Attachment 8.5

Capex Business Cases

January 2020

Dampier Bunbury Pipeline

CONTENTS

Compressor Stations Business Case – Capex DBP01

1.1 Project approvals

Table 0.1: Compressor stations business case DBP01 – Project approvals

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1.2 Project overview

Table 0.2: Compressor Stations business case DBP01 - Project overview

Description of issue/project	This business case covers the program of capital works necessary over the next five years to ensure the DBNGP's compressor stations are operating safely, reliably, within acceptable risk tolerances, and are providing a level of performance consistent with that expected by customers. The compressor stations work program comprises three broad categories: 1. end of life asset replacement – this includes replacing rotating equipment, electrical control and instrumentation (ECI), power supply, and mechanical equipment; 2. proactive works – activities to protect compressor station assets from corrosion and safety hazards, or required to maintain current performance or improve deteriorated performance; and 3. upgrades – this includes upgrades of corrosion protection systems, ECI, software, rotating and mechanical equipment. The work program contains 34 individual initiatives, which are guided by their respective Asset Management Plans. There are ten compressor stations on the DBNGP. Compressor stations are critical assets that enable gas to be transported along the pipeline. They run based on customers' gas requirements and must be ramped up or down quickly to meet these requirements. Deterioration in compressor station performance can impact pipeline integrity and compromise our ability to fulfil customers' contracted gas supply. It is therefore important the ongoing capital works program is sufficient to maintain compressor station performance and mitigate integrity and reliability/performance risks. The long life of compressor station assets, coupled with the different age, location and utilisation of each compressor station, means the replacement and repair cycle of compressor stations can vary depending on the overall condition of assets. As a result, the overall capital program will necessarily be inconsistent across regulatory periods. This business case recommends an increase in the compressor station works program over the next five years (the AA5 period) compared to the volume of works undertaken over the last five years (the AA4 period). This is because a significant number of assets are at or will reach the end of their useful life during AA5. Upgrades to obsolete/unsupported software and equipment are also required within the next five years. However, overall expenditure on proactive works during AA5 is expected to be the same as that incurred during AA4.
Project name	Compressor Stations
Estimated cost	Total forecast capex for the next Access Arrangement (AA5) is $35.6 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.

Options considered	• Option 1 - Maintain the volume of activity and expenditure levels undertaken during the AA4 period ($26 million); • Option 2 - Move to a replacement on failure policy for all compressor stations projects ($47 to $53.3 million); and • Option 3 - Deliver the volume and activities identified in the Asset Management Plan (AMP) as required, applying good asset management practice, and adopting emerging techniques/technologies where appropriate ($35.6 million) (this is the recommended option).
Variation from AA4	We propose the works program for AA5 will cost $9.7 million more than incurred over AA4. Approximately $7.5 million of this increase is in end of life replacement. This is because there is a greater volume of assets that are reaching end of life in the next five years than in the AA4 period. The remaining increase primarily relates to upgrades of equipment and software than either have or are becoming obsolete ($2 million). The cost of proactive works in AA5 will broadly remain at AA4 levels (a $0.25 million increase). The key programs driving the increase in expenditure during AA5 are: 15 and 30-year replacement cycles falling due for underground tanks, load banks, air inlet filter systems, fire and gas control and monitoring systems, and station and unit isolation valves. Installation of fire suppression systems on Stage 3A compressor units, and replacement of water bath heaters for fuel gas. Once these key asset replacement and upgrade programs have been delivered, we expect the level of asset replacement and upgrade capex to return to a level more consistent with the historical average.
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the proposed asset replacement, proactive works and upgrade program is consistent with accepted good industry practice, several practicable options have been considered, and market/unit rates have been tested to achieve the lowest sustainable cost of providing pipeline services. **NGR 79(2)** - renewal of rotating, ECI, power supply and mechanical equipment, repair/rectification and proactive works to protect from corrosion and safety hazards, or maintain performance are all necessary to ensure the continued operation of compressor stations to maintain the safety and integrity of services along the DBNGP. Compressor station functionality is a core process in the transportation of gas required to meet contracted obligations. Therefore, the proposed expenditure is conforming capex based on the grounds of NGR 79(2)(c)(ii). **NGR 74** – the forecast costs are based on the latest market rate testing, and project options consider the asset management requirements as per the latest Asset Management Plan. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
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 compressor stations program comprises ongoing and periodic activities to ensure the integrity of compressor stations. During Shipper roundtable meetings, we presented key areas of planning, including our proposed capex and opex. We provided a short summary of the compressor stations program given its high value (an estimated 25% of total forecast capex). Shippers were broadly comfortable with the approach and high-level program in AA5, and acknowledged that there are periodic increases and decreases in capex programs associated with energy transmission assets. Our proposed approach was then outlined in its Draft Plan. There were no questions specifically raised in relation to the compressor stations 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 outlines:

	• reasons for changes in expenditure between AA4 and AA5, and • what alternatives 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 the following documents: • Asset Management Plan in 2016 (TEB-001-0024-07) • Asset Management Plan – Electrical Control and Instrumentation (TEB–001–0024-05) • Asset Management Plan – Rotating Equipment (TEB-001-0024-03) • Asset Management – Pipeline Mechanical (TEB-011-0024-02) • Asset Management – Corrosion Protection (TEB-001-0024-04) • 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.

Compressor stations are critical assets that support the transportation of gas to all customers. They are integral to the safe and reliable delivery of around 600TJ of gas a day. They run based on the gas requirements of customers and operations must be ramped up or down quickly to meet these needs.

The DBNGP has ten compressor stations, which are each equipped with two compressors. Table 0.3 summarises the different asset types and components at each compressor station.

Table 0.3: Compressor station asset components

Asset type	Asset components	
Process	• Upstream and downstream MLVs • Pig launchers and receivers • Gas scrubbers • Turbine compressor units • Vent system	• After coolers • Station and units pipework • Station and units isolation valves • Station and units recycle valves • Station mainline bypass pipe
Utilities	• Turbine fuel gas system • Instrument gas system • GEA fuel gas system • Power generation – Gas engines and diesel engines • Electrical switch gear • 110V and 24V UPS (batteries and chargers) system • Electrical cabling and cable ducts • Integrated earthing system • Air compressors and associated driers	• Unit, station and mainline emergency shut down (ESD) systems • Fire & gas detection systems • Turbine compressor unit fire suppressant systems • Waste oil systems • Portable water systems (bores, piping and storage) • Air conditioning systems • Sewage system

Asset type	Asset components	
Buildings	• Accommodation • Workshop • Warehouse • Store rooms	• Control room • Turbine buildings • Electrical switch room • Equipment room
Grounds	• Station yard • Security fencing • Access roads • Airstrip	• Helipad • Drainage • Rubbish tip

We undertake an ongoing capital works program, which is necessary to maintain the performance of compressor station assets. The compressor station works program comprises the following work categories:

- **end of life asset replacement** – this includes replacing rotating equipment, electrical control and instrumentation (ECI), power supply, and mechanical equipment;
- **proactive works** – activities to protect compressor station assets from corrosion and safety hazards, or required to maintain current performance or improve deteriorated performance; and
- **upgrades** – this includes upgrades of corrosion protection, ECI, software, rotating and mechanical equipment.

Not all compressor stations or their associated assets have the same risk profile, so each is individually assessed for management and maintenance activities. Variances to the risk profile of individual assets can be caused by a number of factors, such as location, customer demand, whether the station runs all year around or only for some of the year, and age.[1]

As a result, the volume of works and capital expenditure will vary across regulatory periods. For example, long-lived assets of a similar age, condition or utilisation will typically need to be refreshed or replaced at around the same time, resulting in a 'lumpy' capex profile over the life of the DBNGP.

The next five years (AA5) will see a number of assets reach their 15 and 30-year replacement cycles. There are also a number of software items and equipment that either are or will become obsolete in the next five years. As a result, there is a need to increase expenditure on asset replacement and upgrades during the AA5 period compared with AA4. Proactive repair and maintenance works will remain at AA4 levels.

This business case sets out a proposal to increase the compressor stations capital works program during AA5 in order to meet the asset management requirements set out in the AMP. This business case also considers options to maintain capital expenditure at current (AA4 actual) levels or to move to reactive replacement only.

[1] Compressor stations were installed and overhauled at various stages over the past thirty years as the DBNGP went through various expansion stages. An overview of the commissioning dates of each compressor station can be found in the AMP.

1.3.1 Compressor stations capital works program

As part of our asset management risk assessment process, risk levels are determined for different asset classes. Criticality of controls are analysed based on the significance of risk reduction provided by these risk controls.

Based on these assessments, the necessary end of life replacements, proactive works and upgrade activities required over the coming five-year period are captured in the AMP. In this business case, risk is considered for two broad categories of activities;

1. those essential in maintaining the integrity of compressor station assets; and
2. those essential in maintaining reliability/performance compressor station assets.

A summary of the AA5 compressor stations works program is shown in Table 0.4.

Table 0.4: Required compressor stations works program activities during AA5

Focus Area	Discipline	Description
End of life replacement		
Replacement	ECI	CS unit F&G control system replacement (Stage 4)
Replacement	ECI	CS unit F&G monitoring system replacement (ACS)
Replacement	ECI	CS unit F&G control system replacement (Stage 2)
Replacement	ECI	Station PLC replacement
Replacement	ECI	24 VDC batteries and charger replacement
Replacement	ECI	110 VDC batteries and charger replacement
Replacement	Rotating	Dry gas seal replacement
Replacement	Rotating	Turbine combustion air inlet filter system replacement
Replacement	Mechanical	Unit isolation valve replacement
Replacement	Mechanical	Station isolation valve replacement
Replacement	Mechanical	Recycle valve replacement
Replacement	Mechanical	Replacement of air conditioning
Replacement	Mechanical	Compressor station pipework cladding removal
Replacement	Mechanical	Replacement of corroded exhaust flange at CS10U3
Replacement	Mechanical	Instrument air system replacement
Proactive works		
Proactive	CP	Refurbishment of below ground pipework
Proactive	CP	Painting of above ground pipework and facilities
Proactive	ECI	Hazardous area inspection and rectification
Proactive	ECI	Electrical protection integrity testing
Proactive	ECI	Measurement of earthing grid resistance
Proactive	Mechanical	Refurbishment of underground oil sump tanks
Proactive	Mechanical	Relocate unit piping to above ground at CS3
Upgrades		
Upgrades	ECI	Installation of fire suppression system on Stage 3A units
Upgrades	ECI	Solar Turbines TT4000 V5 software upgrade/licensing
Upgrades	ECI	Load bank control panel redesign and replacement program

Focus Area	Discipline	Description
Upgrades	ECI	Upgrade of Nuova Pignone HMI software to latest Windows version
Upgrades	ECI	Upgrade of fuel gas pressure control loop for CS01/U1, CS03/U1, CS08/U2
Upgrades	Mechanical	Fuel gas – water bath heater refurbishment / replacement
Upgrades	Rotating	Compressor units online dynamic data vibration monitoring system - server based
Upgrades	Rotating	Solar compressor package dynamic vibration data visibility annual upgrade
Upgrades	CP	Compressor station CP SCADA visibility
Upgrades	CP	As-build of CP equipment at compressor stations

An overview of the activities listed in Table 0.4, including the drivers for each activity, is provided in Appendix B.

The key increases in activity and expenditure compared with the AA4 period relate to:

- end of life replacement – the 15 and 30 year replacement cycles falling due for underground tanks, load banks, air inlet filter systems, fire and gas control and monitoring systems and station and unit isolation valves; and
- upgrades – installation of fire suppression systems on Stage 3A and Stage 2 compressor units and water bath heater replacement.

The overall costs associated with proactive works is expected to remain at AA4 levels.

The forecast costs for the AA5 compressor stations program, and a comparison to the AA4 expenditure is provided in the following section.

1.4 AA5 forecast

In AA5, a total expenditure of $35.6 million is forecast across the three categories of compressor stations works program category. Table 0.5 shows the forecast breakdown of spend by program category over AA5, including a comparison with actual expenditure in AA4.

Table 0.5: AA5 forecast compressor stations program expenditure, compared with AA4 actuals ($'000)

Program category	2021	2022	2023	2024	2025	Total AA5	AA4	Variance
Replacement	4,638	1,585	2,085	3,475	4,720	16,503	9,050	7,453
Proactive	2,782	2,190	2,490	2,690	2,390	12,542	12,295	247
Upgrade	2,049	1,350	1,165	1,025	925	6,514	4,506	2,008
Program total	**9,469**	**5,125**	**5,740**	**7,190**	**8,035**	**35,559**	**25,851**	**9,708**

As shown in Table 0.5, the increase compared with AA4 is predominantly driven by end of life replacement, which accounts for $7.5 million (77%) of the increase. A further $2.0 million (21%) of the increase is driven by upgrades, with the proactive works remaining broadly the same, accounting for $0.25 million of the increase (2%).

The driver for the increase in end of life replacement and upgrade costs is primarily because there are a greater number of compressor stations that require asset replacement during AA5 than in AA4. This is because a large number of compressor station assets are reaching their 15 and 30-year replacement cycles during the next five years. This and other drivers are described in the following sections.

1.4.1 End of life replacement

Expenditure on end of life replacement is forecast to increase from $9 million incurred during the current access arrangement period (AA4), to around $16.5 million over the next five years.

The main contributor to this uplift in activity is the requirement to replace various ECI, rotating and mechanical equipment at compressor stations. Depending on the equipment type, ECI, rotating and mechanical equipment have the following life expectancies:

- ECI – between 10 and 20 years
- Rotating – between 17 and 35 years
- Mechanical – between 10 and 20 years

Compressor station equipment was installed during the various stages of the DBNGP expansion over the past 32 years. As a result, a significant number of assets are at or will reach their 15 and 30-year replacement cycles during the AA5 period (see Table 0.6).

Table 0.6: Summary of DBNGP expansion projects

DBNGP expansion stage	Year	Years in service (as at 2019)
ACS project	1987	32
Stage 2	1997	22
Stage 3A	2000	19
Stage 4	(2004)	15
Stage 5A	(2007)	12
Stage 5B	(2010)	9

We undertake proactive works such as condition based overhauls and repairs (such as seal replacements) as required throughout an asset's life, with asset replacement done at the end of life. They key end of life asset replacement projects required over AA5 are:

- replacement of F&G control and monitoring systems ($4.5 million);
- unit isolation valve replacement ($1.5 million);
- station isolation valve replacement ($1.5 million);
- station PLC replacement ($1.5 million);
- replacement of air conditioning at compressor stations ($1.2 million); and
- turbine combustion air inlet filer replacement ($0.9 million).

In each of these projects, the assets are approaching their 15 or 30-year replacement cycles, and are scheduled for replacement during the next five years. Further information on these capital projects is provided in Appendix B and in the AMP.

Table 0.7 provides an overview of the AA5 compressor stations end of replacement capex program.

Table 0.7: AA5 forecast compressor stations end of life replacement ($'000)

Compressor stations program activity	2021	2022	2023	2024	2025	AA5
End of life replacement						
Unit isolation valve replacement	300	300	300	300	300	1,500
Station isolation valve replacement	500	-	500	-	500	1,500
Recycle valve replacement/overhaul	200	200	200	200	200	1,000
CS unit F&G monitoring system replacement (ACS)	-	-	-	900	900	1,800
CS unit F&G control system replacement (Stage 2)	-	-	-	-	300	300
CS unit F&G control system replacement (Stage 4)	-	-	-	1,200	1,200	2,400
Upgrade of station & unit F&G monitoring system at CSs (incl. SESD & MLESD)	350	-	-	-	-	350
110VDC batteries and charger	75	-	-	75	300	450
24VDC batteries and charger	208	-	-	100	320	628
Dry gas seal replacement.	400	400	400	400	400	2,000
Turbine combustion air inlet filter system replacement	900	-	-	-	-	900
Station PLC replacement	300	300	300	300	300	1,500
Replacement of air conditioning at compressor stations	385	385	385	-	-	1,155
Instrument air system replacement.	90	-	-	-	-	90
Compressor sites cladding removal	800	-	-	-	-	800
Replacement of corroded exhaust flange at CS10U3	130	-	-	-	-	130
Total - end of life replacement	**4,638**	**1,585**	**2,085**	**3,475**	**4,720**	**16,503**

Further information on proposed end of life replacement activities can be found in the AMP and in Appendix B of this business case.

