage panels, low-voltage electrical insulation such as in circuit breaker control looms. These small quantities of ACM are contained within network assets and not in the materials that make up substation buildings and structures, and Energex staff have been suitably trained to remove these small amounts of ACM as a part of their

normal duties of working on network assets. Hence any electrical asset-related ACM removal is not within the scope of this document.

1.3 Identified Need

Energex's approach to the removal of ACM falls within the EQL Asbestos Management Policy P045 consistent with Queensland Government intent, where EQL has committed to become asbestos free by 2030. The policy is manifest through the EQL Asbestos Management Plan (R077 Asbestos Management Plan).

Energex has been addressing asbestos issues steadily in the previous and current regulatory periods, however as the information from audits initiated since the formation of EQL has been gathered, the magnitude of the issue is now considered to require specific financial recognition.

The EQL Asbestos Management Policy and Asbestos Management Plan have been developed in line with good industry practice, as the presence of asbestos is both a health and safety issue as well as an industrial relations issue due to its critical relationship to staff safety. Outworking the Asbestos Management Policy and Plan is intended to resolve these issues.

Recent research indicates that in 2015 approximately 4,152 Australians died due to asbestos related diseases. According to the most recent Safe Work Australia reports, the occupations with the highest rates of workers' compensation claims for cancers (including mesothelioma and lung cancer) include electrical distribution tradespersons and Electricians, as these are in the top 5 job categories. Electricians were the second highest occupation for compensation claims for Mesothelioma and were the third highest occupation for compensation claims for asbestosis.

Since 1997 six former Energex employees and two former employees' partners have been diagnosed with an asbestos related disease. There is currently no cure for asbestos related diseases.

Given the age of some Energex's building assets, the ACM hazard requires careful management, the ongoing cost considerations associated with ACM management and staff protection, as well as the potential future costs of ongoing health care for impacted workers. There are approximately 566 sites across EQL that were built before 31 December 2003 that may contain ACM, and initial audits for these sites have been undertaken to better understand these inherent risk levels.

1.3.1 Energy Queensland Strategic Alignment

Table 1 below details how the Energex substation asbestos removal program contributes to corporate and asset management objectives.

Objectives	Relationship of Initiative to Objectives
Ensure network safety for staff contractors and the community	Removal of building ACM from substations significantly reduces the risk of asbestos-related illness occurring with our staff and contractors in which we are responsible.
Meet customer and stakeholder expectations	Efforts are focussed on the health and wellbeing on supporting customer-facing teams to efficiently deliver their work, without impact of ACM to work plans and delivery
Manage risk, performance standards and asset investments to deliver balanced commercial outcomes	Removing building material ACM in substations reduces the risk that other project will be impacted by adverse disturbance or other contamination in the future, reducing reactive costs and delay costs in future works programs

Table 1: Asset Function and Strategic Alignment

1.3.2 Limitation of existing assets

Existing Energex substation sites that contain ACM pose a latent hazard that has the potential to have adverse health and safety outcomes for both Energex staff and contractors. The nature of work in substation sites involves construction and renewal work, meaning it is difficult to guarantee that the ACM will remain undisturbed. In addition, shock vibrations related to circuit breaker operation tends to activate friable dust so introducing hazards for operational work as well.

Consideration of the most appropriate hierarchy of controls is required when assessing the hazards associated with building ACM, and although there are many administrative and engineering controls in place, the only certain way to eliminate the risks associated with ACM is to undergo a removal program.

1.3.3 Legislative compliance obligations

The following legislation, regulations and codes of practice apply with respect to ACM.

Legislation, Regulation, Code or Licence Condition	Obligations	Relevance to this investment
QLD Work Health & Safety Act 2001	A duty to eliminate risks to health and safety, so far as is reasonably practicable[1]. An obligation to ensure, so far as is reasonably practicable, the health and safety of: • workers and contractors in carrying out work of the business • other persons as a result of the work of the business • workers and other persons in respect of related premises and accommodation necessary for the business[2]. A Duty to ensure, so far as is reasonably practicable, that the management and control of fixtures, fittings or plant at workplaces are without risks to the health and safety of any person[3]. A declaration that asbestos and ACM are classed as Dangerous Goods[4]. An obligation, for the storage and handling of dangerous goods, even if the dangerous goods are not at a workplace or for use in carrying out work, to ensure, so far as is reasonably practicable, the health and safety of workers and the public[5]. A declaration that any construction work carried out in connection with asbestos is classed as High-Risk Construction work[6]. In this context, construction work means any work carried out in connection with the construction, alteration, conversion, fitting-out, commissioning, renovation, repair, maintenance, refurbishment, demolition, decommissioning or dismantling[7].	Chapter 8 of the Queensland Work Health and Safety Regulation 2011 prohibits work involving asbestos. The regulations seek to eliminate workers' exposure to asbestos, and if elimination is not reasonably practicable, to minimise exposure so far as is reasonably practicable, and to always ensure that workers are not exposed to asbestos above the exposure standard (0.1fibres/millilitre of air on a time weighted average(ppm))[8].
Australian Government Asbestos Safety and Eradication Agency	Promotes that this is no minimum safe level of exposure to asbestos. Among its many publications, guidelines and documents, they have provided the Chrysotile Asbestos Fact Sheet which states: Workplaces can put measures in place that can minimise exposure risk, using a hierarchy of controls, but these will not prevent exposure completely unless the hazard is eliminated.	Energex should consider removal of ACM to eliminate the hazard as per the hierarchy of controls.

