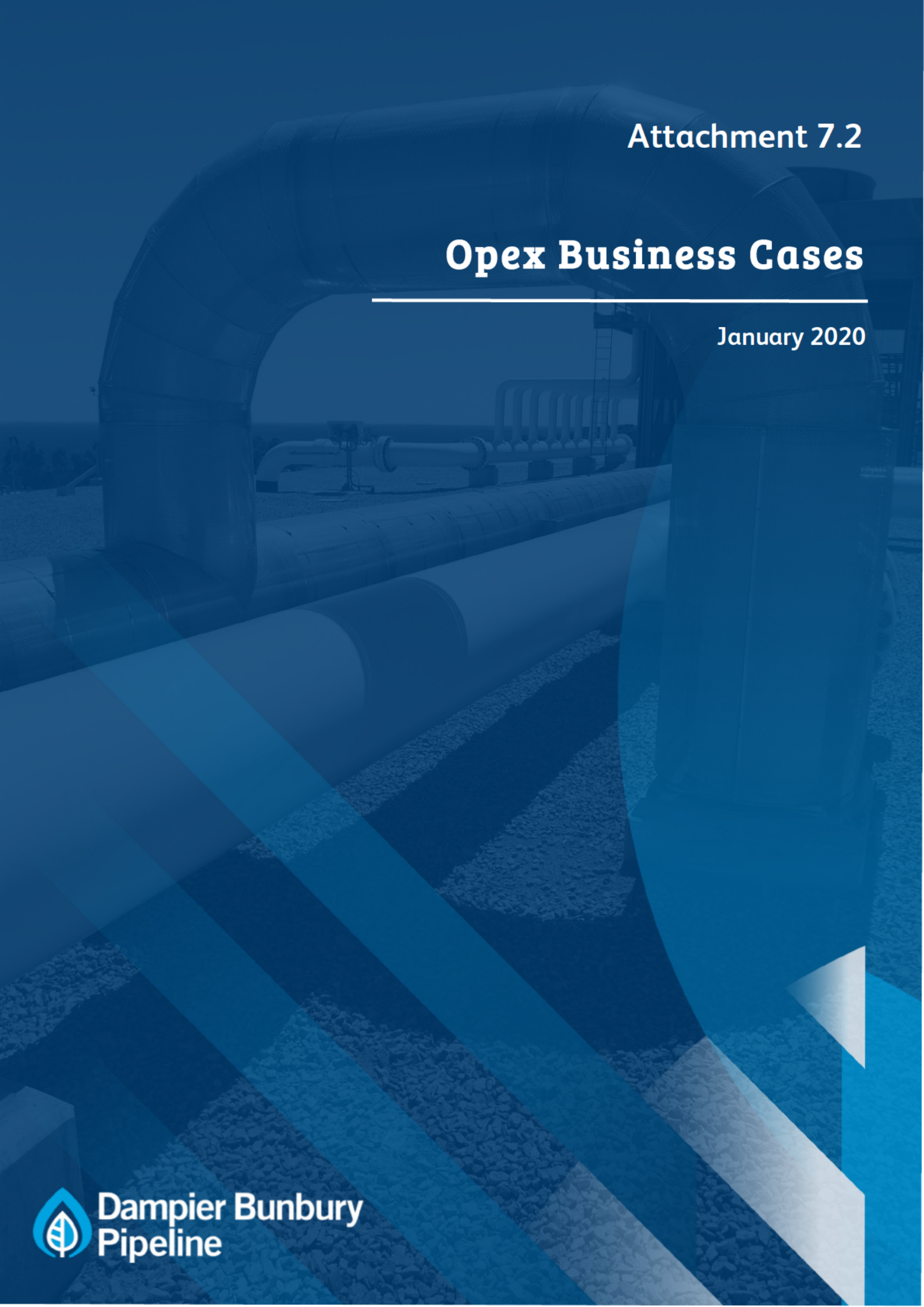
Attachment 7.2

Opex Business Cases

January 2020



Dampier Bunbury Pipeline

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Health, Safety and Environment Business Case – Opex DBP04

1.1 Project Approvals

Table 1.1: Health, Safety and Environment DBP04 – Project approvals

Prepared By	Tawake Rakai, General Manager Transmission Asset Management
Reviewed By	Tawake Rakai, General Manager Transmission Asset Management
Approved By	Tawake Rakai, General Manager Transmission Asset Management

1.2 Project Overview

Table 1.2: Health, Safety and Environment DBP04 – Project overview

Description of Issue/Project	This business case outlines Health, Safety and Environment (HSE) initiatives across the AA5 period, reflecting our ongoing commitment to continually improve the safety of our people. This commitment is embedded in our vision and required by both external regulation, the Safety Case and commitment to driving leading indicators in safety. Our HSE forecast in this business case includes an allowance for planned Health and Safety initiatives which impact on the current management of occupational health and safety practices on the DBNGP.
Project Name	Health, Safety and Environment
Estimated Cost	Total forecast opex for the next Access Arrangement (AA5) is $0.45 million.
Basis of costs	All costs in this business case are expressed in real June 2019 dollars unless otherwise stated.
Variation from AA4	The proposed AA5 expenditure is $0.25 million more than the estimated expenditure for AA4, and $0.15 million less than that allowed for in AA4. The AA5 forecast allows for: 1. System adjustments to support introduction of the Mental Health Code of Practice; 2. Expert advice on Health and Safety Management systems for alignment with new legislation; 3. An allowance for system updates to accommodate environmental legislation changes; 4. Having access via electronic tools on safety procedures, on boarding details of contractors and ensure resources in the field are job ready – having safety rules and documents in shape for this improvement program would be part of this initiative 5. There are ongoing investigations into the suitability of safety clothing in the work place that can sustain heat stress in summer and cold stress in winter – technology on clothing is always on the improve and this is an opportunity that come under this proposal 6. The services to drive improvements in our Wellness initiatives These programs whilst have specific initial instigation as HSE improvement programs, broader business wide implementation of these initiatives will require proper business case justifications.
Consistency with the National Gas Rules (NGR)	National Gas Rule 91 requires that operating expenditure must be 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 delivering pipeline services. The planned Health and Safety initiatives in AA5 have a strong focus on improving the safe working environment for all employees and contractors, therein contributing to an optimised work environment, reflecting best practice from the industry and broader work environment

	expectations. The forecast is based on actual expenditure incurred for the most similar, recent engagements. The allowance for expenditure in the event of a change in environmental legislation reflects a conservative estimate, based on the actual experience in AA4 where environmental legislation changes required the installation of meters on all bores under the DBNGP. This is consistent with rule 74 (2) which requires the forecast to be (a) arrived at on a reasonable basis; and (b) represent the best forecast or estimate possible in the circumstances.
Stakeholder Engagement	Our shippers communicated the high value they place on current levels of reliability and expressed concern at the prospect of this changing in the future. They also noted that they expect us to maintain a strong focus on operational issues as it is important for reliability and emergency management. During Shipper Roundtables, we shared key areas of future planning, including proposed capex and opex. Shippers were broadly comfortable with our approach and high-level program in AA5. No questions were specifically raised in relation to the Health, Safety and Environment program.
Other relevant documents	This Business Case should be read in conjunction with: • Asset Management Plan (TEB-001-0024-07); • Safety Case; and • Risk Management Policy and Operational Risk Model (together our Risk Management Framework).

1.3 Background

Our commitment to compliance and delivering continuous improvement in our management and maintenance of a safe pipeline means a conservative allowance is requested through each regulatory submission to allow for the delivery of health, safety and/or environmental compliance requirements.

1.3.1 Development of program

We are committed to ensure we offer a safe working environment that not only meets regulatory requirements but also internal safety matrices in terms of physical and mental health needs of employees.

1.3.2 Health and safety systems

Our Health and Safety program delivers initiatives to support the health and safety of our employees and contractors who work along or near the pipeline.

The need to be ready to adapt to changes in legislation - particularly noting the anticipated Workplace Health and Safety legislation and Mental Health Code of Practice changes - is considered particularly important for our fly in and fly out workforce.

The proposed Health and Safety focus areas for AA5 are:

- Mental health - this includes system adjustments required under the introduction of the Mental Health Code of Practice, engagement of consultants to assess the mental status of the different levels within the business and presentations on different mental health topics depending on the key drivers; and
- Safety systems - this includes identified equipment needs arising from confined space and ergonomic assessments, advice from industry experts on cultural assessment and the assessment of Health and Safety Management systems for alignment with new legislation.
- Having access via electronic tools on safety procedures, on boarding details of contractors and ensure resources in the field are job ready – having safety rules and documents in shape for this improvement program would be part of this initiative
- There is ongoing investigations into the suitability of safety clothing in the work place that can sustain heat stress in summer and cold stress in winter – technology on clothing is always on the improve and this is an opportunity that come under this proposal

1.3.3 Environmental systems

Our environmental program focuses on compliance, ensuring that updates are rolled out as needed to reflect changes to regulatory or reporting requirements which are often driven by external changes. For the AA5 environmental program, an allowance for system updates has been made to accommodate environmental legislation changes similar to those encountered during the AA4 period, which required the provision to meter all water accessed via all DBNGP operational water bores.

1.4 AA5 forecast

In AA5, a total expenditure of $0.45 million is forecast as shown in Table 1.3 to be deployed on an average of $90K per year. The forecast is based on the programs as detailed in 1.3.2 and 1.3.3.

Table 1.3: Summary of AA5 forecast spend for HSE

($'000)	2021	2022	2023	2024	2025	AA5
Health and safety	60	60	60	60	60	300
Environment	30	30	30	30	30	150
Total program ($000)	90	90	90	90	90	450

When individual projects are sufficiently defined in terms of scope and schedule, as directed by external drivers (such as legislative change), each will be individually assessed for its merits in the same way similar investment decisions were made in AA4.

1.4.1.1 AA4 compared to AA5

In AA5, we forecast total expenditure of $0.45 million. This is $0.2 million higher than our expected spend in AA4, as shown in Table 1.4

Table 1.4: Summary of actual and forecast spend across AA4 and AA5

($'000)	Year 1	Year 2	Year 3	Year 4	Year 5	Total
AA4 estimate	(4)	98	60	21	-	175
AA5 proposed	90	90	90	90	90	450
Variance	**(94)**	**8**	**(30)**	**(69)**	**(90)**	**(225)**

1.5 Risk Assessment

Risk management is a constant cycle of analysis, treatment, monitoring, reporting and then identifying once again, as shown below in

Figure 1.1, with a commitment to balance outcomes sought with delivery and cost implications considered and assessed.

Figure 1.1: Risk management principles

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur.

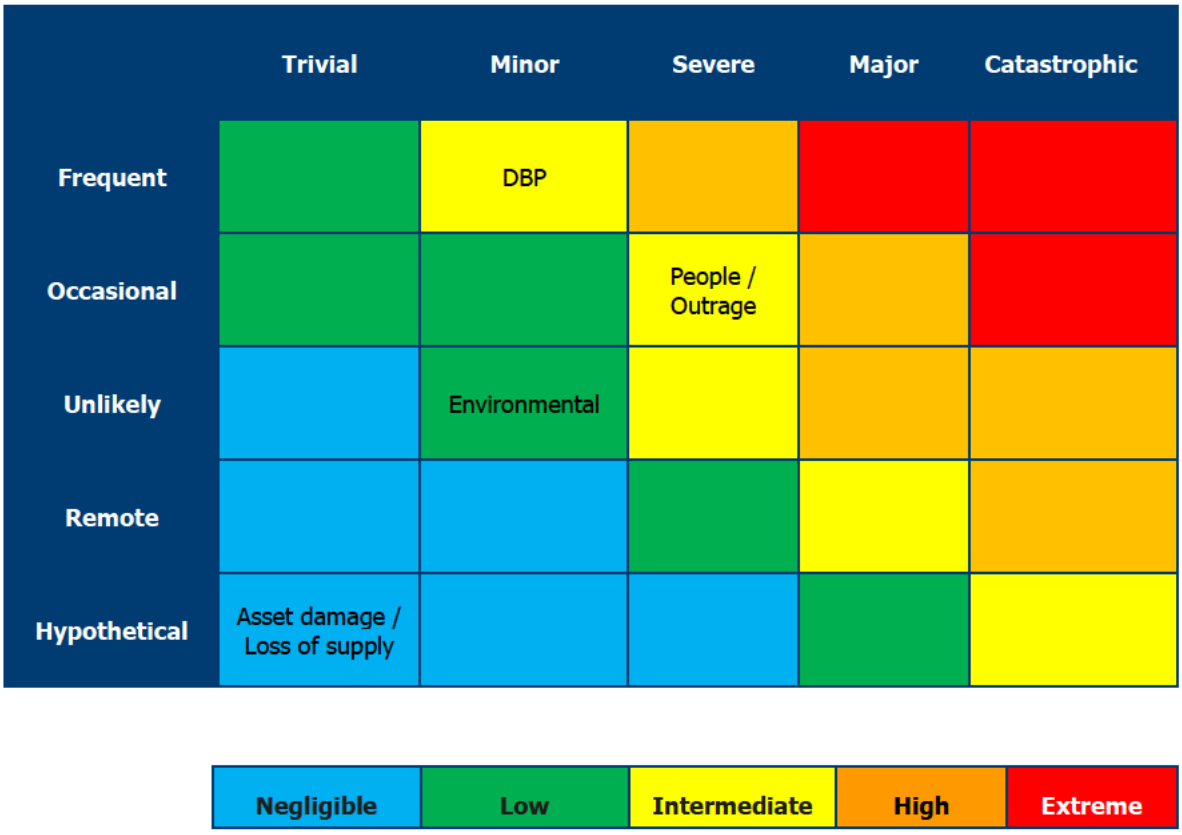
Based on these two key inputs, the risk assessment and derived risk rating then guides the actions and activities required to ensure safety and compliance are not compromised, while delivery of this outcome is done as efficiently and effectively as possible. The risk rating assesses the consequence and likelihood of the risk.

The risk of an event is rated based on the combined effect of the consequence and likelihood rating to provide an overall risk rating. This risk rating guides the risk management and mitigation activities and facilitates prioritisation.

Our Operational Risk Framework is based on AS/NZS 2885 and requires all identified risks ranked as intermediate or above to be addressed. For risks ranked as high we must *'Moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.*

The overall risk rating of HSE is presented in Figure 5.2. Three elements of risk are rated as intermediate, one low and two negligible. This results in an intermediate risk ranking for HSE in an untreated scenario.

Figure 1.2: Risk rating – HSE



1.5.1 Untreated risk

The table below summarises the untreated risk rating for the HSE initiatives

Table 1.5: Risk rating

Risk Area	Untreated
DBP	Intermediate
People	Intermediate
Environment	Low
Reputation/Outrage	Intermediate
Asset Damage	Negligible
Supply	Negligible
Overall Rating	**Intermediate**

HSE driven initiatives are intermediate risk but high priority.

- **DBP** – without investment in HSE initiatives, there would be no significant impact on DBP, issues are dealt with internally;
- **People** – without investment in HSE initiatives, there would be up to four LTIs or MTIs; and
- **Reputation/Outrage** – without investment in HSE initiatives there could be widespread complaints and anger.

1.6 Options Considered

Alternatives options for management of HSE the AA5 period which have been considered are:

- Option 1 – Maintain expenditure at AA4 levels;
- Option 2 – Allow for HSE initiatives as recommended; and
- Option 3 – Do nothing.

1.6.1 Option 1 – Maintain expenditure at AA4

Under this option, the expenditure incurred in the current period would be maintained in the next, and planned an unplanned HSE initiatives undertaken within the budget provided.

As this budget is less than that forecast required if any legislative changes occur in the next regulatory period, this would likely result in at least unplanned expenditure or failure to comply.

1.6.1.1 Achievement of objectives

Table 1.6 outlines how Option 1 would support the achievement of our vision objectives in AA5.

Table 1.6: Option 1 - Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	-
Delivering for Customers – Customer Service	-
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	N
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

This option does not deliver against our being a good employer objectives as it would allow for only the most modest of expenditure in these HSE initiatives, at a time where mental as well as physical health and well-being priorities need to be appropriately supported and resourced by all.

1.6.1.2 Cost assessment

The forecast cost would be the same as AA4 at $0.2 million.

1.6.1.3 Risk assessment

Table 1.7 shows that option 1 in AA5 does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.7: Risk rating – option 1

Risk Area	Untreated	Treated
DBP	Intermediate	Intermediate
People	Intermediate	Intermediate
Environment	Low	Low
Reputation/Outrage	Intermediate	Intermediate
Asset Damage	Negligible	Negligible
Supply	Negligible	Negligible
Overall Rating	**Intermediate**	**Intermediate**

1.6.2 Option 2 – Allow for HSE initiatives as recommended

Under this option, two health and safety initiatives and one environmental initiative would be allowed for in AA5.

1.6.2.1 Achievement of objectives

Table 1.8 outlines how option 2 will support the achievement of our vision objectives in AA5.

Table 1.8: Achieving objectives – option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	-
Delivering for Customers – Customer Service	-
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	Y
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option does align with being a good employer in terms of health and safety of employees and contractors and is sustainably cost efficient in terms of being environmentally and socially responsible and working within industry benchmarks.

1.6.2.2 Cost assessment

The forecast cost of this option is $0.45 million, which is $0.2 million more than the AA$ forecast and $0.15 million less than the AA4 allowance.

1.6.2.3 Risk assessment

Table 1.9 shows that option 2 in AA5 does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.9: Risk rating impact - Option 2

Risk Area	Untreated	Treated
DBP	Intermediate	Negligible
People	Intermediate	Low
Environment	Low	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	Negligible	Negligible
Supply	Negligible	Negligible
Overall Rating	**Intermediate**	**Low**

1.6.3 Option 3 – Do not undertake the HSE initiatives

Under this option, no HSE initiatives would be undertaken in AA5.

1.6.3.1 Achievement of objectives

Table 1.10 outlines how option 3 will support the achievement of our vision objectives in AA5.

Table 1.10: Achieving objectives – option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	-
Delivering for Customers – Customer Service	-
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	N
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

This option does not deliver against relevant vision objectives of being a good employer and being sustainably cost efficient as it would not invest in HSE initiatives driven by internal commitments to health, safety and well-being or employees and would also fail to support the business in delivering on regulatory requirements in the event of a new requirement being introduced in the next five years.

1.6.3.2 Cost assessment

There is no direct cost associated with the 'do nothing' option.

In the event of a non-compliance, we could incur a penalty as deemed appropriate by the relevant authority.

1.6.3.3 Risk assessment

Table 1.11 shows that option 3 in AA5 does not moderate the threat, the frequency and/or the consequence to reduce the risk rank.

Table 1.11: Risk rating impact - Option 3

Risk Area	Untreated	Treated
DBP	Intermediate	Intermediate
People	Intermediate	Intermediate
Environment	Low	Low
Reputation/Outrage	Intermediate	Intermediate
Asset Damage	Negligible	Negligible
Supply	Negligible	Negligible
Overall Rating	**Intermediate**	**Intermediate**

Option 3 does not address any risks associated with these HSE initiatives.

1.7 Summary of Cost/Benefit Analysis

Table 1.12: Summary of Cost Benefit analysis

Option	Objectives	Cost	Risk
Option 1 – Maintain expenditure at AA4 level	This option does not achieve our objectives of being a good employer	$0.20m	This option does not adequately address the risks to People
Option 2 – Undertake 2 health and safety initiatives and 1 x environmental	This option achieves our objective of being a good employer and sustainably cost efficient	$0.45m	This option treats the identified risks as appropriate.
Option 3 – Do not undertake the HSE program	This option does not achieve our objectives of delivering for customers or being a good employer	$0.0m	This option does not address any of the risks and are therefore left untreated

1.7.1 Why are we proposing this solution?

The recommended option is Option 2 as discussed in sections 1.3.2 and 1.3.3

- Mental health - this includes system adjustments required under the introduction of the Mental Health Code of Practice, engagement of consultants to assess the mental status of the different levels within the business and presentations on different mental health topics depending on the key drivers; and
- Safety systems - this includes identified equipment needs arising from confined space and ergonomic assessments, advice from industry experts on cultural assessment and the assessment of Health and Safety Management systems for alignment with new legislation.
- Having access via electronic tools on safety procedures, on boarding details of contractors and ensure resources in the field are job ready – having safety rules and documents in shape for this improvement program would be part of this initiative
- There is ongoing investigations into the suitability of safety clothing in the work place that can sustain heat stress in summer and cold stress in winter – technology on clothing is always on the improve and this is an opportunity that come under this proposal
- An allowance for system updates has been made to accommodate environmental legislation changes similar to those encountered during the AA4 period, which required the provision to meter all water accessed via all DBNGP operational water bores.

Reducing the expenditure budget to that required in AA4 as per option 1 is likely to lead to at least one unaddressed initiative over the period.

Not undertaking the HSE initiatives could give rise to penalties and reputational impact should an incident or a non-compliance occur.

1.7.1.1 Consistency with the National Gas Rules

National Gas Rule 91 requires that operating expenditure must be 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 delivering pipeline services.

Rule 91

The relevant opex rule is detailed below and has been extracted from the latest version of the National Gas Rules (available here: http://www.aemc.gov.au/energy-rules/national-gas-rules/current-rules):

> *"Division 7 Operating expenditure*
>
> *91 Criteria governing operating expenditure*
>
> *(1) Operating expenditure must be 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 delivering pipeline services.*
>
> *(2) The AER's discretion under this rule is limited."*

Option 2 - Undertake 2 health and safety initiatives and 1 environmental is the recommended solution and recommends that we proceed with the planned HSE initiatives.

Consistent with the requirements of NGR 91(1) we consider HSE initiatives in AA5 are:

- **Prudent** – The expenditure forecast in AA5 is based on forecast anticipated programs as noted above;
- **Efficient** – The forecast expenditure is estimated reduction on AA4 forecast;
- **Consistent with accepted and good industry practice** – it is provisioning for forecast changes that may incur capital expenditure
- To achieve the **lowest sustainable cost of delivering pipeline services** – improvement initiatives will undergo proper business cases and recommendations

1.7.2 Estimating efficient costs

As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology 2021-2025', the forecast unit rates for all initiatives managed within this program are inclusive of internal labour, external labour/contractors, materials, travel and other costs.

Table 1.13 below summarises the total unescalated costs for HSE in real dollars June 2019.

Table 1.13: HSE cost estimate

($'000)	2021	2022	2023	2024	2025	Total
Health and safety	60	60	60	60	60	300
Environment	30	30	30	30	30	150
Total cost	**90**	**90**	**90**	**90**	**90**	**450**

Table 1.14 below summarises the total unescalated costs by cost type.

Table 1.14: HSE cost estimate, by cost type

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	3	3	3	3	3	15
External Contractors/ Consultants	5	5	5	5	5	25
Materials & Services	82	82	82	82	82	410
Travel & Others	-	-	-	-	-	-
Total cost	**90**	**90**	**90**	**90**	**90**	**450**

Table 1.15 below shows the escalation applied to escalate the HSE costs to real dollars of December 2020 including labour cost escalation of 0.69%.

Table 1.16: HSE total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	90	90	90	90	90	450
Escalation	2	3	3	3	3	14
Total escalated ($ Dec 20)	**92**	**93**	**93**	**93**	**93**	**464**

Appendix A – Risk Assessment

Figure 1.3 provides a summary of the risk assessment for HSE initiatives

Figure 1.4: Summary of HSE initiatives risk assessment

	DBP			People			Environmental			Outrage			Asset Damage			Loss of Supply		
	Consequence	Frequency	Risk	Consequence	Frequency	Risk	Consequence	Frequency	Risk	Consequence	Frequency	Risk	Consequence	Frequency	Risk	Consequence	Frequency	Risk
Untreated risk	Minor	Frequent	INTERMEDIATE	Severe	Occasional	INTERMEDIATE	Minor	Unlikely	Low	Severe	Occasional	INTERMEDIATE	Trivial	Hypothetical	Negligible	Trivial	Hypothetical	Negligible
Option 1 - AA4 expenditure	Minor	Occasional	INTERMEDIATE	Severe	Unlikely	INTERMEDIATE	Minor	Unlikely	Low	Severe	Unlikely	INTERMEDIATE	Trivial	Hypothetical	Negligible	Trivial	Hypothetical	Negligible
Option 2 - 2 x health and safety, 1 x environmental	Minor	Remote	Negligible	Severe	Remote	Low	Minor	Remote	NEGLIGIBLE	Severe	Remote	Low	Trivial	Hypothetical	Negligible	Trivial	Hypothetical	Negligible
Option 3 - do not undertake HSE program	Minor	Frequent	INTERMEDIATE	Severe	Occasional	INTERMEDIATE	Minor	Unlikely	Low	Severe	Occasional	INTERMEDIATE	Trivial	Hypothetical	Negligible	Trivial	Hypothetical	Negligible

Gas Turbines and GEA Overhaul Business Case – Opex DBP05

1.1 Project Approvals

Table 1.1: Gas Turbines and GEA Overhaul DBP05 – Project approvals

Prepared By	Salman Azhar, Senior Rotating Equipment Engineer Robert Bauer, Gas Transmission Engineer Henry Muharemovic, Head of Mainline - Transmission Operations
Reviewed By	Hugo Kuhn, Head of Engineering
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 1.2: Gas Turbines and GEA Overhaul DBP05 – Project overview

Description of Issue/Project	Gas turbines and gas engine alternators (GEA) provide an important role in operating the pipeline. Gas turbines enable pressure to be maintained appropriately and GEA's provide the electricity required given operational requirements. This business case outlines the ongoing preventative maintenance required for identified gas turbines and gas engine alternators (GEAs) to ensure continued performance. When these assets become deficient in performance, individual assets are selected for overhaul based on criteria identified in the relevant Asset Management Plan, supported by manufacturer (such as OEM) specification. The key criterion for identifying performance issues that may require overhaul is the number of hours individual assets have been in operation. • this business case identifies which gas turbines and GEAs need to be overhaul to maintain performance and includes: • drivers for the need for overhaul; • method of forecasting hours; • assessment of untreated risk; and • potential impact of failing to undertake overhauls as guided by the AMP and OEM. This business case also outlines the cost and how the identified assets are prioritised based on expectation of failure and changes in operational hours due to external events.
Project Name	Gas turbine and GEA overhaul
Estimated Cost	Total forecast opex for the next Access Arrangement (AA5) is $29.7 million.
Basis of costs	All costs in this business case are expressed in real June 2019 dollars unless otherwise stated.
Options considered	• Option 1 – Maintain expenditure at AA4 levels ($24.0 million); • Option 2 – Move to a replacement on failure policy (upwards of $29.7 million); and • Option 3 – Proactive overhaul based on the volume and activities identified in the AMP ($29.7 million) (this is the recommended option).