1.4.2 Upgrades

The second biggest contributor to the compressor stations capital program uplift in AA5, is the requirement to upgrade a number of equipment and software items that are either obsolete or will become obsolete/unsupported during the next five years. Expenditure on upgrades is forecast to increase from $4.5 million during AA4 to $6.5 million over AA5.

The key projects driving the increase in upgrades expenditure are:

- installation of fire suppression system on stage 3A and stage 2 units ($1.95 million); and
- water bath heater upgrades at compressor stations ($1.2 million).

The installation of fire suppression systems at compressor stations is a critical program, particularly following the lessons learnt from a fire incident at CS10.

Following the CS10 incident, in consultation with our insurance assessors and compressor package vendors, our Fire and Gas Policy has been refined to require that all new units must include fire suppression systems. Work commenced during AA4 on bringing the compressor station assets up to the new policy standard, and this is forecast to be completed during AA5. Fire suppressant systems will be installed at the following compressor stations during AA5:

- CS2/2 (2021)
- CS4/2 (2022)
- CS6/2 (2023
- CS9/1 (2024)

The upgrade of water bath heaters at compressor stations is another critical upgrade program for AA5. The majority of water bath heaters currently in use at compressor stations are electric immersion heaters. However, six compressor station units still have old gas water bath heaters. Electric immersion heaters require less maintenance and carry a lower integrity risk than gas heaters, therefore the plan is to replace the remaining gas heaters with electric during the next five years.

The six remaining gas heaters are at the end of their useful lives, and recent (2019) inspections have found microbial corrosion present on both the shell and the tube bundle of each heater (see Appendix B.3.4 of this document). Tube bundles in four heaters have been replaced due to excessive corrosion ($60,000 per heater), however these will likely need to be replaced again within the next five years as microbial corrosion is prone to recur once present at a location.

Heater shells will likely also require replacement ($230,000 per heater), therefore our considers it prudent to replace the corroded gas heaters with electric immersion heaters, which are not prone to microbial corrosion.

Table 0.9 provides an overview of the AA5 compressor stations upgrades capex program.

Table 0.8: AA5 forecast compressor stations upgrades ($'000)

Compressor stations program activity	2021	2022	2023	2024	2025	AA5
Upgrades						
Compressor station CP SCADA visibility	200	200	-	-	-	400
As-build of CP equipment at compressor stations	124	-	-	-	-	124
Upgrade of fuel gas pressure control loop for CS01/U1, CS03/U1, CS05/U1 & U2, CS08/U2	140	-	140	-	-	280
Solar Turbines TT4000 V5 software upgrade/licensing	560	-	-	-	-	560
Installation of fire suppression system on Stage 3A and Stage 2 units	425	425	550	550	-	1,950
Load bank control panel redesign and replacement program	250	125	125	125	125	750
Upgrade of Nuovo Pignone HMI software to latest Windows version	-	250	-	-	250	500

Compressor stations program activity	2021	2022	2023	2024	2025	AA5
Solar compressor package dynamic vibration data visibility annual upgrade	60	60	60	60	60	300
Compressor units online dynamic data vibration monitoring system - server based	90	90	90	90	90	450
Fuel gas - water bath heater refurbishment/replacement	200	200	200	200	400	1,200
Total - Upgrades	**2,049**	**1,350**	**1,165**	**1,025**	**925**	**6,514**

Further information on proposed compressor stations asset upgrade activities can be found in the AMP and in Appendix B of this business case.

1.4.3 Proactive works

Proactive works relates to the ongoing capital program necessary to repair and maintain assets that are not due for end of life replacement or do not have obsolescence/upgrade issues. Forecast capex on proactive works over the next five years is expected to remain at AA4 levels, and represents a prudent level of expenditure required to maintain asset performance and customer delivery at current standards.

The largest proactive works program is the ongoing refurbishment of below ground pipework. Coating used on compressor station pipework lasts around ten years. A proactive coating refurbishment program has been in place since the DBNGP was commissioned, with the objective to retouch/replace coating before corrosion occurs.

During the AA5 period, the coating on below ground pipework at the following compressor stations will be undertaken:

- CS6
- CS7
- CS9
- CS10
- completion of CS2 (which commenced during the AA4 period, but was delayed due to a cyclone)

By the end of the AA5 period, all below ground compressor station piping will have been recoated.

Table 0.9 provides an overview of the AA5 compressor stations proactive works capex program.

Table 0.9: AA5 forecast compressor stations proactive works ($'000)

Compressor stations program activity	2021	2022	2023	2024	2025	AA5
Proactive works						
Refurbishment of below ground pipework	1,300	1,300	1,300	1,300	1,300	6,500
Painting of above ground facility (including compressor stations)	500	500	1,000	1,000	500	3,500
Hazardous area inspection and rectification	400	200	-	200	400	1,200
Electrical protection integrity testing	110	110	110	110	110	550
Refurbishment of underground oil sump tanks	80	80	80	80	80	400
Relocate unit piping to above ground at CS3	297	-	-	-	-	297
Measurement of earthing grid resistance	95	-	-	-	-	95
Total - Proactive works	**2,782**	**2,190**	**2,490**	**2,690**	**2,390**	**12,542**

Further information on proposed proactive works on compressor stations can be found in the AMP and in Appendix B of this business case.

1.4.4 AA4 variance

Actual expenditure during the AA4 period was $17.1 million lower than the amount determined in the 2016 AA4 Final Decision (see Table 0.10).

Table 0.10: AA4 actual expenditure compared with budget

Actual v Budget	Category ($'000)	2016	2017	2018	2019	2020	AA4
Actual	Replacement	2,674	2,909	1,504	835	1,128	9,050
	Repairs/preventative	2,160	2,675	1,245	3,345	2,870	12,295
	Upgrades/other	708	1,697	1,167	467	467	4,506
	Total	**5,542**	**7,280**	**3,916**	**4,646**	**4,465**	**25,851**
Budget	Replacement	3,369	2,822	2,107	1,842	1,953	12,093
	Repairs/preventative	4,154	3,751	3,333	4,098	4,032	19,368
	Upgrades/other	2,409	2,742	2,605	1,855	1,889	11,499
	Total	**9,931**	**9,314**	**8,045**	**7,795**	**7,874**	**42,960**
Variance		**4,389**	**2,034**	**4,129**	**3,149**	**3,409**	**17,109**

The lower-than-forecast expenditure on compressor stations during the AA4 period is primarily due to the reprioritisation of resources due to a number of emerging priorities in other work programs. For example, three significant incidents relating to metering assets happened during the AA4 period, which led to relocation of resources and significant changes in the overall capital works program.

The metering incidents were unforeseen and high priority. We are conscious of the future impact on end customers if it incurs expenditure significantly higher than the amounts approved in our revenue determination, therefore we took steps to prudently defer some projects from the compressor stations program (where safe to do so) in order to accommodate the higher spend on metering.

[redacted]

In addition, only one of the two compressor station refurbishment/replacement projects was completed during the AA4 period. CS1 was completed, whereas CS2 had to be postponed before completion due to a cyclone. The CS2 works will be completed as part of the AA5 program.

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

Figure 0.1: 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 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'.

[2] We have committed to completing the fire suppression works during AA5.

Six areas are considered for each type of risk:

1. DBP – corporate/financial risk
2. People – safety risk to the public and employees
3. Environmental – risk of adverse impact on environment/local ecosystems
4. Reputation/Outrage – risk of customer anger and reputational damage
5. Asset Damage – dollar impact on assets
6. Supply – risk of supply interruption to customers

Compressor stations initiatives have been split into two categories for risk assessment:

1. those related to the integrity of compressor stations; and
2. those related to the reliability and performance of compressor stations.

The overall risk rating of managing and maintaining the integrity and the reliability and performance of compressor stations in line with relevant AMPs is outlined in the following sections.

1.5.1 Integrity risk

The integrity risk rating associated with compressor stations is presented in Figure 0.2. If the risk remains untreated, of the six risk areas, three are rated high risk and two are rated intermediate risks. As a result, the compressor station integrity-driven initiatives are ranked high risk and high priority.

Figure 0.2: Integrity untreated risk rating – Compressor stations

	Trivial	Minor	Severe	Major	Catastrophic
Frequent					
Occasional					
Unlikely			Reputation/ Outrage Supply	DBP Asset Damage	
Remote		Environment			People
Hypothetical					

Negligible	Low	Intermediate	High	Extreme

Table 0.11 shows the untreated risk for each risk area.

Table 0.11: Compressor station integrity risk rating

Risk area	Untreated
DBP	High
People	High
Environmental	Negligible
Reputation/Outrage	Intermediate
Asset Damage	High
Supply	Intermediate
Overall rating	**High**

The drivers of the risk rating for each area are discussed below.

- **DBP** – compressor station integrity is critical to public safety and customer service/delivery. An integrity breach potentially costing millions of dollars in penalties and foregone revenue for both us and our customers. The consequence of a compressor station integrity issue is ranked major as it can threaten the effective operation of the DBNGP for a substantial period. Undertaking the proposed capex program will reduce the likelihood of such an event from unlikely to remote.

- **People** – compressor stations, while designed to be unmanned, are used as base locations for roster teams to work. The compressor stations also contain stores and inventory, as well as accommodation. Given the potential consequences of serious injury if employees are working at stations at the time of an integrity breach, it is imperative that the ongoing capex program maintains the risk of integrity issues as unlikely or remote. Maintaining high integrity at compressor stations promotes an acceptable level of safety workplace and shelter in emergencies for our employees. Allowing integrity levels to decline, and accepting a lower level of risk would require personnel and sensitive equipment to be located away from compressor stations due to the failure consequences of high pressure assets.

- **Reputation/Outrage** – compressor station integrity works are required to ensure equipment performs to acceptable standards. Inconsistent or unreliable performance due to underinvestment can lead to unplanned outages, which leads to irate customers. Underinvestment in integrity activities may lead to reputational damage and outrage internally as well as externally.

- **Asset Damage** – without the planned investment in managing compressor station integrity, there is a high risk the asset will be damaged. Reactive costs to repair damage will likely escalate compared to the planned works program to maintain the design intent of the assets.

- **Supply** – compressor stations are integral to the effective operation of the DBNGP. Maintaining compressor station assets is necessary in ensuring we are able to safely and reliably deliver the forecast demand, as well as be ready to meet contractual obligations of Shippers on any given day within the terms of shipper contracts. The advent of renewable electricity generation technology, which are prone to change without forward planning, puts pressure on the DBNGP to fill the gaps. Peaking demand has grown and will be a critical part of load management during the AA5 period. Shippers are expected to be able to access and use their peaking rights more regularly, therefore the compressor station integrity programs are necessary to ensure the pipeline line pack, and we can meet AA5 forecast throughput.

1.5.2 Reliability/Performance risk

The reliability/performance risk rating associated with compressor stations is presented in Figure 0.43. If the risk remains untreated, of the six risk areas, one is rated an intermediate risk.

Figure 0.3: Reliability/performance untreated risk rating – Compressor stations

	Trivial	Minor	Severe	Major	Catastrophic
Frequent					
Occasional		Reputation/ Outrage	DBP		
Unlikely		Asset Damage Supply			
Remote					
Hypothetical	People Environment				

Negligible	Low	Intermediate	High	Extreme

Table 0.12 shows the untreated risk for each risk area.

Table 0.12: Compressor station reliability/performance risk rating

Risk area	Untreated
DBP	Intermediate
People	Negligible
Environmental	Negligible
Reputation/Outrage	Low
Asset Damage	Low
Supply	Low
Overall Rating	Intermediate

Compressor station reliability/performance driven initiatives are intermediate risk and medium priority, but are key in delivering a capex program that can be considered as efficient and achieving the lowest sustainable cost of delivering services. Only one risk area is identified as being intermediate or higher if the proposed compressor stations works are not undertaken:

- **DBP** – compressor station reliability/performance driven initiatives do not pose a threat to the effective operation of the DBNGP, but do expose us to unacceptable cost consequences through lower fuel efficiency, and contractual penalties if gas availability agreement with Shippers are not fulfilled. The proposed work program will reduce the likelihood of a severe reliability/performance risk from unlikely to remote.

1.6 Options considered

Different options for delivering the ongoing compressor stations capital works program have been considered. The options are:

- Option 1 - Maintain the volume of activity and expenditure levels undertaken during the AA4 period;
- Option 2 - Move to a replacement on failure policy for all compressor stations projects; or
- Option 3 - Deliver the volume and activities identified in the AMP as required, applying good asset management practice, and adopting emerging techniques/technologies where appropriate (this is the recommended option).

These options are discussed in the following sections.

1.6.1 Option 1 – Maintain the volume of activity and expenditure levels undertaken during the AA4 period

With this option, the volume of activity and expenditure that was delivered in the AA4 period would be committed to for the AA5 period.

During the AA4 period, total compressor station capital expenditure was $25.8 million.[3] This comprised a similar level of expenditure on proactive works ($12.3 million) as is being proposed under the recommended option for AA5, but expenditure on end of life replacement and upgrades was lower than what has been identified as required in the latest AMP.

Due to the long life of gas pipeline assets, the variety of assets within a compressor station, and the varying age and utilisation of each asset, the end of life replacement cycle will necessarily vary across and between regulatory periods. As a result, historical expenditure on the ongoing compressor station works program is not always an accurate indicator of the level of expenditure going forward.

During the AA4 period, there were fewer assets identified as being at or near end of life, therefore lower capex levels were required than will be necessary in AA5. We were also able to prudently defer some works as priorities, customer requirements and risk profiles evolved over the period.

During AA5, a large number of assets (which were installed at similar times) are reaching their 15 and 30-year replacement cycles. This leads to a greater end of life replacement cost during the next five years.

Ongoing asset condition is a key consideration when managing critical DBNGP assets, however, age is typically the primary trigger for replacement and/or reassessment of risk. Given the

[3] Estimated to the end of December 2019.

importance of the pipeline to Western Australia's energy sector and resources industry, we are vigilant in our compliance with AS 2885. An integrity failure can have catastrophic consequences for us, our customers, and the WA economy, therefore, as a prudent asset manager, operating efficiently, and consistent with good asset management practice, we refurbish/replace all critical DBNGP assets based on age. However, where practicable and safe to do so, we will seek to defer replacement of some assets where it finds condition/performance has deteriorated less than expected and integrity risk is not compromised.

If the AA4 expenditure level of $25.8 million were to be maintained over the AA5 period, there would be insufficient funding to undertake the compressor stations capital works program identified in the AMP in full. As a result, a considerable number of the proposed projects would have to be deferred.

Based on the risk ranking of initiatives within the preferred program of works, the following compressor stations reliability and performance initiatives **would not be delivered** if option 1 were pursued:

- one third of the dry gas seal replacements;
- as-build of cathodic protection (CP) equipment at compressor stations;
- replacement of corroded exhaust flange at CS10U3;
- turbine combustion air inlet filter system replacement;
- upgrade of fuel gas pressure control loop for CS01/U1, CS03/U1, CS05/U1 & U2, CS08/U2;
- compressor station CP visibility;
- upgrade of station & unit F&G monitoring system at CSs (incl. SESD & MLESD);
- 24VDC batteries & charger replacement;
- compressor sites cladding removal;
- load bank control panel redesign and replacement program;
- refurbishment of underground oil sump tanks;
- station PLC replacement;
- upgrade of [redacted] HMI software to latest Windows version;
- compressor units online dynamic data vibration monitoring system – server based;
- [redacted] compressor package dynamic vibration data visibility annual upgrade;
- [redacted] Turbines TT4000 V5 software upgrade/licensing;
- replacement of air conditioning at compressor stations; and
- instrument air system replacement.