[1] Queensland Work Health and Safety Act 2011 s17
[2] Queensland Work Health and Safety Act 2011 s19
[3] Queensland Work Health and Safety Act 2011 s21
[4] Queensland Work Health and Safety Act 2011 Schedule 1 Part 1
[5] Queensland Work Health and Safety Act 2011 Schedule 1 Part 1
[6] Queensland Work Health and Safety Regulations s291
[7] Queensland Work Health and Safety Regulations s289
[8] Safe Work Australia: Workplace exposure standards for airborne contaminants, effective April 2013

Legislation, Regulation, Code or Licence Condition	Obligations	Relevance to this investment
Australian Government Safe Work Australia Code of Practice	Promotes that the ultimate goal of asbestos prohibition is for all workplaces to be free of asbestos. Within the Code of Practice, it states: A person conducting a business or undertaking (PCBU) must always aim to eliminate a hazard and associated risk first, for example by removing the asbestos, furthermore it states that the ultimate goal is to have a workforce free from asbestos. Removal may be the most appropriate way to achieve this.	Energex should consider removal of ACM to eliminate the hazard as per the hierarchy of controls.
Queensland Office of Industrial Relations, Workplace Health and Safety Queensland	Code of Practice states: If asbestos or ACM is identified in a workplace and demolition or refurbishment work is going to be carried out, the asbestos or ACM must be removed if it is likely to be disturbed before the work starts. If other maintenance or service work is to be carried out at the workplace, removal of asbestos should be considered as a control measure.	Energex considers proactive removal of asbestos is "reasonably practicable" and meets the requirement under section 35 of the Qld Workplace legislation.
Queensland Government Workplace Health and Safety Electrical Safety Office	Within the Work Health and Safety Regulation 2011 Chapter 3, 3.1 Managing Risk to Health and Safety it states: A duty holder in managing risks to health and safety must- (a) eliminate risks to health and safety so far as reasonably practicable.	Energex considers proactive removal of asbestos is "reasonably practicable" and meets the requirement under section 35 of the Qld Workplace legislation.
Queensland Government Department of Housing and Public Works	Guide asbestos management through the Queensland Government Asbestos Management Policy for its Assets, which states: Our long-term objectives are for all assets managed or controlled by government departments to be free of asbestos containing materials	Energex considers proactive removal of asbestos is "reasonably practicable" and meets the requirement under section 35 of the Qld Workplace legislation.

Table 2: Relevant legislation, regulations and codes of practice

Energex has developed its Asbestos Removal Plan to align with the Australian and Queensland Government positions on the removal and management of asbestos containing materials in order to maintain government, shareholder and community expectations.

1.3.4 Health and safety obligations

Energex also recognises that there is a risk of historical and present asbestos exposure for some of its employees, particularly electrical distribution tradespersons. This aligns with Safe Work Australia recently reported findings that one of the occupations with the highest rates of workers compensation claims for cancers including mesothelioma and Lung Cancer associated with asbestos exposure is

electrical distribution tradespersons. Unfortunately, there is currently no cure available once a person contracts asbestos related disease, it is considered a terminal diagnosis.

Energex can see evidence of this trend in their current and previous electrical distribution tradesperson employee groups due to the rising number of asbestos related claims and freedom of information requests for related asbestos related records. Energex and WorkCover Queensland have settled a growing number of claims with ex-employees including two wives of ex-employees who have contracted asbestos related diseases through being in contact with asbestos or cleaning uniforms, tools and equipment which have been in contact with asbestos.

Energex believe this issue is growing in significance and as a result, has an ongoing monitoring program to manage and measure staff exposure to asbestos and asbestos related materials. As per the monitoring program, currently EQL has:

- 758 employees that have indicated that they have been exposed to asbestos whilst working for Energex and Ergon Energy
- 54 employees have participated in Asbestos Medical Testing in the last 12 months
- 1 current service employee who has been diagnosed with an asbestos related disease
- An unknown, but likely growing number of previous employees who have been diagnosed with an asbestos related disease

Energex continues to manage this growing issue in relation to its current and previous staff, however it reinforces the need to prevent future staff, customer and community exposure to asbestos and asbestos containing materials. Energex's current experience confirms the need for and benefit of investing in a proactive Asbestos Removal Program, such as the program proposed for Energex during the next regulatory control period.