Variation to AA4	The proposed AA5 expenditure is $5.7 million more than the actual expenditure forecast for AA4 based on identifying a greater number of turbine overhauls required. The AA5 forecast allows for: 1. 7 planned gas turbine overhauls; 2. 1 unplanned gas turbine overhaul; and 3. 20 GEA overhauls - 4 each year. This compares to 6 planned and 2 unplanned gas turbine overhauls and 16 GEA overhauls. The forecast run hours, which drives the need for overhaul, is monitored on a monthly basis. The forecast run hours for AA5 is based on information available as at September 2019, which allows for the impact of seasonality, weather and customer demands.
Consistency with the National Gas Rules (NGR)	NGR 91 – Proactive overhaul of gas turbines and GEAs maintains the safety, integrity and reliable delivery of gas along the DBNGP by ensuring gas turbine units are available as required to meet customer demand and GEAs can provide for the power needs of the gas turbines and other assets at compressor stations and other facilities. Proactively overhauling, in line with manufacturer recommendations and over 35 years of operational experience, ensures these assets continue to perform efficiently and represents a more cost-effective solution over the life of the asset than full replacement. Therefore it is consistent with the expenditure that would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of delivering pipeline services. NGR 74(2) - Our forecasts for when overhauls will fall due is based on the latest information on run hours, utilisation and expected throughput. The forecast cost per overhaul is based on a three-year average historical cost and current prevailing foreign exchange rates. Therefore the forecast is arrived at on a reasonable basis and represents the best forecast or estimate possible in the circumstances.
Stakeholder Engagement	Our Shippers require current levels of reliability to be maintained and expect effective emergency management. Our gas turbine and GEA overhaul program comprises ongoing and periodic activities to ensure the integrity, reliability and effective capability to respond to emergencies. This was supported in our Shipper Roundtable discussions. We tested our approach with Shippers and responded to questions which are further addressed in this business case.
Other relevant documents	This Business Case should be read in conjunction with: • Asset Management Plan (TEB-001-0024-07); • Asset Management Plan – Rotating Equipment (TEB-001-0024-03); • Risk Management Policy and Operational Risk Model (together our Risk Management Framework).

1.3 Background

All physical DBNGP assets are managed in accordance with the policies and principles set out in the Asset Management Plan (AMP) which is part of our Asset Management System Framework.

A key principle of the Asset Management System Framework is effective management of asset risks which includes identification of risks and evaluation of the adequacy of controls in terms of physical safeguards and asset maintenance requirements. These controls are often supported by the relevant manufacturer's warranty and/or maintenance guidelines.

As part of the asset management risk assessments, risk levels are determined for different asset classes and criticality of controls analysed based on the significance of risk reduction provided by the risk controls.

Gas turbines and Gas Engine Alternators (GEA) are critical assets within the DBNGP, and proactive (preventative) maintenance due to the large impact on the supply of gas to customers and the

associated financial impact which could be experienced in the event of a catastrophic failure. Our management of these assets also has regard to manufacturer's recommendations.

Both gas turbines and GEAs are considered high risk assets. A key control for managing this risk is preventative maintenance. The performance of these assets can be restored through overhaul rather than replacement. Our approach to this is outlined in 'Asset Management Plan – Rotating Equipment (TEB–001–0024-03)', section 5.1.4.1.1 [redacted] and Maintenance Tasks, 5.1.4.2 [redacted] and 5.3.3.3 Routine Maintenance for GEAs.

1.3.1 Development of program

The need to overhaul gas turbines will differ depending on activity. Some gas turbines could require multiple overhauls within a single AA period, while others require one or none. Detailed consideration of the individual asset's unique operational activity levels are assessed in the forecasting of run hours and associated overhaul need.

With scheduled (proactive) overhauls, the likelihood of failures in both gas turbines and GEAs is reduced, the cost associated with their maintenance is more easily forecast and logistical challenges associated with spare parts which often have a long lead time are optimally managed.

Conversely, failure to appropriately maintain gas turbines and GEAs could result in significantly more expensive corrective maintenance when compared with a planned preventative overhaul, and could cause significant operational issues and cost, as catastrophic failure can result in a need for asset replacement and cause significant outages. Unplanned outages adversely impact on customers and result in a failure to deliver on contractual obligations. An unplanned outage resulting from a catastrophic failure which requires a new turbine to be installed could last up to 3 months and cost significantly more than a pre-emptive overhaul.

The AA5 forecast allows for 8 gas turbine and 20 GEA overhauls, as shown in Table 1.3, with the one gas turbine overhaul in 2025 expected to be an overhaul undertaken within the manufacturer's warranty period resulting in a lower unit rate. In 2021, there [redacted].

Table 1.4: AA5 gas turbine and GEA overhauls – units and cost

Overhaul type	AA5					
	2021	2022	2023	2024	2025	TOTAL
Gas turbine ($'000)	[redacted]					
Gas turbine (units)						
GEA ($'000)	[redacted]					
GEA (units)						
Total cost ($'000)	**8,700**	**7,400**	**7,400**	**4,200**	**2,000**	**29,700**

1.3.2 Gas turbines

The purpose of a gas turbine driven compressor unit is to boost gas pressure in the pipeline.

There are three primary gas turbine driven centrifugal gas compressor unit types installed at DBNGP compressor stations, supplied by different manufacturers. They are:

[redacted]

[redacted]

Maintenance of [redacted] gas turbines is carried out in accordance with OEM recommendations, though modifications can be made to OEM intervals to better suit DBNGP's operational requirements.

Our AMP identifies 30,000 run hours as the trigger for a planned overhaul for these two gas turbines, which is in line with that recommended in the manufacturer's specifications.

Maintenance of [redacted] gas turbines is also carried out in accordance with OEM recommendations, with modification made to better suit DBNGP operational requirements.

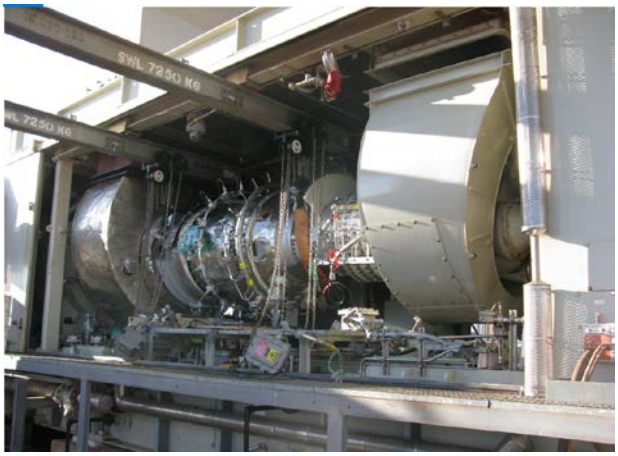
The AMP identifies 35,000 hours as the trigger for a planned overhaul for these gas turbines. This is also in line with that recommended in the manufacturer's specifications.

Overhaul of a gas turbine includes disassembly, inspection, repair and replacement of subcomponents, assembly and test of the gas generator and/or power turbine component.

Figure 3.1: and Figure 1.2 below show the gas turbine being removed for overhaul and being overhauled.

Figure 1.1: Gas turbine removal

Figure 1.2: Gas turbine replacement



There are two gas turbines in each compressor station designed to operate in duty and standby mode with capability to operate in series for maximum capacity to deliver as demand calls for it. Critical units are identified based on their history of run hours. Each month, every unit is reviewed and operational changes made to optimise unit run hours and ensure units reaching their overhaul targets are staggered and smoothed.

The monthly review allows for incorporation of externally driven changes to ensure runs hours accumulated across the fleet is managed so that no more than 3 units can reach their overhaul target in any given year. Plant Operating Advise notifications are issued to the Control Room to identify units to be operated as 'duty' and those to be used as standby. The more reliable the duty units, the less hours are consumed on the standby units. This process is continually managed and monitored to ensure we meet our targets.

1.3.2.1 Volume of activity over time

Within the DBNGP, there are 20 gas turbines which need to be maintained in line with the AMP and manufacturers' specifications. Eight of these are scheduled for overhaul in AA5.

If there is an unplanned (preliminary) failure of a gas turbine within a warranty period and before the milestone for overhaul has been reached, we incur the field repair costs but are then compensated by the manufacturer when an overhaul on that turbine occurs.

The AA5 forecast can be seen relative to the AA3 and AA4 actuals and forecast on an individual asset basis in Table 1.4.

Table 1.4: Gas turbine overhaul program over time

Facility	Unit	AA3 delivered	AA4 planned	AA4 delivered	AA5 scheduled
CS1	1	-	-	-	-
CS1	2	-	-	-	✓
CS2	2	✓	✓	-	✓
CS2	3	-	✓	✓	-
CS3	1	-	✓	swapped	✓
CS3	3	-	✓	✓	-
CS4	2	✓	✓	-	-
CS4	3	✓	-	✓	-
CS5	1	-	✓	✓	-
CS5	2	-	-	swapped	-
CS6	2		✓	-	✓
CS6	3	✓	-	-	✓
CS7	2		✓	✓	-
CS7	3	✓	-	-	-
CS8	1	✓	✓	swapped	✓
CS8	2	✓	-	-	✓
CS9	1	✓	-	-	-
CS9	2	-	✓	✓	-
CS10	3	-	-	-	-
CS10	4	-	-	-	-
Total number		**8**	**10**	**6**	**7 + 1**

In AA4, a number of assets were additionally 'swapped out', moving gas turbines which had lower run hours to compressor stations with higher utilisation, in order to extend the useful life of all assets and prudently defer overhaul.

The AA5 forecast has identified 7 gas turbines for overhaul based on forecast throughput and associated operational hours.

There is also an allowance for one premature failure in 2025 which is expected to occur within the manufacturer's warranty period. Two premature failures were experienced in AA4.

Table 1.5 shows the gas turbines identified for overhaul and their run hours as at September 2019.

Table 1.5: Gas turbines for overhaul in AA5 - run hours

Facility	Unit	Current hours
CS1	2	29, 737
CS2	2	28,175
CS3	1	25,867
CS6	2	25,428
CS6	3	23,566
CS8	1	15,781
CS8	2	12,996
*TBC	*TBC	<30,000 (if [redacted]) <35,000 (if [redacted])

1.3.3 GEAs

The purpose of a GEA is to generate electricity. They are used at compressor stations as prime power generation and at MLVs for backup power generation for battery charging. They range from 10 kW Lister units at MLVs to 850 kW [redacted] units at compressor stations.

The majority of maintenance performed on GEAs is based on preventative maintenance requirements directed by the OEM, with periodic checks and scheduled maintenance of at specified intervals, based on operational run hours or calendar time, whichever comes first.

Initially maintenance practices were developed from the recommendations of the OEM and progressively refined through experience. Maintenance practices for items of plant or key components of a system that are critical to the safe operation of the process are augmented with prescriptive requirements in Australian Standards and relevant codes of practices. Prescriptive maintenance requirements are also set by the relevant state pipeline regulator or from state government regulations.

Maintenance practices as applied to GEAs include preventative (time-based) maintenance activities and predictive (on-condition) maintenance activities. Preventative maintenance activities are based on the application of the following:

- Scheduled in-service inspections;
- Scheduled overhaul; and
- Scheduled replacement.

Scheduled overhauls and scheduled replacements form the majority of the maintenance tasks carried out on GEAs. Scheduled overhaul activities can be minor or major.

There are two primary GEA unit types installed at DBNGP compressor stations, supplied by different manufacturers. They are [redacted]. An image of a GEA is shown in Figure 1.3 below.

Figure 1.3: GEA

GEAs need to be serviced at regular intervals and to undergo overhauls at 12,000, 24,000, 48,000 and 52,000 hours. This is noted in the AMP – Rotating Equipment. Major overhauls are required after 48,000 and 52,000.

DEAs are also in place on the DBNGP. DEAs are Diesel Engine Alternators and their function on the DBNGP is similar to that of the GEA. These are all manufactured by [redacted]

Within the DBNGP, there are 26 GEA and 4 DEAs which need to be maintained in line with the AMP and manufacturers' specifications. 20 of these are scheduled for major or minor overhaul in AA5. GEAs which are forecast for overhaul in AA5 are shown in Table 1.6. No DEAs require overhaul in AA5.

Table 1.6: GEAs identified for overhaul in AA5

Facility	Unit	Run hours	Identified for overhaul in AA5
Dampier	1	2,338	✓
CS01	1		-
CS01	2	75,510	✓
CS01	3	52,655	✓
CS02	1	89,730	✓
CS02	3		-
CS02	4	8,433	✓
CS03	1	21,695	✓
CS03	2	47,756	✓
CS03	DEA/1		-
CS04	1	76,101	✓
CS04	3	58,414	✓
CS04	4	5,991	✓
CS05	1	22,597	✓
CS05	2	92,771	✓
CS05	DEA/1		-
CS06	1	27,819	✓
CS06	2	36,473	✓
CS06	3	25,789	✓
CS07	1		-
CS07	2	1,744	✓
CS07	3	27,000	✓
CS07	4		-
CS08	1	52,085	✓
CS08	2	57,398	✓
CS09	1		-
CS09	2	37,323	✓
CS09	DEA/1		-
CS10	DEA/1		-
Transportable DEA	1		-
			20

1.4 AA5 forecast

In AA5, a total expenditure of $29.7 million is forecast as shown in Table 1.7. The forecast is based on identifying the units that will require overhaul given the forecast hours and the unit cost. One unplanned gas turbine overhaul is assumed to occur in 2025.

Table 1.7: Summary of AA5 forecast spend for Gas turbine and GEA overhauls

($'000)	2021	2022	2023	2024	2025	AA5
Gas turbine	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Premature gas turbine	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
GEA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program total	**8,700**	**7,400**	**7,400**	**4,200**	**2,000**	**29,700**

1.4.1 AA4 comparison

In AA4, we forecast actual expenditure of $24.0 million reflecting 6 gas turbine overhauls and 16 GEA overhauls. This is $7.2 million lower than our approved forecast in AA4 which was based on an expectation of 10 gas turbine overhauls and 16 GEAs, as shown in Table 1.8.

Table 1.8: Summary of actual and approved spend in AA4

($'000)	2016	2017	2018	2019	2020	AA4
Actual	7,886	4,874	3,189	4,062	4,000	24,012
Approved	5,277	7,230	8,821	4,986	4,893	31,207
Variance	**2,609**	**(2,356)**	**(5,631)**	**(924)**	**(893)**	**(7,195)**

The lower expected expenditure in AA4 than forecast for gas turbines was driven by:

- Lower shipper demand and hence throughput (640TJ/day forecast versus 626 TJ/day actual) which resulted in lower utilisation and run hours;
- Premature failures of gas turbines within the warranty period and some insurance coverage offsetting costs incurred (and affecting unit costs); and
- Favourable foreign exchange rates.

Unlike gas turbines, GEA overhauls are not driven primarily by throughput. They are driven by power demands at each site. The power is required to keep the lights on and to ensure the site is ready to respond to compression requirements even when turbines are not operational.

The process for overhauling GEA's evolved in AA4, resulting in operational advantages. Previously, GEAs were removed, stripped and cleaned. Then all parts were re-conditioned and re-assembled. In AA4, we have started to keep a refurbished spare engine from a retired GEA in stock, so it is available when needed and reduces the disruption of a GEA overhaul.

Table 1.9: Comparison of volumes and costs AA4 and AA5

	AA4 volume #	AA4 cost ($'000)	AA5 volume #	AA5 cost ($'000)	Variance volume #	Variance cost ($'000)
Gas turbines	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
GEAs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	**22,260**	[redacted]	**19,700**	[redacted]	**7,440**

In AA5, we forecast total expenditure of $29.7 million. This is $5.7 million higher than our actual forecast in AA4, as shown in Table 1.10.

Table 1.11: Summary of actual and forecast spend across AA4 and AA5

($'000)	Year 1	Year 2	Year 3	Year 4	Year 5	AA
AA4 forecast	7,886	4,874	3,189	4,062	4,000	24,012
AA5 proposed	8,700	7,400	7,400	4,200	2,000	29,700
Variance	**(814)**	**(2,526)**	**(4,211)**	**(138)**	**2,000**	**(5,688)**

The increase is driven by:

- Increased volume of overhauls (increased from 6 in AA4 to 8 in AA5 for gas turbines and from 16 to 20 for GEAs) based on forecast throughput and operational hours for the period; and
- An assumption that there will only be one premature failure of a gas turbine and that this will occur within the relevant manufacturer's warranty period reducing the cost incurred.

The latest information on run hours, utilisation and expected throughput in the period has been used as the predictor for operational activity levels for AA5. This incorporates the impact of seasonality and also reflects the most up to date customer demand information available.

1.5 Risk Assessment

Risk management is a constant cycle of analysis, treatment, monitoring, reporting and then identifying once again, as shown below in

Figure 1.4, with a commitment to balance outcomes sought with delivery and cost implications considered and assessed.

Figure 1.5: Risk management principles

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur.

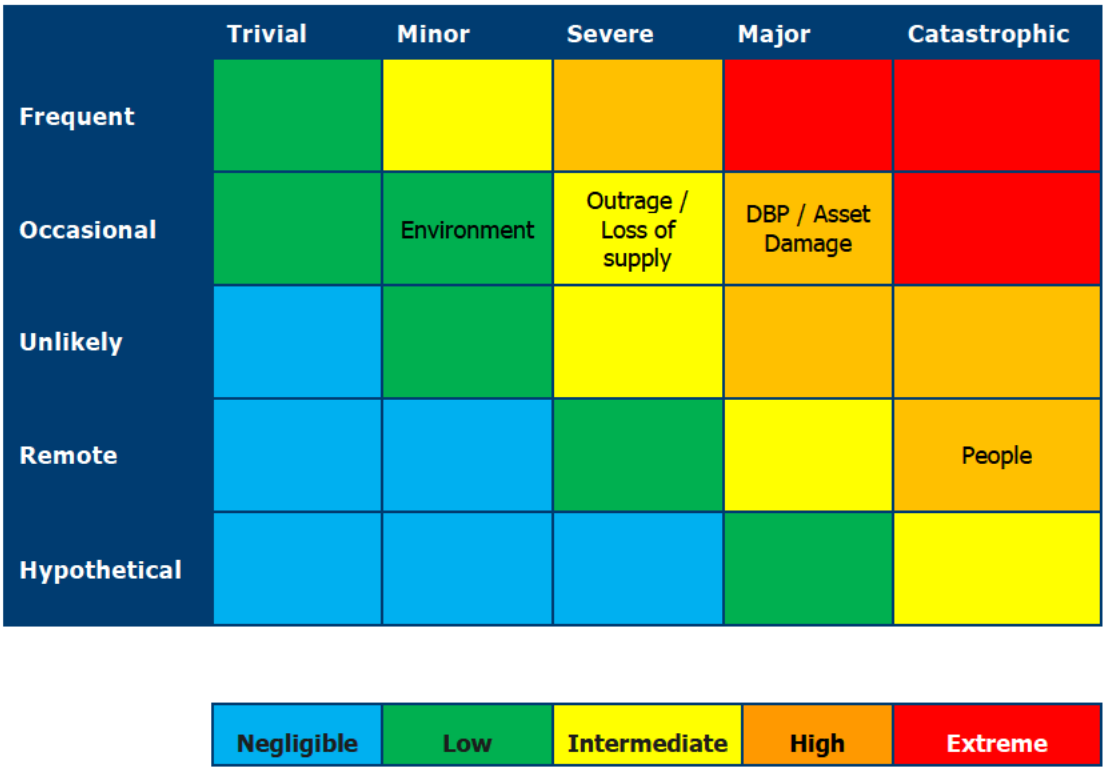
Based on these two key inputs, the risk assessment and derived risk rating then guides the actions and activities required to ensure safety and compliance are not compromised, while delivery of this outcome is done as efficiently and effectively as possible. The risk rating assesses the consequence and likelihood of the risk.

The risk of an event associated with failure of an asset is rated based on the combined effect of the consequence and likelihood rating to provide an overall risk rating. This risk rating guides the risk management and mitigation activities and facilitates prioritisation.

Our Operational Risk Framework is based on AS/NZS 2885 and requires all identified risks ranked as intermediate or above to be addressed. For risks ranked as high we must *'Modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.*

The overall risk rating of gas turbines and GEAs is presented in Figure 1.6. Three elements of risk are rated as high, two intermediate and one low. This results in a high risk ranking for these assets in an untreated scenario.

Figure 1.7: Risk rating – gas turbines and GEAs



1.5.1 Untreated risk

The table below summarises the untreated risk rating for the failure of gas turbines and GEAs.

Table 1.121: Risk rating

Risk Area	Untreated
DBP	High
People	High
Environment	Low
Reputation/Outrage	Intermediate
Asset Damage	High
Supply	Intermediate
Overall Rating	**High**

Gas turbine and GEA driven initiatives are high risk and high priority.

- **DBP** – Untreated, the gas turbines and GEAs would threaten the effective operation of DBP for a substantial period, including its ability to raise capital, or have a significant effect on how DBP will operate in the future;
- **People** – Untreated, the gas turbines and GEAs could result in more than two fatalities or more than four individuals with life threatening injuries or permanent disabilities where there is a catastrophic failure of an asset resulting in gas released at high pressure or explosion;
- **Reputation/Outrage** – Untreated, the gas turbines and GEAs could result in widespread complaints and anger from our Shippers, regulators and the public, particularly where the DBNGP supports electricity generation in WA;
- **Asset Damage** – Untreated, the gas turbines and GEAs could result in asset damage of between $10 million and $25 million where failure requires replacement of other components of the turbine package, or even full replacement of a compressor unit;
- **Supply** – Untreated, the gas turbines and GEAs could result in interruption of supply to our customers.

1.6 Options Considered

Alternatives options for management and maintenance of gas turbine and GEAs for the AA5 period which have been considered are:

- Option 1 – Maintain expenditure at AA4 levels;
- Option 2 – Move to a replacement on failure policy; and
- Option 3 – Proactive overhaul based on the volume and activities identified in the AMP

1.6.1 Option 1 – Maintain expenditure at AA4

Under this option, the expenditure incurred in the current period would be maintained and planned an unplanned overhauls undertaken within the budget provided. As this budget is less than that forecast required if overhauls occur in line with expected operational hours, this would be likely to result in at least one additional unplanned failures. This failure could occur within a warranty period but could also result in significant additional costs, including the potential replacement or other remediation activities, and significant disruption to services.

1.6.1.1 Achievement of objectives

Table 1.132 outlines how Option 1 would support the achievement of our vision objectives in AA5.

Table 1.142: Option 1 - Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	N
A Good Employer – Skills Development	N
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

This option does not deliver against any of our vision objectives of delivering for customers or being a good employer as whilst it would address the highest risk gas turbines and GEAs, based on a prioritised view of all assets identified for overhaul, it would not address all of the gas turbines or GEAs which require an overhaul based on the AMP or the manufacturers' specifications, leaving assets that have been identified by both the business and their relevant manufacturer as outside maintenance norms.

1.6.1.2 Cost assessment

The forecast cost is the same as AA4 ($24.0 million). At least 2 gas turbines and 4 GEAs would not be overhauled as required by the AMP based on this option.

In the event of an unplanned break down of an additional gas turbine or GEA, we could reasonably expect to incur higher unit costs, due to the possibility of requiring air freight of the materials from the USA.

1.6.1.3 Risk assessment

Table 1.13 shows that option 1 in AA5 does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.13: Risk rating impact - Option 1

Risk Area	Untreated	Treated
DBP	High	High
People	High	Intermediate
Environment	Low	Low
Reputation/Outrage	Intermediate	Intermediate
Asset Damage	High	High
Supply	Intermediate	Intermediate
Overall Rating	**High**	**High**

1.6.2 Option 2 – Move to a replacement on failure policy

Under this option, the volume of overhauls forecast in AA5 would reflect the number of breakages/outages experienced on these assets, with a reactive rather than proactive approach to the management of gas turbines and GEAs.