Undertaking a compressor station program that omits (or defers) such a significant portion of works identified in the AMP, would not address the risk level associated with compressor station assets, and would not be consistent with our Risk Management Framework or the requirements of AS 2885. Most importantly, deferring works leads to a greater risk of asset failure, as the assets will be operating in sub-standard condition for longer, increasing the likelihood they will fail. Asset failure can lead to supply interruptions as well as the higher costs of reactive works to repair/replace the assets when they fail.

In line with good industry asset management practices, an appropriate proactive capital maintenance program is essential to ensuring that ageing assets deliver to their performance standards and specifications. Short term underinvestment escalates short, medium and long term risks, and can lead to higher reactive maintenance costs in the future. Where end of life asset replacement is deferred, this can lead to price shock in future access arrangement periods as the volume of ageing assets that require replacement grows.

1.6.1.1 Achievement of objectives

This option would fail to address the end of life and hardware obsolescence asset management objectives identified in the AMP. All risks ranked high would not be addressed during the period. This is inconsistent with our Risk Management Framework. The highest public safety risks would, however, be prioritised.

This option will also make us non-compliant with regulatory requirements, including for example environmental issues in relation to soil contamination from leaking underground sump tanks.

If the program is not delivered as proposed in the recommended option, and equipment not maintained as per the AMP, it could lead to more expensive maintenance practices. For example, failure to replace leaking valves can render isolation of plant for maintenance purposes not possible. This means scheduled maintenance works cannot be delivered, leading to re-mobilisation crews and delay in planned maintenance. This in turn can affect our contractual arrangements with Shippers, which typically require 98% reliability levels.

Table 0.7 summarises how the reduced compressor stations capital works program will support the achievement of our vision objectives in AA5.

Table 0.13: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
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	N

1.6.1.2 Cost assessment

Under Option 1, the costs incurred for planned activities would be similar to those experienced in AA4 for management and maintenance of compressor station assets. The forecast would be $26 million, not taking into account the re-work or ad-hoc work required if the plant is not maintained to the AMP requirements.

Not undertaking the required reliability and performance activities in AA5 would likely lead to increased costs related to:

- increased reactive maintenance and travel to address load banks that have tripped from overheating;
- damage to compressor units from deteriorating air inlet filters which may allow debris into the units and excessive vibration that goes undetected, which can also increase the likelihood of debris getting into the unit;
- additional field costs as crews have to physically inspect cathodic protection, which is not visible on SCADA, take vibration readings which are not automatically fed back to the operations control centre;
- increased insurance premiums where fire and gas monitoring and/or suppression systems have not been introduced; and
- fuel gas wastage through deteriorating control loops.

1.6.1.3 Risk assessment

Table 0.14 shows the residual integrity and performance/reliability risk associated with compressor stations if the full capital works program is not undertaken as per the AMP.

Table 0.15: Risk assessment – Option 1

Risk category	Integrity treated risk	Performance/Reliability treated risk
DBP	High	Intermediate
People	High	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	High	Low
Supply	Intermediate	Low
Overall Rating	**Intermediate**	**Intermediate**

1.6.2 Option 2 – Move to replacement on failure policy for all compressor stations projects

With this option, the volume of replacements undertaken during the AA5 period would be directly driven by the number of failures experienced on these assets, with a reactive rather than proactive approach to asset management.

While it is not possible to predict with any accuracy the number of failures that will occur over the next five years, the fact that many assets are approaching their 15 and 30-year replacement cycles during the AA5 period, the likelihood of failure is expected to be higher than during AA4 if not treated proactively. Given the higher cost of reactive replacement compared with proactive replacement (potentially two to five times higher per asset depending on asset type and location), the potential cost of works during AA5 is significantly greater than the proposed works program if widespread asset failure arises.

Should asset failure be lower than expected, though the overall cost of a reactive compressor station may be less than forecast, the ongoing compressor station works program identified in the AMP would not be delivered in full (similar to option 1). The works program identified in the AMP is the prudent level of activity required to manage the integrity and reliability/performance risk associated with compressor station assets. Therefore all the high risks identified would not be addressed.

Neither of these outcomes are tolerable for us and our customers. An entirely reactive 'replace on failure' approach to managing compressor stations is not consistent with good asset management practice, and therefore not consistent with NGR 79(1)(a).

A replace on failure strategy is also not prudent for a critical infrastructure asset such as the DBNGP. As shown by the 2008 Varanus Island explosion, disruption to the state's gas supply can have catastrophic consequences for the energy sector (the Varanus Island incident reduced gas supply by around 30% and cost an estimated $2.4 billion to $3 billion dollars). At a more localised level, outages can cost us up to [redacted] per day in penalties[4], in addition to foregone revenue for customers and us. Therefore, as a prudent asset manager, we would not recommend moving to a pure replace on failure strategy for the DBNGP.

1.6.2.1 Achievement of objectives

This option would address only the assets that have actually failed, with a focus on returning them to being operational as quickly as possible, rather than proactively managing and planning for them. This could impact throughput and contracted supply obligations. This option would also increase frequency of remote travel to address ad-hoc failures occurring, which is considered one of the highest risk activities on the DBNGP.

Unplanned availability of compressor units may also require changes to the pipeline operation that don't represent an optimised case for the level of supply and demand resulting in extra fuel gas consumption and costs, that would not have been incurred had the units been available.

An entirely reactive approach may also result in non-compliance with regulatory requirements. For example, AS 60079 specifies electrical equipment in hazardous areas must be inspected every three years and any defects found must be rectified.

There would also be potential for non-compliance with Safe Work Australia recommendations[5] and employers duty of care[6], whereby minimum break requirements are not met when trying to get crew to reactive works promptly. To avoid this, a move to replacement on failure approach would require us to increase the size of its field work force to respond in peak times. However, this would reduce the overall utilisation of the field workforce.

Option 2 also does not align to our contractual obligations of 98% reliability for gas supply.

Table 0.16 summarises how a reactive compressor stations capital works program will support the achievement of our vision objectives in AA5.

[4] Subject to contractual arrangements with shippers/customers.
[5] Safe Work Australia, Guide for Managing the Risk of Fatigue At Work, 2013.
[6] Section 19(1), Occupational Safety and Health Act 1984 (WA).

Table 0.17: Alignment with vision – 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

1.6.2.2 Cost assessment

With this option, the unit costs incurred would almost certainly be higher. Corrective activities are likely to incur higher costs than planned alternative due to:

- additional travel costs (planned activities allow us to share travel costs across different activities at the same location);
- additional costs for expedited freight; and
- additional costs for removing crews from other planned work to address a corrective maintenance requirement and then remobilising to complete the previous planned work.

We will also incur unplanned operating expenditure, as failures could lead to interruption to supply and associated contract delivery breaches. Interruption to supply to major industrial sites could result in a refund [redacted] and does not include any cost related to damage to customers' plant due to loss of gas supply.

While it is not possible to estimate precisely how many asset failures will occur during the AA5 period, broad cost estimates can be developed based by escalating the cost of the proposed works program if delivered reactively. It is a generally accepted asset management principle that delivery of works reactively is significantly more expensive that undertaking proactive or preventative works. Various sources cite the increase in reactive costs compared with proactive can be between two and five times[7] more than undertaking the same works proactively.

For the DBNGP the cost escalation for reactive vs proactive works varies depending on the type (and scarcity) of asset being replaced, as well as the remoteness of the asset from the Perth Metropolitan area. For example, compressor stations located in remote areas of the Pilbara and Gascoyne regions require more travel time, while major components, such as turbine inlet air combustion filters have a minimum three-month lead time. In our experience, material costs can increase significantly where products are bespoke and/or have to be fast-tracked, while overtime, transport and additional resources can lead to labour costs more than tripling in a reactive/emergency scenario.

[7] Marshall Institute, Omega engineering, ARMS reliability.

Taking a conservative approach, if we assume a weighted average increase of only 1.5 times the material and labour/contractor costs if the work program were to be undertaken entirely reactively, we estimate the full AMP compressor station works program would cost approximately $53.3 million to deliver (see Table 0.18).

Table 0.18: Estimated cost of 100% reactive program ($'000)

Program category	AMP proposed works program	100% reactive program Escalation x1.5
Replacement	16,503	24,755
Proactive works	12,542	18,813
Upgrade	7,064	9,771
Total	**35,559**	**53,339**

Given the increase in works program during AA5 is driven by increases in end of life replacement and upgrades, if we were to only deliver the end of life replacement and upgrade programs reactively, with the $12.5 million proactive works being delivered as forecast, the total works program would cost approximately $47 million (see Table 0.19)

Table 0.19: Estimated cost of replacements and upgrades delivered reactively ($'000)

Program category	AMP proposed works program	EOL replacement and upgrades only delivered reactively Escalation x1.5
Replacement	16,503	24,755
Proactive works	12,542	12,542
Upgrade	7,064	9,771
Total	**35,559**	**47,068**

It is important to note that the estimated costs do not include costs associated with penalties and foregone revenue for us and customers. Penalties charged for non-supply are as high as [redacted]. The cost impact of asset failure that leads to a 4-5 day supply outage, noting the likelihood of failure under this option is higher, can be tens of millions of dollars in addition to the higher cost of reactive works. As shown by these rule-of-thumb estimates, a reactive compressor stations capital works program is likely to cost between $53.3 million and $47 million.

In any event, costs associated with a predominantly replace on failure works program would not *"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 providing services."*[8]

[8] NGR 79(1)(a)

Table 0.20: Comparison of reactive cost options ($'000)

Program category	AMP proposed works program	100% reactive program Escalation x1.5	Replacement and upgrades delivered reactively Escalation x1.5
Replacement	16,503	24,755	24,755
Proactive works	12,542	18,813	12,542
Upgrade	6,514	9,771	9,771
Total	**35,559**	**53,339**	**47,068**

1.6.2.3 Risk assessment

Table 0.21 shows the residual integrity and performance/reliability risk associated with compressor stations if the compressor stations capital works program is delivered on replace on failure approach.

Table 0.21: Risk assessment – Option 2

Risk category	Integrity treated risk	Performance/Reliability treated risk
DBP	High	Intermediate
People	High	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	High	Low
Supply	Intermediate	Low
Overall Rating	**Intermediate**	**Intermediate**

1.6.3 Option 3 – Deliver the volume and activities identified in the AMP as required, applying good asset management practice, and adopting emerging techniques/technologies where appropriate (recommended option)

With this option, the volume of activity undertaken in AA5 would be based on the criteria identified in the AMP, employing a small number of emerging techniques and technologies, consistent with good asset management practice.

1.6.3.1 Achievement of objectives

This option would address all the assets that need to be replaced, repaired or inspected in the AA5 period. It will reduce the risk associated with a potential failure and any subsequent potential impact on the quality (accuracy and timeliness) of data available to support decisions relating to the pipeline. It also looks to continuous improvement in the way assets are managed throughout their lifecycle by exploring emerging techniques and technologies.

Delivering the compressor stations works program will enable us to achieve contracted level of customer service and reliability, as well as mitigating the risk of public safety incidents. The proposed works program is fully resourced and deliverable, and will promote optimal workforce utilisation.

While the estimated cost of this program is $35.6 million, we will make every endeavour to apply new/emerging technology to help reduce costs and/or increase productivity as appropriate.

Table 0.22: 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

1.6.3.2 Cost assessment

The estimated cost of this option is $35.5 million. Refer to section 1.4 for the detailed cost breakdown.

By adopting a proactive, planned approach to the management of these assets, 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 a production loss. A continuous improvement culture is embedded, constantly looking at doing things better and more effective, taking advantages of technological advances.

1.6.3.3 Risk assessment

This option represents the lowest treated risk, as it is targeting the individual assets in line with the AMP. It is therefore consistent with our Risk Management Framework and the only option that can achieve a 98% reliability contractual obligation at the lowest sustainable cost.

Refer to section 1.5 for more detail.

Table 0.23 : Risk Assessment – Option 3

Risk category	Integrity treated risk	Reliability/Performance treated risk
DBP	Intermediate	Low
People	High	Negligible
Environment	Negligible	Negligible
Reputation/Outrage	Low	Negligible
Asset Damage	Intermediate	Negligible
Supply	Low	Negligible
Overall Rating	**Intermediate**	**Low**

1.7 Summary of cost/benefit analysis

Table 0.1322 presents a summary of how each option compares in terms of achieving our objectives, the estimated cost, and the residual risk rating.

Table 0.24: Summary of cost/benefit analysis

Option	Achievement of objectives	Estimated cost	Treated residual risk rating (integrity/reliability)
Option 1	This would fail to achieve safety and reliability objectives or meet industry standards	$26m	High / Intermediate
Option 2	This would fail to achieve safety and reliability objectives or meet industry standards	$47 to 53.3m	High / Intermediate
Option 3	This option sufficiently reduces risk in the short-term, but is not the lowest cost, and does not support continuous improvement in the way we manage assets over their lifecycle	$35.6m	Intermediate / Low

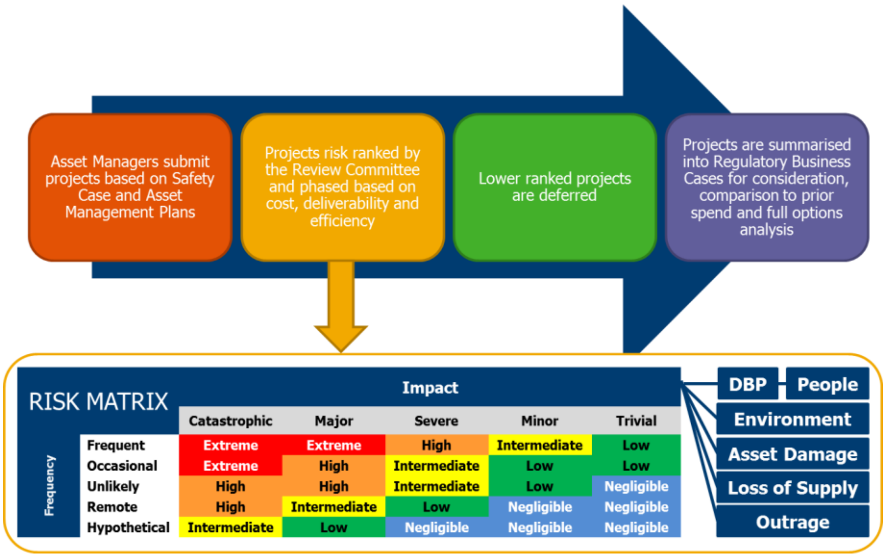
1.8 Proposed solution

1.8.1 Why is the recommended option prudent?

Option 3 is the recommended option due to its alignment with our Risk Management Framework, asset management principles and the primary manufacturer's specification. It supports our vision and values and delivers for its customers on public safety, reliability of performance and customer service.

Figure 0.4 summarises how we develop our capital expenditure plans, and highlights that risks identified as intermediate or higher are prioritised, with lower risks removed or deferred from the capital program. Option 3 is consistent with this approach as it focuses on treating all intermediate or higher risks as soon as is reasonably practicable (by the end of the AA5 period). Option 1 or 2 would not address the identified risks within the AA5 period and would increase the overall risk associated with the DBNGP as projects get pushed into AA6, leading to an even larger capital works program in the future.