1.3.5 Industrial relations considerations

The significance of asbestos related disease and its prevention is also a clear priority for Energex staff and their union representatives who promote the benefits of Energex's proactive Asbestos Removal Program. In the Energy Queensland Union Collective Agreement, which guides the employment conditions for the majority of the organisation's electrical distribution tradespersons, it includes specific asbestos related requirements and associated commitments. This Union Collective Agreement has been ratified by the Fair Work Commission and is binding upon EQL, and the commitment of asbestos management in the Energex network was strengthened during the formation of EQL as it was recognised that it did not previously have the commitment it requires in the Energex network.

Under this industrial agreement, EQL has a documented goal of achieving, as far as is reasonably practical, an asbestos free workplace as per the details below:

Energy Queensland Union Collective Agreement Section 14.8 states:

- *In line with the Queensland Code of Practice for How to Manage and Control Asbestos in the Work Health and Safety Act 2011 and relevant legislation (as amended from time to time), the long-term goal of Energy Queensland is to achieve, as far as is reasonably practicable, an asbestos-free workplace.*

- *Energy Queensland will continue to maintain and further develop an asbestos management plan, with a view to achieving the objective which is set out above.*

- *Energy Queensland commits to introducing to introducing an EQL Asbestos Management Policy within 3 months of approval of agreement.*

As per this section of the agreement, EQL has clear industrial commitment to facilitate asbestos removal and create an asbestos free workplace. There is a risk that any approach other than a proactive substation building ACM removal program may result in industrial action and other operational impacts. While this risk is currently low due to the proactive program currently employed as well as open communications with industrial unions, this risk is expected to increase substantially if this approach changes.

Any lost operational productivity of EQL's workforce due to industrial action because of changes to EQL's asbestos approach, is likely to significantly and quickly erode any financial gains that may come for implementing cheaper non-removal asbestos strategies. This is also likely to translate directly to a reduction in customer reliability service performance and consistently of supply.

2 Counterfactual Analysis

2.1 Purpose of asset

Substation buildings are critical components of the Energex substation network, as they house assets such as protection and control equipment, medium voltage switchgear, communications equipment, AC and DC supplies and a host of other assets and secondary systems. Their integrity is critical for safety as well as for continuity of supply to deliver services to the standards expected by the community.

2.2 Business-as-usual service costs

The ongoing costs for substation building assets relate to ongoing inspection and remediation of defects on these assets as they age, however, the presence of ACM does have an impact on the ability to easily replace existing equipment within sites with new equipment, if the building materials (walls, ceilings, flooring etc.) contain ACM and require disturbance. Once ACM has been identified, it is not uncommon for projects and work to be delayed for a time until qualified asbestos contractors have undertaken removal activities, and clearance certificates have been received.

2.3 Key assumptions

The counterfactual option in this case is assumed to be that Energex will not manage a proactive program to have all building material ACM removed from its substation network, only removing ACM as it degrades and requires urgent attention due to a heightened level of risk.

2.4 Risk assessment

A qualitative risk assessment has also been conducted in Table 3 below in accordance with the EQL Network Risk Framework and the Risk Tolerability table from the framework is shown in Appendix B**Error! Reference source not found.**.

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
ACM deteriorates to a point that it becomes friable before it is identified and rectified. Multiple workers are exposed to the friable ACM and develops a serious asbestos-related illness resulting in **multiple incurable fatal illnesses**.	Safety	6 *(Multiple incurable fatal illnesses)*	3 *(Unlikely)*	**18** ***(High)***	2020
ACM is accidently disturbed by workers while replacing assets in a substation, exposing two workers of the crew to friable ACM. These workers go on to develop **multiple long-term asbestos related disease/illnesses**	Safety	4 *(Multiple serious illnesses)*	3 *(Unlikely)*	**12** ***(Moderate)***	2020
ACM is accidently disturbed by workers while replacing assets in a substation, exposing workers of the crew to friable ACM. A family member from a worker is exposed to ACM while laundering their clothing and go on to develop a **single long-term asbestos related disease/illness**	Safety	3 *(Single serious illnesses)*	3 *(Unlikely)*	**9** ***(Low)***	2020
ACM is accidently disturbed by workers while replacing assets in a substation. Energex reports the incident to the regulatory bodies and an **improvement notice is issued by the regulator**	Legislated	4 *(Improvement notice)*	3 *(Unlikely)*	**12** ***(Moderate)***	2020
ACM is accidently disturbed by workers while replacing assets in a substation, forcing the ACM removal to be undertaken immediately by accredited removalists, and providing delays to the planned work. This results in a **significant impact on any restoration or planned works equating to >$100,000 in additional costs and delay**.	Business	2 *(Asset impact)*	4 *(Likely)*	**8** ***(Low)***	2020

Table 3: Counterfactual risk assessment

Further Details of the risk ratings and descriptions can be found in Energy Queensland's Network Risk Framework.

3 Options Analysis

3.1 Options considered but rejected

The only option that was rejected as a part of this assessment was the 'Do Nothing' option. This option would have Energex effectively undertake zero works for ACM removal at substation sites for the 2020-25 regulatory control period.