1.6.2.1 Achievement of objectives

Table 1.15 outlines how option 2 will support the achievement of our vision objectives in AA5.

Table 1.16: Achieving objectives – option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	-N
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

This option does not deliver for customers in terms of public safety or reliability, does not align with being a good employer in terms of health and safety of employees and contractors and is not sustainably cost efficient in terms of being environmentally and socially responsible.

This option would address only the assets which have actually failed, with a focus on returning them to being operational as quickly as possible, rather than proactively managing and planning for them. However, the failure of these assets is likely to result in significant disruption to services, higher cost due to the likely higher impact of the failure on the asset, including higher likelihood of replacement. A failure of these assets could also have significant impacts on the safety of workers in the vicinity of the failed asset.

As these units are limited to [redacted] hours run time, it is not safe to run these units over there maximum OEM defined lifespan as parts might become loose, causing damage to the asset and possible loss of life where it results in gas escape or explosion.

The unplanned impact to services could also lead to penalties [redacted] due to breach of contractual arrangement with our major customers.

1.6.2.2 Cost assessment

The forecast cost of this option is unknown. However, given that the overhaul program is based on pre-emptive action, that is preventative action is scheduled to occur before a failure is expected, a forecast of failures would reflect the forecast overhaul. However the cost would be greater as the likely damage to assets may increase the cost of rectifying the issues for each unit. Therefore, this option is assumed to cost at least the same as the proactive replacement program. This option could cost significantly more to reflect the higher unit rate cost of rectification and penalty rates, potential damage to other assets, higher unit and freight costs to expedite delivery, and significant additional costs to customers of poor reliability and increased length of outages.

1.6.2.3 Risk assessment

Table 1.17 shows that option 2 in AA5 does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.18: Risk rating impact - Option 2

Risk Area	Untreated	Treated
DBP	High	High
People	High	Intermediate
Environment	Low	Low
Reputation/Outrage	Intermediate	Intermediate
Asset Damage	High	High
Supply	Intermediate	Intermediate
Overall Rating	**High**	**High**

1.6.3 Option 3 – Proactive overhaul based on the volume and activities identified in the AMP

Under this option, the volume of overhauls undertaken in AA5 would be based on the criteria identified in the AMP, guided by the manufacturers' specifications for optimised maintenance of the asset and based on current forecasts for operational 'run' hours.

1.6.3.1 Achievement of objectives

Table 1.19 outlines how option 3 will support the achievement of our vision objectives in AA5.

Table 1.20: Achieving objectives – option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option delivers against all relevant vision objectives of delivering for customers, being a good employer and being sustainably cost efficient as it overhauls gas turbines and GEAs in line with manufacturer's guidelines, in a planned and controlled manner, adjusting priority assets as appropriate based on actual run hours. It also supports improved procurement outcomes, with proactive planning for freight and an opportunity to somewhat manage foreign exchange exposure. It also leads to a safer environment for employees and contractors, allowing them to operate in an environment where risk is proactively managed.

1.6.3.2 Cost assessment

The cost of this option is $29.7 million in AA5. By adopting a proactive, planned approach to overhauls for these two asset classes, DBP can best manage the efficient delivery of the program, minimising the need for unplanned and disruptive repair work on the network, which might otherwise result in a failure on either a gas turbine or GEA or a production loss.

The cost has been estimated by identifying the volume of overhauls required given the forecast operational hours and applying a unit rate relevant to the unit and assumption. One failure is assumed which would be covered by warranty to some extent. Unit rates for planned gas turbines overhauls have been estimated as [redacted]

Unit rates for planned GEA overhauls have been estimated as [redacted] and are based on the most recent actual cost incurred.

Within this option, there is still an expectation that one gas turbine will run to failure, but will do so within the warranty period, resulting in a much lower cost for us. All newly overhauled items are run at the highest possible activity rate to ensure any inherent weakness in the operations is identified within that warranty period, and that we are not disadvantaged financially from its failure when relatively new but outside the warranty period.

1.6.3.3 Risk assessment

Table 1.21 shows that option 3 in AA5 does moderate the threat, the frequency and/or the consequence to reduce the risk rank to intermediate or lower.

Table 1.22: Risk rating impact - Option 3

Risk Area	Untreated	Treated
DBP	High	Intermediate
People	High	Intermediate
Environment	Low	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	High	Intermediate
Supply	Intermediate	Low
Overall Rating	**High**	**Intermediate**

Option 3 appropriately addresses risks, reducing the inherent risk of these assets to ALARP with planned overhauls in line with manufacturer's guidelines to ensure gas turbines are available supporting our ability to deliver gas safely and reliably to meet the needs of our customers and gas producers.

1.7 Summary of Cost/Benefit Analysis

Table 1.23: Summary of cost benefit analysis

Option	Objectives	Cost	Risk
Option 1 – Maintain expenditure at AA4 level	This option does not achieve our objectives of delivering for customers or being a good employer	$24.0m	This option does not adequately address the high risks to DBP/People/Asset Damage or intermediate risks to Outrage/Loss of supply
Option 2 – Replace on failure	This option achieves our objective of delivering for customers and being a good employer but is not sustainably cost efficient	>$29.7m	This option does not treat the identified risk at all.
Option 3 – Overhaul based on the volume and activities that AMP has identified as required	This option achieves our objectives of delivering for customers, being a good employer and being sustainably cost efficient	$29.7m	This option appropriately moderates all high/intermediate risks to ALARP

1.7.1 Why are we proposing this solution?

The recommended option is Option 3 - Overhaul based on the volume and activities that AMP has identified as required to appropriately mitigate the risk identified under our Operational Risk Framework, and manage the asset consistent with asset management principles and the relevant manufacturers' specification.

Reducing the expenditure budget to that required in AA4 as per option 1 is likely to lead to at least one or more unplanned failure that will be more costly to address, give rise to significant safety risk and impact on the services to customers.

Running the assets to failure as per option 2 is likely to result in catastrophic failure of an asset which gives rise to significant safety risk, significant additional costs and have a significant impact on the service provided to customers. It could also give rise to penalties and reputational impact should a failure result in an inability to meet customer capacity demands.

1.7.1.1 Consistency with the National Gas Rules

Proactive overhaul of gas turbines and GEAs maintains the safety, integrity and reliable delivery of gas along the DBNGP by ensuring gas turbine units are available as required to meet customer demand and GEAs can provide for the power needs of the gas turbines and other assets at compressor stations and other facilities.

Proactively overhauling, in line with manufacturer recommendations and over 35 years of operational experience, ensures these assets continue to perform efficiently and represents a more cost-effective solution over the life of the asset than full replacement. Therefore it is consistent with the expenditure that would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of delivering pipeline services.

Rule 91

The relevant opex rule is detailed below and has been extracted from the latest version of the National Gas Rules (available here: http://www.aemc.gov.au/energy-rules/national-gas-rules/current-rules):

"Division 7 Operating expenditure

91 Criteria governing operating expenditure

(1) Operating expenditure must be 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 delivering pipeline services.

(2) The AER's discretion under this rule is limited."

Option 3 – 'Do the volume and activities that AMP has identified as required' is the recommended solution and recommends that we proceed with the overhaul of the gas turbine and GEA assets in line with AMP and manufacturer's guidelines.

Proactive overhaul based on the AMP is consistent with the requirements of NGR 91(1), specifically the proposed expenditure is:

- **Prudent** – Proactive overhaul of gas turbines and GEAs maintains the safety, integrity and reliable delivery of gas along the DBNGP by ensuring gas turbine units are available as required to meet customer demand and GEAs can provide for the power needs of the gas turbines and other assets at compressor stations and other facilities. The proposed expenditure can therefore be seen to be of a nature that would be incurred by a prudent service provider;

- **Efficient** –Our forecasts for when overhauls will fall due is based on the latest information on run hours, utilisation and expected throughput. The forecast cost per overhaul is based on a three-year average historical cost and current prevailing foreign exchange rates. Proactively overhauling represents a more cost-effective solution over the life of the asset than full replacement. The proposed 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** – The proposed overhaul activity follows good industry practice of aligning overhauls with commitments embedded within the AMP and manufacturer's recommendations; and

- To achieve the **lowest sustainable cost of delivering pipeline services** –Undertaking the overhaul program in a proactive, planned and scheduled manner based on run hours forecast reduces total costs over the life of these assets, where unplanned failure could lead to damage requiring full replacement. Our contractual arrangements with the OEM are managed in line with our procurement policy to ensure the best commercial terms can be achieved.

1.7.2 Justification of Non-Base Year Cost

The preventative maintenance overhaul program for gas turbines and GEAs is influenced not by financial or regulatory periods, but by the pace with which these assets' useful lives are consumed.

The use of a base year would not take into consideration the core driver for this activity – run hours in operational use - or the impact an arbitrary overhaul volume selection could have on the broader health and reliability of the pipeline or risk profile of the individual asset.

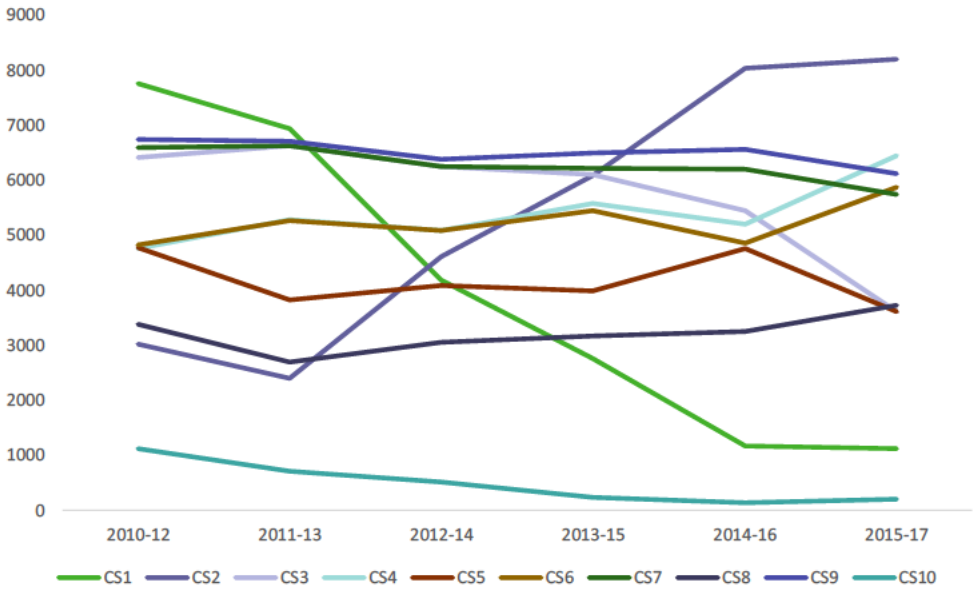
The operational use of these assets is not uniform across assets, so each one needs to be considered individually based on its current and forecast run hours. The forecast activity is reviewed on a monthly basis, as external changes such as customer demands, weather and the

'transfer' of operational load to alternative assets is considered and overhaul dates adjusted accordingly.

There is a large variation of annual hours across these assets, as can be seen in

Figure 1.6 and analysis of these hours is considered a key input in to the identification of assets requiring overhaul in AA5.

Figure 1.8: Operational hours over time



Forecast operational run hours for the AA5 period have been based on the most recent completed period September 2019 which incorporates the impact of seasonality, weather and customer demands, as well as forecasts for customer demand over the next five years.

1.7.3 Estimating efficient costs

As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology 2021-2025', the forecast unit rates for all initiatives managed within this program are inclusive of internal labour, external labour/contractors, materials, travel and other costs.

Where possible, the unit rate forecast in AA5 is based on a three-year average actual cost incurred in AA4. This has been used for GEAs.

1.7.3.1 Estimating efficient costs – gas turbines

For gas turbine overhauls, the reflection of a three year average actual cost incurred in AA4 has not been possible, due to the impact on the average unit rate of the overhauls completed within manufacturer's warranty and the impact of favourable foreign exchange rates. For AA5, the unit costs have instead been estimated based on the most recent historical cost incurred for the same or a similar program of work, [redacted]

Key assumptions which have been made in the cost estimation for gas turbine overhauls include:

- Forecast rates for AUD equivalent costs of USD sourced equipment items are based on the two most recent purchases, reflecting recent exchange rates

- [redacted] the overhauls will [redacted] turbine;
- One overhaul will occur under manufacturer's warranty;
- The price differential between [redacted] remain unchanged relative to the most recent overhauls completed, with the difference driven by the cost of the equipment; and
- Internal costs unchanged relative to recent actual costs incurred.

Specialist engineering, procurement and construction management (EPCM) activities are provided utilising internal resources, supplemented by external specialist input as required. Delivery of the work is primarily through external resources. This is the model that has been successfully deployed and implemented on the DBNGP for AA4 and previous AAs.

Table 1.24 below summarises the total unescalated costs for gas turbine overhauls in real dollars June 2019.

Table 1.25: Gas turbine overhauls cost estimate

($'000)	2021	2022	2023	2024	2025	Total
[redacted]						
[redacted]						
[redacted]						
[redacted]						
[redacted]						
[redacted]						
Total (volume)						
Total (cost)	**7,700**	**6,400**	**6,400**	**3,200**	**1,000**	**24,700**

Table 1.26 below summarises the total unescalated costs by cost type.

Table 1.27: Gas turbine overhauls cost estimate, by cost type

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	420	349	349	175	55	1,348
External Contractors/ Consultants	89	74	74	37	12	285
Materials & Services	7,135	5,931	5,931	2,965	927	22,889
Travel & Others	55	46	46	23	7	178
Total cost	**7,700**	**6,400**	**6,400**	**3,200**	**1,000**	**24,700**

Table 1.28 below shows the escalation applied to escalate the gas turbine overhaul costs to real dollars of December 2020 including labour cost escalation of 0.69%.

Table 1.29: Gas turbine overhauls total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	7,700	6,400	6,400	3,200	1,000	24,700
Escalation	197	181	198	108	36	720
Total escalated ($ Dec 20)	**7,897**	**6,581**	**6,598**	**3,308**	**1,036**	**25,420**

1.7.3.2 Estimating efficient costs – GEAs

For GEA overhauls, the use of a three year average actual cost incurred in AA4 has been used.

[redacted] supply the equipment for this program under a preferred supplier contract. The costs are specific to the GEA that is being overhauled. The estimated cost for the equipment in AA5 is based on recent actual costs incurred, which reflect improved commercial terms recently secured.

Key assumptions which have been made in the cost estimation for gas turbine overhauls include:

- Forecast rates for AUD equivalent costs of USD sourced equipment items are based on the two most recent purchases, reflecting recent exchange rates;
- None of the overhauls will be done under manufacturer's warranty; and
- Internal costs unchanged relative to recent actual costs incurred.

Specialist engineering, procurement and construction management (EPCM) activities are provided utilising internal resources, supplemented by external specialist input as required. Delivery of the work is primarily through external resources. This is the model that has been successfully deployed and implemented on the DBNGP for the current AA4 and previous AAs.

Table 1.22 below summarises the total unescalated costs for gas turbine overhauls in real dollars June 2019.

Table 1.30: GEA overhauls cost estimate

($'000)	2021	2022	2023	2024	2025	Total
[redacted]						
[redacted]						
Total	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**5,000**

Table 1.23 below summarises the total unescalated costs by cost type.

Table 1.31: GEA overhauls cost estimate, by cost type

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	54	54	54	54	54	271
External Contractors/ Consultants	128	128	128	128	128	642
Materials & Services	816	816	816	816	816	4,079
Travel & Others	2	2	2	2	2	10
Total cost	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**5,000**

Table 1.24 below shows the escalation applied to escalate the GEA overhaul costs to real dollars of December 2020 including labour cost escalation of 0.694%.

Table 1.32: GEA overhauls total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	1,000	1,000	1,000	1,000	1,000	**5,000**
Escalation	26	28	31	34	36	**155**
Total escalated ($ Dec 20)	**1,026**	**1,028**	**1,031**	**1,034**	**1,036**	**5,155**

Appendix A – Risk Assessment

Figure 1.9 provides a summary of the risk assessment for gas turbine and GEA overhauls

Figure 1.10: Summary of gas turbine and GEA overhaul risk assessment

	DBP				People				Environmental				Outrage				Asset Damage				Loss of Supply				
	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Total Risk Score
Untreated	Major	Occasional	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Occasional	LOW	5	Severe	Occasional	INTERMEDIATE	25	Major	Occasional	HIGH	125	Severe	Occasional	INTERMEDIATE	25	430
Option 1 - Maintain AA4 volume of overhauls	Major	Occasional	HIGH	125	Catastrophic	Hypothetical	INTERMEDIATE	25	Minor	Occasional	LOW	5	Severe	Unlikely	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	330
Option 2 - Move to a replacement on failure policy	Major	Occasional	HIGH	125	Catastrophic	Hypothetical	INTERMEDIATE	25	Minor	Occasional	LOW	5	Severe	Occasional	INTERMEDIATE	25	Major	Occasional	HIGH	125	Severe	Occasional	INTERMEDIATE	25	330
Proactively overhaul in line with the AMP	Major	Remote	INTERMEDIATE	25	Catastrophic	Hypothetical	INTERMEDIATE	25	Minor	Remote	NEGLIGIBLE	1	Severe	Remote	LOW	5	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	86

Station Inspections Business Case – Opex DBP13

1.1 Project Approvals

Table 1.1: Station inspections DBP13 – Project approvals

Prepared By	Andrew Stanwix, Senior Mechanical Engineer
Reviewed By	Hugo Kuhn, Head of Engineering
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 1.2: Station inspections DBP13 – Project overview

Description of Issue/Project	Pressure vessels and pressure relief valves are located at both compressor stations and meter stations. This business case includes inspection of both. This business case outlines three core station inspection activities, namely: • Mandatory inspection of pressure vessels; • Mandatory inspection of pressure relief valves; and • Inspection and re-preservation of compressor bundles in long term storage. These inspections are conducted in line with AS 3788. The merit of these inspection programs is well understood, with data captured during these inspections allowing us to monitor the condition of compressor station assets and detect anomalies in condition early to allow for proactive, preventative intervention rather than the reactive, corrective alternatives. This program has not been separately reported. However, the costs incurred were captured in other programs previously. Pipeline pressure vessel inspections and pressure relief valve inspections are included with the Pipeline and MLV inspections business case [DBP19].
Project Name	Station inspections
Estimated Cost	Total forecast opex for the next Access Arrangement (AA5) is $4.0 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Variation from AA4	The proposed AA5 expenditure is $1.4 million more than the forecast expenditure for AA4. The cost estimate is based on identifying the number of inspections required and the appropriate unit cost of each. The unit cost will vary for different inspection types, whether it is done on a compressor station or meter station and its location. The AA5 forecast assumes the following inspection activities will be undertaken: • 5 yearly inspection of pressure relief valves [redacted] compressor stations per year and [redacted] meter stations per year • 4 yearly inspection of pressure vessels at compressor stations – assumed average of [redacted] compressor stations inspected per calendar year with approximately [redacted] vessels per station • 8 yearly inspection of pressure vessels at meter stations – assumed average of [redacted] meter stations inspected per calendar year The frequency of these inspections is directed by the requirements of AS 3788, however, additional inspections occur where the condition of the assets identifies it is needed.

	AA4 expenditure was lower than expenditure forecast for AA5 due reduced activity levels.. The increase in expenditure from AA4 to AA5 is likely to stabilise in future AA periods.
Consistency with the National Gas Rules (NGR)	National Gas Rule 91 requires that operating expenditure must be 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 delivering pipeline services. Pressure vessels and pressure release valves are high risk assets which are important in maintaining the safety, integrity and reliable delivery of gas along the DBNGP. The performance of these assets can be proactively managed through inspection to ensure early intervention as needed, in accordance with AMP requirements and AS 3788 guidelines. The need to address these assets is based on the latest information available resulting from previous inspections, and ongoing assessment of the most appropriate inspection methodology ensures consistency with rule 74 (2) which requires the forecast to be (a) arrived at on a reasonable basis; and (b) represent the best forecast or estimate possible in the circumstances is also achieved. The cost of each inspection type is based on historical actual cost, which reflect commercially negotiated unit rates that have been market tested, in line with our Procurement Policy and Purchasing Procedure.
Stakeholder Engagement	Our Shippers advised they highly value current levels of reliability and would be concerned if this were to change. They also expect us to maintain a strong focus on operational issues as it is important for reliability and emergency management. Our gas turbine and GEA overhaul program comprises ongoing and periodic activities to ensure the integrity of our pipeline. During Shipper Roundtables, we presented key areas of planning, including our proposed capex and opex. Shippers were broadly comfortable with the approach and high-level program in AA5. Our proposed approach was then outlined in the Draft Plan. No questions were specifically raised in relation to the station inspections program. In response to Shippers' general interest in how we deal with changing business needs during an AA period, this business case outlines what changes in approach have been considered and will be implemented in our AA5 program of work.
Other relevant documents	This Business Case should be read in conjunction with: • Asset Management Plan (TEB-001-0024-07); • Asset Management Plan – Rotating Equipment (TEB-001-0024-03); and • DBP19 – Pipeline and MLV inspections; and • Risk Management Policy and Operational Risk Model (together our Risk Management Framework).

1.3 Background

All physical DBNGP assets are managed in accordance with the policies and principles set out in the Asset Management Plan (AMP) which is part of our Asset Management System Framework.

A key principle of the Asset Management System Framework is effective management of asset risks which includes identification of risks and evaluation of the adequacy of controls in terms of physical safeguards and asset maintenance requirements.

As part of the asset management risk assessments, risk levels are determined for different asset classes and criticality of controls analysed based on the significance of risk reduction provided by the risk controls.

The station inspections program is an essential part of the asset management framework we have in place, helping to ensure integrity of the pipeline is not compromised over time. These scheduled inspections of stored compressor bundles, pressure vessels and pressure relief valves help us to

monitor the condition of compressor station and meter station assets and detect anomalies in condition early.

Information captured during routine inspections is then used to assess operational risks (safety and reliability), highlight anomalies in asset condition/deterioration, identify safety hazards/improvement potential, appropriately schedule and prioritise preventative maintenance activities as well as optimise future inspection activities.

Both pressure vessels and pressure relief valves are considered high risk assets. A key control for managing this risk is preventative maintenance, including inspection.

1.3.1 Development of program

There are three core inspection activities for the station inspections program:

- Mandatory inspection of pressure vessels;
- Mandatory inspection of pressure relief valves; and
- Inspection and re-preservation where needed of compressor bundles in long term storage.

The frequency of inspections are consistent with the AMP and differ depending on the asset that is being inspected.

The nominal inspection intervals stipulated in AS 3788 are generic in order to address a wide range of industries, applications and process conditions. As such, and in light of the relatively mild environments to which our pressure vessels are subjected (clean, dry natural gas at moderate temperatures), the intervals are believed to be conservative for DBP's application.

AS 3788 allows for a Risk Based Inspection (RBI) process to be adopted whereby the inspection frequency can be altered based on a thorough understanding of the level of risk and the controls involved. This allowance is made available based on accurate inspection and maintenance history and a thorough understanding of the likely modes of failure.

We leverage historical information and all other knowns to determine the optimum inspection frequency.

The AA5 forecast allows for an inspection profile, as shown in Table 1.3.

Table 1.3: AA5 station inspections – units and cost

Inspection type	AA5					
	2021	2022	2023	2024	2025	TOTAL
Pressure vessels ($'000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pressure vessels (units)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pressure relief valves ($'000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pressure relief valves (units)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Compressor bundle ($'000)		[redacted]		[redacted]		[redacted]
Compressor bundle (units)		[redacted]		[redacted]		[redacted]
Total cost ($'000)	**785**	**820**	**785**	**820**	**785**	**3,995**

1.3.2 Pressure vessel inspections

Pressure vessels on the DBNGP are typically designed to hold gas or liquid at pressures considerably higher than the ambient pressure. Although designed with inbuilt safety factors, pressure vessels are susceptible to a number of failure types (ie corrosion, mechanical damage, wear and vibration) that can result in loss of strength over time. In extreme cases, these failures can advance to a point where the strength of the vessel is insufficient for the applied stresses – causing the vessel to fail.

There are approximately 950 pressure vessels in operation on the DBNGP, located at compressor stations, meter stations and pipelines. Over 50% of all vessels are located at compressor stations.

Australian Standard AS 1210-2010: Pressure Vessels considers a pressure vessel to be any vessel subjected to internal or external pressure. This includes all interconnecting parts and components (e.g. baffles, valves, flanges, nozzles).

Our pressure vessels are designed to comply with AS 1210. We are further required to comply with the inspection and testing obligations of Australian Standard AS 3788 as a condition of the pipeline licence.

AS 3788 mandates a routine inspection regime for pressure vessels. While the interval for external inspections is fixed, the standard allows for the internal inspection interval to be extended based on a proven history of integrity. The standard provides both a nominal as well as a maximum extended interval. This program includes inspection every 5 years for relief valves, 4 years for compressor stations and 8 years for meter stations.

Where previous vessel inspections indicated no corrosion or deterioration of the vessel, we can change the inspection method to non-intrusive inspection, which significantly reduces the time and costs of future inspections while remaining compliant with AS 3788.