Figure 0.5: Our capex plan development process



Failure to proactively plan for the management and maintenance of the compressor station assets could result in catastrophic failure of an asset which would result in loss of throughput, excessive operating expenditure and impact on reliability and the ability to meet contractual obligations.

1.8.1.1 Consistency with the National Gas Rules

Option 3 is the proposed solution and recommends that we proceed with the management and maintenance of compressor station assets in line with the relevant AMP guidelines.

NGR 79(1)

Option 3 is consistent with Rule 79(1)(a), which requires that capital 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 providing services.

We consider that the capital expenditure is:

- **Prudent** – the project is based on replacement of existing assets are arriving at the end of their useful lives. Assets are scheduled to be replaced ahead of failure, minimising disruption to customers, mitigating pipeline integrity risk, and allowing for efficient resource scheduling. The proposed expenditure is there consistent with such that would be incurred by a prudent service provider.

- **Efficient** – forecast expenditure is based on the actual unit cost incurred in the delivery of similar work undertaken in AA4. The design and operational delivery of the program is forecast for completion by internal staff and external resources. External resources are engaged as a result of formal contracts in place following the tender process, as per our Procurement Policy. These services are reviewed annually by our Contracts and Procurement functions, and new rates negotiated accordingly.

- Original Equipment Manufacturer (OEM) costs, while less controllable than labour costs, are also reviewed annually to test that the costs of spare parts and materials is consistent with market conditions. The review is undertaken by Contracts and Procurement. 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 compressor stations works program follows good industry practice of aligning replacement activity with commitments embedded within the AMP and manufacturer's recommendations. Our commitment to continuous improvement and adopting new technologies/process where practicable is also consistent with ISO 55001, the prevailing industry asset management standard. Therefore the proposed capital 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 proposed option achieves the lowest sustainable cost delivery of services by undertaking works that reduce risks to as low as reasonably practicable while maintaining reliability of supply. This mitigates the costs of reactive works and penalties resulting from asset failure. We are undertaking works in a proactive, planned and scheduled manner, with the volume of activity based on useful life and in line with manufacturer's guidance and associated support. It also considers continuous improvement in the way we manages assets throughout their lifecycle by introducing new and emerging techniques and technologies, which may reduce costs over the medium-to-long term.

NGR 79(2)(c)(ii)

The proposed compressor station capital works program is necessary to maintain integrity of pipeline services. Replacing, repairing and/or managing these assets satisfies the grounds under Section 79(2)(c) of the National Gas Rules (NGR), which states capex is justifiable if:

(c) the capital expenditure is necessary:

> (i) to maintain and improve the safety of services; or
>
> (ii) to maintain the integrity of services; or
>
> (iii) to comply with a regulatory obligation or requirement; …

There is a clear need to maintain the integrity of services, which would otherwise be compromised should these assets not be replaced, repaired or managed in line with the AMP and/or at the end of their useful life.

NGR 74

NGR 74(2) requires that a forecast of estimate:

a) must be arrived at on a reasonable basis; and
b) must represent the best forecast or estimate possible in the circumstances.

The forecast costs in this business case are based on the latest market rate testing, and project options consider the asset management requirements as per the latest AMP. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

1.8.2 Estimating efficient costs

As noted in the 'Final Plan Attachment 8.7 - Cost Estimation Methodology 2021-25', the unit rates used for all projects managed within this program of include the internal labour, external labour and materials/other costs forecast.

Where possible, the unit rate used to determine the cost of the program in AA5 is based on a three year average actual cost incurred in AA4.

Where this has not been possible, due to infrequent or new activities identified for AA5, the 2, these activities have been estimated based on the historical cost of the same or similar program of work. These programs include replacing assets at the end of their useful life or what is referred to as 'one off' activities, which are expected to be required in the AA5 period but have not been required in the past and are not expected to be required in to the future (for example, Compressor Sites Cladding Removal project). These cost of these activities would usually be determined through a competitive tender process.

Where a competitive tender has not yet occurred, the associated cost is estimated in two ways:

1. where the work is sufficiently comparable to other work – the most recent historical average unit rate or actual cost and matched to similar locations where the program is delivered externally; and
2. where the work is unique or greater than $5 million – an estimate is developed based on internal estimates from different engineering disciplines or from external engineering specialists.

Specialist engineering disciplines, procurement and construction management activities are provided utilising internal resources, supplemented by external specialist input as required. This is the model that has been successfully deployed and implemented on the DBNGP under the existing AA4 and previous arrangements.

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

- Cost based on historical expenditure noting that these works are not new
- Estimates derived from contractual rates of vendors to be utilised
- Resource cost based on other similar projects ongoing at present or in previous AA periods
- OEM contractual rates for spares and labour that are part of our services agreements

Table 0.25 presents a breakdown of the compressor stations capital works program by cost category. Table 0.26 shows the escalation applied to the costs to December 2020 dollars, including real labour cost escalation of 0.69% per annum.

Table 0.25: Compressor stations capital works program cost estimate, by cost category

($'000)	2021	2022	2023	2024	2025	Total
Internal labour	2,157	885	785	2,796	3,272	9,896
Contractors/ consultants	3,609	1,945	2,405	2,312	2,326	12,598
Materials & services	3,439	2,142	2,292	1,822	2,288	11,983
Travel & others	264	153	257	259	149	1,082
Total	**9,469**	**5,125**	**5,740**	**7,190**	**8,035**	**35,559**

Table 0.26: Escalated compressor station cost estimate ($'000 real 2020)

	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	9,469	5,125	5,740	7,190	8,035	35,559
Escalation	242	145	178	242	293	1,099
Total escalated ($ Dec 20)	**9,710**	**5,270**	**5,918**	**7,432**	**8,328**	**36,658**

Appendix A – Risk assessment

Figure 0.6: Summary of Compressor Stations risk assessment

	DBP				People				Environmental				Outrage				Asset Damage				Loss of Supply				
Integrity	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	Unlikely	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	426
Maintain AA4 volume of activity and expenditure	Major	Unlikely	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Unlikely	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	426
Move to a replacement on failure policy for all Compressor Stations projects	Major	Unlikely	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Unlikely	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	426
Do the volume and activities that AMP has identified as required exploring a small number of emerging techniques/technologies	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

	DBP				People				Environmental				Outrage				Asset Damage				Loss of Supply				
Reliability/Performance	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	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	42
Maintain AA4 volume of activity and expenditure	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	42
Move to a replacement on failure policy for all Compressor Stations projects	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	42
Do the volume and activities that AMP has identified as required exploring a small number of emerging techniques/technologies	Severe	Remote	LOW	5	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	10

Appendix B – Overview of compressor station program activities

B.1. End of life replacement – an overview

The end of life replacement activities for AA5 are made up of a number of projects described below.

B.1.1. ECI equipment

ECI equipment at compressor stations has a life expectancy of between 10 and 20 years. We undertake preventative maintenance activities such as condition based overhauls and proactive works (such as seal replacements) as required throughout the assets' lives, with asset replacement done at the end of life.

ECI end of life replacement projects required during the AA5 period are summarised in the following sections.

B.1.1.1. CS unit F&G control and monitoring system replacements

A key driver of the increase end of life replacement program in AA5 is the need to replace fire and gas (F&G) monitoring systems at several compressor station units (listed below). The F&G systems are made up of controllers and detectors used for the purpose of detecting fire and gas at specific locations. The system comprises local alarm equipment (bells, sirens) as well as alarms on HMI and SCADA.

The F&G system is installed within compressor station buildings such as the turbine buildings, controls rooms, workshop, switch room, battery room and accommodation. The replacement cycle for these systems is based on end of life.

The F&G systems have a useful life of 15 years (as per manufacturers specifications). For turbine compressor packages, the F&G system is part of the unit control systems installed as part of the stage 4 and 5 DBNGP expansion (in 2004 and 2007). For the rest of the sites the F&G is a standalone system.

During the AA5 period, the F&G systems at compressor station units that were installed as part of the stage 4 DBNGP expansion will reach their end of life and are scheduled to be replaced. Some F&G systems installed during the ACS project (1987) and stage 2 expansion (1997) are also due for their replacement cycle.

F&G control and monitoring systems must therefore be replaced at the following compressor station units:

- CS1/1 (ACS)
- CS3/1 (ACS)
- CS5/1 (ACS)
- CS5/2 (ACS)
- CS8/1 (ACS)
- CS8/2 (ACS)

- CS6/2 (Stage 2)
- CS9/1 (Stage 2)
- CS1/2 (Stage 4)
- CS2/3 (Stage 4)
- CS3/3 (Stage 4)
- CS4/3 (Stage 4)
- CS6/3 (Stage 4)
- CS7/3 (Stage 4)
- CS9/2 (Stage 4)
- CS10/3 (Stage 4)

Replacement of these F&G systems includes the engineering design, installation scoping and commissioning inclusive of revision to operating procedures, maintenance instructions, spares and updating of the Maintenance Management System. There are three different types of Fire and Gas control systems on the pipeline; (i) [redacted] (ii) [redacted] 1000 and (iii) [redacted] The Micro 1000 will all have been replaced in AA4.

The new F&G system that will replace the old system will consist of:

- new detection devices as per the design philosophy (smoke, gas and fire detectors;
- new cabling or replacement of cables as required;
- new F&G PLC to perform the executive action upon detecting presence of smoke, fire or gas;
- F&G software to perform the executive action based on designed inputs with pre-determined rule base; and
- power supply and associated UPS.

B.1.1.2. Station PLC replacement

Each compressor station control system comprises PLC and HMI in the control room. The PLC is used for continuously monitoring of

- the power system loading and spinning reserve to determine if on-line generation is sufficient for the safe start-up and operation of a second compressor unit;
- the availability of the standby GEA; and
- if required, the PLC will initiate the starting of the standby GEA and automatic synchronising and load sharing with the GEAs that are on line and in duty mode of operation.

The PLC replacement program is based on a predicted useful life of 15 years. It is estimated to have one Station PLC per year will be replaced across AA5, based on the projected useful life for the individual assets.

B.1.1.3. Battery and charger replacement

For both the 24V and 110V UPS systems, there is an eight-year replacement cycle for batteries and a 15-year replacement cycle for chargers.

For the 24V program, the Dampier facilities and CS10 batteries and chargers and the CS7 charger will be replaced during the AA5 period. For the 110V program, the CS3, CS5, CS6, CS7, CS8 and CS9 batteries will be replaced. Chargers for CS6 and CS9 are forecast for replacement in AA6.

B.1.2. Rotating equipment

Rotating equipment at compressor stations has a life expectancy of between 17 and 35 years. We undertakes preventative maintenance activities such as condition based overhauls and repair works (such as seal replacements) as required throughout the assets' lives, with asset replacement done at the end of life.

Rotating equipment end of life replacement projects required during the AA5 period are summarised in the following sections.

B.1.2.1. Dry seal replacement

The dry gas seals and buffer air seals are part of the gas compressor package designed to separate process gas from leaking to atmosphere. Dry gas seal is a non-contacting mechanical seal that works on the principles of aerodynamic forces to create and maintain a precisely defined gap during operation. All current operational units have dry gas seals installed. A dry gas seal failure is very difficult to predict and replacement is done on failure. The volume of activity for AA5 is based on recent actual volumes and assumes the replacement of four seals every three years, averaging 1.3 seals per year.

The buffer seal is ordinarily replaced at the same time as the dry gas seal, to minimise disruption and maximise efficiency of effort. The forecast expenditure for AA5 reflects the assumption that for each dry gas seal that is replaced, the buffer seal will also be replaced at the same time.

B.1.2.2. Turbine combustion air inlet filter system replacement

The turbine combustion air inlet filter system has a useful life of approximately 30 years. Its replacement forecast is guided by age, but the asset is replaced on condition. The materials used on Stage 3A units – CS2/2, CS4/2 and CS7/2 were substandard and structures including the air inlet duct have begun to corrode. These units have been in service since 2000. Two units (CS2/2 and CS7/2) have been replaced and a third air inlet is planned to be installed at CS4/2 in AA5.

The air inlet system is critical to the operation of the turbine, any debris introduced via the air inlet system into the turbine can cause catastrophic failures of the turbine blades.

The air inlet system at CS4/2 is carbon steel and its condition has been closely monitored and corrosion deterioration is now evident after over 19 years of service. It is proposed to install the previously purchased stainless steel air inlet to CS4/2.

The integrity of air intake ducting determines the inlet air quality of the turbine. Any contamination from corroding internals can catastrophically destroy the air compressor and turbine blades.

DPB forecasts the CS4/2 air inlet duct will continue to deteriorate like the previous two units that had already been replaced during the AA3 period, and this will fall into AA5.

This is the only combustion air inlet filter system replacement proposed for AA5. Its replacement will include the new structure to hold the new air inlet, civil works, mechanical welding and instrumentation and control equipment.

B.1.3. Mechanical equipment

Mechanical equipment at compressor stations has a life expectancy of between 10 and 20 years. We undertakes preventative maintenance activities such as condition based overhauls, inspections, leak rate measurement and repair works as required throughout the assets' lives, with asset replacement done at the end of life.

Isolation ball valves are monitored and serviced using valve flush, clean and seal and the leak rate monitoring techniques. Recycle valves are removed, stripped, inspected and overhauled on set frequencies.

The recycle valves protect the compressor against surge, which without proper controls, has the potential to damage the compressor catastrophically.

Mechanical equipment end of life replacement projects required during the AA5 period are summarised in the following sections.

B.1.3.1. Unit isolation valve replacement

Unit isolation valves are generally ball valves used to isolate the compressor units (suction and discharge). When these valves are closed, the unit is isolated from the gas source and it can then be depressurised, so work can be conducted on this asset without the risk of exposure to high pressure gas. The process is also utilised in the event that the unit needs to be isolated and vented in the event that the Fire and Gas detection system senses presences of fire and gas in the enclosure. Their performance is critical to the emergency shut down on the unit as well as firm isolation when maintenance is being conducted on the units.

There are 40 unit isolation valves on the pipeline. There are two core components within unit isolation valves – the valve itself and the actuator. These valves are installed as a single entity and align with the expansion of the pipeline. They have a useful life of up to 30 years and are replaced when an excessive leak rate is identified.

The forecast replacement for unit isolation valves in AA5 assumes the replacement of one per year based on past experience to date. Our Pipeline Efficiency Team monitors the gas vented from all compressor stations when units are off line, and data is assessed to justify replacement when cost of vented gas aligns with cost to replace the valves that are leaking.

B.1.3.2. Station isolation valve replacement

Station isolation valves are generally ball valves and are an integral part of emergency shut down philosophy of the compressor station. Their core function is to isolate the whole compressor station from the main line whilst allowing gas to flow via the station bypass pipework.

There are 20 station isolation valves on the pipeline – two per compressor station located at the station inlet and station discharge. There are two core components within station isolation valves – the valve itself and the actuator. The station isolation valves were installed as a single entity and aligned with the expansion of the pipeline. They have a recognised useful life of 25 years, though many of them have been in service for longer periods.

The forecast replacement for station isolation valves in AA5 assumes the replacement of one station (two valves) every two years.

B.1.3.3. Recycle valve replacement

The core functions of recycle valves is to manage and control surge of the compressor through the recycling of gas from the discharge of the compressor to the suction of the compressor. This is critical to protect the compressor from a surge event during start-up and shut down, by re-directing high pressure gas from discharge to the suction, ensuring no reverse flow in the compressor which can cause catastrophic failure.

There are 55 recycle valves installed across the 10 compressor stations. The AA5 activities assume the following based on experience to date:

- 12 recycle valves will be are removed, stripped, inspected and overhauled; and
- 2 recycle valves will be replaced/overhauled.

These volumes are based on current use factor of compressors and the utilisation to deliver for customers.

B.1.3.4. Compressor station piping cladding removal

Insulation cladding was installed on above ground compressor station pipework originally to insulate hot gas discharged from compressors from employees. Cladding has been in service as summarised below at various stages of expansion.