The reasons that this option was rejected are outlined as follows:

- It does not allow Energex to comply with the respective legislation outlined in section 1.3.3 above
- As sites degrade and ACM becomes friable, Energex has an obligation to act and ensure the health and safety of staff and contractors, and doing nothing could be considered negligent behaviour
- It does not align with the EQL Asbestos Management Policy to support becoming asbestos-free by 2030
- There are many limitations with asbestos containment and over time, 100% containment becomes problematic and impractical. This reduces Energex's ability to ensure a safe working environment.

3.2 Identified options

3.2.1 Option 1 – Remove ACM as Degradation Occurs

This option does not employ a proactive building ACM removal program for Energex substations, rather only removes ACM at a site when and where either:

I. ACM is forecast to be disturbed or impacted by other non-ACM related works (e.g. replacing assets within a substation control building); or
II. degradation occurs to a point when removal is required to manage the escalated health and safety hazard. This occurs as assets age and their condition degrades and the ACM becomes exposed or friable.

3.2.2 Option 2 – Remove ACM in Conjunction with Other Works as they Occur

This option involves only removing building-related ACM at substation sites in conjunction with other projects that are occurring at those sites, as those projects are forecast in the future programs of work.

3.2.3 Option 3 – Remove ACM under a Specific Managed Program from 2020-2025 (Proposed)

This option involves implementation of a targeted building-related ACM removal program at Energex substation sites to manage ACM removal in a proactive manner. Sites that contain ACM and have major projects forecast in the 2020-25 regulatory control period will have the ACM removal added to their project scopes. Sites that that contain ACM and do not have major projects forecast in the 2020-25 regulatory control period will be managed within the period via a stand-alone ACM removal project. All sites will be completed by 2025.

3.2.4 Option 4 – Remove ACM under a Specific Managed Program from 2020-2030

This option involves implementation of a targeted building-related ACM removal program at Energex substation sites to manage ACM removal in a proactive manner. Sites that contain ACM and have major projects forecast in the 2020-30 regulatory control period will have the ACM removal added to their project scopes. Sites that that contain ACM and do not have major projects forecast in the 2020-30 regulatory control periods will be managed within the period via a stand-alone ACM removal project. All sites will be completed by 2030.

3.3 Economic Assessment

The respective assumptions, costs and benefits that have been used for each option in the economic analysis can be found in Appendix A.

Based on the cost and benefit estimates outlined above, the NPV and benefit-cost ratio for all options was evaluated and the results are shown below in Table 4.

In thousands of dollars	Net Present Value	PV of costs	PV of benefits	B/C Ratio
Option 1: Remove ACM as degradation occurs	-589	-2,623	2,034	0.78
Option 2: Remove ACM in Conjunction with other works as they occur	-1,853	-3,236	1,384	0.43
Option 3: Remove ACM under a specific managed program from 2020-2025	469	-5,227	5,696	1.09
Option 4: Remove ACM under a specific managed program from 2020-2030	284	-4,752	5,036	1.06

Table 4: Summary of NPV Results

Based on the economic analysis, Option 3 (targeted asbestos removal program from 2020-25) is the preferred option from both key economic indicators, as the option presents the highest NPV and benefit-cost ratio. Option 4 to undertake a managed program to remove all ACM in a 10-year period (2020-30) is second in ranking, with an NPV $185k lower than Option 3 and a slightly lower benefit-cost ratio.

Options 1 and 2 are both derive negative net present values and should not be further considered as the most economical options for consideration.

3.4 Scenario Analysis

3.4.1 Sensitivities

Based on the number of sites in which asbestos has been removed within both the Energex and Ergon networks, Energex has a high level of confidence in the asbestos removal costs in the forward forecast used for the economic assessment. However, in order to assess the sensitivity of the ROI assessment, a Monte Carlo analysis has been modelled across a known range of +/-20% decrease/increase to the base ACM removal costs. Changes (increase/decrease) to the inspection and staff training costs were not included in the Monte Carlo analysis because these costs are

relatively fixed and unlikely to change (for example, inspection costs are a fixed rate undertaken by a third party under contract).

A summary of the sensitivity analysis is shown in Table 5 below.

In thousands of dollars	Rank	Average NPV	Maximum NPV	Minimum NPV	Best NPV	Worst NPV
Option 1: Remove ACM as degradation occurs	3	-581	-395	-794	0.0%	0.0%
Option 2: Remove ACM in Conjunction with other works as they occur	4	-1,876	-1,646	-2,100	0.0%	100.0%
Option 3: Remove ACM under a specific managed program from 2020-2025	1	354	1,322	-496	61.5%	0.0%
Option 4: Remove ACM under a specific managed program from 2020-2030	2	230	812	-441	38.5%	0.0%