For AA5, we have identified non-intrusive inspections as appropriate for compressor station, which reduce the unit cost per compressor station to almost half the previous unit cost, [redacted]

Unit rates for meter stations are relatively consistent across the two periods, at an average [redacted]

Figure 1.1 overleaf shows an image of the typical pressure vessel on the DBNGP.

Figure 1.1: Pressure vessel

1.3.2.1 Volume of activity over time

The pressure vessels to be inspected and forecast cost for AA5 is provided in Table 1.4.

Table 1.4: Pressure vessel inspection program per category of asset over time

Pressure vessels	AA5					
	2021	2022	2023	2024	2025	TOTAL
Compressor Station ($'000)	[redacted]					
Compressor Station (units)	[redacted]					
Meter station ($'000)	[redacted]					
Meter station (units)	[redacted]					
Total units	[redacted]					
Total cost ($'000)	**285**	**285**	**285**	**285**	**285**	**1,425**

The previous scheduled inspections for compressor station pressure vessels indicated no corrosion/deterioration of the vessels. This has allowed– within the guidelines of AS 3788 - a change the inspection method to a non-intrusive inspection. The volume of inspection remains consistent, in line with the requirements of AS 3788.

1.3.3 Pressure relief valve inspections

A pressure relief valve (also referred to as pressure safety valves or PSVs) is a valve that automatically opens to discharge fluid or gas in order to relieve pressure.

Pressure relief valves on DBNGP facilities form part of the pressure control and protections system, which is installed to prohibit over pressure excursions and to maintain the integrity of pressure containing systems.

Failure of a pressure relief valve during a pressure excursion could result in over pressuring of the protected equipment.

For AA5, these are to be inspected every 5 years which will include testing of 2 compressor stations, each with approximate 65 PSVs and 12 meter stations, each with approximate 10 PSVs.

Figure 1.2: Pressure relief valve

1.3.3.1 Volume of activity over time

The pressure relief valves to be inspected and forecast cost for AA5 is provided in Table 1.5.

Table 1.5: Pressure relief valve inspection program per category of asset over time

Pressure relief valve	AA5					
	2021	2022	2023	2024	2025	TOTAL
Compressor Station ($'000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Compressor Station (units)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Meter station ($'000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Meter station (units)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total cost ($'000)	**500**	**500**	**500**	**500**	**500**	**2,500**

Both the volume of inspection and unit rates for pressure relief valves remain consistent with AA4 and in line with the requirements of AS 3788.

1.3.4 Compressor bundle inspections

A number of compressor station bundles are stored in long term storage in Jandakot. These bundles include high cost compressor rotor assets and are stored in a way which is intended to ensure preservation – specifically mitigating against corrosion. They need to be inspected periodically to confirm the condition of the desiccant - which is required to function as a preservative for the bundles – is adequate. Where the condition of the desiccant is not adequate, it is replaced.

1.3.4.1 Volume of activity over time

The compressor bundle inspection program forecast cost for AA5 is provided in Table 1.6

Table 1.6: Compressor bundle inspection program

Compressor bundle	AA5					
	2021	2022	2023	2024	2025	TOTAL
Inspections ($'000)						
Inspections (units)						
Total units						
Total cost ($'000)	-	35	-	35	-	70

A representative sample of 2 bundles are forecast for inspection and re-preservation every two years during AA5. This is consistent with previous periods, where period inspections were undertaken.

1.4 AA5 forecast

In AA5, a total expenditure of $4.0 million is forecast as shown in Table 1.7. The forecast is based on identifying the units that will require inspection given the frequency of inspection cycle and the unit cost.

Table 1.7: Summary of AA5 forecast spend station inspections

($'000)	2021	2022	2023	2024	2025	AA5
Pressure vessel						
Pressure relief						
Compressor bundles						
Total	785	820	785	820	785	3,995

1.4.1 AA4 comparison

In AA4, we estimate total expenditure of $2.6 million. There was no specific allowance for this inspection program in AA4 as it was not separately reported.

1.4.1.1 AA4 compared to AA5

In AA5, we forecast total expenditure of $4.0 million. This is $1.4 million higher than our actual forecast in AA4, as shown in Table 1.8.

Table 1.9: Summary of actual and forecast spend across AA4 and AA5

($'000)	Year 1	Year 2	Year 3	Year 4	Year 5	AA
AA4 forecast	280	194	888	451	744	2,557
AA5 proposed	785	820	785	820	785	3,995
Variance	(505)	(626)	103	(369)	(41)	(1,438)

The uplift in forecast spend in AA5 compared to AA4 is driven by an increase in activity compared to AA4.

The unit rates have reduced, with non-invasive inspections being introduced in AA5 for compressor station pressure vessels, at a significantly lower rate than the previous inspection norm prompted.

When compared with our own internal annual work program budget, both volumes of work and unit rates incurred were in line with approved for AA4.

1.4.2 AA5 forecast

The rolling cycle of inspection for station assets is guided by the AMP, with different inspection cycles for each type and asset. The AA5 forecast assumes the following inspection activities will be undertaken:

- 5 yearly inspection of pressure relief valves – [redacted] x compressor stations per year and [redacted] x meter stations per year;
- 4 yearly inspection of pressure vessels at compressor stations – assumed average of [redacted] compressor stations inspected per calendar year with approximately [redacted] vessels per station; and
- 8 yearly inspection of pressure vessels at meter stations – assumed average of [redacted] x meter stations inspected per calendar year.

As noted in Section 1.3.1 above, the nominal inspection intervals stipulated in AS 3788 are generic and are considered to be conservative for our specific application.

By adopting the Risk Based Inspection (RBI) process permitted within AS 3788, we seek to ensure the most efficient and prudent approach is adopted in the management of inspections for all impacted assets.

The most significant change for AA5 when compared with AA4 is the move to non-invasive inspections for compressor station pressure vessels.

Volumes of inspection for each asset category has remained unchanged across the two periods.

1.5 Risk Assessment

Risk management is a constant cycle of analysis, treatment, monitoring, reporting and then identifying once again, as shown below in

Figure 1.3, with a commitment to balance outcomes sought with delivery and cost implications considered and assessed.

Figure 1.3: Risk management principles

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur.

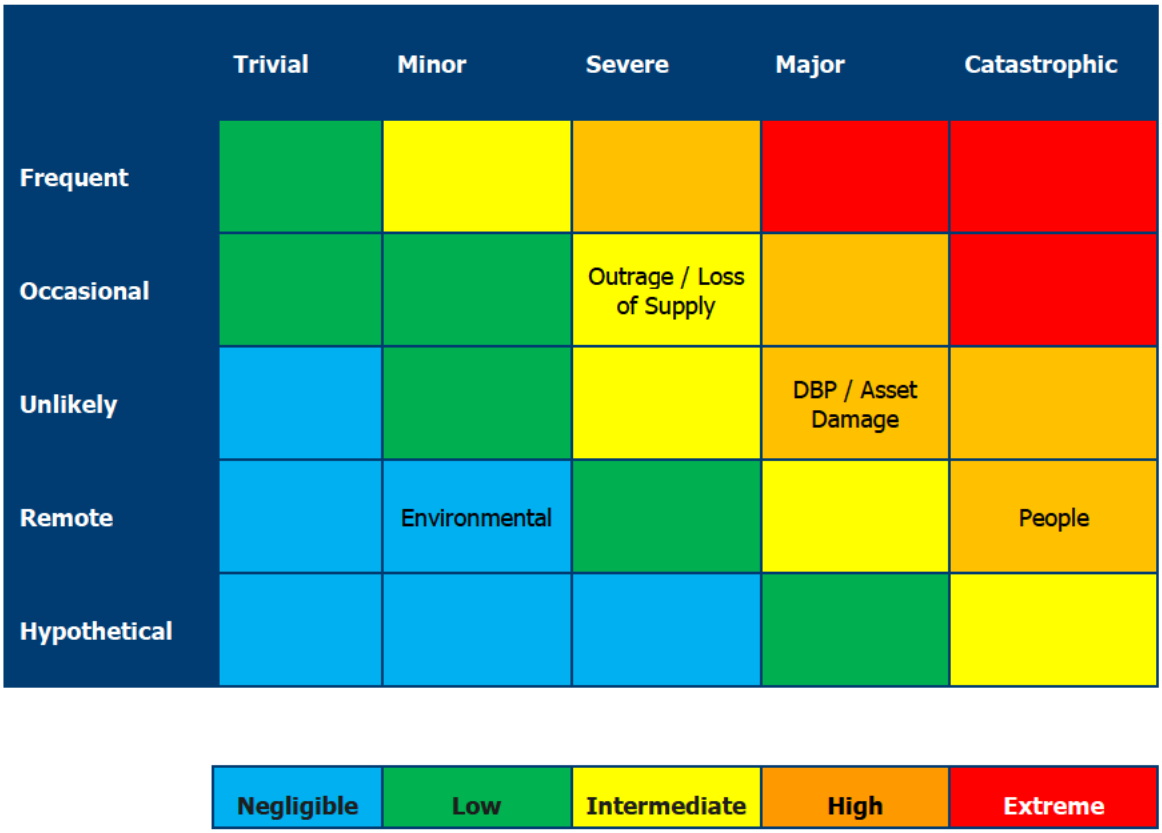
Based on these two key inputs, the risk assessment and derived risk rating then guides the actions and activities required to ensure safety and compliance are not compromised, while delivery of this outcome is done as efficiently and effectively as possible. The risk rating assesses the consequence and likelihood of the risk.

The risk of an event associated with failure of an asset is rated based on the combined effect of the consequence and likelihood rating to provide an overall risk rating. This risk rating guides the risk management and mitigation activities and facilitates prioritisation.

Our Operational Risk Framework is based on AS/NZS 2885 and requires all identified risks ranked as intermediate or above to be addressed. For risks ranked as high we must *'Moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.*

The overall risk rating of pressure vessels and pressure relief valves is presented in Figure 1.4. Three elements of risk are rated as high, two intermediate risk and one low. This results in a high risk ranking for these assets in an untreated scenario.

Figure 1.4: Risk rating – station inspections



1.5.1 Untreated risk

Table 1.10: Risk rating

Risk Area	Untreated
DBP	High
People	High
Environment	Negligible
Reputation/Outrage	Intermediate
Asset Damage	High
Supply	Intermediate
Overall Rating	**High**

Station inspection driven initiatives are high risk and high priority.

- **DBP** – Untreated, the pressure vessels and pressure relief valves would threaten the effective operation of DBP for a substantial period, including its ability to raise capital, or have a significant effect on how DBP will operate in the future;
- **People** – Untreated, pressure vessels and pressure relief valves could result in more than two fatalities or more than four individuals with life threatening injuries or permanent disabilities;
- **Reputation/Outrage** – Untreated, pressure vessels and pressure relief valves could result in widespread complaints and anger;
- **Asset Damage** – Untreated, pressure vessels and pressure relief valves could result in asset damage of between $10M and $25M;

- **Supply** – Untreated, pressure vessels and pressure relief valves could result in localised societal impact or short term supply interruption (hours).

1.6 Options Considered

Alternatives options for management and maintenance of pressure vessels and pressure relief valves for the AA5 period which have been considered are:

- Option 1 – Inspect consistent with volume and activities consistent with the AMP;
- Option 2 – Increase frequency of inspections; and
- Option 3 – Do not undertake station inspections program.

1.6.1 Option 1 – Do the volume identified in the AMP

This program includes inspections consistent with the volume based on the requirements identified in the AMP, aligned to standard industry practice, comply with the requirements of AS 3788 and in line with the Safety Case.

1.6.1.1 Achievement of objectives

Table 1.10 outlines how Option 1 would support the achievement of our vision objectives in AA5.

Table 1.11: Option 1 - Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option delivers against our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient.

This option would address all the identified inspection requirements for the pressure vessels and pressure relief valves as noted in the AMP and demonstrates an inspection program that is sustainably cost efficient – adopting commercially negotiated unit rates, adjusting for lower cost, less invasive inspection methodologies where this option exists, and delivering for customers in terms of public safety and reliability by completing inspections on a cycle without impact to pipeline operations. It also ensures health and safety of employees and contractors working across the pipeline assets by minimising risk and working within industry standards in a manner which is compliant with legislative and other regulatory requirements.

1.6.1.2 Cost assessment

The cost of this program is $4.0 million in AA5.

By adopting a proactive, planned approach to inspections, we can best manage the efficient delivery of the program, minimising the need for unplanned and disruptive repair work on the network, which might otherwise result in a failure or other expensive disruption.

1.6.1.3 Risk assessment

Table 1.11 shows that option 1 in AA5 is effective at 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.121: Risk rating impact– Option 1

Risk Area	Untreated	Treated
DBP	High	Intermediate
People	High	High
Environment	Negligible	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	High	Intermediate
Supply	Intermediate	Low
Overall Rating	**High**	**ALARP**

1.6.2 Option 2 – Increase frequency of inspections

Under option 2, the volume of inspections would double so that almost all vessels are inspected and relief valves tested twice per regulatory period.

1.6.2.1 Achievement of objectives

Table 1.12 outlines how option 2 will support the achievement of our vision objectives in AA5.

Table 1.13: Achieving objectives – option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	-
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

While this option delivers for customers and employees in terms of safety, it is not sustainably cost efficient and the additional frequency of inspections is also likely to have a greater impact on supply/reliability and double the amount of travel, which is one of the highest risk activities on the pipe line.

1.6.2.2 Cost assessment

Under option 2, the unit costs are assumed to remain stable, with the total number of activities doubling to increase expenditure to $8.0 million.

1.6.2.3 Risk assessment

Table 3.14 shows that option 2 in AA5 does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.15: Risk rating impact - Option 2

Risk Area	Untreated	Treated
DBP	High	Intermediate
People	High	High
Environment	Negligible	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	High	Intermediate
Supply	Intermediate	Low
Overall Rating	**High**	**Intermediate**

Undertaking inspections at double the frequency as current is unlikely to reduce risk any further than for option 1, particularly based on condition information from DBP's current inspection program.

1.6.3 Option 3 – No inspections

This option would stop inspections and instead take reactive action to address .

1.6.3.1 Achievement of objectives

Table 1.16 outlines how option 3 will support the achievement of our vision objectives in AA5.

Table 1.17: Achieving objectives – option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	N
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	N
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

This option does not deliver against any of DBP's vision objectives of delivering for customers, being a good employer and being sustainably cost efficient, particularly over the medium to long term.

Failure of these assets is likely to result in significant disruption to services, higher cost due to the likely higher impact of the failure on the asset, including higher likelihood of replacement. A failure of these assets could also have significant impacts on the safety of workers in the vicinity of the failed asset.

1.6.3.2 Cost assessment

With this option, no costs would be incurred as a result of inspections. However, there could be significant unplanned cost associated with issues that required remediation and penalties to customers from not delivering on commitments. There could also be additional costs where an incident occurs causes major impact to people, asset damage or loss of supply.

1.6.3.3 Risk assessment

Table 1.18 shows that option 3 in AA5 not does moderate the threat, the frequency and/or the consequence to reduce the risk rank to intermediate or lower. It could be considered negligent.

Table 1.19: Risk rating impact - Option 3

Risk Area	Untreated	Treated
DBP	High	High
People	High	High
Environment	Negligible	Negligible
Reputation/Outrage	Intermediate	Intermediate
Asset Damage	High	High
Supply	Intermediate	Intermediate
Overall Rating	**High**	**High**

1.7 Summary of Cost/Benefit Analysis

Table 1.20: Summary of Cost Benefit analysis

Option	Objectives	Cost	Risk
Option 1 – complete the work consistent with the volumes identified in the AMP	This option achieves our objectives of delivering for customers, being a good employer and being sustainably cost efficient	$4.0m	This option appropriately moderates all high/intermediate risks to ALARP
Option 2 – double the frequency of inspections	This option achieves our objective of delivering for customers and being a good employer but is not sustainably cost efficient	$8.0m	This option addresses the high risks, but is more than required to reflect good industry practice or efficient norms at increased cost.
Option 3 – undertake no inspections and respond to issues as they rise.	This option does not achieve our objectives of delivering for customers or being a good employer	>$4m	This option does not treat the identified risk, is unlikely to comply with obligations and could result in considerable additional cost be

1.7.1 Why are we proposing this solution?

The recommended option is Option 1 - to complete the inspections required consistent with the AMP - is the recommended solution due to its alignment with our Operational Risk Framework, asset management principles and the Safety Case, the conditions of our operating licence and good industry practice. It also meets the requirement of NGR 91 that operating expenditure be 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 delivering pipeline services .

Option 2 – increase frequency of inspections would unnecessarily introduce a level of expense that we believe would fail to meet expectations of NGR 91.

Option 3 – do not undertake inspections program could result in catastrophic failure of an asset which would result in loss of revenue as well as reputational impact should a failure result in an inability to meet customer capacity demands.

1.7.1.1 Consistency with the National Gas Rules

National Gas Rule 91 requires that operating expenditure must be 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 delivering pipeline services.

Rule 91

The relevant opex rule is detailed below and has been extracted from the latest version of the National Gas Rules (available here: http://www.aemc.gov.au/energy-rules/national-gas-rules/current-rules):

> *"Division 7 Operating expenditure*
>
> *91 Criteria governing operating expenditure*
>
> *(1) Operating expenditure must be 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 delivering pipeline services.*
>
> *(2) The AER's discretion under this rule is limited."*

Option 1 – 'Do the volume identified in the AMP' is the recommended solution and recommends that we proceed with the inspection of pressure vessels and pressure relief valves in line with AMP.

The station inspections program is consistent with Rule 91(1), to achieve the lowest sustainable cost of providing services. Consistent with the requirements of Rule 91(1) of the National Gas Rules, DBP considers that the operating expenditure is:

- **Prudent** – The expenditure is necessary in order to meet conditions of our operating licence and provide assurance as to the integrity of pressure vessels and relief valves which are integral to the safe and reliable supply of gas along the DBNGP. The proposed expenditure can therefore be seen to be of a nature that would be incurred by a prudent service provider.

- **Efficient** – The forecast expenditure is based on historical average actual costs to deliver the program of work achieved through a competitive tender process in line with our Procurement Policy and Purchasing Procedure and therefore be considered consistent with the expenditure that a prudent service provider acting efficiently would incur.

- **Consistent with accepted and good industry practice** – The proposed expenditure follows good industry practice by undertaking risk-based inspections of pressure vessels and related assets in line with AS 3788. Therefore the proposed expenditure 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 delivering pipeline services** – The sustainable delivery of services includes reducing risks to as low as reasonably practicable and reducing maintenance or replacement costs by proactively inspecting and responding to the condition of pressure vessels and associated assets. We have identified factors in our operation that may enable us to extend the duration between inspections and are collecting condition information from its station inspections program to inform its approach moving forward. This will ensure it is carried out at the lowest sustainable cost without impacting the safe and reliable delivery of pipeline services.

1.7.2 Justification of Non-Base Year Cost

The preventative inspection program for pressure vessels and pressure relief valves is influenced not by financial or regulatory periods, but by the frequency of inspection noted within the relevant AMP and as directed by AS 3788.

The use of a base year would not take in to consideration the core purpose of this activity – which is to complete the cyclical assessment of the health of the asset based on all current knowns – and would artificially reduce the cost of the inspection program for our assets.

1.7.3 Estimating efficient costs

As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology 2021-2025', the forecast unit rates for all initiatives managed within this program are inclusive of internal labour, external labour/contractors, materials, travel and other costs.

Where possible, the unit rate forecast in AA5 is based on a three year average actual cost incurred in AA4. Where the inspection methodology has materially changed, the most recent actual unit cost incurred is used for forecasting purposes.

Key assumptions which have been made in the cost estimation for station inspections include:

- Actual historical unit rates will be maintained for the future for all like for like inspections, including re-preservation for compressor bundles;
- Reduced rate for non-intrusive inspections for compressor station pressure vessels will be maintained throughout AA5; and
- Internal costs unchanged relative to recent actual costs incurred.

Specialist engineering, procurement and construction management (EPCM) activities are provided utilising internal resources, supplemented by external specialist input as required. Delivery of the work is primarily through external resources. External resources are provided by specialist companies, which are engaged through a formal commercial process.

Table 1.21 overleaf summarises the total unescalated costs for station inspections in real dollars June 2019.

Table 1.22: Station inspection cost estimate

($'000)	2021	2022	2023	2024	2025	Total
Pressure Vessel (total unit)						
Compressor station (units)						
Meter stations (units)						
Pressure Vessel (total $)						
Compressor station (unit rate)						
Meter stations (unit rate)						
Pressure relief valve (total unit)						
Compressor station (units)						
Meter stations (units)						
Pressure relief valve (total $)						
Compressor station (unit rate)						
Meter stations (unit rate)						
Compressor station bundle (units)						
Compressor station bundle (total $)						
Total (volume) **Total (cost)**	**785**	**820**	**785**	**820**	**785**	**3,995**

Table 1.23 below summarises the total unescalated costs by cost type.

Table 1.24: Station inspection cost estimate, by cost type

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	41	70	41	70	41	264
External Contractors/ Consultants	417	423	417	423	417	2,099
Materials & Services	326	326	326	326	326	1,631
Travel & Others	0	1	0	1	0	1
Total cost	**785**	**820**	**785**	**820**	**785**	**3,995**

Table 1.25 below shows the escalation applied to escalate the station inspection costs to real dollars of December 2020 including labour cost escalation of 0.69%.

Table 1.26: Station inspection total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total cost (2019)	785	820	785	820	785	3,995
Escalation	20	24	26	30	31	131
Total escalated ($ Dec 20)	**805**	**844**	**811**	**850**	**816**	**4,126**

Appendix A – Risk Assessment

Figure 1.3: Summary of station inspections risk assessment

			DBP				People				Environmental				Outrage				Asset Damage				Loss of Supply				
	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Total Risk Score
Untreated/ inherent risk	Major	Unlikely	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Occasional	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Occasional	INTERMEDIATE	25	426
Option 1 - Do the volume AMP requires	Major	Remote	INTERMEDIATE	25	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Remote	LOW	5	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	186
Option 2 - Increase frequency of inspections	Major	Remote	INTERMEDIATE	25	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Remote	LOW	5	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	186
Option 3 - Do Nothing	Major	Unlikely	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Occasional	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Occasional	INTERMEDIATE	25	426

Asset Management – Opex DBP14

1.1 Project Approvals

Table 1.1: Asset Management DBP14 – Project approvals

Prepared By	Hugo Kuhn, Head of Engineering
Reviewed By	Tawake Rakai, GM Transmission Asset Management
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 1.2: Asset Management DBP14 – Project overview

Description of Issue/Project	This business case outlines DBP's approach to identifying, prioritising and responding to changing asset requirements and functionality based on real time feedback from field crews. The focus of this business case is on two key streams of work: 1. Engineering and Operational Projects (EOP) subsequent costs; and 2. Management of Change (MoC) projects. This annual program provides for EOP subsequent costs and MoC projects consistent with a historical program with works prioritised as per AMPs and the Safety Case, particularly where works are safety or operational critical. The Asset Management program provides for the works that cannot be adequately forecast on an individual basis, but which DBP knows are likely to occur.
Project Name	Asset Management
Estimated Cost	Total forecast capex for the next Access Arrangement (AA5) is $2.8 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Variation from AA4	The proposed AA5 expenditure is $0.1 million more than the estimated expenditure for AA4 of $2.7 million. The increase in allocation for Asset Management relates to the following: 1. The expansion programs which drive increases as additional assets that have been added to the gas transmission system that need to be managed and maintained; and 2. As work volumes increase and improvement initiatives are assessed and implemented, MoC expenditure has been increasing. This level of expenditure forecast for AA5 is likely to continue across future AA periods as the forecast EOP and MoC projects tend to follow a consistent and predictable pattern of expenditure.
Consistency with the National Gas Rules (NGR)	Rule 91 requires that operating expenditure must be 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 delivering pipeline services. The proposed volume of activity is guided by our AMPs and has regard to our regulatory obligations, manufacturer's recommendations, Australian and International Standards. The work will be delivered by a mix of internal and external resources. External resources and materials are procured competitively in line with our procurement policy and purchasing procedure to ensure efficient costs. The method and timing of delivery also considers bundling and optimization with other programs of work where possible. The opex is therefore

	of a nature that would be incurred by a prudent service provider, acting efficiently, in line with good industry practice and to achieve the lowest sustainable cost of delivering pipeline services and is consistent with Rule 91.
Stakeholder Engagement	Our Shippers have advised us that they highly value current levels of reliability and would be concerned if this were to change. They also expect us to maintain a strong focus on operational issues as it is important for reliability and emergency management. Our Asset Management program will keep asset drawings up to date and allow us to undertake minor engineering changes to support day to day operations. During our Shipper Roundtables we presented key areas of our planning, including our proposed capex and opex. Shippers were broadly comfortable with our approach and high-level program in AA5. Our proposed capex was then outlined in our Draft Plan. There were no questions specifically raised in relation to the Asset Management program. In response to Shippers' general interest in how we deal with changing business needs during an AA period, this business case clearly outlines what changes in approach have been considered and will be implemented in our AA5 program of work.
Other relevant documents	This Business Case should be read in conjunction with: • AMP TEB-001-0024-01 (General); and • Risk Management Policy and Operational Risk Model (together our Risk Management Framework).

1.3 Background

All physical DBNGP assets are managed in accordance with the policies and principles set out in the Asset Management Plan (AMP) which is part of our Asset Management System Framework.