- ACS project (1987) – 32 years
- Stage 2 (1997) – 22 years
- Stage 3A (2000) – 19 years
- Stage 4 (2004) – 15 years
- Stage 5A (2007) – 12 years
- Stage 5B (2010) - 9 years

The main purpose of insulation cladding is to eliminate accidental contact and hence injuries between employees and hot surfaces created at the discharge of compressor units. Units most vulnerable to long term integrity issues are ACS, Stage 3A and 4 and these are recommended to be targeted for controlled removal.

The insulation over time will allow moisture to leak into the insulated cavity and form corrosion with rates that are accelerated due to hot surfaces – the rate can be aggressive and by design – is difficult to inspect as it requires the full removal of the cladding and then its re-installation, which undermines the integrity of the isolation of the insulation cladding from atmosphere. This is a universal challenge faced by operators where insulated cladded materials hide the pipework from visual inspection.

The proposal is to remove all pipework cladding to expose the pipework to more regular inspection and remove the hazard and risk of corrosion occurring that cannot be seen until it is too late. In place of the cladding, DPB proposes to paint the exposed pipework with standard paint specification and install barricading fences with signs warning 'Hot Surfaces' to segregate the personnel from the hazard.

Like corrosion underneath tape wrap system at the interfaces of above and below ground pipework – this system is considered high risk to integrity management, particularly as the pipeline ages.

B.1.3.5. Replacement of air conditioning

Air conditioning units are required in multiple buildings at compressor stations. For example:

- Accommodation areas;
- Workshops;
- Warehouses;
- store rooms;
- control rooms;
- turbine buildings;
- electrical switch room; and
- equipment rooms.

These systems provide a stable temperature environment for equipment to operate reliably within their defined operating temperatures, as well as ensuring buildings where staff reside and work are at a suitable temperature. Air conditioning systems are designed to maintain air temperatures stable at 25 degrees Celsius, depending on its application.

This program targets the replacement of air conditioning units at compressor stations which are approaching end of life. Their useful life is between five and ten years. Replacement of these units is an ongoing program. The costs incurred are inclusive of design, installation with removal of old units, reconfiguration, patching and remedial works and the updating of spares, maintenance procedures and maintenance management requirements.

B.1.3.6. Replacement of corroded exhaust flange

Exhaust flange is an interface piece that connects the turbine exhaust to the unit combustion chamber. They normally have a useful life of 20 to 30 years, depending on the type of units and turbine package. ACS and Stage 3A units are installed in a building, whereas Stage 4 and 5 units are modular units designed to be used in offshore installations. CS10 units are smaller versions of Stage 4 and 5 modular units and have exposed exhaust flanges that are subject to environmental exposures. CS10 is located in the Kwinana industrial area and exposed to coastal weather.

The exhaust flange at CS10 has been identified as suffering heavy corrosion and requires replacement. CS10- is a critical site as it serves to ensure entry pressures to the south west are at design pressures to deliver demands of our customers.

B.1.3.7. Instrument air system replacement

Each compressor station has two compressed air systems with dryers and storage pressure vessels operating in duty and standby mode. Compressed air is used primarily for the control systems of the compressor and gas turbines at all compressor stations.

The replacement programs for compressed air systems planned in AA5 will continue following those that were completed in AA4.

B.2. Proactive works – an overview

Proactive works are the preventative maintenance activities undertaken on compressor station assets on a cyclical and ongoing basis. The proactive works program for AA5 is made up of a number of projects, which are described below.

B.2.1. Corrosion protection

Below ground pipework at compressor stations has a life expectancy of over 50 years and are similar to pipelines. However, this life expectancy is dependent on the coating systems used, the process conditions and duty of the compressors, environmental conditions and location of the stations, the cathodic protection system and the overall adopted design of earthing systems compatibility with the cathodic protection system. The interrelationship between these factors affect the performance of the station pipework in particular the coating systems used.

Corrosion protection proactive works required during the AA5 period are summarised in the following sections.

B.2.1.1. Refurbishment of below ground pipework

Coating used on compressor station pipework has a life of about ten years. A coating refurbishment program has been in place since the DBNGP was commissioned to monitor the in service condition and replace before the coating failure leads to pipework corrosion. Coating systems do not last for ever and will fail in service. Our experience is that coating applied on compressor station buried below ground pipework will require replacement every ten years. The condition of below ground pipework is reviewed annually to assess performance and rate of deterioration. Issues that are monitored include the following:

- type of coating used;
- stations with single units and series operation capability (series operation has potential to deliver gas temperatures of up to 100 deg C into the station pipework before the Aftercoolers);
- historical performance of series operation and periods of exposure to high exit temperatures from the second unit; and
- cathodic protection current demand and potential of the station pipework

The coating refurbishment program consists of the following:

- the PMO process of risk assessment to determine the levels of controls required to be at ALARP before full mobilisation;

- the development of work packs and tools to ensure stabilisation of the pipework once excavated and the avoidance of long free spans causing additional stresses;
- the selection and testing of the new coating systems to be used;
- the selection of experienced personnel that can conduct excavation and coating repair works; and
- the coating repair systems to be adopted, curing time and selection of backfill material.

Set out below are photos of station pipework being exposed and coating repaired in 2019.

Unit discharge pipework exposed to access areas with high gas temperatures

Unit discharge pipework failed coating system

B.2.1.2. Painting of aboveground compressor station pipework

Above ground compressor station pipework is also exposed to corrosion. Paint used on above ground pipework at compressor stations is a function of stage of expansion and their adopted paint system. The compressor stations pipework have been expanded and added to the DBNGP in the following sequences of stages of development:

- The original compressor stations (1984) – CS2/1, 3/1, 4/1, 6/1, 7/1 – **35 years**
- ACS project (1987) – CS1/1,CS3/2, CS5/1, CS5/2, CS8/1, CS8/2 – **32 years**
- Stage 2 (1997) – CS6/2, CS9/1 – **22 years**
- Stage 3A (2000) CS2/2, CS4/2, CS7/2 – **19 years**
- Stage 4 (2004) – **15 years**
- Stage 5A (2007) – **12 years**
- Stage 5B (2010) - **9 years**

In assessing compressor stations in most need for painting, the following criteria was used:

- Motivation 1 – climatic conditions; and
- Motivation 2 – observed conditions from inspections.

Under climatic conditions with close proximity to the coast, high rainfall area – CS1, 2, 8, 9 and 10 fall within this category. CS3, 4, 5, 6 and 7 are stations located in remote areas away from the coast and relatively dry conditions.

It is planned to have 2 compressor stations painted in AA5 (CS8 and 9) with the 3 potentially in AA6 (to be confirmed at that time)

The following table is included for completeness to identify all above ground facilities that would require painting in AA5 and AA6 continuing on the program from AA4.

Priority	Motivation 1 – climatic conditions	Motivation 2 – observed condition	Compressor station
1	Close proximity to coast, high rainfall area and in and industrial area with lot of pollutants causing corrosion	Historical general inspection findings confirm severe coating degradation	3
2	Intermediate proximity to coast, medium rainfall area and in and not in an industrial area with lot of pollutants causing corrosion	Historical general inspection findings confirm intermediate coating degradation	2
3	Not close to the coast, low rainfall areas and not close to any industrial areas. Hot not humid areas	Historical general inspection findings confirm relative low coating degradation	5

Based on addressing the highest priorities first, and other activities across the capital program, there are 28 facilities planned to be painted in AA5. This compares to 17 in AA4, and a further 37 in AA6 as summarised in the tables below.

Facility type	2021	2022	2023	2024	2025
Compressor stations	-	-	1	1	-
Meter stations	5	5	5	5	4
MLVs	-	-	-	-	2
Total cost ($'000)	**500**	**500**	**1,000**	**1,000**	**500**

Facility type	AA4	AA5	AA6
Compressor stations	1	2	-
Meter stations	15	24	13
MLVs	1	2	24
Total cost ($'000)	**2,122**	**3,500**	**2,500**

B.2.2. ECI equipment

ECI equipment proactive works required during the AA5 period are summarised in the following sections.

B.2.2.1. Hazardous area inspection and rectification

The inspection of hazardous areas is done in line with the requirements of AS60079, which states that there needs to be four-yearly inspections of hazardous area (and equipment) and repairs of identified non-conformances implemented based on degree of risk. This activity is monitored as part of the DBNGP's process safety dashboard.

The DBNGP is divided into 4 sections:

(i) CS01 - CS05
(ii) CS06 -CS10
(iii) MLV and Meter stations located north of CS09
(iv) MLV and Meter stations located south of CS09

The costs for inspection and rectification can vary dependent on the extent of damage found, location and addition/mothballing of assets.

The AA5 program of work described in the table below is for Compressor Stations with their inspections and rectification estimates.

Focus area	2021	2022	2023	2024	2025
Inspection	CS6 to 10			CS1 to 5	CS6 to 10
Rectification	CS1 to 5	CS6 to 10			CS1 to 5

B.2.2.2. Electrical protection integrity testing

This is the protection setting testing of 415VAC air circuit breakers and moulded case circuit breakers, including inspection of the motor control centres.

This program is to verify the protection settings on switch gear installed as part of basis of design. This program was developed out of findings at CS1, which was done as a trial in AA4.

Most of the switch gear was installed as part of initial DBNGP design basis. The protection settings on this switch gear requires verification and validation to ensure stability since installation. The testing of these protection devices require specialised equipment and expertise. Based on findings at CS1 and the confirmation of stability of design and specification of original installation with no major issues found, verification of two stations per year is deemed adequate on an ongoing basis. The cost for one station is estimated at $55k.

B.2.2.3. Measurement of earthing grid resistance

Earthing grids in compressor stations have shown degrees of deterioration. This was evident during compressor stations dig up program and other programs involving excavating the pipe works in compressor stations.

As part of the earth grid testing and replacement program, a trial was conducted in AA4 at CS7 to test the method for assessing the resistance to remote earth and to assess condition of earthing before replacement is implemented.

Examples of earthing wire found during dig up activities

The photo show the condition of earthing excavated at CS7 with the bottom showing the galvanised wire strands with all galvanising depleted from onset of corrosion and the top two strands showing heavy corrosion with deposits.

Whilst the exposed strands show different stages of corrosion – the ultimate test to determine if earthing requires replacement is to test for the total buried earthing system's resistance to remote earth as they are connected to above ground features.

Summary - test results (resistances) at selected locations conducted at CS7

Location	Resistance ohms, Ω
Pig receiver and launcher	4.46
Launcher polarisation cell	67.73
Scrubber pipework and valves	0.91
LM500 pipework and valves	0.93
Vent stack and valve manifold	1.24
After cooler structure	1.64
Unit 2 pipework and valves	4.41
Unit 2 wash down north west corner	8.77
Unit 2 Gas Filter Skid	8.83
Unit 2 PDSL2301B	7.77
Unit 3 pipework and valves	3.29
Unit 3 HV3236	8.97
GEA pipework structure	3.65
GEA #3 north west corner	11.49
GEA #4 north west corner	14.21
Control room external earthing	1.43

CS7 was chosen for a series of testing to measure the grids resistance to remote earth. CS7 was deemed to be representative of all the compressor stations being one of the original compressor stations commissioned in 1984.

Findings from this exercise will be used for inspection at other sites. They will also be used to develop a more effective replacement program of earthing at compressor stations, taking into account the requirements of lightening protection as well as ground potential rises from local earth faults with site generated power.

The replacement of a complete earthing system at a compressor station like for like is not a cost effective approach due to the intrusive nature of exposing the complete site earth matrix and replace with new. A repair / replacement strategy would most probably be the installation of deep well anodes, strategically spaced on the site, based on the earth resistance test results conducted.

In AA5, it is envisaged to conduct these inspections and tests at all other sites. If results indicate repairs are required, it will be actioned on an 'as needs' basis.

Due to the results of earth tests conducted and the positive results obtained, a dedicated replacement program will only commence when multiple location resistances to remote earth are above 10 ohms the standard set for resistances of earthing for above ground gas facilities.

B.2.3. Mechanical equipment

Mechanical equipment proactive works required during the AA5 period are summarised in the following sections.

B.2.3.1. Refurbishment of underground oil sump tanks

All compressor stations sumps for waste water laden with oil are designed to have above ground waste oil storage either double skinned or in sumps. This allows for ease of oil removal and for elimination of ground contamination from deteriorating below ground sump tanks.

These above ground tanks are serviced from a multitude of below ground tanks, which waste gravity flows into and are either then pumped to the above ground tanks or directly into waste oil trucks.

An audit was conducted in 2017 on all below ground tanks installed on the DBNGP. There a total of 57 tanks of which 40 (4 per station) are located inside compressor stations.

The audit included taking soil samples from the surrounds of the tanks for analysis. Five tanks were found to have soil samples with contamination readings above threshold levels. These tanks are located at CS4, CS7, CS8 and CS9. (CS4 and CS7 were installed with the original DBNGP in 1984, CS8 in 1987 and CS9 in 1997)

The tanks at CS4 and CS7 are related to the original LM500 compressor buildings, and have been abandoned from further use, with CS8 and CS9 tanks earmarked for replacement in AA5. The plan therefore is to assess the best available materials for underground tanks with the view to replace one in AA5 and the other in AA6.

B.2.3.2. Relocate unit piping to above ground at CS3

The discharge piping between unit 1 and unit 2 at CS3 was installed below ground to provide easy access to the site. During the coating refurbishment program conducted at CS3 during the AA3/4 periods, this section of pipe was found to be badly corroded. Root cause analysis confirmed it was due to complex interference process occurring between the cathodic protection system of the pipeline and the current drawn by the earthing system that was also under cathodic protection.

Based on our defect assessment procedure, the pipe was deemed to be safe and was left in operation, but a clock spring repair kit was installed as a precaution. It is recommended that the unit piping between the two units is relocated above ground consistent with the Stage 4 and 5 sites, where above ground pipework is maximised to avoid complications between underground challenges with corrosion and earthing compatibility. This is a short section of pipe of about 30 metres, and would reduce the need to excavate and repair in the future.

B.3. Upgrades – an overview

Compressor station upgrades relate to capital expenditure necessary to upgrade equipment or software that is or will shortly become obsolete, unsupported, or no longer fit for purpose. This includes upgrade of corrosion protection, ECI, rotating equipment, and mechanical equipment.

B.3.1. Corrosion protection equipment

Corrosion protection upgrades required during the AA5 period are summarised in the following sections.

B.3.1.1. Compressor station cathodic protection (CP) visibility

The compressor station SCADA CP visibility program of work in AA5, will provide visibility of the CP performance on the pipework within the compressor station. Station pipework is exposed to most severe conditions of operations with fluctuating pressures, temperatures driven by the compressors and the ground conditions under which the pipes are buried. CP is the primary form of protection, together with coating systems monitoring. This project proposes to install devices that can monitor the level of CP being injected and achieved at selected sections of the station pipework. This will enable remote adjustments to be made on a continuous basis.

The scope of work is to replace existing equipment with TRUs that have signal cards, which can send actual voltage and current via the SCADA system to the master station in Perth. Online visibility, alarms and reports can be generated to further enhance and improve the integrity monitoring devices of systems.

Currently, CP performance only be verified through site inspection, making prompt rectification very difficult.

The asset focus for this program includes:

- hot buried pipework between the compressor discharges and after-coolers;
- station bypass pipework;
- downstream mainline; and
- downstream loop line.

The DBNGP CP system is visible at all MLV and meter station injection points, and this project brings compressor stations into line with all our existing CP injection systems.

This investment would provide the following benefits:

- enable the cathodic protection monitoring of station pipework in line with monitoring of the mainline and loop lines at MLVs and meter stations;
- reduces the need for field staff to take ad hoc readings that are prone to human errors;
- provide a more robust integrity monitoring system overall for compressor station pipework; and
- eliminate the need to conduct annual site surveys of the station piping.