Table 5: NPV Sensitivity Monte Carlo Results

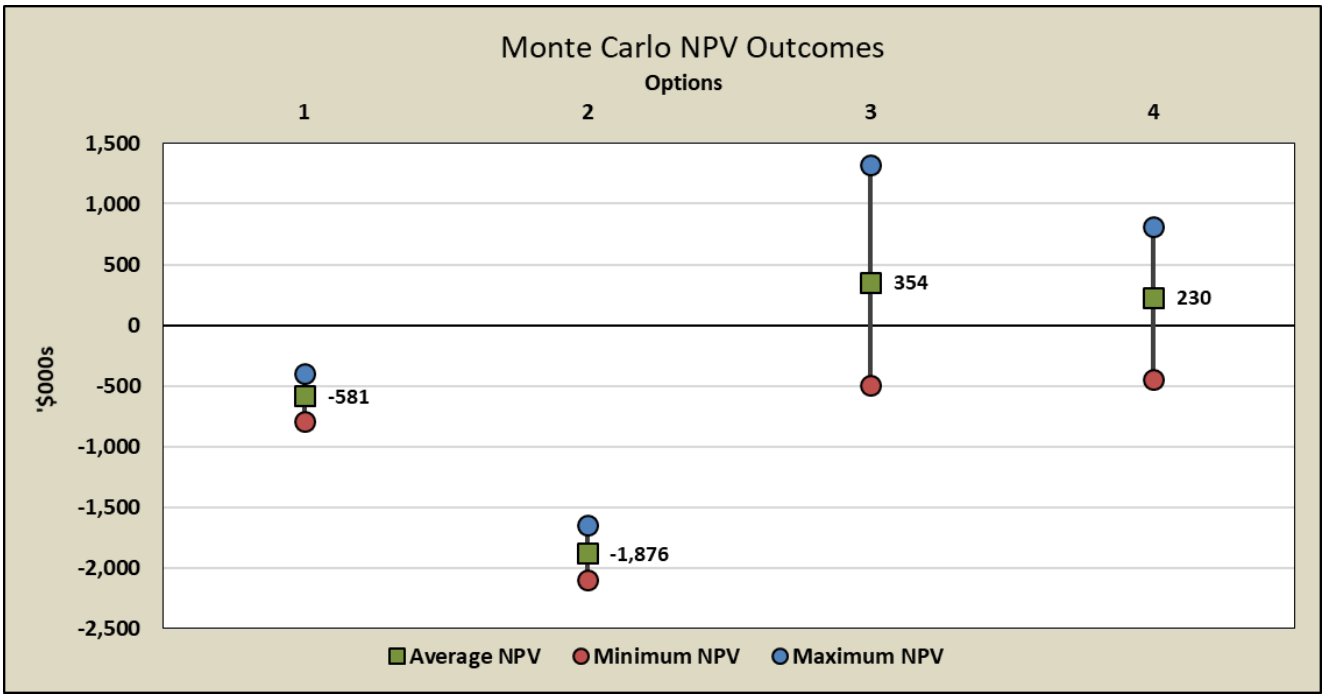

Figure 1: NPV Sensitivity Monte Carlo Results

The table above indicates that a Monte Carlo analysis using 5,000 iterations has Option 3 derived as the preferred option 61.5% of the time, Option 4 favourable 38.5% of the time, while Option 2 yields the worst NPV 100% of the time.

In addition, it can be seen from Figure 1 that from a purely economic perspective, Option 3 is more likely to generate a more favourable result over Option 4 under the majority of simulated scenarios. Both Options 3 and 4 share similar minimum NPVs under the simulated scenarios, however Option 3 has a much greater best-case NPV. From this perspective, Options 1 and 2 should be dismissed and Option 3 should be chosen as more favourable over Option 4 due to the greater upside when assessed against the sensitivity of ACM removal costs.

3.4.2 Value of regret analysis

The key regret identified in this business case is the adverse impact of employees potentially obtaining an asbestos-related disease as a result of ACM exposure. The value of this risk has been quantified and included in the economic analysis shown above.

As can be seen in Table 5 above, Option 2 has the worst NPV 100% of the time under each scenario so should not be considered further, as the ACM removal is very slow and ongoing ACM exposure levels remain in place for many years. Option 1 is also less favourable to Options 3 and 4 under most circumstances so should not be pursued.

When considering Options 3 and 4, both are most favourable in 100.0% of simulated cases and represent the best options in terms of benefit-cost ratio. Even under worst case conditions, Options 3 and 4 are higher in NPV than Option 1 and given that this NPV difference is still relatively moderate with respect to the overall $8 million program size, the ongoing benefits post-2025 or post-2030 of having all building material ACM removed from the Energex substation network, it is considered a relatively minor consideration in the assessment.

Hence pursuing either Option 3 or Option 4 to undertake a planned and managed ACM removal program would represent a ‘no regret’ decision.

3.5 Qualitative comparison of identified options

3.5.1 Advantages and disadvantages of each option

Table 6 below details the advantages and disadvantages of each option considered.