A key principle of the Asset Management System Framework is effective management of asset risks which includes identification of risks and evaluation of the adequacy of controls in terms of physical safeguards and asset maintenance requirements.

The Asset Management program includes two key streams of work:

- Engineering and Operational Projects (EOP) subsequent costs; and
- Management of Change (MoC) projects.

1.3.1 EOP subsequent costs

EOPs include those investments in existing assets that occur each year but are unable to be forecasted due to their ad hoc, unscheduled nature. They fall outside the planned maintenance and replacement regimes specified in the relevant AMPs and often are not related to specific projects or programs of work but are required for the safe and reliable operation of the pipeline.

The EOP subsequent costs program covers the following activities:

- undertake GIS mapping and drawing updates to ensure asset location and as built drawings reflect current status to facilitate optimised maintenance activities;
- ongoing revisions to control software such as [redacted] tool kit to enable safe and reliable operations;
- accommodate ongoing refinement of Maximo as an optimisation strategy in maintenance management (as distinct from the major reconfiguration of Maximo which is covered in a separate business case);

- maintenance of the technical document management system as required to ensure that information is accessible, accurate and reliable; and
- review of critical spares, including adequacy of emergency response equipment and associated processes and plans.

1.3.2 Management of Change

MoC projects include initiatives addressing defects or unsafe situations. These are typically engineering changes that are minor but can be safety or operation critical. Issues are usually identified onsite by field crews where an alternate solution to the current practice is recommended due to safety, obsolescence, operations, quality or efficiency. It should be noted that MoC projects do not include costs where reactive maintenance is undertaken using like for like replacement, as these are attributed to the relevant asset's operations and maintenance budget.

DBP receives an average of 150 MoC documented initiatives per annum. These MOC initiatives are assessed from an engineering perspective and proposed solutions recommended for implementation.

Examples of projects undertaken under MoC include:

- Upgrading to the latest version of gas measurement software;
- Review of the Kwinana Junction UPS supply;
- Corrosion repairs;
- Odorant incineration modification;
- Replacement of cathodic protection reference cells;
- Adoption of new technology, equipment or spares; and
- Review of process safety set points.

1.4 AA5 forecast

In AA5 a total expenditure of $2.8 million is forecast and distributed as follows.

Table 1.3: Summary of AA5 forecast spend for Asset Management

($'000)	2021	2022	2023	2024	2025	AA5
EOP	300	300	300	300	300	1,500
MoC projects	250	250	250	250	250	1,250
Gas measurement monitoring software	-	-	50	-	-	50
Total	**550**	**550**	**600**	**550**	**550**	**2,800**

1.4.1 AA4 comparison

In AA4 we forecast to spend $2.7 million. This is $0.2 million lower than our approved forecast in AA4.

Table 1.4: Summary of actual and approved spend in AA4

($'000)	2016	2017	2018	2019	2020	AA4
Actual	727	573	256	675	425	2,656
Approved	672	564	554	543	533	2,866
Variance	**55**	**9**	**(298)**	**132**	**(108)**	**(210)**

1.4.2 What are the drivers for this variation

AA5 forecast expenditure is consistent with historical actual average capex.

Table 1.5: Comparison of costs AA4 and AA5

($'000)	AA4 cost	AA5 cost	Variance
EOP	1,389	1,500	111
MoC	1,174	1,250	76
Other asset management projects	93	50	(43)
Total	**2,656**	**2,800**	**144**

1.5 Risk Assessment

Risk management is a constant cycle of analysis, treatment, monitoring, reporting and then identifying once again, as shown below in Figure 1.1, with a commitment to balance outcomes sought with delivery and cost implications considered and assessed.

Figure 1.1: Risk management principles applied

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur.

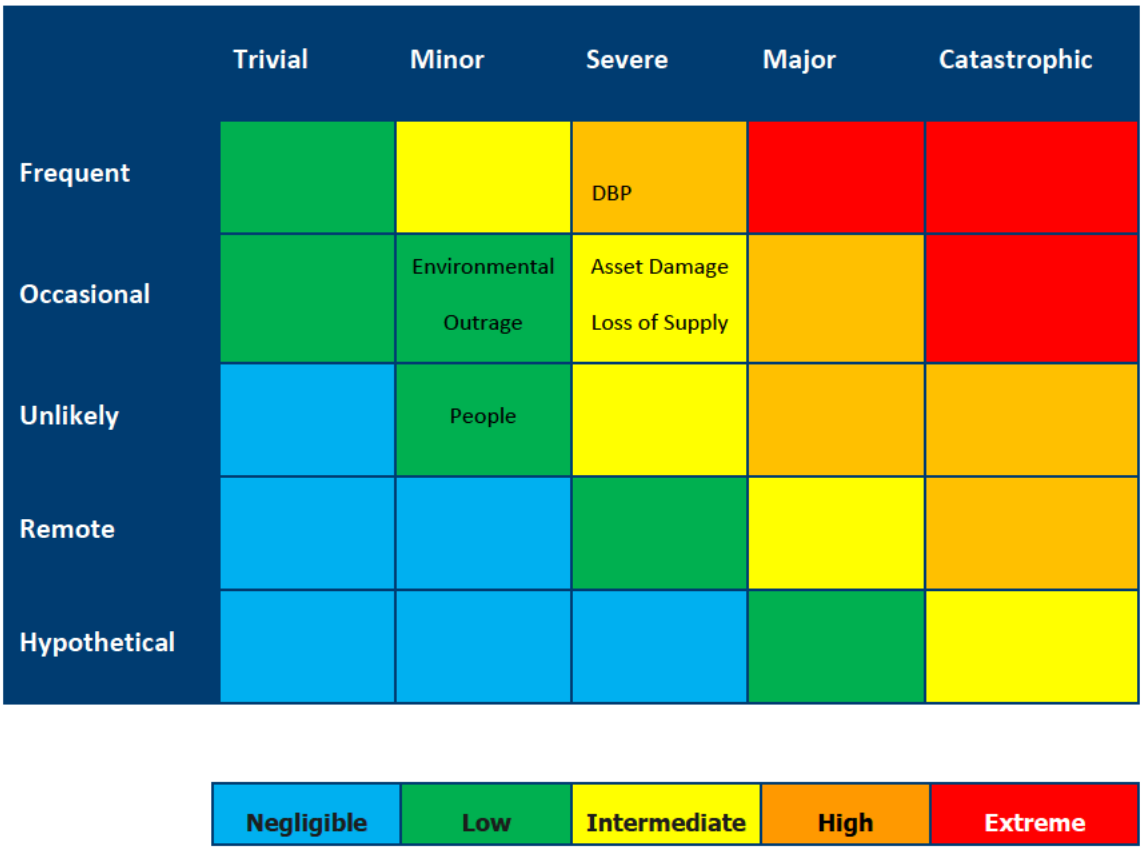
Based on these two key inputs, the risk assessment and derived risk rating then guides the actions and activities required to ensure safety and compliance are not compromised, while delivery of this outcome is done as efficiently and effectively as possible.

The risk of an event associated with failure of an asset is rated based on the combined effect of the consequence and likelihood rating to provide an overall risk rating. This risk rating guides the risk management and mitigation activities and facilitates prioritisation.

Our Operational Risk Framework is based on AS/NZS 2885 and requires all identified risks ranked as intermediate or above to be addressed. For risks ranked as high we must *'Moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.*

The overall risk rating of Asset Management is outlined in Figure 1.2. As displayed, there is one high risk, two intermediate risks and three low risks associated with the Asset Management. This results in an overall high risk rating for these assets in an untreated scenario.

Figure 1.2: Risk rating – Asset Management



1.5.1 Untreated risk

Table 1.6: Risk rating - untreated

Risk Area	Untreated
DBP	High
People	Low
Environment	Low
Reputation/Outrage	Low
Asset Damage	Intermediate
Supply	Intermediate
Overall Rating	**High**

The annual EOP subsequent costs and MoC projects are required as per AMPs and the Safety Case, particularly where works are safety or operational critical. The overall risk rating of not undertaking EOP and MoC Projects is identified as high in Figure 1.2.

Specifically:

- **DBP –** In the event of poorly maintained records, including inaccurate or unreliable GIS information related to our assets, DBP is unable to effectively operate and maintain its assets.
- **Asset Damage –** Without intervention of EOP and MoC projects, DBP will be exposed to unacceptable risks of not responding to field crews when they identify issues for immediate rectification, including for safety or operational critical reasons, potentially causing asset damage where equipment or assets fail to operate as intended. Further, there will be difficulty in performing fault finding if drawings are not up to date.
- **Supply –** DBP will likely suffer an increase in serious safety incidents or curtailment of customers where defects and unsafe situations are not rectified.

1.6 Options Considered

Alternative options for Asset Management for the AA5 period which have been considered are:

- Option 1 – Remove provision of EOP and MoC projects
- Option 2 – Undertake the volume of activity based on historical average
- Option 3 – Move to a proactive approach of repairing and replacing all identified defects

1.6.1 Option 1 – Remove provision of EOP and MoC projects

Under this option we would rely on the planned and scheduled maintenance and replacement programs for all assets as defined in the relevant AMPs with no explicit allowance. However, the work would still be required to address major defects and reactive works identified during AA5 would be subject to the SIB process and prioritised according to existing annual programs and budgets. The effect of this option is to provide no allowance for the efficient cost of the work which would still be required and undertaken based on assessment of risk and priority.

1.6.1.1 Risk assessment

Table 1.7 shows that option 1 does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.8: Risk assessment Option 2 Increase frequency of inspections

Risk category	Untreated	Treated
DBP	High	High
People	Low	Low
Environment	Low	Low
Reputation/Outrage	Low	Low
Asset Damage	Intermediate	Intermediate
Supply	Intermediate	Intermediate
Overall Rating	**High**	**High**

Option 1 does not result in any change to the untreated risk rating for each category.

1.6.2 Option 2 – Provision for of EOP and MoC projects based on average incurred in AA4

This option assumes the same level of activity is required in AA5 as in AA4 to respond to and address issues is prioritised and undertaken to ensure the safe and reliable operations of the pipeline, including undertaking EOP and MoC projects that, amongst other things, address defects, maintain critical spares and maintain up to date GIS drawings.

1.6.2.1 Achievement of objectives

Table 1.8 outlines how option 2 will support the achievement of our vision objectives in AA5.

Table 1.8: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	Y
A Good Employer – Skills Development	Y
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option delivers against all relevant vision objectives of delivering for customers, being a good employer and being sustainably cost efficient as it continues to adopt an asset management approach consistent with historical actual expenditure and levels of activity, and ensures that the identified and prioritised work is undertaken to facilitate safe and reliable operations.

1.6.2.2 Cost assessment

The cost of this option is $2.8 million in AA5.

Table 1.9: Summary of AA5 forecast spend for Asset Management

($'000)	2021	2022	2023	2024	2025	AA5
EOP						
MoC						
Gas measurement monitoring software						
Total	550	550	600	550	550	2,800

1.6.2.3 Risk assessment

Table 1.10 shows that option 2 does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.10: Risk assessment Option 2 Increase frequency of inspections

Risk category	Untreated	Treated
DBP	High	Low
People	Low	Negligible
Environment	Low	Negligible
Reputation/Outrage	Low	Negligible
Asset Damage	Intermediate	Low
Supply	Intermediate	Low
Overall Rating	**High**	**Low**

Option 2 appropriately addresses risks, reducing the inherent risk of these assets to ALARP with sufficient provision made for EOP and MoC projects to be undertaken consistent with historical averages to ensure assets perform as expected and identified issues are prioritised and rectified.

1.7 Summary of Cost/Benefit Analysis

Table 1.11: Summary of Cost/Benefit Analysis

Option	Objectives	Cost	Risk
Option 1 – Remove provision for EOP and MoC projects	This option does not achieve our objectives of delivering for customers, being a good employer or being sustainably cost efficient	$2.8m	The work would still be required but the efficient costs would not be recovered
Option 2 – EOP and MoC consistent with historical actuals	This option achieves our objectives of delivering for customers, being a good employer or being sustainably cost efficient	$2.8m	This option addresses the high/intermediate risks to DBP/People/ Environment/ Reputation/Asset Damage/Supply

1.7.1 Why are we proposing this solution?

The recommended option is to continue to undertake EOP and MoC projects at a level consistent with historical volume and expenditure because it appropriately mitigates risk and is consistent with good industry practice. It provides rigour in the evaluation and assessment of EOP and MoC projects to prioritise the most critical work. It aligns with our Risk Management Framework, asset management principles, vision objectives and regulatory requirements including the Safety Case.

Option 3 would result in no discernible risk improvement but would impose higher costs on customers.

1.7.1.1 Consistency with the National Gas Rules

Option 2 is the preferred solution and provides sufficient and timely information on the condition and performance of our assets and makes appropriate provision for prioritised rectification of issues.

Rule 91

The relevant opex rule is detailed below and also in the Guidance Note and has been extracted from the latest version of the National Gas Rules (available here: http://www.aemc.gov.au/energy-rules/national-gas-rules/current-rules):

"Division 7 Operating expenditure

91 Criteria governing operating expenditure

(1) Operating expenditure must be 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 delivering pipeline services.

(2) The AER's discretion under this rule is limited."

1.7.2 Estimating efficient costs

The costs are estimated by identifying the activities to be undertaken given the historical actual volumes and then multiplying by the appropriate unit rate for materials and labour.

As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology 2021-2025', the forecast unit rates for all projects/initiatives managed within this program are inclusive of internal labour, external labour/contractors, materials, travel and other costs.

Specialist engineering disciplines, procurement and construction management activities will be provided by internal resources. The delivery of the work and supply of required materials will be undertaken by external resources.

Table 1.12 summarises the total unescalated costs by cost type.

Table 1.12: Asset Management cost estimate by cost category

	2021	2022	2023	2024	2025	Total
Internal Labour	128	128	133	128	128	643
Contractors / Consultants	1	1	46	1	1	50
Materials & Services	418	418	418	418	418	2,088
Travel & Others	4	4	4	4	4	18
Total	**550**	**550**	**600**	**550**	**550**	**2,800**

Table 1.13 below shows the escalation applied to escalate the Asset Management costs to real dollars of December 2020 including labour cost escalation of 0.69%.

Table 1.13: Asset Management total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	550	550	600	550	550	2,800
Escalation	14	16	19	19	20	87
Total escalated ($ Dec 20)	**564**	**566**	**619**	**569**	**570**	**2,887**

Appendix A – Risk Assessment

Figure 1.3: Summary of Asset Management risk assessment

	DBP				People				Environmental				Outrage				Asset Damage				Loss of Supply				
	Consequence	Frequency	Risk	**Score**	Consequence	Frequency	Risk	**Score**	Consequence	Frequency	Risk	**Score**	Consequence	Frequency	Risk	**Score**	Consequence	Frequency	Risk	**Score**	Consequence	Frequency	Risk	**Score**	**Total Risk Score**
Untreated	Severe	Frequent	HIGH	125	Minor	Unlikely	LOW	5	Minor	Occasional	LOW	5	Minor	Occasional	LOW	5	Severe	Occasional	INTERMEDIATE	25	Severe	Occasional	INTERMEDIATE	25	190
Remove provision of EOP subs costs and MoC	Severe	Frequent	HIGH	125	Minor	Unlikely	LOW	5	Minor	Occasional	LOW	5	Minor	Occasional	LOW	5	Severe	Occasional	INTERMEDIATE	25	Severe	Occasional	INTERMEDIATE	25	190
Provision for EOP subs cost and MoC based on AA4 average requirements	Severe	Remote	LOW	5	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Severe	Remote	LOW	5	Severe	Remote	LOW	5	18

Pipeline and Mainline Valve inspections Business Case – Opex DBP19

1.1 Project Approvals

Table 1.1: Pipeline and MLV inspections DBP19 – Project approvals

Prepared By	Andrew Stanwix, Senior Mechanical Engineer
Reviewed By	Hugo Kuhn, Head of Engineering
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 1.2: Pipeline and MLV inspections DBP19 – Project overview

Description of Issue/Project	This business case outlines the approach to inspecting the pipeline and MLV assets in accordance with AS 2885 and AS 3788. There are five core inspection categories, namely: • In Line Inspections (ILI) of the main line, loop line and laterals (8 yearly); • Inspection of piping at above and below ground interfaces (5 yearly); • Piping inspection under insulation and within buried pits (10 yearly); • Mandatory inspection of pressure vessels (12 yearly); and • Mandatory inspection of pressure relief valves (5 yearly). Regular inspection of the condition of these assets ensures we can intervene at the most appropriate time to take preventative action to repair any defects, such as faults in pipelines, interfaces or valves, which might otherwise cause a loss of gas, negative impact on pressure in the pipeline or even a pipeline rupture. For AA5, no expenditure associated with in line inspection is forecast, as the frequency of these programs means there are none scheduled for the 2021 to 2025 period.
Project Name	Pipeline and MLV inspections
Estimated Cost	Total forecast opex for the next Access Arrangement (AA5) is $2.2 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Variation	The proposed AA5 expenditure is $10.6 million less than the estimated expenditure for AA4 of $12.8 million. We invested some $12.2 million on ILI of the pipeline, laterals and loops in AA4 and this program of work will not be required in the next regulatory period. The frequency of pipeline and MLV inspections is directed by the requirements of AS 2885 and AS 3788. The following inspection schedule has been embedded in to the AA5 forecast: 1. [redacted] yearly inspection of ILI of laterals last pigged in 2016 and 2017 – 0 inspections in AA5 2. 5 yearly inspection of pressure relief valves – [redacted] MLVs per year 3. 12 yearly inspection of pressure vessels at MLVs – [redacted] MLVs per year 4. 5 yearly inspection of piping above/below ground interface – [redacted] compressor stations, [redacted] meter stations and [redacted] MLVs per year 5. 10 yearly piping inspection under insulation and within buried pits

Consistency with the National Gas Rules (NGR)	Rule 91 requires that operating expenditure must be 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 delivering pipeline services. The proposed volume of activity is guided by our AMPs and has regard to our regulatory obligations, manufacturer's recommendations, Australian and International Standards. The work will be delivered by a mix of internal and external resources. External resources and materials are procured competitively in line with our procurement policy and purchasing procedure to ensure efficient costs. The method and timing of delivery also considers bundling and optimization with other programs of work where possible. The opex is therefore of a nature that would be incurred by a prudent service provider, acting efficiently, in line with good industry practice and to achieve the lowest sustainable cost of delivering pipeline services and is consistent with Rule 91.
Stakeholder Engagement	Our Shippers have advised us that they highly value current levels of reliability and would be concerned if this were to change. They also expect us to maintain a strong focus on operational issues as it is important for reliability and emergency management. Our Pipeline and MLV inspection program comprises ongoing and periodic activities to ensure the integrity of our pipeline, laterals and loops. During Shipper Roundtables, we presented key areas of planning, including our proposed capex and opex. We discussed our proposal to change the classification of asset inspections, other minor pipeline works and small health and process safety initiatives from capex to opex from AA5, noting this did not affect total expenditure in the period. Shippers were broadly comfortable with this approach and high-level program in AA5. Our proposed approach was then outlined in our Draft Plan. There were no questions specifically raised in relation to the Pipeline and MLV program. In response to Shippers' general interest in how we deal with changing business needs during an AA period, this business case clearly outlines what changes in approach have been considered and will be implemented in the AA5 program of work.
Other relevant documents	This Business Case should be read in conjunction with: • DBP13_Station Inspections Business Case; • Asset Management Plan General (TEB-001-0024-07); • Asset Management Plan – Corrosion Protection (TEB–001–0024-04); and • Risk Management Policy and Operational Risk Model (together our Risk Management Framework).

1.3 Background

All physical DBNGP assets are managed in accordance with the policies and principles set out in the Asset Management Plan (AMP) which is part of our Asset Management System Framework.

A key principle of the Asset Management System Framework is effective management of asset risks which includes identification of risks and evaluation of the adequacy of controls in terms of physical safeguards and asset maintenance requirements.

The Pipeline and MLV inspection program is an essential component of the asset management strategies adopted to ensure the integrity of the pipeline is not compromised over time. With these inspections, we test asset related information to facilitate the assessment of the current and forecast condition of the below ground pipework, so preventative intervention can be undertaken as needed.

There are five core categories for the Pipeline and MLV inspection program.

1. In-line Inspections (intelligent pigging) occur on an 8 year cycle;
2. Inspection of piping above/below ground interface – occur on an 5 year cycle;
3. Pressure vessel inspections – occur on an 12 year cycle;
4. Pressure relief valve inspections – occur on an 5 year cycle; and
5. Piping inspections under insulation and within buried pits – occur on an 10 year cycle.

These inspection programs are undertaken on a rolling basis, as required by the AMP and guided by industry standards and operational experience.

1.3.1 In-line Inspections (ILI)

The integrity of a gas pipeline body and its welding system can be monitored using in-line inspection (ILI) tools, also known as intelligent pigs.

These devices are driven by gas pressure to travel along inside a pipeline and create a map of the wall thickness variation by detecting magnetic flux leakage. Wall thinning, metal losses, mill anomalies and weld irregularities are readily detected by this technique.

Comparison of intelligent pigging results over time allows actively growing anomalies to be distinguished from passive or pre-existing pipe wall features, which is ultimately used to guide investment decisions on repairs, maintenance and replacement.

Intelligent pigging is undertaken every 8 years for the main pipeline laterals and loops, with laterals usually inspected after the mainline and/or loops as this optimises delivery and the utilisation of inhouse resources.

The intelligent pigging relies upon a software called RunCom to enable direct signal-to-signal comparison between two inspections. It is used to determine the changes in defect sizes between two inspections and calculates the growth or change over time. It can also detect and report on any new anomalies that have developed since the previous inspection.

Data gathered by RunCom as a result of intelligent pigging is used to forecast rates of corrosion, identifying key areas of attention for excavation and inspection.

The outcome of this program supports the identification of an annual list of prioritised assets for inspection that can be incorporated into our annual work program.

There are no ILI forecast for AA5 as the last pigging was conducted in 2016 and 2017, however, ILI philosophy and approach is included in this business case for completeness of the Pipeline and MLV inspection program business case was undertaken in AA4.

1.3.2 Inspection of piping above/below ground interface

The interface of pipe between below ground and above ground is the area where corrosion is most commonly found.

This is because the coating used to provide additional protection fails due to extended UV exposure, with the delaminating coating creating a crevice where moisture is captured and causes corrosion. This is where Corrosion Protection (CP) is ineffective as the delaminating coating separates the CP from the crevice. Corrosion then occurs undetected. This was the main cause of the Varanus Island incident. We have identified several instances on the DBNGP where corrosion has occurred with only a few millimetres of wall thickness remaining, such as the loss of containment at Thomas Road Meter Station.

The risk further increases as assets age with examples of corrosion underneath interface pipework arising due to the failure of interface coating, ultimately causing crevice corrosion as shown in Figure 1.1 below.

Figure 1.1: Photos of interface corrosion detected at facilities – features hidden behind the tape wraps

This inspection program has been developed leveraging our 38 years of operational experience on the DBNGP, where systematic inspection of all interfaces ensures all areas of corrosion are identified in a timely manner and the most appropriate intervention is undertaken.

There are approximately 150 sites in total that need interface inspections. The program of inspections is presented in the following table.

Table 1.3: 15 year view of above and below ground inspections

Facility type	AA4	AA5	AA6
Compressor Stations	[redacted]	[redacted]	[redacted]
Meter Stations	[redacted]	[redacted]	[redacted]
MLVs	[redacted]	[redacted]	[redacted]
Total inspections	**67**	**33**	**33**

1.3.3 Pressure vessel inspection

The inspection of pressure vessels occurs every 12 years.

Six pressure vessels will be inspected each year throughout AA5 consistent with the AMP.

1.3.4 Pressure relief valve inspection

The inspection of pressure relief valves occurs every 5 years. The inspection of these assets involves the mandatory calibration and testing as per the AMP and as required under AS 3788. These devices are used to relieve the pressure in a system as soon as the pressure reaches a pre-set level based on the maximum allowable operating pressure of the pipe or system. The pressure is relieved to a safe area via vent pipes before the system fails catastrophically.

Pressure relief valves will be inspected at 19 MLV sites each year over AA5, consistent with our AMP.

1.3.5 Piping inspection under insulation and within buried pits

There are a number of buried pits and insulated sections of piping on the DBNGP. Due to scheduling/resourcing priorities, these have not been inspected as part of previous piping and interface inspection activities and are subsequently scheduled during AA5.

Sites have been prioritised based on identifying where insulation, soil and air interfaces present an increased risk of corrosion for assets. These sites will undergo a two phase inspection regime, with the inspection being the first phase and the dig up inspection being the second.

63 sites are considered low or medium risk for corrosion and will be subject to inspection during AA5.

1.4 AA5 forecast

In AA5, a total expenditure of $2.2 million is forecast, distributed as follows:

Table 1.4: Summary of AA5 forecast spend for Pipeline and MLV inspections

($'000)	2021	2022	2023	2024	2025	AA5
ILI pigging	-	-	-	-	-	-
Above/below ground	145	145	145	145	145	725
Pressure vessel	60	60	60	60	60	300
Pressure relief valve	152	152	152	152	152	760
Under insulation and within buried pits	416	-	-	-	-	416
Total	**773**	**357**	**357**	**357**	**357**	**2,201**

1.4.1 AA4 comparison

In AA4, we estimate expenditure on this program will be $12.8 million. This is $1.1 million higher than the approved forecast in AA4.