CP resources savings though incremental allows field resources to be utilised in other areas of operations.

B.3.1.2. As-build of CP network at compressor stations

During AA5, we intend to undertake a comprehensive as-build survey of the whole CP network and components of all compressor stations. This is being done to ensure the system – from test points to terminals, cable routes and terminations are updated and documented. This level of detail is essential to verify proper operation of the system and enable fault finding.

The as-build exercise will require site visits to all locations, designing and installing a new CP system where required and is linking the existing CP system to SCADA where required. The entire program will be completed in AA5, across 2024 and 2025 as the resource capacity is available.

B.3.2. ECI equipment

ECI equipment upgrades required during the AA5 period are summarised in the following sections.

B.3.2.1. Installation of fire suppression system

Fire suppression systems are an important component in the safe and reliable operation of the DBNGP. The fire suppressant adopted in the DBNGP are summarised as follows:

- Original DBNGP (LM500 at CS2, 3, 4, 6 and 7) – Halon system (was decommissioned following government ban on the use if Halon). Halon replacement on original sites on the DBNGP was not implemented as no alternative was found suitable. The LM500 are no longer in use and the units are decommissioned.
- ACS Project (CS1/1, 3/1, 5/1 and 5/2 and 8/1 and 8/2) – CO2 suppressant system was installed and remain in service
- Stage 2 (CS6/2 and CS9/1) – no suppressant system was installed
- Stage 3A (CS2/2, 4/2 and 7/2) – no system was installed originally but CS7/2 has been retrofitted with Stage 4 design in AA4
- Stage 4 and 5 – suppressant system was installed

In consultation with our insurance assessors and compressor package vendors, and lessons learnt from the fire incident at CS10, our Fire and Gas Policy has been refined so that all new units must now include suppressant system. The revised policy is consistent with the requirements of ISO 21789:2009, which specifies a risk-based approach in respect of fire precautions in enclosures:

ISO 21789:2009

5.13.3 Enclosure fire precautions

5.13.3.1 General

The risk of fire shall be assessed in all enclosures and, where necessary, fire precautions shall be implemented in accordance with 5.15.

5.13.3.2 Gas turbine enclosure

An integrated fire protection system, including fire detection and suppression equipment, together with the necessary controls and instrumentation shall be provided in the gas turbine enclosure in accordance with 5.15. The system shall be able to detect fire automatically, directly or indirectly, and extinguish it reliably.

The vendor [redacted] specification also says all of their packages MUST include fire and gas control (including fitment of suppressant system):

Solar specification

12.2.9 Fire and Gas Detection System

Enclosed packages must include a fire and gas control system. The fire and gas system shown in Figure 21 provides gas monitoring, fire detection, and extinguishing agent release using an advanced distributed architecture to monitor gas, heat, and optical flame detectors. The system communicates with the *Turbotronic* 4 control system to initiate a shutdown if a fire or a high gas level is detected. On the package exterior, indicator lights, strobe lights, and an alarm horn provide system status. A keyswitch is provided to inhibit the system and a push button switch is provided to manually release the fire-extinguishing agent.

The ISO and vendor standard has been adopted on all Stage 4 and 5 compressor packages. To bring all of the DBNGP's outstanding compressor units to align with the new policy, the following units will be retrofitted with suppressant systems in AA5:

- CS6/2 and CS9/1 are [redacted] units installed in large compressor buildings. The proposal as these units are similar to the units built during the ACS expansion stage to adopt the CO2 design fire suppressant system; and
- CS2/2 and CS4/2 are Stage 3A [redacted] packages similar in design to the Stage 4 and 5 Solar packages and as already been adopted at CS7/2, to adopt the same design of water mist suppressant system.

The current F&G design for these units is that the moment a fire is detected in the building, the units are automatically shut down and all gas within the building is vented to atmosphere. However, the challenge remains that these units still have hydraulic oil circulating within the building that are source of fuel (CS10 incident was hydraulic oil catching fire and was not gas related). The follow table shows the proposed F&G upgrade schedule.

	2021	2022	2023	2024	2025
Station	CS 2/2	CS 4/2	CS 6/2	CS 9/1	

B.3.2.2. [redacted] Turbines TT4000 V5 software upgrade/licensing

The [redacted] Turbines TT4000 v5 software upgrade project is required by design to upgrade the current control systems software operating on Windows XP version to Version 5. In addition to the upgrade of the control systems software, there will be the associated new set up of user licences inclusive of the spare HMI, to align with new user requirements to enable the new upgrades to be commissioned and operated with access and interfaces from maintenance lap tops.

The turbine/compressor package is controlled via [redacted] PLCs. These devices have an operating system installed that allows other programs to be loaded and run on the device, and to be able to conduct its design functions of controlling the compressor/turbine packages based on the loaded software.

PLCs operating systems now run on new Windows version and the new TT4000 v5 software. The old XP versions are redundant and not supported (they also have issues with security and vulnerable to external breaches).

This proposal is to upgrade the software on our existing PLCs controlling the compressor and turbines with the new TT4000 v5 software to ensure we have ongoing coverage of support from the vendors with spares back up.

The changes to the new operating system will also require upgrading of licences on all field maintenance devices and laptops to allow interface with the new operating systems.

B.3.2.3. Load bank control panel redesign and replacement

Load banks are provided for individual GEAs for exercising and testing purposes whilst other GEAs are in service. They are also used to supplement the station load to prevent damage to the engines when there is a low load operation.

A review of these assets has identified a design issue with the cabling and component parts used for Stage 5A. These load bank control panels have prompted electrical overheating, leading to load banks tripping and being rendered out of service. The table below shows history of overheating and trip incidents.

Load bank overheating and trip incidents

	2015	2016	2017	2018	2019
Number of trips due to overheating	19	14	28	14	No data

The following table shows the cost since 2012 on the load banks. This is mainly for replacement of the heater elements.

Year	Cost
2012	$966.80
2013	$31,973.69
2014	$58,484.59
2015	$58,735.27
2016	$61,518.19
2017	$60,851.23
2018	$57,845.29

The Stage 5A load bank control panels were installed in 2008. They typically have a useful life of 10 to 15 years but are scheduled for replacement in AA5 due to performance and operational stability issues.

B.3.2.4. Upgrade of [redacted] HMI software to Windows

The periodic upgrade of software and associated hardware is a business as usual activity. Upgrades to new Windows versions are often required to ensure compliance of third party software with the platform it is working from.

The upgrade of [redacted] Turbine HMI software was included in the AA4 submission, when the assumption of the requirement to change from Windows XP to Windows 7 version was perceived to be absolute.

It has since been decided that only the [redacted] HMI software needs to be replaced on a seven-year replacement cycle, while the [redacted] Turbine HMI software will be replaced only on failure.

CS6 and CS9 [redacted] HMI software was upgraded in AA4, in 2019 and 2016 respectively. CS9 will require upgrade again in 2022 and CS6 in 2025, in line with the upgrade/replacement cycle recommended by [redacted].

B.3.2.5. Upgrade of fuel gas pressure control loop for CS01/U1, CS03/U1, CS05/U1 & U2, CS08/U2

We currently use pneumatic controllers and positioners, and electronic transmitters and digital positioners to control the pressure of fuel gas and instrument gas to service the gas turbines and compressors. With this proposed upgrade project, the remaining fuel gas pressure control loops with pneumatic controllers and positioners will be replaced with electronic and digital equivalents.

The drivers for this upgrade are:

(i) need for improvement in monitoring and control; and
(ii) the increasing levels of difficulty the business has encountered when seeking spare parts for pneumatic controllers, due to the low number of pneumatic manufacturers.

Pneumatic controls cannot be monitored through SCADA. This conversion to digital will give accurate control, improved monitoring through SCADA and reliability of valve operation through signature analysis.

Unit rates for this work in AA5 are lower than in AA4, as the initial project required detailed design and drawings while the AA5 activity will leverage from this information. Units completed in AA4 include CS5/1, 5/2 and CS8/1. The AA5 period will include the completion of CS1/1, CS3/1 and CS8/2 – all ACS project sites.

B.3.3. Rotating equipment

Rotating equipment upgrades required during the AA5 period are summarised in the following sections.

B.3.3.1. Compressor units online dynamic data vibration monitoring system – server based

This project covers the installation and commissioning of online vibration monitoring system on our compressor packages. Online monitoring of vibration data of the compressors and turbines is critical to ensuring proactive actions are taken before critical trip alarms are breached.

The scope of work involves the installation of additional communication cards on the three sectors of the [redacted] machines:

1. gas producer;
2. power turbine; and
3. gas compressor.

The proposal is to procure and install 3 cards each year

B.3.3.2. [redacted] compressor package dynamic vibration data visibility annual upgrade

This project is directly linked with the sever based project described above.

When new communication cards are installed, software to enable their operation must also be installed. SystemOne is the online dynamic data vibration monitoring software used.

This initiative began in 2010 and is forecast for completion in 2025. This project is the software part of online monitoring system. Once the cards (hardware) are installed, software licences are required to communicate with online monitoring system (SystemOne).

B.3.4. Mechanical equipment

B.3.4.1. Fuel gas – water bath heater refurbishment

The majority of water bath heaters in use at compressor stations are electric immersion heaters. Electric immersion heater require less maintenance and lower integrity risk than gas water bath heaters. This program allows for the replacement of the remaining gas water bath heaters with an electric immersion equivalent.

The following background information is provided:

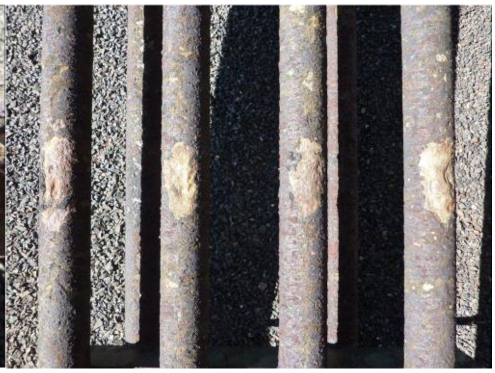
Heaters

- There are six gas water bath heaters installed on compressor stations. These are located as follows:
  - CS01 – 1 on Unit 1
  - CS03 – 1 on Unit 2
  - CS05 – 2 heaters, 1 on Unit 1 and 1 on Unit 2
  - CS08 – 2 heaters, 1 on Unit 1 and 1 on Unit 2

Inspections

- The mandatory statutory inspections of these vessels is costly, at approximately $30k per unit, as the tube bundle needs to be removed from the shell
- These inspections are required on each unit every 4 years
- These heaters were inspected during 2014/15, and again in 2019
- Of the 6 heaters in service:
  - microbial corrosion has been identified in all heaters (see attached photos);
  - microbial corrosion is present on both the shell and tube bundle in all heaters;
  - tube bundles in four heaters have been replaced due to excessive corrosion, at a cost of approximately $60,000 per heater;
  - all replaced tube bundles have experienced recurrence of the microbial corrosion attack and will require replacement again, likely within the AA5 period; and
  - it is likely that further tube bundles and heater shells will require replacement during the AA5 period, at a combined cost of approximately $230,000 per heater.
- Microbial corrosion is very difficult to remove and is not affected by the corrosion inhibitor
- Due to the presence of the microbial corrosion, the frequency of the statutory inspections cannot be reduced by Risk Based Inspection, and will need to be increased

Photos of impacted internals of water bath heaters

Proposal

- To mitigate against the ongoing expense and integrity risk of these heaters, it is proposed that they be replaced with electric immersion heaters
- Electric immersion heaters offer the following benefits over water bath heaters:
    - they are not prone to microbial corrosion;
    - they do not require disassembly in order to carry out statutory internal inspections;
    - they do not require ongoing monitoring and maintenance of corrosion inhibitor;
    - similar heaters installed on the pipeline have been found to be in excellent condition after many years of service, and have been approved for extended internal inspection intervals.

Costing

- Based on similar projects, the cost to replace the existing water bath heaters with electric immersion heaters is approximately $200,000 ($100,000 for the heater, and $100,000 for installation)
- The cost of inspecting and maintaining the water bath heaters over the AA4 period was approximately $600,000. This includes:
    - internal inspections;
    - tube bundle replacements; and
    - corrosion inhibitor monitoring and maintenance.
- Due to the further deterioration of the condition of the shells and tube bundles, the total projected cost of maintaining the existing water bath heaters for the AA5 period is $1,440,000, this includes:
    - internal inspections;
    - tube bundle replacements;
    - shell replacements; and

    - corrosion inhibitor monitoring and maintenance.
- The estimated cost to replace all six gas water bath heaters with electric immersion heaters is $1,200,000
- There are likely to be efficiencies gained if all heaters are replaced in one program
- Ongoing replacement, inspection and maintenance costs are expected to reduce from approximately $180,000 per annum to less than $5,000 per annum

Six gas water bath heaters will be replaced in AA5, so no gas water bath heaters will remain at the conclusion of AA5.

Pipeline and Main Line Valves – Capex DBP02

1.1 Project approvals

Table 0.1: Pipeline and MLV DBP02 – Project approvals

Prepared by	Jignesh Shah, Senior Electrical Engineer Jacques De Micheli Stradivari, Senior Corrosion & Protection Engineer Andrew Stanwix, Senior Mechanical Engineer
Reviewed by	Tawake Rakai, GM Transmission Asset Management
Approved by	Tawake Rakai, GM Transmission Asset Management

1.2 Project overview

Table 0.2: Pipeline and MLV DBP02 – Project overview

Description of issue/project	This business case covers the program of capital works necessary over the next five years to ensure the pipeline and main line valve (MLV) assets are operating safely, reliably, within acceptable risk tolerances, and are providing a level of performance consistent with that expected by customers. The pipeline and MLV work program comprises three broad categories: 1. **replacement of end of life electrical control and instrumentation (ECI) equipment** – this includes gas engines control systems, power systems such as solar panels and batteries, and remote terminal units to support SCADA communications; 2. **replacement of end of life mechanical equipment** – this includes high pressure danger signage and valves to facilitate in line inspections; and 3. **preventative works to protect pipeline and MLV assets from corrosion** – including fit for purpose transformer rectification units and cathodic protection ground bed systems. Looped sections aside, the pipeline and MLVs have been in operation for more than 35 years. The assets are subject to an ongoing proactive capital works program, which includes activities such as replacing ECI and mechanical equipment, and corrosion prevention programs. The ongoing capex program is necessary to allow primary asset (the pipeline) to operate with minimal direct and costly repair or replacement of the pipeline itself, maximising the DBNGP's design life. This business case recommends a capital expenditure increase of $3.2 million in the pipeline and MLV capital works program over the next five years (AA5) compared to works undertaken over the last five years (AA4). The increase is required because a greater number of assets are at or will reach the end of their technical design life during AA5, as well the need to enhance corrosion protection on the asset (due to the pipeline's age and deteriorating condition).
Project Name	Pipeline and MLV
Estimated Cost	Total forecast capex for the next Access Arrangement (AA5) is $9.4 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.