Option	Advantages	Disadvantages
Option 1 – Remove ACM as degradation occurs	Reduced funding for the 2020-25 regulatory control period	OPEX and CAPEX funding is forecast to be increased and extended for some decades Higher ACM risk exposure for personnel Site access restrictions will be invoked due to ACM as it degrades and becomes friable ACM removals are not completed in a planned manner where areas can be bundled to achieve cost efficiencies
Option 2 – Remove ACM in conjunction with other works as they occur	Reduces the initial CAPEX spend	Higher risk of personnel exposed to asbestos fibres Total CAPEX spend will be higher as the ACM degrades over time, the risk increases, and remediation is more difficult and costly OPEX costs will increase as a result of additional testing and inspection required due to contamination as ACM degrades ACM removals are not holistically completed in a planned manner where areas can be bundled to achieve overall cost efficiencies Site access restrictions will be invoked due to ACM as ACM degrades and becomes friable Removals will impact other work being completed at some sites, as all site access must be restricted when ACM removal works are underway (hence other works must be suspended)
Option 3 – Remove ACM under a specific managed program from 2020-2025	Higher net present value Reduces the latent risk of ACM exposure to personnel Reduced total CAPEX program costs OPEX inspection/testing costs are eliminated after 5 years Cost effective delivery through coordination and bundling with other work Aligns with EQL asbestos policy	Higher initial CAPEX cost

Option	Advantages	Disadvantages
Option 4 – Remove ACM under a specific managed program from 2020-2030	Highest net present value Reduces the latent risk of ACM exposure to personnel Reduced total CAPEX program costs OPEX inspection/testing costs are eliminated after 10 years Cost effective delivery through coordination and bundling with other work Aligns with EQL asbestos policy Lower initial CAPEX spend over Option 3	ACM exposure is present 5 years longer than Option 3

Table 6: Qualitative assessment of options

3.6 Risk Assessment Following Implementation of Proposed Option

The qualitative risk assessment outlined in Section 2.4 above has been revisited in Table 7 below, following the implementation of the proposed option to undertake a proactive and managed substation building-material ACM removal program from 2020-25.

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
ACM deteriorates to a point that it becomes friable before it is identified and rectified. Multiple workers are exposed to the friable ACM and develops a serious asbestos-related illness resulting in **multiple incurable fatal illnesses**.	*(Original)*				
	Safety	*6 (Multiple incurable fatal illnesses)*	*3 (Unlikely)*	***18 (High)***	*2020*
	(Mitigated)				
	Safety	6 *(Multiple incurable fatal illness)*	1 *(Almost no likelihood)*	**6 *(Very Low)***	2025
ACM is accidently disturbed by workers while replacing assets in a substation, exposing two workers of the crew to friable ACM. These workers go on to develop **multiple long-term asbestos related disease/illnesses**	*(Original)*				
	Safety	*4 (Multiple serious illnesses)*	*3 (Unlikely)*	***12 (Moderate)***	*2020*
	(Mitigated)				
	Safety	*4 (Multiple serious illnesses)*	1 *(Almost no likelihood)*	**6 *(Low)***	2025
ACM is accidently disturbed by workers while replacing assets in a substation, exposing workers of the crew to friable ACM. A family member from a worker is exposed to ACM while laundering their clothing and go on to develop a **single long-term asbestos related disease/illness**	*(Original)*				
	Safety	3 *(Single serious illness)*	3 *(Unlikely)*	**9 *(Low)***	2020
	(Mitigated)				
	Safety	3 *(Single serious illness)*	1 *(Almost no likelihood)*	**3 *(Very low)***	2025
ACM is accidently disturbed by workers while replacing assets in a substation. Energex reports the incident to the regulatory bodies and an **improvement notice is issued by the regulator**	*(Original)*				
	Legislated	4 *(Improvement notice)*	3 *(Unlikely)*	**12 *(Moderate)***	2020
	(Mitigated)				
	Legislated	4 *(Improvement notice)*	1 *(Almost no likelihood)*	**4 *(Very low)***	2025

ACM is accidently disturbed by workers while replacing assets in a substation, forcing the ACM removal to be undertaken immediately by accredited removalists, and providing delays to the planned work. This results in a **significant impact on any restoration or planned works equating to >$100,000 in additional costs and delay**.	*(Original)*				
	Business	*2 (Asset impact)*	*4 (Likely)*	***8 (Low)***	*2020*
	(Mitigated)				
	Business	2 *(Asset impact)*	2 *(Very unlikely)*	**4 *(Very Low)***	2025

Table 7: Post-program risk assessment

4 Recommendation

The preferred option is to remove all building-related ACM from Energex substations within the 2020-25 regulatory control period through an $8 million targeted and managed program. This option is preferred as it has the highest positive NPV and benefit-cost ratio of all options considered, is the most favourable option from an economic perspective during sensitivity analysis, and has all respective ACM removed in the forward 5-year window, minimising future exposure and risk.

Energex will take advantage of bundling opportunities for delivery and to minimise overall the cost to undertake this work. If projects in the forward program are scheduled to be undertaken at a site that is also flagged for ACM removal works (based on priority, exposure etc.) then the ACM removal will be incorporated into the broader project scope of works.