Table 1.5: Summary of actual and approved spend in AA4

($'000)	2016	2017	2018	2019	2020	AA4
Actual	296	388	3,787	4,906	3,433	12,810
Approved	105	231	126	4,445	6,785	11,691
Variance	**191**	**157**	**3,661**	**461**	**(3,352)**	**1,119**

1.4.2 What are the drivers for this variation

The reduction in forecast spend in AA5 is because no ILI inspections will be required during AA5.

The increase in expenditure in AA4 compared to forecast reflects:

- An increase in the cost of the ILI inspection due to the presence of radon in gas embedded in debris which resulted in additional costs to manage radioactive contamination;
- Additional inspection of piping at above/belowground interfaces, under insulation and within buried pits identified and prioritised through the annual SIB governance process.

Table 1.6: Comparison of costs AA4 and AA5

($'000)	AA4	AA5	Variance
ILI pigging	12,166	-	(12,166)
Above/below ground	315	725	410
Pressure vessel	212	300	88
Pressure relief valve	117	760	643
Under insulation and within buried pits	-	416	416
Total	**12,810**	**2,201**	**(10,609)**

1.5 Risk Assessment

Risk management is a constant cycle of analysis, treatment, monitoring, reporting and then identifying once again, as shown below in Figure 1.2, with a commitment to balance outcomes sought with delivery and cost implications considered and assessed.

Figure 1.3: Risk management principles applied

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur.

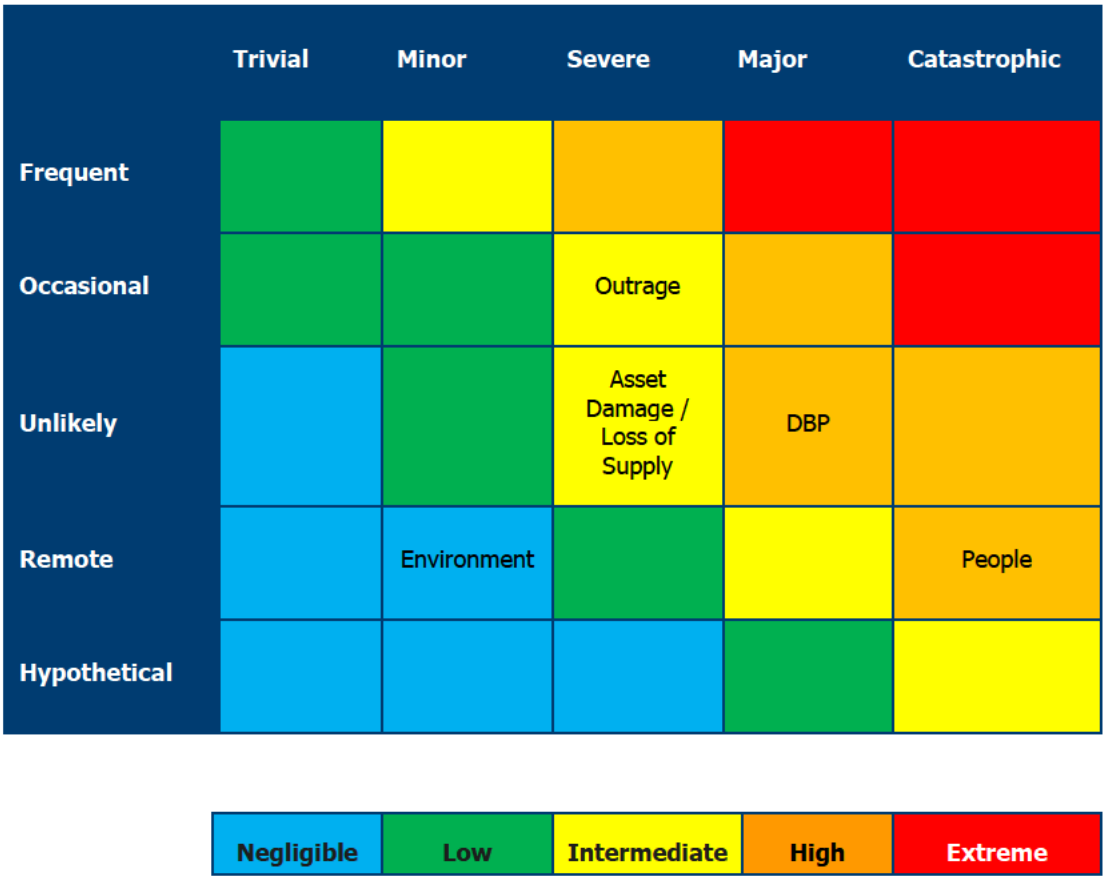
Based on these two key inputs, the risk assessment and derived risk rating then guides the actions and activities required to ensure safety and compliance are not compromised, while delivery of this outcome is done as efficiently and effectively as possible.

The risk of an event associated with failure of an asset is rated based on the combined effect of the consequence and likelihood rating to provide an overall risk rating. This risk rating guides the risk management and mitigation activities and facilitates prioritisation.

Our Operational Risk Framework is based on AS/NZS 2885 and requires all identified risks ranked as intermediate or above to be addressed. For risks ranked as high we must *'Moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.*

The overall risk rating of Pipeline and MLV inspections is outlined in Figure 1.4. As displayed, there are two high risk, two intermediate risk and one low risk associated with the Pipeline and MLV assets. This results in an overall high risk rating for these assets in an untreated scenario.

Figure 1.5: Risk rating – Pipeline and MLV assets



1.5.1 Untreated risk

Table 1.7: Risk rating - untreated

Risk Area	Untreated
DBP	High
People	High
Environment	Negligible
Reputation/Outrage	Intermediate
Asset Damage	Intermediate
Supply	Intermediate
Overall Rating	**High**

The inspection of pipelines and MLVs is a requirement of the AMP in order to appropriately manage the risk associated with these assets. The overall risk rating of uninspected Pipeline and MLV main line, loop line and laterals is identified as high in Figure 1.6.

Pipeline and MLV inspections are aimed at mitigating the risk of defects, such as faults in pipelines, interfaces or valves, which might otherwise cause a loss of gas, negative impact on pressure in the pipeline or even a pipeline rupture.

Specifically:

- **DBP –** Gas release, rupture or explosion as a result of corrosion at interfaces, failure of pressure relief valves or failure of pressure vessels presents a major risk to the effective operation of the DBNGP. Failure to undertake inspections in line with Australian Standards is likely to jeopardise our operating licence. It is also likely to cause unacceptable cost consequences for us.

- **People –** Gas release, rupture or explosion as a result of corrosion at interfaces, failure of pressure relief valves or failure of pressure vessels presents a major risk to public safety and the health and safety of employees and could result in multiple fatalities in extreme circumstances.

- **Reputation/Outrage –** Failure to undertake inspections in line with Australian Standards is likely to cause widespread complaints, anger and concern, particularly from our safety regulator, DMIRS, and other pipeline operators.

- **Asset Damage –** Gas release, rupture or explosion as a result of corrosion at interfaces, failure of pressure relief valves or failure of pressure vessels presents a severe risk of asset damage, including to surrounding assets[1].

- **Supply –** Gas release, rupture or explosion as a result of corrosion at interfaces, failure of pressure relief valves or failure of pressure vessels presents a severe risk to supply continuity, where damaged assets are inoperable for extended periods of time, thereby impeding our ability to achieve its Shipper commitments.

1.6 Options Considered

Alternative options for Pipeline and MLV inspections for the AA5 period which have been considered are:

- Option 1 – Inspection cycle consistent with the AMP
- Option 2 – Increase frequency of inspections
- Option 3 – Reactive action only

1.6.1 Option 1 – Inspection cycle consistent with the AMP

Under this option the volume of inspections undertaken in AA5 will reflect the requirements identified in the AMP, aligned to standard industry practice, comply with the requirements of AS 2885 and AS 34788 and be conducted in line with the Safety Case.

1.6.1.1 Achievement of objectives

Table 1.8 outlines how Pipeline and MLV inspections will support the achievement of our vision objectives in AA5.

[1] Similar incidents have occurred in Boston in 2018 where a gas explosion caused structural damage to a nearby property and resulted in a fatality.

Table 1.8: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	-
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

This option delivers for customers in terms of public safety and working within industry benchmarks by complying with Australian Standards for inspections, and reliability by completing inspections on a cycle without impact to pipeline operations. It also ensures health and safety of employees and contractors working across the pipeline assets by having reliable, accurate information in relation to pipeline and MLV asset condition.

1.6.1.2 Cost assessment

The cost of this option is $2.2 million over AA5. The proposed work, including volume and value, under this option is provided in Table 1.9 below.

Table 1.8: Summary of AA5 forecast spend for Pipeline and MLV inspections

($'000)	Measure	2021	2022	2023	2024	2025	AA5
ILI pigging	Units						
	Unit cost						
	Total						
Above/below ground	Units						
	Unit cost						
	Total						
Pressure vessel	Units						
	Unit cost						
	Total						
Pressure relief valve	Units						
	Unit cost						
	Total						
Under insulation and within buried pits	Units						
	Unit cost						
	Total						
Total		**773**	**357**	**357**	**357**	**357**	**2,201**

By adopting a proactive, planned approach to inspections, we can best manage the efficient delivery of the program, which also minimises the need for unplanned and disruptive repair work on the network that is typical in reactive approaches to asset management.

1.6.1.3 Risk assessment

Table 1.9 shows that conducting the volume of pipeline and MLV inspections as required in the AMP in AA5 does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.100: Risk assessment Option 1 Do volume required in AMP

Risk category	Untreated	Treated
DBP	High	Intermediate
People	High	Intermediate
Environment	Negligible	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	Intermediate	Low
Supply	Intermediate	Low
Priority rating	**High**	**Low**

This option is considered ALARP as it inspects all main lines, loop lines and laterals to detect defects early so that they can be effectively controlled to deliver gas safely and reliably to meet the needs of our customers and gas producers.

1.6.2 Option 2 – Increase the frequency of inspections

Under this option the frequency of inspections would increase so that the frequency of inspections doubles in comparison to the volume contemplated in the AMP.

1.6.2.1 Achievement of objectives

Table 1.11 outlines how doubling the frequency of inspections will support the achievement of our vision objectives in AA5.

Table 1.12: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	-
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

This option does not deliver for customers in terms of reliability as there would be at least double the number of scheduled activities to accommodate inspections, which cause supply interruptions and increases cost. It is also outside industry benchmarks by unnecessarily increasing the frequency of inspections beyond Australian Standards. It does deliver on safety for both the public and staff by increasing the likelihood that all defects will be detected before causing a potential incident.

1.6.2.2 Cost assessment

The cost of doubling the frequency of inspections in AA5 would be $8.6 million.

Table 1.12: Summary of AA5 forecast spend for Pipeline and MLV inspections

($'000)	Measure	2021	2022	2023	2024	2025	AA5
ILI pigging	Units						
	Unit cost						
	Total						
Above/below ground	Units						
	Unit cost						
	Total						
Pressure vessel	Units						
	Unit cost						
	Total						
Pressure relief valve	Units						
	Unit cost						
	Total						
Under insulation and within buried pits	Units						
	Unit cost						
	Total						
Total		**3,020**	**688**	**1,438**	**1,938**	**1,938**	**8,626**

1.6.2.3 Risk assessment

Table 1.13 shows that option 2 of doubling the frequency of inspections in AA5 does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.13: Risk assessment Option 2 Increase frequency of inspections

Risk category	Untreated	Treated
DBP	High	Intermediate
People	High	High
Environment	Negligible	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	Intermediate	Low
Supply	Intermediate	Low
	High	**Low**

1.6.3 Option 3 – Reactive action only

With this option, inspections would not be undertaken and corrective action occur when an issue arises. Any preventive action would rely on the availability of asset performance data being readily available to alert us to potential or actual failure, and our resultant ability to mobilise teams to undertake necessary reactive and/or emergency works.

1.6.3.1 Achievement of objectives

Table 1.14 outlines how option 3 to replace only on failure will support the achievement of our vision objectives in AA5.

Table 1.14: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	-
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

This option does not deliver against any of our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient as reactive correction significantly increases the risk of defects, such as faults in pipelines, interfaces or valves, which might otherwise cause a loss of gas, negative impact on pressure in the pipeline or even a pipeline rupture.

1.6.3.2 Cost assessment

With this option, no cost would be incurred for inspections, as the business moves to reactive (corrective) approach to asset management. However, the costs are likely to be higher than preventative maintenance due to the need to mobilise crews reactively, which can include penalty rates, as well as the high likelihood of incurring additional expenditure on repair works where leaks and/or explosions damage adjacent assets.

Supply interruptions to customers would be severe (and potentially unacceptable) and we may incur some costs if there are contractual commitments made which would prompt the need for penalty or other termination payments to be made.

1.6.3.3 Risk assessment

Table 1.15 shows that a reactive only approach to asset management in AA5 does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.165: Risk assessment Option 3 Replace on Failure

Risk category	Untreated	Treated
DBP	High	High
People	High	High
Environment	Negligible	Negligible
Reputation/Outrage	Intermediate	Intermediate
Asset Damage	Intermediate	Intermediate
Supply	Intermediate	Intermediate
	High	**High**

By not undertaking the inspections program, the risk rating would be unchanged from the untreated risk assessed and would not comply with our operational risk management framework

which requires us to treat high risks to 'Moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

1.7 Summary of Cost/Benefit Analysis

Table 1.176: Summary of Cost/Benefit Analysis

Option	Objectives	Cost	Risk
Option 1 – Inspections consistent with the volume required in the AMP	This option achieves our objectives of delivering for customers, being a good employer or being sustainably cost efficient	$2.2m	This option addresses the high/intermediate risks to DBP/People/ Environment/ Reputation/Asset Damage/Supply
Option 2 – Increase the volume from the AMP	This option achieves our objective of delivering for customers and being a good employer but is not sustainably cost efficient	$8.6m	This option addresses the high/intermediate risks to Reputation and Supply, but does not mitigate/still poses a risk to DBP, People and Asset Damage.
Option 3 – Reactive action only	This option does not achieve our objectives of delivering for customers, being a good employer and being sustainably cost efficient	-	This option does not change any inherent risk assessment

1.7.1 Why are we proposing this solution?

Option 1 is to conduct inspections as required under the AMP is the preferred solution because it is consistent with Australian Standards, sufficiently mitigates risk and is consistent with good industry practice. It aligns with our Risk Management Framework, asset management principles, vision objectives and regulatory requirements including the Safety Case.

Option 2 is to increase the frequency of inspections and is not recommended as it requires significant additional investment with limited additional risk benefit, whilst increasing the cost and supply interruptions to customers and results in no further improvement to risk mitigation than under Option 1.

Option 3 is a reactive approach which significantly increases our risks in relation to safety and does not meet Australian Standards.

Further, Options 2 and 3 are not appropriate as any deliberate increase or reduction in inspection activity for these assets would be based on an arbitrary assessment driven not by appropriate, industry standard asset management disciplines, but by the adoption of an artificial framework.

1.7.1.1 Consistency with the National Gas Rules

Option 1 is the preferred solution and provides us with sufficient and timely information on the condition and performance of our main line, loop line and laterals. This information is then used upon to make assessments which ultimately prioritise repairs or replacement activities on pipeline and MLV assets.

Rule 91

The relevant opex rule is detailed below and also in the Guidance Note and has been extracted from the latest version of the National Gas Rules (available here: http://www.aemc.gov.au/energy-rules/national-gas-rules/current-rules):

"Division 7 Operating expenditure

91 Criteria governing operating expenditure

(1) Operating expenditure must be 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 delivering pipeline services.

(2) The AER's discretion under this rule is limited."

1.7.1.2 Justification of Non-Base Year Cost

The preventative inspection program for Pipeline and MLV assets is influenced not by financial or regulatory periods, but by the frequency of inspection noted within the relevant AMP which is based on pipeline license requirements, vessel standards and pressure safety valve standards.

The use of a base year would not take into consideration the core purpose of this activity, which is the cyclical assessment of the health of the asset based on all current knowns and would artificially inflate the cost of the inspection program.

1.7.2 Estimating efficient costs

The costs are estimated by identifying the activities to be undertaken given the inspection cycle outlined in the AMP and then multiplying by the appropriate unit rate for materials and labour. As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology 2021-2025', the forecast unit rates for all projects/initiatives managed within this program are inclusive of internal labour, external labour/contractors, materials, travel and other costs. Specialist engineering disciplines, procurement and construction management activities will be provided by internal resources. The delivery of the work and supply of required materials will be undertaken by external resources. External labour is delivered by [redacted]

Table 1.187 below summarises the total unescalated costs by cost type.

Table 1.197: Pipeline and MLV inspections cost estimate by cost category

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	148	85	85	85	85	490
Contractors / Consultants	415	149	149	149	149	1,009
Materials & Services	95	87	87	87	87	443
Travel & Others	115	36	36	36	36	258
Total	**773**	**357**	**357**	**357**	**357**	**2,201**

Table 1.18 below shows the escalation applied to escalate the Pipeline and MLV inspection costs to real dollars of December 2020 including labour cost escalation of 0.69%.

Table 1.18: Pipeline and MLV inspections total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	773	357	357	357	357	2,201
Escalation	19	10	12	13	14	69
Total escalated ($ Dec 20)	**792**	**367**	**369**	**370**	**371**	**2,270**

Appendix A – Risk Assessment

Figure 1.7: Summary of Pipeline and MLV inspections program

	DBP				People				Environmental				Outrage				Asset Damage				Loss of Supply				
	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Total Risk Score
Untreated	Major	Unlikely	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Occasional	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	326
Undertake required inspections as per AMP	Major	Remote	INTERMEDIATE	25	Catastrophic	Hypothetical	INTERMEDIATE	25	Minor	Hypothetical	NEGLIGIBLE	1	Severe	Remote	LOW	5	Severe	Remote	LOW	5	Severe	Remote	LOW	5	66
Increase frequency of inspections	Major	Remote	INTERMEDIATE	25	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Remote	LOW	5	Severe	Remote	LOW	5	Severe	Remote	LOW	5	166
Do Nothing - reactive action only	Major	Unlikely	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Occasional	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	326

Process Safety - Opex DBP24

1.1 Project Approvals

Table 1.1: Process Safety DBP24 – Project approvals

Prepared By	Tim Aujard, Senior Process Engineer
Reviewed By	Tawake Rakai, GM Transmission Asset Management
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 1.2: Process Safety DBP24 – Project overview

Description of Issue/Project	Process Safety has developed across the Oil and Gas Industry due to recent major incidents in Australia and around the world, driving regulatory changes that require Pipeline License holders to develop measurable KPIs to prevent the occurrence of Major Accident Events (MAE - defined in Regulation as events that has the potential to cause more than 1 fatality). As a result, a Process Safety Dashboard was developed in consultation with DMIRS and categorised into a 4 Tier Process Safety Pyramid that is aligned with the Occupational Safety Indicator Pyramid. The DBNGP Process Safety expressed as a triangle are detailed as follows: • Tier 1 – Loss of Primary Containment – events of greater consequence • Tier 2 – Loss of Primary Containment – events of lesser consequence • Tier 3 – Challenges to safety systems • Tier 4 – Operating discipline and management systems performance indicators This project is a business improvement initiative that commenced in 2017 and requires ongoing evolution to maintain its relevance in changing operational and safety environments.
Project Name	Process Safety
Estimated Cost	Total forecast capex for the next Access Arrangement (AA5) is $0.25 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Variation from AA4	The proposed AA5 expenditure is $0.2 million more than the estimated expenditure for AA4 of $0.04 million. The reasons for the increase in AA5 are: • AA4 expenditure related to the introduction of a new system; and • AA5 expenditure relates to ongoing evolution, implementation and continuous improvement of the system, as well as ongoing training for staff.
Consistency with the National Gas Rules (NGR)	Providing a safe working environment, inclusive of safe processes and procedures for all staff and contractors is a critical obligation of any employer. Therefore, process safety is critical to maintain and improve the safety of services, maintain the integrity of services and/or comply with a regulatory obligation or requirement consistent with 79(2)(c)(ii). The proposed volume of activity is also consistent with NGR 79(1)(a), which requires lowest sustainable cost of delivering pipeline services.
Stakeholder Engagement	Our Shippers have advised us that they highly value current levels of reliability and would be concerned if this were to change. They also expect us to maintain a strong focus on operational issues as it is important for reliability and emergency management. Our Process Safety program will deliver initiatives to continuously improve the safety of our processes.

	During our Shipper Roundtables we presented key areas of our planning, including our proposed capex and opex. We discussed our proposal to change the classification of asset inspections, other minor pipeline works and small health and process safety initiatives from capex to opex from AA5, noting this did not affect total expenditure in the period. Shippers were broadly comfortable with our approach and high-level program in AA5. Our proposed approach was then outlined in our Draft Plan. There were no questions specifically raised in relation to the Process Safety program. In response to Shippers' general interest in how we deal with changing business needs during an AA period, this business case clearly outlines what changes in approach have been considered and will be implemented in our AA5 program of work. DMIRS was engaged in the development and implementation of this project. DMIRS also advised that Process Safety Indicators will be required as part of the revision and modernisation of Safety Regulations in WA. This initiative places us in good stead for improvements in Process Safety in the Transmission business.
Other relevant documents	This Business Case should be read in conjunction with: • Asset Management Plan General (TEB-001-0024-07) • Risk Management Policy and Operational Risk Model (together our Risk Management Framework).

1.3 Background

All physical DBNGP assets are managed in accordance with the policies and principles set out in the Asset Management Plan (AMP) which is part of our Asset Management System Framework.

A key principle of the Asset Management System Framework is effective management of asset risks which includes identification of risks and evaluation of the adequacy of controls in terms of physical safeguards and asset maintenance requirements.

Process Safety is a framework for managing the integrity of hazardous operating systems and processes by applying good design principles, good engineering and good operating and maintenance practices.

Process Safety operates in parallel with occupational safety. Occupational safety primarily covers management of personnel safety and incidents affecting individual workers, such as slips and falls. Process Safety addresses major hazards that are more likely to result in major accidents, for example gas explosion or fire.

Process Safety deals with the prevention and control of events that have potential to release hazardous materials or energy. A release of hazardous material or energy in an uncontrolled manner is termed a Loss of Primary Containment (LOPC).

1.3.1 Process Safety History

In recent years Process Safety has gained significant traction as a discipline across the oil and gas industry. Like several of our peers, such as Woodside, APA and Chevron, we adopted this contemporary practice during AA4 and has been focused on continually improving it as the system matures and evolves.

Process Safety has developed across the Oil and Gas Industry due to recent major incidents in Australia and around the world. Whilst no such incident has occurred on the DBNGP, incidents have occurred in gas transmission pipelines in Australia that drove Regulatory changes in the development of Safety Cases where Pipeline License holders were required to develop measurable KPIs to prevent the occurrence of MAEs.

In consultation with DMIRS, we developed a Process Safety Dashboard and categorised incidents into a 4 Tier Process Safety Pyramid as described below. The tiered process is aligned with the

Occupational Safety Indicator Pyramid. It assumes that, whilst major incidents like fatalities in OHS are indeed rare, we must focus on managing leading indicators in a similar way by controlling and reducing recordable injuries, first aid incidents and near misses in the delivery of works on the DBNGP.

The DBNGP Process Safety System that meets requirements for asset management and maintenance includes:

- The Dashboard incorporated into the InControl Safety Reporting System;
- The manual aggregation of information and integration into the Dashboard; and
- Process Safety Communication via the training module and case studies to promote the consequences of breaches in the 4 tiers.

The DBNGP Process Safety 4 Tiers are:

- Tier 1 – Loss of Primary Containment – events of greater consequence;
- Tier 2 – Loss of Primary Containment – events of lesser consequence;
- Tier 3 – Challenges to safety systems; and
- Tier 4 – Operating discipline and management systems performance indicators.

The Process Safety project commenced in 2017 and involved consultations with Chevron, Woodside and the APGA industry to arrive at the most suitable and effective model for the DBNGP. A Process Safety Steering Committee was established to develop a simple and specific Process Safety Dashboard referencing the Safety Case MAE submissions as presented in a Bow Tie format.

Key outcomes of the Process Safety project to date include:

- Development of a charter of the Process Safety committee
- Completion of a training module
- Engagement with KPI leads for:
    - Management of Change – Engineering reviews
    - FSA/HAZOP/HAZID actions outstanding
    - Cyber Security
    - Electrical Equipment Hazardous Area process
    - Alarm management and reporting
    - OT systems security (SCADA, Comms and CSN)

This is a simple system developed to introduce this important facet to asset management and assure compliance with our Safety Case.