Options considered	• Option 1 - Maintain the volume of activity and expenditure levels undertaken during AA4 ($6.2 million); • Option 2 - Move to a replacement on failure policy for all pipeline and MLV assets ($13.1 to $14.1 million); and • Option 3 - Deliver the volume and activities identified in the Asset Management Plan (AMP) as required, applying good asset management practice, and adopting emerging techniques/technologies where appropriate ($9.4 million) (this is the recommended option).
Variation from AA4	The forecast expenditure for AA5 is $3.2 million more than the forecast expenditure in AA4 of $6.2 million. The incremental increase in AA5 is a result of: • more assets reaching end of life during the period compared to AA4; • increasing corrosion prevention measures on aging assets to maintain integrity; and • valve installations to facilitate ongoing in line inspection compliance.
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the proposed asset replacement, proactive works and upgrade program is consistent with accepted good industry practice, several practicable options have been considered, and market/unit rates have been tested to achieve the lowest sustainable cost of providing pipeline services. **NGR 79(2)** – renewal of ECI and mechanical equipment, and repair/rectification and proactive works to protect from corrosion and safety hazards, or maintain performance are all necessary to ensure the continued operation of the pipeline and MLVs to maintain the safety and integrity of services along the DBNGP. Pipeline and MLV functionality are core to the transportation of gas required to meet contracted obligations. Therefore, the proposed expenditure is conforming capex based on the grounds of NGR 79(2)(c)(i) and (ii). **NGR 74** – the forecast costs are based on the latest market rate testing, and project options consider the asset management requirements as per the latest AMP. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Stakeholder Engagement	Shippers have 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, long term integrity of the buried assets and emergency management. The pipeline and MLV program of work is key to ensure long term integrity is attained and reliability is maintained at the level our customers require. During Shipper roundtables us presented key areas of planning, including proposed capex. Shippers were broadly comfortable with the approach and high-level program in AA5. There were no questions specifically raised in relation to the Pipeline and MLV program. In response to Shippers' general interest in key areas and drivers of increased spend, and how us deal with changing business needs during an AA period, this business case outlines: • reasons for changes in expenditure between AA4 and AA5; and • drivers for the projects that will be implemented in the AA5 program of work.
Other relevant documents	This Business Case should be read in conjunction with: • AMP TEB-001-0024-05 (ECI) • AMP TEB-001-024-02 (Mechanical) • AMP TEB-001-0024-04 (Corrosion Protection) • DBNGP Above Ground Piping Inspection Procedure TEB-003-0100-01 • 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 supported by the relevant manufacturer's warranty and/or maintenance guidelines.

This business case covers the capital work program that is required to maintain the pipeline, MLVs and associated assets/equipment in good working condition to provide safe and reliable pipeline services for customers.

Pipeline assets include the primary pipeline asset that conveys natural gas, and the pipeline sections within the compressor stations, which consist of piping and associated equipment up to the station isolation valves (e.g. pig launcher/receiver, station bypass and station emergency bypass).

MLV assets contain include the following equipment:

- the impressed current system (ICS), which includes transformer rectifier units (TRU) and ground beds that are installed at MLVs to provide cathodic protection current to the DBNGP;
- the electrical power supply system, close circuit vapour turbines (CCVTs), gas engines, solar and DC batteries (which power the ICS, monitoring and control equipment), and the microwave communication system that provides the primary communication to support the SCADA system; and
- the MLVs, which allow remote isolation of sections of the DBNGP. There are 157 MLVs on the DBNGP main pipeline and 37 MLVs on the loop line.

The pipeline is buried in its own 30-metre-wide easement, and is identified on the surface by the installation of danger marker signs designed to AS2885. These warning marker signs are one of the key measures of ensuring the DBNGP does not get damaged by third party activities. Management of the marker signs also forms part of the pipeline and MLV capital program.

The pipeline and the majority of MLV assets have been in service for more than 35 years and have been subject to an ongoing capital works program since installation. As with most energy transmission assets, the replacement cycles of components and equipment are long and varied depending on the type of asset in question, which means the capex profile of the capital works program will vary as more (or fewer) assets are due for replacement.

During AA5, a significant number of pipeline and MLV assets are at or will reach the end of their design life and are therefore due for replacement. This means the works program during AA5 will be larger than that undertaken during AA4, requiring an additional $3.2 million over the five years.

The key programs driving the increased pipeline and MLV capital works program in AA5 are as follows:

- Scheduled replacement of end of life ECI equipment and ICS, which includes:
    - replacement of 15-year-old obsolete remote terminal units (RTUs);
    - replacement of 35-year-old obsolete gas engine control systems;

- MLV redesign for closing operation;
- replacement of solar panels and DC battery banks; and
- a DC power upgrade for MLV6.

- Scheduled replacement of mechanical equipment, which includes:
  - replacement of worn signage along the length of the DBNGP; and
  - replacement of substandard pig barrel isolation valves to allow in line inspection as required by our Safety Case.

- Cathodic protection program, which includes:
  - implementation of long-range ultrasonic tool at unpiggable sites;
  - replacement of end of life TRUs;
  - replacement of 35-year-old ground beds;
  - improving cathodic protection visibility;
  - annual dig ups; and
  - removal of piping interface wrap.

Undertaking the proposed program in full will address all identified high risks associated with the pipeline and MLV assets by the end of the AA5 period. This program is consistent with our Risk Management Framework.

The program forecast is developed from requirements outlined in the relevant AMPs and Safety Case, both of which are developed consistent with good industry practice and manufacturer requirements for maintenance and replacement.

1.4 AA5 forecast

In AA5, capital expenditure of $9.4 million is forecast for the pipeline and MLV program. Table 0.3 shows the forecast AA5 expenditure compared with actual expenditure in AA4.

Table 0.3: AA5 forecast pipeline and MLV capital expenditure, compared with AA4 actual ($'000)

Forecast spend ($'000)	2021	2022	2023	2024	2025	AA5	AA4 total	Variance
Capital expenditure	2,005	1,644	2,345	1,893	1,520	**9,407**	**6,246**	**3,161**

As shown in Table 0.3, the proposed pipeline and MLV program for AA5 is approximately $3.2 million more than incurred during the AA4 period. This increase is due a higher number of assets reaching their end of life replacement cycles during the AA5 period, as well as the need to enhance corrosion protection systems.

The majority of the increase ($2.2 million) relates to replacement of end of life mechanical equipment, and is driven by two key programs:

1. Replacing pig barrel isolation valve replacement ($1.5 million); and
2. Replacing worn DBNGP signage ($1.7 million).

The pig barrel isolation valve replacement program will see the replacement of ten isolation valves over the ten years (commencing in 2023), to enable in line inspections (ILI) to be conducted safely. The pig barrel isolation valve is required to allow launch and removal of pigging equipment during the ILI program. The current valves do not have sufficient sealing capacity to provide positive isolation from mainline pressure when installing pigging equipment and therefore must be replaced ahead of the commencement of the next ILIs. Under our licence and Safety Case requirements, the next ILIs must commence in AA6, therefore the valves must be replaced in AA5.

The signage replacement program is required as a large number of signs and warning markers along the DBNGP are worn and not legible. We must maintain legible signage as per the requirements of AS2885.3. Warning signs are a key control for managing the risk of third party impact on the pipeline, as identified in our Safety Case. Signs on the DBNGP mainline were installed in 1984, while signs on the loop were installed between 2000 and 2008. Almost all have suffered considerable weathering and deterioration.

The remainder of the proposed capital program uplift for AA5 is to replace end of life ECI equipment ($800,000 increase) and cathodic protection ($240,000 increase).

The increase in ECI equipment replacement is due to an increase in the volume of equipment reaching end of life during the period. Examples of such equipment include TRUs, cathodic protection ground beds, closed circuit vapour turbines, GEA control systems and solar panels.

The increasing corrosion protection expenditure in AA5 reflects corrosion prevention assets reaching end of life, but more substantively there is need to monitor and remediate the condition of an increased number of assets as a result of corrosion inspection regimes that were instigated as part of good industry practice learnings from the Varanus Island incident. These factors have determined a requirement to invest more in preventative measures that maintain the standard of service to customers.

Table 0.4 provides an overview of the AA5 pipeline and MLV capital works program.

Table 0.4: AA5 forecast pipeline and MLV capital works program

Pipeline and MLV program activity	2021	2022	2023	2024	2025	AA5
Lister GEA control system replacement	-	-	195	210	210	**615**
RTU replacement	-	-	340	350	350	**1,040**
Replacement of solar panels	-	-	500	-	-	**500**
Replace batteries at MLV and meter stations	290	290	-	-	-	**580**
DC power upgrade MLV6	65		-	-	-	**65**
MLV redesign for closing operation	260	260	-	-	-	**520**
Replacement of original DBNGP signage	450	450	450	373	-	**1,723**
Pig barrel isolation valve replacement	-	-	300	600	600	**1,500**
Annual dig up program based on Runcom results	150	-	-	-	-	**150**
TRU replacement	60	80	60	60	60	**320**
Impressed current ground beds replacement	100	100	100	100	100	**500**
CP visibility on non-visible sites	115	-	-	-	-	**115**
Piping interface wrap removal	415	264	200	-	-	**879**
Long range ultrasonic testing of unpiggable facilities	100	200	200	200	200	**900**
Total – AA5 pipeline and MLV	**2,005**	**1,644**	**2,345**	**1,893**	**1,520**	**9,407**

Further information on the projects listed in Table 0.4 is provided in Appendix B of this business case.

1.4.1 AA4 variance

Actual expenditure during the AA4 period was $623,000 lower than the amount determined in the 2016 AA4 Final Decision.

Table 0.5: AA4 actual expenditure compared with budget

Actual v budget ($'000)	2016	2017	2018	2019	2020	AA4
AA4 actual	589	1,697	1,431	1,295	1,234	6,246
AA4 approved	1,893	1,422	1,314	1,082	1,159	6,869
Variance	**(1,303)**	**275**	**117**	**213**	**75**	**(623)**

With the exception of 2016, expenditure in each year of the period was broadly in line with forecast. During the AA4 period, we made several efficiencies or prudent deferrals, which led to the slightly lower than forecast expenditure levels on pipeline and MLV assets.

For example, a project to address the poor performance of batteries was completed more efficiently than forecasted, applying a technical solution that was originally not thought possible. As opposed to retrofitting batteries into cubicles at their existing location, the batteries are now located inside the communication hut. Approximately $1.65 million of savings from this revised approach were achieved.

Solar panels that were due for replacement in AA4 were also deferred. The performance of the existing solar panels, although not as good as new units, continued to satisfy performance criteria during the period. Replacement of these panels has been pushed into to the AA5 period, deferring approximately $340,000 of investment from AA4.

These efficiencies and deferrals enabled the following projects to be delivered:

1. an extensive rectification program to manage pipeline interface corrosion that was identified during additional inspections as a result of Varanus Island incident learnings, whereby undetected corrosion at the interface of pipework between above and below ground can occur. This program is critical in maintaining asset health and as such is continuing into AA5. The project required an incremental increase of $700,000 during AA4; and
2. in order to comply with Working at Height legislation, fixed platforms have been installed at all CCVTs. Access was previously through the use of ladders, however this is approach is no longer acceptable. Platforms were required to ensure the ongoing safety of personnel, as well as ongoing maintainability of the CCVTs. The project required an additional $771,000 during AA4.

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

Figure 0.1: 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 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'.*

Six areas are considered for each type of risk:

1. DBP – corporate/financial risk
2. People – safety risk to the public and employees
3. Environmental – risk of adverse impact on environment/local ecosystems
4. Reputation/Outrage – risk of customer anger and reputational damage
5. Asset Damage – dollar impact on assets
6. Supply – risk of supply interruption to customers

All equipment is replaced in accordance with manufacturer specifications and AMP requirements, and a robust CP program is implemented in order to provide assurance of safe, reliable pipeline operations. Major risks associated with deferral of asset replacement or CP preventative works include:

- potentially higher NPV as a result of penalties arising from breached shipper contracts where the pipeline and MLV are not operating to >98% reliability; and
- increased safety incidents (people and environment) in the event of corrosion leading to explosions in built up areas.

Pipeline and MLV initiatives have been split into two categories for risk assessment:

1. those related to the integrity of the pipeline and MLV assets; and
2. those related to the reliability and performance of the pipeline and MLV assets.

The overall risk rating of managing and maintaining the integrity and the reliability and performance of pipeline and MLV assets in line with relevant AMPs is outlined in the following sections.

1.5.1 Integrity

The integrity risk rating associated with pipeline and MLV assets is presented in Figure 0.2: Integrity untreated risk rating – Pipeline and MLV.

Figure 0.2: Integrity untreated risk rating – Pipeline and MLV

	Trivial	Minor	Severe	Major	Catastrophic
Frequent					
Occasional					
Unlikely			Outrage Supply	DBP Asset Damage	
Remote		Environmental			People
Hypothetical					

Negligible	Low	Intermediate	High	Extreme

Table 0.6 shows the untreated risk for each risk area.

Table 0.6: Pipeline and MLV integrity risk rating

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

Integrity driven initiatives are high risk and high priority, specifically the risks are:

- **DBP** – pipeline and MLV related assets' integrity are critical to the delivery of public safety, delivering for customers and customer service. Equipment installed at MLVs ensure the long-term integrity, safety and value of the assets.

- **People** – pipeline and MLV related assets, while designed to be unmanned, are used as base locations for provision of communication continuity with SCADA as well as communication with operational staff. The MLVs are also used to manage inventory escape in an emergency.

- **Reputation/Outrage** – these activities are required to ensure equipment performance are to acceptable standards and operate when required. Inconsistent and unreliable performance due to under investment in capital leads to higher efforts required to manage unplanned outages – working in extreme and challenging conditions to meet irate customers. Low investment in these activities will lead to reputational damage and outrage internally as well as externally as customer demands are exposed to unreliable operation of the DBNGP.

- **Asset damage** – this risk simply implies that without the planned investment on integrity – the asset will be damaged and repairs costs escalate compared to planned works program to maintain the design intent of the assets.

- **Supply** – pipeline and MLV assets are integral to the effective operation of the DBNGP and maintaining these assets is necessary in ensuring we are able to safely and reliably deliver the forecast demand as well be ready to meet contractual obligations of shippers on any given day within the terms of shipper contracts. The advent of renewable electricity generation technology, which are prone to change without forward planning, puts pressure on the DBNGP to fill the gaps. Peaking demand has grown and will be a critical part of load management during the AA5 period. Shippers are expected to be able to access and use their peaking rights more regularly, and for this reason the pipeline and MLV programs are required to ensure the pipeline line pack and deliverability can meet shipper requirements.

1.5.2 Reliability/performance

The reliability/performance risk rating associated with pipeline and MLV assets is presented in Figure 0.3.

Figure 0.3: Reliability/performance untreated risk rating – Pipeline and MLV

	Trivial	Minor	Severe	Major	Catastrophic
Frequent					
Occasional		Outrage	DBP		
Unlikely		Asset Damage Supply			
Remote	Environmental				
Hypothetical	People				

Negligible	Low	Intermediate	High	Extreme

Table 0.7 shows the untreated risk for each risk area.

Table 0.7: Pipeline and MLV reliability/performance risk rating

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

Pipeline and MLV reliability/performance driven initiatives are intermediate risk and medium priority, but are key in delivering a capital program that can be considered as efficient and achieving the lowest sustainable cost of delivering services.

- **DBP** – Pipeline and MLV reliability/performance driven initiatives do not propose a threat to the effective operation of the DBNGP, but do expose us to unacceptable cost consequences through additional energy costs or additional remote travel for visual inspections or repairs.

1.6 Options considered

Different options have been considered to address the ability to ensure the pipeline and MLV assets continue to function as required for safe, reliable pipeline operations. The options are:

- Option 1 – Maintain the volume of activity and expenditure levels undertaken in AA4;
- Option 2 – Move to a replacement on failure policy; and

- Option 3 – Deliver the volume and activities identified in the AMP as required, applying good asset management practice, and adopting emerging techniques/technologies where appropriate (this is the recommended option).

These options are discussed in the following sections.

1.6.1 Option 1 – Maintain the volume of activity and expenditure levels undertaken in AA4

Under this option replacement of end of life ECI and mechanical equipment, along with corrosion prevention initiatives, would continue consistent with AA4 expenditure. We would deliver a capital program within the expenditure limits set during AA4 rather than consistent with the AMP requirements.