For sites that require ACM removal but do not have other works scheduled in the forward 2020-25 program, a separate project will be raised to address the ACM removal only.

By undertaking a proactive asbestos removal program, Energex expects to not only mitigate but eliminate asbestos-related exposure over time, while exercising the most prudent investment practice.

Appendix A. Economic Analysis Information

Introduction to the Cost-Benefit Analysis Framework

A useful way of highlighting the benefits of such a workplace health and safety intervention is by estimating and reporting the Return on Investment (ROI), the investment's "bang for buck", or the ratio of dollars of benefits to dollars of costs. The ROI ($ of benefits/$ of costs) will be calculated using a standard cost-benefit analysis model which includes estimated costs and benefits over a 20-year time horizon and discounts future costs and benefits to present values (PVs) by applying a discount rate.

Overview of Benefit and Cost Items to be Estimated

An overview of the broad benefits and costs that will be included in the economic analysis are listed below in Table 8.

Benefits	Costs
Avoided costs of audits every 1 and 3 years at high risk and moderate risk sites respectively	Asbestos removal and replacement at sites (along with placement of QR codes)
Deferred cost of eventually having to replace asbestos in the future	Risk assessments
Long-term reduction in asbestos related disease	Training of staff and ongoing repeat training for currency

Table 8: Overview of costs and benefits

Estimation of Costs

The estimation approach of the costs that will be included in the economic analysis are listed below in Table 9.

Cost Item	Estimation Approach
Asbestos removal in the 2020-25 period	Funding over 5 years of $8 million, with expenditure annualised (i.e. $1.6 million per annum)
Asbestos inspection (audits) in the 2020-25 period	A uniform rate of $900 per audit. There are 3 high risk sites, and 35 moderate risk sites in the 2020-25 program of work
Asbestos inspection (audits) in the 2025-40 period	A uniform rate of $900 per audit
Asbestos removal in 20 years' time	Present value based on current rates
Staff training	Field staff will require continued basic asbestos training every 2 years

Table 9: Estimation approach for costs

Estimation of Benefits

The estimation approach of the benefits that will be included in the ROI analysis are listed below in Table 10.

Cost Item	Estimation Approach
Avoided or deferred costs of audits at high risk and moderate risk sites	A uniform rate of $900 per audit. High risk sites are audited annually, and moderate risk sites are audited every 3 years. These costs have been annualised in the model
Deferred cost of eventually having to replace all asbestos in the future	This assumes that in the 'Remove ACM as it degrades' option, remaining asbestos will need to be removed after 20 years
Long-term reduction in asbestos related disease	Risk monetisation calculation involving the Value of Statistical Life (VoSL), disproportionate factor of 12, 6 people (see Section 1.3), 1 in 40 years and a 1 in 100 chance of acquiring an asbestos-related disease
Avoided cost of outages and other network impacts, including work plan disruption	Not quantified as difficult to forecast the number of outages and impacts

Table 10: Estimation approach for benefits

Assumptions Used for the Cost-Benefit Analysis

The following assumptions have been included in the analysis:

- Weighted Average Cost of Capital (WACC) used as the discount rate is 3.16% (regulated real pre-tax WACC) as per the EQL Network NPV Tool
- Value of Statistical Life (VSL) of $4.5M[9] with a disproportion factor of 12[10]

Option 1 – Remove ACM as Degradation Occurs

The following assumptions have been included for the base case option:

- Only 5 of the 38 sites currently targeted have their asbestos removed in the 2020-25 period. This is annualised as 5/38 x $8,000,000/5 = $210k per annum
- Inspection costs are a flat rate at $900 per site from 2020-25
- Inspection costs from 2025-40 are a flat rate at $900 per site
- One site per annum degrades and requires ACM removal (costed at 1/38 x $8M = $210k per annum)
- Removal costs for 18 sites that remain after 20 years have been calculated as 18/38 x $8M = $3.8M in 20 years' time
- Staff training in 2020-25 of 1,000 field staff training 2 hours every 2 years at $75/hour (annualised)
- Staff training from 2025-2040

[9] Best Practice Regulation Guidance Note Value of Statistical Life (accessed September 2019) https://www.pmc.gov.au/sites/default/files/publications/Value_of_Statistical_Life_guidance_note.pdf

[10] Energex selected based on monetisation risk model. Factor of 12 used for an inherent safety consequence of 6 (multiple fatal incurable illnesses)

- 20 sites will be completed within the next 20 years, so 18 sites remain. Deferred benefit is based on the 18 site deferred completed and is calculated as 18/38 x $8M = $3.8M in 20 years' time.