1.3.2 Process Safety performance indicators

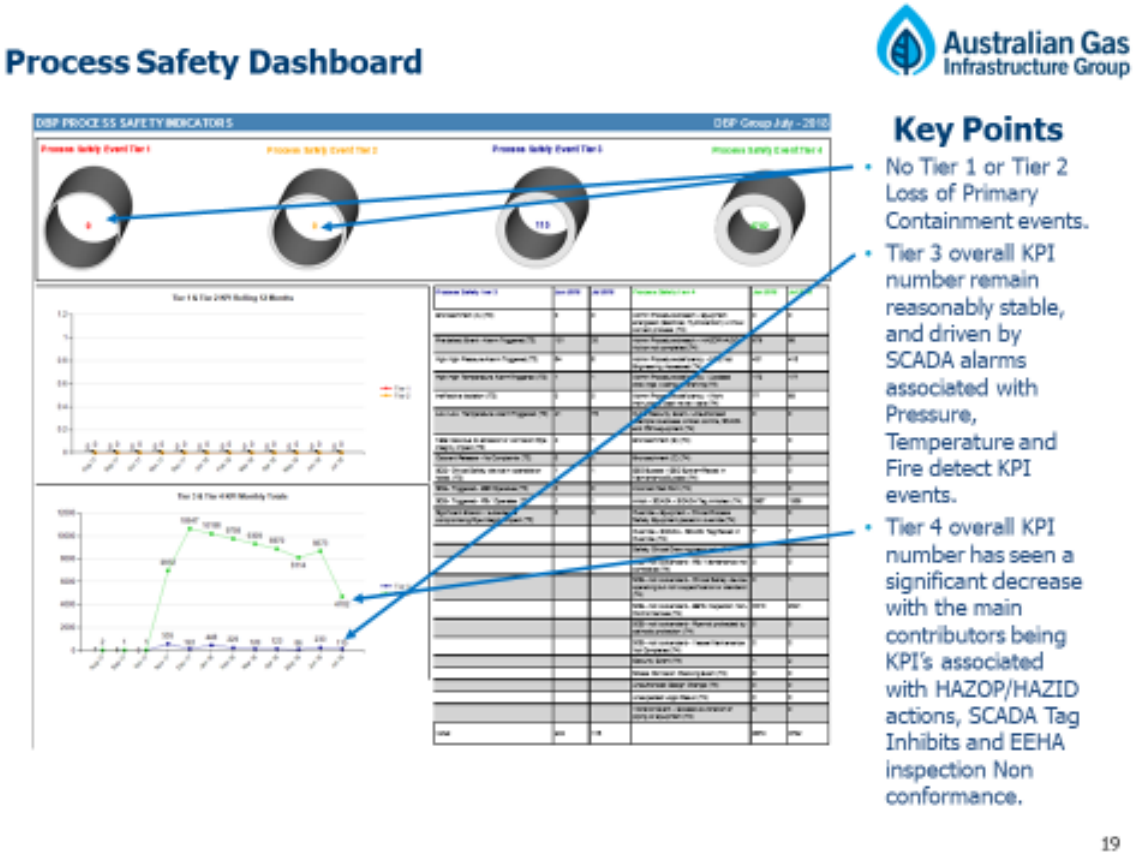
In 2017 we implemented a reporting framework that monitors the performance of process safety related controls. A set of process safety KPIs have been developed in line with the ANSI/API Recommended Practice 754 – Process Safety Performance Indicators for the Refining and Petrochemical Industries.

The KPIs developed incorporate measures implemented for the prevention and control of MAEs as well as other key process safety risks. The KPIs have been categorised into the following tiers in accordance with RP754:

- Tier 1 – The most serious process safety events that are possible within our scope of operations. They represent a loss of primary containment of an energy source that results in a Catastrophic, Major or Severe consequence outcome – ie uncontrolled gas ignition, uncontrolled gas release into third party facility, design or equipment failure leading to electrocution and odorant release that results in non-DBP personnel evacuation.
- Tier 2 – These events represent a loss of primary containment of an energy source that results in a lower consequence outcome than Tier 1 events (Minor or Severe) – ie uncontrolled gas release within our facility (no ignition), design or equipment failure leading to electric shock (ELV excluded) and odorant release that results in multiple complaints from non-DBP personnel.
- Tier 3 – These events represent a challenge to a safety critical system or the identification of a faulty safety critical element or isolation – eg PSV operates, ESD operates, critical safety device inoperable or failed and ineffective isolation.
- Tier 4 – These events are mostly process non-compliances, backlog monitoring or lower level control failures – eg equipment energised (electrical, hydrocarbon) without correct process, unauthorized change to design, Incorrect Set Point and critical safety device operating but not to specification or standard Targets for Tiers 1 and 2 events are 0.

The KPIs are used to drive behaviours of staff and contractors in order to improve overall safety performance and outcomes. The previous version of dashboard that we relied on for process safety was ineffective as it was not linked to the corporate HSE system and relied of significant manual intervention as shown below. Since the new system was implemented, we have seen a significant improvement in the number and frequency of Tier 3 and Tier 4 events as shown in the graph below.

Figure 1.1: Trend in T3 and T4 events



The 2019 version of the Dashboard that is reported corporately is as shown below and is mapped to demonstrate Process Safety cultural progression to align with our HSE Culture Model.

Figure 1.2: Tier 3 and Tier 4 Leading Indicators

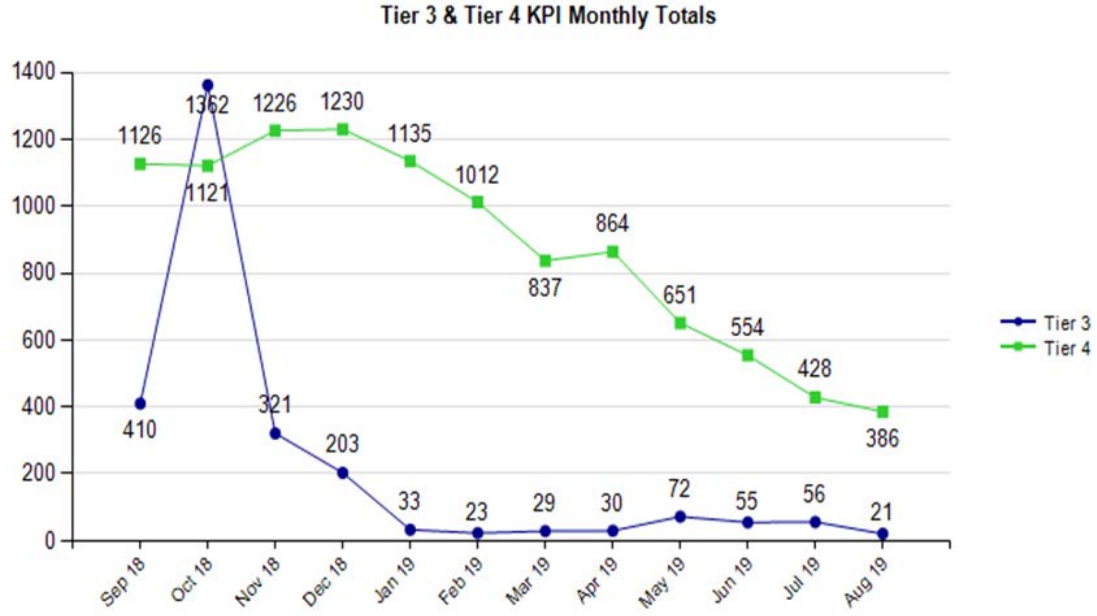


Figure 1.3: Process Safety Culture Model

The chart above show the improvement since this project was initiated in 2017 to current trends in 2019.

It should be noted that there were no Tier 1 or Tier 2 events during this period, hence are not shown on the graph.

1.3.3 Process Safety System enhancements

We propose to include expenditure on Process Safety system enhances to accommodate:

- **Dashboard enhancements**. Currently the existing dashboard design does not meet our requirements and needs a system design to ensure it presents as a dashboard.
- **Report automation**. All bulk data is currently manually aggregated and reported. We will partition a server for use as a database and configure the data automation, having identified four data sources that need to be configured in order to complete the automation.
- **Process Safety internal communication program**. We have a training course that uses four real case studies. As part of the internal communication program, we intend to create relevant case studies each year (estimated 1-2 per annum).
- **Training program enhancements**. As the internal understanding of process safety increases and the data retrieved from our monitoring system increases it is expected that the training course will require ongoing updates and enhancements to maintain its relevancy and impact.

Therefore, we will continue with the current Process Safety System and invest in annual improvements and enhancements to ensure that the system continues to provide accurate, relevant and reliable data in relation to process safety consistent with the Safety Case reporting requirements.

1.4 AA5 forecast

In AA5, a total expenditure of $0.25 million is forecast distributed as follows.

Table 1.3: Summary of AA5 forecast spend for Process Safety

($'000)	2021	2022	2023	2024	2025	AA5
Process Safety	50	50	50	50	50	250
Total	**50**	**50**	**50**	**50**	**50**	**250**

1.4.1 AA4 comparison

In AA4, we estimate expenditure on this program will be $0.04 million. No budget was approved for Process Safety during AA4 as it was not contemplated by us or broader industry at the time of submission.

Table 1.4: Summary of actual and approved spend in AA4

($'000)	2016	2017	2018	2019	2020	AA4
Actual	13	25	-	-	-	38
Approved	-	-	-	-	-	-
Variance	**13**	**25**	**-**	**-**	**-**	**38**

1.4.2 What are the drivers for this variation?

The increase in forecast spend in AA5 is because:

- AA4 expenditure related to the introduction of a new system, development and roll out of a comprehensive training package, and development of a reporting dashboard; and
- AA5 expenditure relates to ongoing evolution, implementation and continuous improvement of the system, as well as ongoing training for staff.

Expenditure on this initiative was not contemplated until commencement of the AA4 period. Since that time, it has become standard industry practice. For example, other organisations such as Woodside, APA and Chevron also implemented process safety systems as they considered it essential to gather data on process safety type events. Through this program we have identified many issues that had the potential to escalate to major events, for example, a better ability to identify and manage mitigations to corrosion as well as more effective deployment of safety critical systems.

Table 1.5: Comparison of costs AA4 and AA5

($'000)	AA4 cost	AA5 cost	Variance cost
Process Safety	38	250	212
Total	**38**	**250**	**212**

1.5 Risk Assessment

Risk management is a constant cycle of analysis, treatment, monitoring, reporting and then identifying once again, as shown below in Figure 1.4, with a commitment to balance outcomes sought with delivery and cost implications considered and assessed.

Figure 1.4: Risk management principles applied

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur.

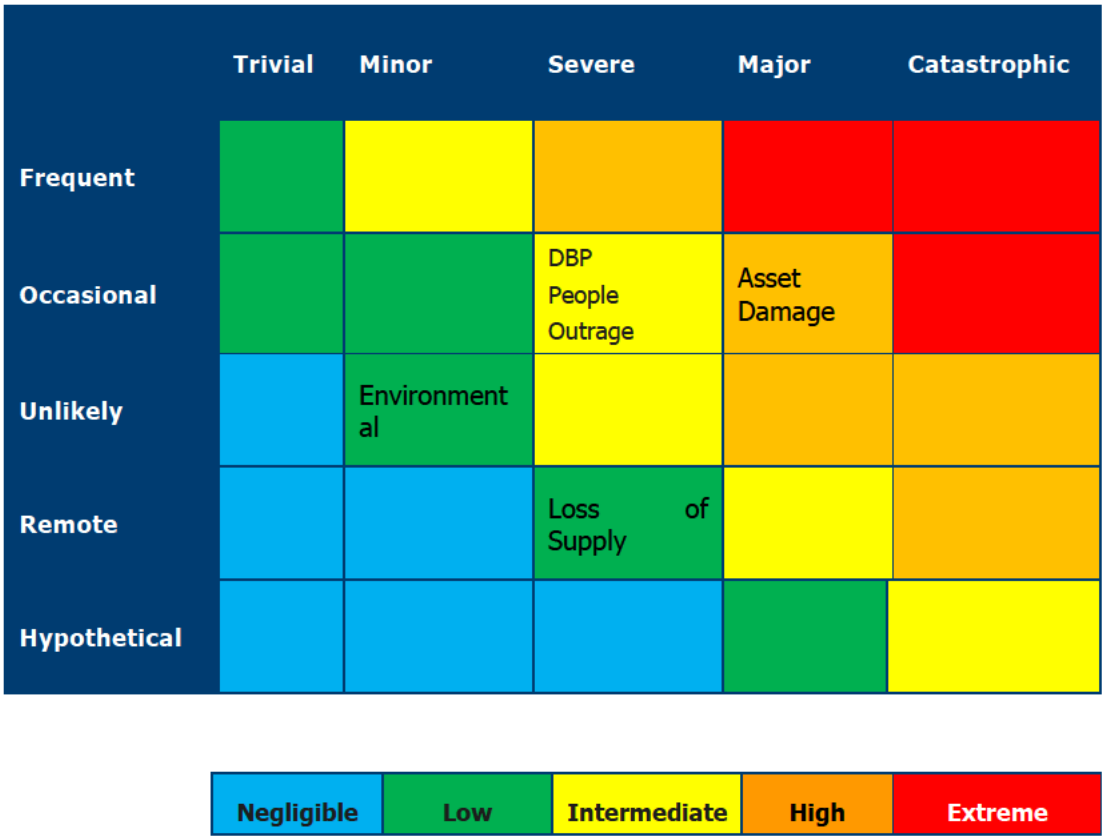
Based on these two key inputs, the risk assessment and derived risk rating then guides the actions and activities required to ensure safety and compliance are not compromised, while delivery of this outcome is done as efficiently and effectively as possible.

The risk rating assesses the consequence and likelihood of the risk. *The risk of an event associated with failure of an asset is rated based on the combined effect of the consequence and likelihood rating to provide an overall risk rating. This risk rating guides the risk management and mitigation activities and facilitates prioritisation.*

Our Operational Risk Framework is based on AS/NZS 2885 and requires all identified risks ranked as intermediate or above to be addressed. For risks ranked as high we must *'Moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.*

The overall risk rating of Process Safety is outlined in Figure 1.5. As displayed, there is one high risk, two intermediate risk and two low risks associated with the Process Safety program. This results in an overall high risk rating in an untreated scenario.

Figure 1.6: Risk rating – Process Safety



1.5.1 Untreated risk

Table 1.6: Risk rating - untreated

Risk Area	Untreated
DBP	Intermediate
People	Intermediate
Environment	Low
Reputation/Outrage	Intermediate
Asset Damage	High
Supply	Low
Overall Rating	**High**

The Process Safety program is a requirement of the Safety Case and reflects good industry practice. The overall risk rating of not continuing with the Process Safety program is identified as high in Figure 1.7.

Our enhancements to process safety are critical to improving the overall safety of the pipeline as well as reducing the frequency or severity or MAEs.

Major risks associated with reduced investment in Process Safety must consider the lessons learnt from MAEs that concluded that 'Major incidents rarely result from a single cause but rather by multiple failures of systems and controls'. The focus on Bow Tie and translation to the Tier process integrates hazard identification and management with the risk of multiple, concurrent failures that can collectively lead to catastrophic events.

Specifically:

- **DBP –** Untreated, we would risk non-compliance with the Safety Case.
- **People –** Untreated, there would be emotional and reputational impact of incidents that harm people and the public.
- **Reputation/Outrage –** Untreated, we would be operating outside the Safety Case which is likely to cause widespread complaints, anger and concern, particularly from our safety regulator, DMIRS, and other pipeline operators.
- **Asset Damage –** Untreated, a release of hazardous material or energy in an uncontrolled manner is termed a Loss of Primary Containment (LOPC) and may cause MAEs.

1.6 Options Considered

Alternative options for Process Safety for the AA5 period which have been considered are:

- Option 1 – Maintain the safety system without enhancements
- Option 2 – Maintain and improve the safety system as per Safety Case
- Option 3 – Introduce a new safety system

1.6.1 Option 1 – Maintain the system without enhancement

Under this option we would continue to operate with current leading indicators frozen. Data would be accessed via InControl and manipulated in excel spreadsheets and plotted on a monthly basis. No further changes or enhancements would be made.

1.6.1.1 Achievement of objectives

Table 1.7 outlines how Process Safety will support the achievement of our vision objectives in AA5.

Table 1.8: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	-
Delivering for Customers – Customer Service	-
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	-
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

This option does not deliver for customers because it fails to effectively manage process safety risk. It also fails to achieve our objective to be a good employer as it exposes staff and contractors to higher risks than would otherwise be the case with a current Process Safety System. It does deliver profitable growth in the short term as there are no costs allocated in AA5, but at the risk of medium to long term viability.

1.6.1.2 Cost assessment

The effect of this option is to provide no allowance for the efficient cost of maintaining our current Process Safety system. Therefore, we assume no change to initial expenditure during AA4 of $0.04 million.

1.6.1.3 Risk assessment

Table 1.8 shows that not maintaining and updating the Process Safety system does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.8: Risk assessment Option 1

Risk category	Untreated	Treated
DBP	Intermediate	Intermediate
People	Intermediate	Intermediate
Environment	Low	Low
Reputation/Outrage	Intermediate	Intermediate
Asset Damage	High	High
Supply	Low	Low
Overall Rating	**High**	**High**

1.6.2 Option 2 – Maintain and improve the system

This approach assumes that we continue to maintain and improve the safety system in order to best achieve the intent of the Safety Case, which provides a framework for the management of process safety associated with the pipeline and associated facilities. The objectives of the DBNGP Safety Management System (SMS) are, amongst other things, to minimise the impacts of our activities on the health and safety of people.

This option provides an allowance for:

- **Dashboard enhancements**. Currently the existing dashboard design does not meet our requirements and needs a system design to ensure it presents as a dashboard.
- **Report automation**. All bulk data is currently manually aggregated and reported. We will partition a server for use as a database and configure the data automation, having identified four data sources that need to be configured in order to complete the automation.
- **Process Safety internal communication program**. We have a training course that uses four real case studies. As part of the internal communication program, we intend to create relevant case studies each year (estimated 1-2 per annum).
- **Training program enhancements**. As the internal understanding of process safety increases and the data retrieved from our monitoring system increases it is expected that the training course will require ongoing updates and enhancements to maintain its relevancy and impact.

1.6.2.1 Achievement of objectives

Table 1.9 outlines how enhancing the Process Safety system will support the achievement of our vision objectives in AA5.

Table 1.10: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	Y
A Good Employer – Skills Development	Y
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option delivers against all relevant vision objectives of delivering for customers, being a good employer and being sustainably cost efficient as it effectively manages process safety risk by keeping the system up to date to meet evolving operational and regulatory requirements.

1.6.2.2 Cost assessment

The cost of this option in AA5 would be $0.25 million.

Table 1.10: Summary of AA5 forecast spend for Process Safety

($'000)	2021	2022	2023	2024	2025	AA5
Process Safety	50	50	50	50	50	250
Total	**50**	**50**	**50**	**50**	**50**	**250**

1.6.2.3 Risk assessment

Table 1.11 shows that option 2 does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.121: Risk assessment Option 2 Increase frequency of inspections

Risk category	Untreated	Treated
DBP	Intermediate	Low
People	Intermediate	Low
Environment	Low	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	High	Intermediate
Supply	Low	Low
Overall Rating	**High**	**Low**

With this option, all risks are reduced to intermediate or below, aligned with expectations of AS 2885 and our operational risk management framework.

1.6.3 Option 3 – Introduce a new system

This approach assumes that we replace the current SMS with a new system that is potentially already used by other service providers, such as Chevron, Woodside and APGA Pipeline Operators Group. The intent would be to upgrade to a standardised system that could potentially have additional functionality, albeit would likely be more generic than the current bespoke system.

The Process Safety system that we have developed is to be able to report on the effectiveness of process safety controls that are embedded into its processes.

Importantly, Woodside and Chevron have developed bespoke system to capture their inherent processes suggesting that there is no readily available system to buy 'off the shelf'.

1.6.3.1 Achievement of objectives

Table 1.12 outlines how option 3 will support the achievement of our vision objectives in AA5.

Table 1.132: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	N
A Good Employer – Skills Development	Y
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option delivers against our vision objectives of delivering for customers because an 'off the shelf' process safety system would comply with the Safety Case. It does not deliver against being a good employer as there would likely be significant work required to manipulate information in a generic system in order to suit our unique operational requirements. It also does not work within industry benchmarks as an 'off the shelf' product is inconsistent with the practice adopted by other prudent operators.

1.6.3.2 Cost assessment

We consulted with [redacted], [redacted] and members of the APGA Pipeline Operators Group and the systems adopted are more expensive to implement. In consideration of no system readily available to purchase, it is estimated that to locate, trial, implement, train and maintain a new system would include:

- Three-fold increase on implementation costs incurred in 2016 to be incurred in 2021 to allow for expert advice and competitive tendering costs for a new system;
- A one-off purchase of a new system in 2021; and
- Ongoing capex as would be otherwise incurred under Option 2.

Table 1.143: Summary of AA5 forecast spend for Process Safety

($'000)	2021	2022	2023	2024	2025	AA5
Process Safety	500	50	50	50	50	520
Total	**500**	**50**	**50**	**50**	**50**	**520**

1.6.3.3 Risk assessment

Table 1.14 shows that implementing a new system in AA5 does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.154: Risk assessment Option 3 Replace on Failure

Risk category	Untreated	Treated
DBP	Intermediate	Intermediate
People	Intermediate	Intermediate
Environment	Low	Low
Reputation/Outrage	Intermediate	Intermediate
Asset Damage	High	High
Supply	Low	Low
Overall Rating	**High**	**High**

By adopting an 'off the shelf' system, the risk rating would be reduced from the untreated risk assessed but would not comply with our operational risk management framework which requires us to treat high risks to 'Moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower' as the risk to asset damage would remain high.

1.7 Summary of Cost/Benefit Analysis

Table 1.165: Summary of Cost/Benefit Analysis

Option	Objectives	Cost	Risk
Option 1 – Do not update the system	This option achieves our objectives of being sustainably cost efficient but does not achieve delivering for customers or being a good employer	$0.04m	This option does not address the high risk of Asset Damage
Option 2 – Maintain and enhance the system	This option achieves our objectives of delivering for customers, being a good employer and being sustainably cost efficient	$0.25m	This option addresses the high/intermediate risks to DBP/People/ Environment/ Reputation/Asset Damage/Supply
Option 3 – Implement a new system	This option achieves our objectives of delivering for customers but does not achieve being a good employer or sustainably cost efficient	$0.5m	This option does not address the high risk of Asset Damage

1.7.1 Why are we proposing this solution?

Option 2 is preferred as it meets the requirements of the Safety Case and provides for an appropriate approach to measuring and monitoring process safety related performance of the pipeline.

Option 1 is not considered viable as the system will deteriorate over time and become ineffective to use. It also exposes us to risks of non-compliance with the Safety Case.

Option 3 is not preferred as new systems are unknown and would likely result in significant additional expenditure in procurement, implementation and training. It also renders expenditure on the current Process Safety System redundant.

1.7.1.1 Consistency with the National Gas Rules

Option 2 is the preferred solution and provides us with sufficient and timely information to improve its process safety performance. This information is then proactively used to enhance the safety of pipeline operations.

Rule 79(2)

The option is consistent with Rule 79(2)(c)(ii) as the capex is necessary to maintain the integrity of services, specifically by:

- Maintaining good industry practice in relation to operational technology reliability and accuracy, thereby ensuring that our systems and data accuracy provide the reliability required to ensure safe and reliable supply.

Rule 79(1)

The option is consistent with Rule 79(1)(a), to achieve the lowest sustainable cost of providing services. Consistent with the requirements of Rule 79 of the National Gas Rules, we consider that the capital expenditure is:

- **Prudent** – The expenditure is necessary in order to address the identified ongoing operational requirements of the Safety Case. The proposed expenditure can therefore be seen to be of a nature that would be incurred by a prudent service provider.

- **Efficient** – The expenditure is consistent with other operators and is based on prudent, incremental improvements to the SMS. The proposed 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** – The proposed expenditure reflects good industry practice by benchmarking against other operators and sharing learnings as appropriate. The proposed capital expenditure is therefore 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 delivering pipeline services** – The sustainable delivery of services includes reducing risks to as low as reasonably practicable and maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the works in line with the relevant useful life.

1.7.1.2 Justification of Non-Base Year Cost

The maintenance of the SMS is influenced not by financial or regulatory periods, but by the operational and Safety Case requirements which is based on pipeline license requirements, vessel standards and pressure safety valve standards.

The use of a base year would not take into consideration the core purpose of this activity, which is the prudent and incremental improvement of the SMS.

1.7.2 Estimating efficient costs

The costs are estimated by identifying the activities to be undertaken given the inspection cycle outlined in the AMP and then multiplying by the appropriate unit rate for materials and labour.

As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology 2021-2025', the forecast unit rates for all projects/initiatives managed within this program are inclusive of internal labour, external labour/contractors, materials, travel and other costs.

Table 1.176 below summarises the total unescalated costs by cost type.

Table 1.16: Process Safety cost estimate by cost category

	2021	2022	2023	2024	2025	Total
Internal Labour	36	36	36	36	36	180
Contractors / Consultants	13	13	13	13	13	64
Materials & Services	-	-	-	-	-	-
Travel & Others	1	1	1	1	1	6
Total	**50**	**50**	**50**	**50**	**50**	**250**

Table 1.17 below shows the escalation applied to escalate the Process Safety Program to real dollars of December 2020 including labour cost escalation of 0.69%.