Option 2 – Remove ACM in conjunction with other works

The following assumptions have been included for the base case option:

- Only 8 of the 38 sites currently targeted have their asbestos removed in the 2020-25 period. This is annualised as 8/38 x $8,000,000/5 = $337k per annum
- Inspection costs are a flat rate at $900 per site from 2020-25
- Inspection costs from 2025-40 are a flat rate at $900 per site
- 20 sites have their ACM removed between 2025 and 2040. Distributed evenly as 1 or 2 sites per year
- Removal costs for 10 sites that remain after 20 years have been calculated as 10/38 x $8M = $2.11M in 20 years' time
- Staff training in 2020-25 of 1,000 field staff training 2 hours every 2 years at $75/hour (annualised)
- Staff training from 2025-2040
- 10 sites remain by 2040. Deferred benefit is based on the 10 sites completed and is calculated as 10/38 x $8M = $2.11M in 20 years' time
- Long-term reduction in asbestos related disease - Assume 20% of this benefit of Option 3 as asbestos is removed very slowly ($4.5M VoSL x 12 disproportionate factor x 6 people x 1 in 40 years x 1 in 100 chance) * 20% = $16.2k per annum.

Option 3 – Remove ACM in a Managed Program from 2020-25

The following assumptions have been included for the base case option:

- All 38 sites will have their asbestos removed in the 2020-25 period. This is annualised as $8,000,000/5 = $1.6M per annum
- Inspection costs are a flat rate at $900 per site
- Staff training in 2020-25 of 1,000 field staff training 2 hours every 2 years at $75/hour (annualised)
- Avoided costs are based on asbestos audits, with high risk sites requiring annual inspections, and moderate risk sites requiring inspection every 3 years. These costs have been annualised [high risk is 3 sites x 900 = $2,700 per annum, moderate risk is 35 sites/3 x 900 = $13,200 per annum]
- Avoided ACM removal benefit is based on all sites completed and is calculated as $8M in 20 years' time
- Long-term reduction in asbestos related disease $4.5M VoSL x 12 disproportionate factor x 6 people x 1 in 40 years x 1 in 100 chance) = $81k per annum.

Option 4 – Remove ACM in a Managed Program from 2020-30

The following assumptions have been included for the base case option:

- 19 sites will have their asbestos removed in the 2020-25 period, and 19 sites in the 2025-30 period. This is annualised as $8,000,000/10 = $800k per annum
- Inspection costs are a flat rate at $900 per site
- Staff training in 2020-30 of 1,000 field staff training 2 hours every 2 years at $75/hour (annualised)
- Avoided costs are based on asbestos audits, with high risk sites requiring annual inspections, and moderate risk sites requiring inspection every 3 years. These benefits are 50% of those incurred for Option 3 as the ACM removal takes twice as long (i.e. twice the exposure period). This equates to $6,600 per annum.
- Avoided ACM removal benefit is based on all sites completed and is calculated as $8M in 20 years' time
- Long-term reduction in asbestos related disease is assessed as 50% of the benefit of Option 3, as the ACM removal takes twice as long (i.e. twice the exposure period). This equates to 50% x $4.5M VoSL x 12 disproportionate factor x 6 people x 1 in 40 years x 1 in 100 chance) = $40.5k per annum.

Appendix B. Risk Tolerability Scale

Risk Analysis 6x6 multiplication R=C x L		Consequence →					
		1	2	3	4	5	6
Likelihood ↑	6	6	12	18	24	30	36
	5	5	10	15	20	25	30
	4	4	8	12	16	20	24
	3	3	6	9	12	15	18
	2	2	4	6	8	10	12
	1	1	2	3	4	5	6

Network Risks - *Risk Tolerability Criteria and Action Requirements*					
Risk Score	Risk Descriptor		Risk Tolerability Criteria and Action Requirements		
30 – 36	*Intolerable* (stop exposure immediately)				
24 – 29	*Very High Risk*	*ALARP Risk in this range managed to As Low As Reasonably Practicable	Executive Approval (required for continued risk exposure at this level)	May require a full Quantitative Risk Assessment (QRA) Introduce new or changed risk treatments to reduce level of risk Periodic review of the risk and effectiveness of the existing risk treatments	SFAIRP Risks in this area to be mitigated So Far as is Reasonably Practicable
18 – 23	*High Risk*		Divisional Manager Approval (required for continued risk exposure at this level)	Introduce new or changed risk treatments to reduce level of risk Periodic review of the risk and effectiveness of the existing risk treatments	
11 – 17	*Moderate Risk*		Group Manager / Process Owner Approval (required for continued risk exposure at this level)	Introduce new or changed risk controls or risk treatments as justified to further reduce risk Periodic review of the risk and effectiveness of the existing risk treatments	
6 – 10	Low Risk				
1 to 5	*Very Low Risk*		No direct approval required but evidence of ongoing monitoring and management is required	*Periodic review of the risk and effectiveness of the existing risk treatments*	

**Note: SFAIRP to be used for Safety Risks and ALARP for Network Risks*

Figure 2: Risk tolerability scale for evaluating semi-quantitative risk score

Appendix C. Reconciliation Table

Reconciliation Table Conversion from $18/19 to $2020	
Business Case Value	
(M$18/19)	$8.00
Business Case Value	
(M$2020)	$8.34