Table 1.187: Process Safety total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	50	50	50	50	50	250
Escalation	1	1	2	2	2	8
Total escalated ($ Dec 20)	**51**	**51**	**52**	**52**	**52**	**258**

Appendix A – Risk Assessment

Figure 1.8: Summary of Process Safety risk assessment

	DBP				People				Environmental				Outrage				Asset Damage				Loss of Supply				
	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Total Risk Score
Untreated	Severe	Occasional	INTERMEDIATE	25	Severe	Occasional	INTERMEDIATE	25	Minor	Unlikely	LOW	5	Severe	Occasional	INTERMEDIATE	25	Major	Occasional	HIGH	125	Severe	Remote	LOW	5	210
Maintain the safety system without enhancements	Severe	Occasional	INTERMEDIATE	25	Severe	Occasional	INTERMEDIATE	25	Minor	Unlikely	LOW	5	Severe	Occasional	INTERMEDIATE	25	Major	Occasional	HIGH	125	Severe	Remote	LOW	5	210
Maintain and improve the safety system as per Safety Case	Severe	Remote	LOW	5	Severe	Remote	LOW	5	Minor	Remote	NEGLIGIBLE	1	Severe	Remote	LOW	5	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	46
Introduce a new safety system	Severe	Unlikely	INTERMEDIATE	25	Severe	Occasional	INTERMEDIATE	25	Minor	Unlikely	LOW	5	Severe	Unlikely	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Remote	LOW	5	210

Decommissioning – Opex DBP25

1.1 Project Approvals

Table 1.1: Decommissioning DBP25 – Project approvals

Prepared By	Hugo Kuhn, Head of Engineering
Reviewed By	Tawake Rakai, GM Transmission Asset Management
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 1.2: Decommissioning DBP25 – Project overview

Description of Issue/Project	Non-operational assets and facilities degrade over time posing a risk to the environment, public and employee safety and future operations (where the asset may again be required in the provision of services). Appropriate decommissioning or mothballing of non-operational assets and facilities reduces risk to the environment and public and employee safety. Unlike decommissioning, which renders the asset permanently unusable, appropriate mothballing practices ensure there can be a smooth transition into reoperation where the asset is required to deliver services in future. There are 6 sites identified for decommissioning or mothballing during AA5 including: 1. HiSmelt Meter Station & Offtake (decommission – onsite) 2. Carnarvon Power Station Lateral (mothball) 3. Westlime (decommission – dismantle) 4. Mondarra Meter Station (decommission – onsite) 5. LM500 water bath heaters (5 of) (decommission – dismantle) 6. Eneabba MS (decommission - onsite)
Project Name	Decommissioning
Estimated Cost	Total forecast opex for the next Access Arrangement (AA5) is $0.5 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Variation from AA4	The proposed AA5 expenditure is $0.3 million more than the estimated expenditure for AA4 of $0.2 million. The increase in allocation for Decommissioning relates to the following: 1. Moving to a proactive plan for decommissioning in line with the DBP Asset Decommissioning Procedure (implemented in 2018) which requires provision for additional assets to be decommissioned than in previous periods; 2. Damage on those assets inspected is more severe than originally envisaged; and 3. Some assets are deemed a contractual obligation to keep intact, although they have not been in use for many years or the actual facility they serviced no longer exists, enabling them to be mothballed. This level of expenditure forecast for AA5 is not likely to continue across future AA periods as there are no further assets identified for decommissioning in AA6.
Consistency with the National Gas Rules (NGR)	Rule 91 requires that operating expenditure must be 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 delivering pipeline services. Our decommissioning program will maintain and improve the safety of services and maintain the integrity of services by implementing a proactive plan to mothball or decommission non-operational assets, thereby removing the risks these assets pose to the environment, public and employee safety and future operations.

	The opex is therefore of a nature that would be incurred by a prudent service provider, acting efficiently, in line with good industry practice and to achieve the lowest sustainable cost of delivering pipeline services and is consistent with Rule 91.
Stakeholder Engagement	Our Shippers told us they highly value current levels of reliability and would be concerned if this were to change. They also expect us to maintain a strong focus on operational issues as it is important for reliability and emergency management. Our decommissioning program is important to ensure that only operational assets are kept in service, and other assets are appropriately and safely decommissioned. During our Shipper Roundtables we presented key areas of our planning, including our proposed capex. Shippers were broadly comfortable with our approach and high-level program in AA5. There were no questions specifically raised in relation to the decommissioning program. In response to Shippers' general interest in key areas and drivers of increased spend, and how we deal with changing business needs during an AA period, this business case clearly outlines: • reasons for changes in expenditure between AA4 and AA5, and • what changes in approach have been considered and will be implemented in our AA5 program of work.
Other relevant documents	This Business Case should be read in conjunction with: • AMP TEB-001-0024-01 (General) • Risk Management Policy and Operational Risk Model (together our Risk Management Framework).

1.3 Background

All physical DBNGP assets are managed in accordance with the policies and principles set out in the Asset Management Plan (AMP) which is part of our Asset Management System Framework.

A key principle of the Asset Management System Framework is effective management of asset risks which includes identification of risks and evaluation of the adequacy of controls in terms of physical safeguards and asset maintenance requirements.

Our Asset Management System Framework spans five (5) phases:

- Asset development or enhancement;
- Operation;
- Maintenance, including routine and emergency;
- Review and improvement; and
- Asset replacement and decommissioning.

As part of this Framework, redundant assets will be decommissioned when there is no longer a need and retention of the asset presents risks in terms of safety, environment, financial, impact on DBP and/or operation. Decommissioning is executed in accordance with Asset Decommissioning Procedure (TEB-003-0077-01), which is normally initiated through the Management of Change (MoC) process.

All "live" assets present some inherent risk, whether it is from pressurised hydrocarbons, stored fuel/oil, electrical energy, or any other form of hazard. Consistent with the relevant AMP, assets that have reached the end of their operational life will be decommissioned or placed in a "mothballed" state as a prudent strategy to eliminate or mitigate risk. This approach also applies to assets that have been suspended in operation for an extended period of time.

Further, live assets require maintenance to ensure their integrity. The decommissioning or mothballing of assets that are no longer required for operational purposes reduces the overall burden on maintenance resources and reflects a prudent and efficient operating philosophy.

Once decommissioned, consideration is given to the appropriate disposal of the asset where there is no economic benefit in retaining it.

The plan for decommissioning and/or disposal of a redundant asset will be formulated meeting the requirements of AS 2885.3 and assessed as part of the MoC process.

1.3.1 Proposed assets and facilities for decommissioning

We propose to decommission or mothball six (6) assets that are no longer required for operation, with the decommissioning strategy for each shown in Table 1.3 below.

Table 1.3: Assets proposed for decommissioning

Asset	Forecast cost ($'000)	Asset Year	Decom. – onsite	Decom. – dismantle	Mothball
HiSmelt Meter Station & Offtake	80	1985	✓		
Carnarvon Power Station Lateral	80	1987			✓
Westlime	60	1997		✓	
Mondarra Meter Station	80	1984	✓		
LM500 water bath heaters (5 off)	120	1985		✓	
Eneabba MS	80	1982	✓		

In line with the Asset Decommissioning Procedure our proposed approach is to:

- Develop a decommissioning/mothballing strategy for each asset/facility and obtain approval from the required business units;
- Develop a detailed decommissioning/mothballing plan for each asset/facility; and
- Execute the decommissioning/mothballing plan.

Figure 1.1: Kwinana Power Station Heaters to be decommissioned

Figure 1.2: Eneabba meter station to be decommissioned

1.4 AA5 forecast

In AA5 a total expenditure of $0.5 million is forecast and distributed as follows.

Table 1.4: Summary of AA5 forecast spend for Decommissioning

($'000)	2021	2022	2023	2024	2025	AA5
Decommissioning	-	-	250	250	-	500
Total	-	-	250	250	-	500

1.4.1 AA4 comparison

We estimate expenditure of $0.2 million in AA4. This is $0.03 million higher than our approved forecast in AA4. The historical cost was for electrical and mechanical isolation of LM500 turbines as well as the decommissioning of Jandakot GEA in 2016. The driver for the above forecast expenditure was the actual cost of decommissioning the LM500 units ($0.15 million) was higher than forecast ($0.095 million). The reason for this variation was that the amount of effort required to remove the LM500 control systems was more complex than originally envisaged. The original scope was only related to isolation of the gas system but was extended to the removal of the control system, which was integrated with operational station controls.

Table 1.5: Summary of actual and approved spend in AA4

($'000)	2016	2017	2018	2019	2020	AA4
Actual	21	130	1	-	-	151
Approved	82	39	-	-	-	121
Variance	(60)	91	1	-	-	30

1.4.2 What are the drivers for this variation?

The increase in expenditure from AA4 to AA5 is due to the commencement of mothballing of large assets as they have reached the end of their useful life. This is exacerbated by having the assets deteriorating further, increasing the risk of incident if the decommissioning program is not increased to include those aged assets.

Table 1.6: Comparison of costs AA4 and AA5

($'000)	AA4	AA5	Variance
Decommissioning program	151	500	349
Total	**151**	**500**	**349**

1.5 Risk Assessment

Risk management is a constant cycle of analysis, treatment, monitoring, reporting and then identifying once again, as shown below in Figure 1.3, with a commitment to balance outcomes sought with delivery and cost implications considered and assessed.

Figure 1.4: Risk management principles applied

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur.

Based on these two key inputs, the risk assessment and derived risk rating then guides the actions and activities required to ensure safety and compliance are not compromised, while delivery of this outcome is done as efficiently and effectively as possible.

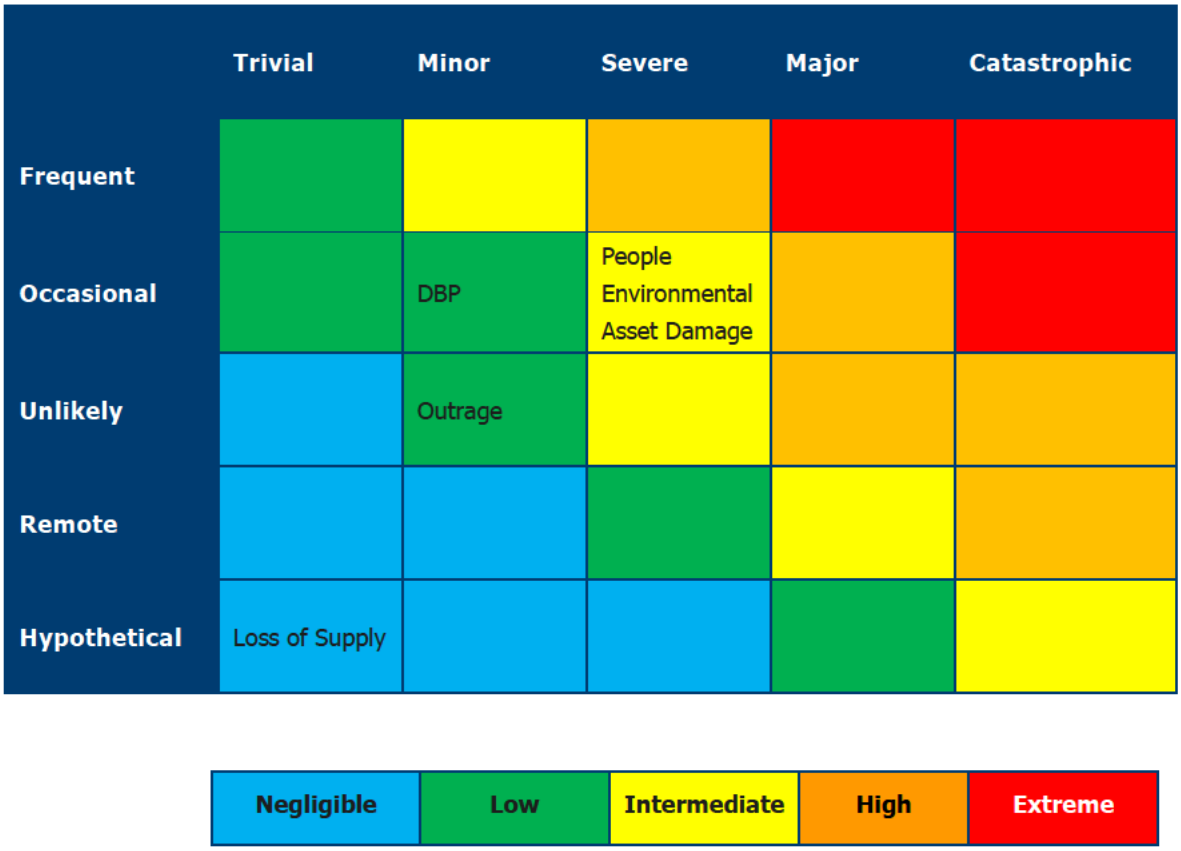
The risk rating assesses the consequence and likelihood of the risk.

The risk of an event associated with failure of an asset is rated based on the combined effect of the consequence and likelihood rating to provide an overall risk rating. This risk rating guides the risk management and mitigation activities and facilitates prioritisation.

Our Operational Risk Framework is based on AS/NZS 2885 and requires all identified risks ranked as intermediate or above to be addressed. For risks ranked as high we must *'Moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.*

The overall risk rating of Decommissioning is outlined in Figure 1.5. As displayed, there is one intermediate risk, two low risks and one negligible risk associated with Decommissioning. This results in an overall high risk rating for these assets in an untreated scenario.

Figure 1.6: Risk rating – Decommissioning



1.5.1 Untreated risk

Table 1.7: Risk rating - untreated

Risk Area	Untreated
DBP	Low
People	Intermediate
Environment	Intermediate
Reputation/Outrage	Low
Asset Damage	Intermediate
Supply	Negligible
Overall Rating	**Intermediate**

The decommissioning program is required as per AMPs and the Safety Case, particularly where decommissioning presents a significant opportunity to eliminate or mitigate risks of leaving the assets "live". The overall risk rating of not undertaking decommissioning works is identified as intermediate in Figure 1.5.

Specifically:

- **People –** Untreated, there are safety risks related to leaving assets in a 'live' condition despite them not being required for service, especially where staff are required to work in or around assets that have not been appropriately decommissioned or mothballed.

- **Environment –** Untreated, pressurised hydrocarbons, stored fuel/oil, electrical energy, or any other form of hazard pose risks to the environment.

- **Asset damage –** Untreated, there is the potential for assets to be damaged, including those kept "live" where they are no longer required for service.

1.6 Options Considered

Alternative options for Decommissioning for the AA5 period which have been considered are:

- Option 1 – Continue to take an ad hoc approach to asset decommissioning
- Option 2 – Do not decommission/mothball non-operational assets
- Option 3 – Move to proactive plan for decommissioning following DBP Asset Decommissioning Procedure (implemented in 2018)

1.6.1 Option 1 – Continue to take an ad hoc approach to asset decommissioning

This option aims to continue the current practice of isolating some ECI equipment alongside occasional decommissioning of other assets and facilities. No major assets would be mothballed or decommissioned under this approach. Further, some meter station, turbine packages or heaters might be positively isolated (blinds, spades) and purged. However, normal planned maintenance would be stopped causing the asset condition to deteriorate over time, resulting in unnecessary repairs (such as painting, maintaining cathodic protection and maintaining earthing).

There would be no provision made for decommissioning of large assets during the AA5 period.

1.6.1.1 Achievement of objectives

Table 1.8 outlines how option 1 will support the achievement of our vision objectives in AA5.

Table 1.9: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	-
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	-
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

This option delivers against sustainably cost efficient in the short term but risks medium to long term viability, and delivers against customer service as there will be no impact on customers from the current practice. It does not deliver against being a good employer as the risks associated with

leaving assets in service past their useful life is not mitigated, thereby continuing to pose risks to staff and contractors who work in affected areas.

1.6.1.2 Cost assessment

With this option, no costs would be incurred as a result of decommissioning major assets. However, there could be significant unplanned cost associated with issues that required remediation and penalties to customers from not delivering on commitments. There could also be additional costs where an incident occurs causes major impact to people, asset damage or loss of supply.

The forecast cost of this option is difficult to accurately predict, however estimated costs would be:

- $0.1 million per meter station for above ground painting;
- $0.05 million for inspection, testing and repairing earthing systems at the proposed sites; and
- $0.01 million per year per site for continuing in the annual CP surveys.

1.6.1.3 Risk assessment

Table 1.10 shows that option 1 does not have any impact on the untreated risk for each category.

Table 1.11: Risk assessment Option 2

Risk category	Untreated	Treated
DBP	Low	Low
People	Intermediate	Intermediate
Environment	Intermediate	Intermediate
Reputation/Outrage	Low	Low
Asset Damage	Intermediate	Intermediate
Supply	Negligible	Negligible
Overall Rating	**Intermediate**	**Intermediate**

Under option 1 there would be no change to the untreated risk rating as an ad hoc approach to decommissioning could further lead to failure, resulting in asset damage and reputational damage. These assets also deteriorate to a point where they cannot be deployed to other sites, if required in the future, resulting in loosing efficiencies with regard to future new-builds.

1.6.2 Option 2 – Do not decommission/mothball non-operational assets

This approach assumes that no assets or facilities are decommissioned or mothballed during AA5.

1.6.2.1 Achievement of objectives

Table 1.12 outlines how option 2 will support the achievement of our vision objectives in AA5.

Table 1.13: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	N
A Good Employer – Skills Development	N
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	N
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

This option does not deliver against any relevant vision objectives of delivering for customers, being a good employer and being sustainably cost efficient as it exposes significant risks to safety, environment, operations and financial performance by leaving assets in service beyond their useful life and requiring ongoing maintenance activities to be undertaken which is inconsistent with prudent and efficient practice.

1.6.2.2 Cost assessment

The estimated costs associated with this option are indirect as a result of increasing and ongoing maintenance costs. No direct decommissioning expenditure will be incurred in AA5.

Based on our current expenditure on operations and maintenance of the assets and facilities currently proposed for decommissioning, it is expected that $0.2 million of expenditure will continue to be incurred each year in order to ensure that the assets are in a safe and steady state.

The maintenance management system captures all the required work to be performed on the site. The following is the planned maintenance requirements:

1) Labour: $0.2 million per annum

2) Materials: $0.1 million annum

In addition, it is estimated the reactive maintenance costs would be:

- $0.1 million per meter station for above ground painting;
- $0.05 million for inspection, testing and repairing earthing systems at the proposed sites; and
- $0.01 million per year per site for continuing in the annual CP surveys.

1.6.2.3 Risk assessment

Table 1.14 shows that option 1 does not have any impact on the untreated risk for each category.

Table 1.15: Risk assessment Option 2 Increase frequency of inspections

Risk category	Untreated	Treated
DBP	Low	Low
People	Intermediate	Intermediate
Environment	Intermediate	Intermediate
Reputation/Outrage	Low	Low
Asset Damage	Intermediate	Intermediate
Supply	Negligible	Negligible
Overall Rating	**Intermediate**	**Intermediate**

Under option 1 there would be no change to the untreated risk rating as an ad hoc approach to decommissioning could further lead to failure, resulting in asset damage and reputational damage. These assets also deteriorate to a point where they cannot be deployed to other sites, if required in the future, resulting in lost efficiencies with regard to future new-builds.

1.6.3 Option 3 – Move to proactive plan for decommissioning following DBP Asset Decommissioning Procedure (implemented in 2018)

This option involved the decommissioning of those assets that have reached the end of their useful life or have been suspended in operation for an extended period and are no longer required.

There are six (6) facilities in total for the AA5 period including:

- 3 assets/facilities to be decommissioned onsite;
- 2 assets/facilities to be dismantled; and
- 1 asset/facility to be mothballed.

1.6.3.1 Achievement of objectives

Table 1.12 outlines how option 3 will support the achievement of our vision objectives in AA5.

Table 1.16: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	Y
A Good Employer – Skills Development	Y
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option delivers against all of our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient as it executes decommissioning consistent with AMP requirements and manufacturer/OEM recommendations for useful life.

1.6.3.2 Cost assessment

Under this option the cost would be $0.5 million in AA5.

Table 1.17: Summary of AA5 forecast spend for Decommissioning

($'000)	2021	2022	2023	2024	2025	AA5
Decommissioning	-	-	250	250	-	500
Total	**-**	**-**	**250**	**250**	**-**	**500**

Internal resource requirements and external costs are calculated primarily on engineering, planning and site work requirements using previous construction work as a basis. However, an accurate cost for the work will not be known until approvals are received and the detailed decommissioning/mothballing plan has been created for each asset/facility.

1.6.3.3 Risk assessment

Table 1.18 shows that this option does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.19: Risk assessment Option 3

Risk category	Untreated	Treated
DBP	Low	Negligible
People	Intermediate	Low
Environment	Intermediate	Low
Reputation/Outrage	Low	Negligible
Asset Damage	Intermediate	Low
Supply	Negligible	Negligible
Overall Rating	**Intermediate**	**Low**

This option is ALARP and reduces the overall risk exposure in each risk category by executing the decommissioning strategy consistent with AMP requirements and following manufacturer recommendations on asset useful life.

1.7 Summary of Cost/Benefit Analysis

Table 1.20: Summary of Cost/Benefit Analysis

Option	Objectives	Cost	Risk
Option 1 – Continue ad hoc approach	This option does not achieve our objectives of delivering for customers, being a good employer or being sustainably cost efficient	>$0.5m	The work would still be required but the efficient costs would not be recovered.
Option 2 – Do no decommissioning	This option does not achieve our objectives of delivering for customers, being a good employer or being sustainably cost efficient	>$0.5m	This option does not address the intermediate risks to People/ Environment/ Asset Damage
Option 3 – Move to a proactive decommissioning approach	This option achieves our objectives of delivering for customers, being a good employer and being sustainably cost efficient	$0.5m	This option addresses the intermediate risks to People/ Environment/ Asset Damage.

1.7.1 Why are we proposing this solution?

The recommended option is to continue to undertake decommissioning work at the nominated 6 sites shown in Table 1.3 in order to sufficiently mitigate or eliminate risks associated with those assets no longer required for service and consistent with good industry practice. It provides rigour in the evaluation and assessment of assets most requiring decommissioning or mothballing and

prioritises them accordingly. It aligns with our Risk Management Framework, asset management principles, vision objectives and regulatory requirements including the Safety Case.

Options 1 and 2 provide no improvement in risk rating and would pose unacceptable risks in relation to pressurised hydrocarbons, stored fuel/oil, electrical energy, or any other form of hazard where assets are kept "live" beyond their useful life. Both options would also incur expenditure that is neither prudent nor efficient by requiring ongoing maintenance expenditure on non-operational assets.

Rule 91

The relevant opex rule is detailed below and also in the Guidance Note and has been extracted from the latest version of the National Gas Rules (available here: http://www.aemc.gov.au/energy-rules/national-gas-rules/current-rules):

> *"Division 7 Operating expenditure*
>
> *91 Criteria governing operating expenditure*
>
> *(1) Operating expenditure must be 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 delivering pipeline services.*
>
> *(2) The AER's discretion under this rule is limited."*

1.7.2 Estimating efficient costs

The costs are estimated by identifying the activities to be undertaken given the historical actual volumes and then multiplying by the appropriate unit rate for materials and labour.

As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology 2021-2025', the forecast unit rates for all projects/initiatives managed within this program are inclusive of internal labour, external labour/contractors, materials, travel and other costs.

Internal resource requirements as well as external costs are dictated primarily by the engineering and planning as well as the site work required and forecasts have been based on previous construction work. However, an accurate cost for the work will not be known until approvals are received and the detailed decommissioning/mothballing plan has been created for each asset/facility.

Table 1.21 below summarises the total unescalated costs by cost type.

Table 1.22: Decommissioning cost estimate by cost category

	2021	2022	2023	2024	2025	Total
Internal Labour	-	-	125	125	-	250
Contractors / Consultants	-	-	65	65	-	130
Materials & Services	-	-	40	40	-	80
Travel & Others	-	-	20	20	-	40
Total	**-**	**-**	**250**	**250**	**-**	**500**

Table 1.23 below shows the escalation applied to escalate the Decommissioning costs to real dollars of December 2020 including labour cost escalation of 0.69%.

Table 1.24: Decommissioning total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	-	-	250	250	-	500
Escalation	-	-	8	8	-	16
Total escalated ($ Dec 20)	**-**	**-**	**258**	**258**	**-**	**516**

Appendix A – Risk Assessment

Figure 1.7: Summary of Decommissioning risk assessment

	DBP				People				Environmental				Outrage				Asset Damage				Loss of Supply				
	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Consequence	Frequency	Risk	Score	Total Risk Score
Untreated/ inherent risk	Minor	Occasional	LOW	5	Severe	Occasional	INTERMEDIATE	25	Severe	Occasional	INTERMEDIATE	25	Minor	Unlikely	LOW	5	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	86
Option 1 - Continue to take an ad hoc approach to asset decommissioning	Minor	Occasional	LOW	5	Severe	Occasional	INTERMEDIATE	25	Severe	Occasional	INTERMEDIATE	25	Minor	Unlikely	LOW	5	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	86
Option 2 - Do not decommission/mothball non-operational asset	Minor	Occasional	LOW	5	Severe	Occasional	INTERMEDIATE	25	Severe	Occasional	INTERMEDIATE	25	Minor	Unlikely	LOW	5	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	86
Option 3 - Move to proactive plan for decommissioning following DBP Asset Decommissioning Procedure implemented 2018	Minor	Remote	NEGLIGIBLE	1	Severe	Remote	LOW	5	Severe	Remote	LOW	5	Minor	Remote	NEGLIGIBLE	1	Severe	Remote	LOW	5	Trivial	Hypothetical	NEGLIGIBLE	1	18