As a result, approximately one-third of the proposed projects would need to be deferred and all of the high and intermediate rated risks would not be addressed by the end of AA5.

1.6.1.1 Achievement of objectives

This option would fail to address the end of life and obsolescence asset management objectives identified in the AMP. All risks ranked high would not be addressed during the period. This is inconsistent with our Risk Management Framework. The highest priority public safety risks would, however, be prioritised.

No additional works as identified in the AMP would be undertaken under this option. This would result in equipment not functioning as required, such as TRUs, CP ground beds, CCVTs, Lister engine GEA control system, solar panels, and barriers at MLVs. This will leave the asset vulnerable to serious asset degrading, specifically corrosion due to ineffective CP and TRUs not functioning as required. In addition, not implementing corrosion prevention measures to mitigate the risks identified as part of the Varanus Island incident would not align us with current good industry practice.

Although some signage replacement would be completed, having inadequate signage elsewhere would mean we are not in compliance with AS 2885.3 and would not fully address the high integrity risk rating to people.

With respect to the replacement of pig barrel valves, any deferral beyond AA5 will delay the subsequent ILIs, which are due to commence in AA6. As such, any deferral compromises our ability to meet our obligations under AS/NZS2885, as well as conflicting with the Safety Case.

Table 0.8: Alignment with our vision – Option 1

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

1.6.1.2 Cost assessment

Adopting this option would curtail more than $3 million of planned works in AA5 to artificially match AA4 expenditure. The potential outcomes of this approach are summarised below.

- Sub-optimal solutions, with all replacement programs and initiatives partially completed to phase into AA6;
- Splitting works can cause project execution inefficiencies and rework;
- Increase reliability risks as critical works are delayed;
- Reduced scoping of the cathodic protection program challenges the intent of the Safety Case and our licence; and
- Lack of adequate CP could lead to asset degradation, due to corrosion and results in very expensive reactive repairs. By way of example, the cost for a hot tap to remove a small corrosion defect costs around $270,000.

The pipeline and MLV programs relate to reliability of the ICS and the cathodic protection system. These are engineering solutions that provide assurance to the long term integrity of the pipeline. Deferral of critical works that are required to secure the DBNGP's design life may result in diminishing the useful life of the asset.

1.6.1.3 Risk assessment

Table 0.9 shows the residual integrity and performance/reliability risk associated with the pipeline and MLV assets if the full capital works program is not undertaken as per the AMP.

Table 0.9: Risk assessment – Option 1

Risk category	Integrity treated risk	Performance/reliability treated risk
DBP	High	Intermediate
People	High	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	High	Low
Supply	Intermediate	Low
Overall Rating	**High**	**Intermediate**

1.6.2 Option 2 – Move to a replacement on failure policy

Under this option, ongoing repairs and maintenance would only be on a reactive basis, along the entire pipeline. The rate of required repairs would increase as the volume of activity and failures increase.

This project aims to ensure that all pipeline and MLV ECI and mechanical assets are repaired or replaced only in the event of failure. Corrosion protection of assets along the pipeline and MLV assets would only occur when the corrosion has caused damage to the assets. This program assumes that no preventative investment works occur.

- While it is not possible to predict with accuracy the number of failures that will occur over the next five years, the fact that many assets are becoming obsolete or reaching end of life during AA5 means the likelihood of failure is expected to be higher than during AA4 if not treated proactively. Given the higher cost of reactive replacement compared with proactive replacement (potentially two to five times higher per asset depending on asset type and location), the potential cost of works during AA5 is significantly greater than the proposed works program if widespread asset failure occurs.
- Should asset failure be lower than expected, though the overall cost of a reactive works programme may be less than forecast, the ongoing pipeline and MLVs works program identified in the AMP would not be delivered in full (similar to option 1). The works program identified in the AMP is the prudent level of activity required to manage the safety, integrity and reliability/performance risk associated with the pipeline and MLVs. Therefore, all the high and intermediate risks identified would not be addressed.
- Neither of these outcomes are tolerable for us and our customers. An entirely reactive 'replace on failure' approach to managing the pipeline and MLV's is not consistent with good asset management practice, and therefore not consistent with NGR 79(1)(a).
- A replace on failure strategy is also not prudent for a critical high pressure infrastructure asset such as the DBNGP given the inherent risks of asset failure, therefore, as a prudent asset manager, we would not recommend moving to a pure replace on fail strategy for the DBNGP.

1.6.2.1 Achievement of objectives

Table 0.10 summarises how a reactive pipeline and MLV capital works program will support the achievement of our vision objectives in AA5.

Table 0.10: Alignment with our vision – Option 2

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	N

A replacement on failure policy for all pipeline and MLV assets does not align with our vision objectives to deliver for customers in terms of public safety and reliability, being a good employer in terms of health and safety, or being sustainably cost efficient in terms of working within industry benchmarks.

A reactive approach would not address corrosion prevention measures to mitigate the risks identified as part of the Varanus Island incident, and would not align with good industry practice or prudent asset management principles.

Allowing corrosion equipment to fail will ultimately result in pipeline failure and a significant safety risk to the public or employees should such an occurrence happen in proximity to people. This reactive approach will increase the probability to interrupt contracted flow to much higher than ALARP and could result in not achieving the 98% reliability as a contracted obligation. It could further result in financial penalties of [redacted] if we cannot deliver to contracted obligations.

Failure to replace poor condition signage may also give rise to Coronial enquiries and potential negligence allegations if signs are not legible and the risk of third party pipeline damage is not sufficiently mitigated. The requirement to install signage alerting the public to the location of subterranean gas pipelines (as well as the Dial Before You Dig campaign) was a Coronial recommendation following the rupture of the WA Natural Gas transmission pipeline in Jandakot in the early 1980s.

1.6.2.2 Cost assessment

- With this option, the unit costs incurred would almost certainly be higher. Corrective activities are likely to incur higher costs than planned alternative due to:
  - additional travel costs (planned activities allow us to share travel costs across different activities at the same location);
  - increased likelihood of overtime and shift penalties (planned activities allow us to optimise staff rostering);
  - additional costs for expediated freight; and
  - additional costs for pulling crews off other planned work to address a corrective maintenance requirement and then remobilising to complete the planned work they were doing.

- We will also incur unplanned operating expenditure, as failures could lead to interruption to supply and associated contract delivery breaches. Interruption to supply to major industrial sites could result in a refund of around [redacted] and does not include any cost related to damage to customers' plant due to loss of gas supply. A replace on failure strategy is particularly unsuited when dealing with cathodic protection systems, which are in place to protect and be proactive.

If the cathodic protection systems are allowed to fail, they are no longer protecting the primary assets from corrosion. This may lead to large scale replacement of pipeline sections and MLVs that would otherwise have been prevented. Replacing a corroded section of pipeline is estimated to cost around [redacted] per kilometre, not including the impact of shutting down sections of pipelines while repairs are being done.

- While it is not possible to estimate precisely how many asset failures will occur during the AA5 period, broad cost estimate can be developed based by escalating the cost of the proposed works program if delivered reactively. It is a generally accepted asset management principle that delivery of works reactively is significantly more expensive that undertaking proactive or preventative works. Various sources cite the increase in reactive costs compared with proactive can be between two and five times[9] more than undertaking the same works proactively.

- For the DBNGP the cost escalation for reactive vs proactive works varies depending on the type (and scarcity) of asset being replaced, as well as the remoteness of the asset from the Perth Metropolitan area. For example, pipeline and MLVs located in remote areas of the Pilbara and Gascoyne regions require more travel time, while bespoke components will have long lead times that would exacerbate continuity of supply issues.

- Taking a conservative approach, if we assume a weighted average increase of only 1.5 times the material and labour/contractor costs if the work program were to be undertaken entirely reactively, we estimate the full AMP pipeline and MLV works program would cost approximately $14.1 million to deliver.

- Given the increase in works program during AA5 is driven by increases in replacement of mechanical and electronic equipment ($7.4 million), if we were to only deliver the end of life replacements reactively, with the proactive cathodic protection works program being delivered as forecast ($2 million), the total works program would cost approximately $13.1 million.

- It is also important to note that the estimated costs do not include costs associated with penalties and foregone revenue for us and our customers. [redacted] The cost impact of asset failure that leads to a 4-5 day supply outage, noting the likelihood of failure under this option is higher, can be tens of millions of dollars in addition to the higher cost of reactive works.

- As shown by these rule-of-thumb estimates, the pipeline and MLVs capital works program is likely to cost between $13.1 million and $14.1 million. Consideration is also not made to the impact of future costs from taking a reactive maintenance approach for a 5-year period, with future costs expected to escalate in remediated issues from poor asset management practices.

[9] Marshall Institute, Omega engineering, ARMS reliability.

- In any event, costs associated with a predominantly replace on failure works program would not *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 providing services.*[10]

Table 0.11: Comparison of reactive cost options ($'000)

Program category	AMP proposed works program	100% reactive program Escalation x 1.5	Replacement delivered reactively, cathodic protection proactively Escalation x 1.5
Pipeline & MLV	9,400	14,100	13,000

1.6.2.3 Risk assessment

Table 0.12 shows the residual integrity and performance/reliability risk associated with the pipeline and MLV assets if a replace on failure approach is taken.

Table 0.12: Risk assessment – Option 2

Risk category	Integrity treated risk	Performance/reliability treated risk
DBP	High	Intermediate
People	High	Negligible
Environment	Negligible	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	High	Low
Supply	Intermediate	Low
Overall Rating	**Intermediate**	**Intermediate**

1.6.3 Option 3 – Deliver the volume and activities identified in the AMP as required, applying good asset management practice, and adopting emerging techniques/technologies where appropriate

This approach assumes that all works are undertaken, including both preventative and corrective, to properly maintain and operate ECI and mechanical equipment on the pipeline and MLV. This option also adopts a balanced approach to preventative and corrective CP consistent with AMP requirements, Safety Case and good industry practice.

1.6.3.1 Achievement of objectives

This option would address the assets which need to be replaced in the period as they reach the end of their technical design life, minimising risk associated with a potential failure and any subsequent potential impact on the quality (accuracy and timeliness) of data available to support decisions relating to the pipeline.

It also looks to continuous improvement in the way assets are managed throughout their lifecycle by exploring emerging techniques and technologies, such as long range ultrasonic

[10] NGR 79(1)(a)

testing and stress concentration tomography for unpiggable assets. Option 3 therefore aligns with our vision objectives to deliver for customers, be a good employer and be sustainably cost efficient.

Table 0.13: Alignment with our vision – 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	Y
A Good Employer – Skills Development	Y
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

1.6.3.2 Cost assessment

The estimated cost of this option is $9.4 million. Refer to section 1.4 for the detailed cost breakdown.

By adopting a proactive, planned approach to the management of these assets, 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 a production loss. A continuous improvement culture is embedded, constantly looking at doing things better and more effective, taking advantages of technological advances.

1.6.3.3 Risk assessment

This option represents the lowest treated risk, as it is targeting the individual assets in line with the AMP. It is therefore consistent with our Risk Management Framework and the only option that can achieve a 98% reliability contractual obligation at the lowest sustainable cost.

Refer to section 1.5 for more detail.

Table 0.14 : Risk assessment – Option 3

Risk category	Integrity treated risk	Reliability/Performance treated risk
DBP	Intermediate	Low
People	High	Negligible
Environment	Negligible	Negligible
Reputation/Outrage	Low	Negligible
Asset Damage	Intermediate	Negligible
Supply	Low	Negligible
Overall Rating	**High**	**Low**

1.7 Summary of cost/benefit assessment

To assess the options, the costs, objectives and risk are considered for each option. A summary of the option assessment is shown in Table 0.15.

Table 0.15: Summary of cost/benefit analysis

Option	Achievement of objectives	Cost	Risk (integrity/reliability)
Option 1	Does not deliver for customers, a good employer or sustainably cost efficient	\$6.2m	High / Intermediate This option does not adequately address the identified risks to DBP, People, Reputation, Asset Damage and Supply
Option 2	Does not deliver for customers, a good employer or sustainably cost efficient	\$13.1 to \$14.1m	High / Intermediate This option does not adequately address the identified risks to DBP, People, Reputation, Asset Damage and Supply
Option 3	Achieves all relevant aspects of vision to deliver for customers, be a good employer and be sustainably cost efficient	\$9.4m	Intermediate / Low This option appropriately addresses the identified risks to DBP, People, Reputation, Asset Damage and Supply and is considered ALARP

1.9 Proposed solution

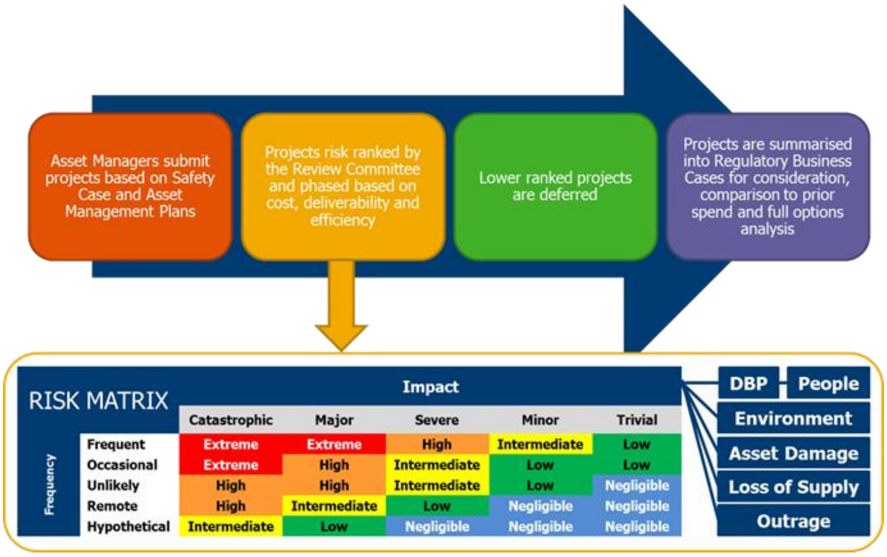
1.7.1 Why is the recommended option prudent?

Option 3 is recommended for the pipeline and MLV program to ensure we continue to deliver safe and reliable pipeline services. The Option 3 approach is consistent with good industry practice, considers learners from the Varanus Incident and follows the recommendations of our equipment providers and manufacturers, thereby ensuring continued repair and replacement. This option is selected to undertake replacement of equipment that no longer perform their design intent and therefore sub optimal in their services.

Although proactive corrosion protection costs are increasing, they are critical to the long term integrity of the pipeline in preventing future risks. These solutions ensure minimal disruption to the required levels of customer services and optimises performance of pipeline and MLV assets across the asset lifecycle, while preserving public, environmental and employee safety. The program of work also sets us up for a successful ILI program in AA6.

Figure 0.4 summarises how we develop our capital expenditure plans, and highlights that risks identified as intermediate or higher are prioritised, with lower risks removed or deferred from the capital program. Option 3 is consistent with this approach as it focuses on treating all intermediate or higher risks as soon as is reasonably practicable (by the end of the AA5 period). Option 1 or 2 would not address the identified risks within the AA5 period and would increase the overall risk associated with the DBNGP as projects get pushed into AA6, leading to an even larger capital works program in the future.

Figure 0.5: Our capex plan development process



Source: Shipper Roundtable #9 meeting held on 25 November 2019

Failure to proactively plan for the management and maintenance of assets listed under Pipeline MLV could result in catastrophic failure of an asset which would result in loss of through-put, excessive operating expenditure and impact on reliability and the ability to meet contractual obligations.

1.7.1.1 Consistency with the National Gas Rules

Rule 79(2)

The proposed capex on pipeline and MLV assets is necessary to improve or maintain the safety, and to maintain the integrity of services, as required by NGR 79(2)(c)(i) and (ii). Specifically, it will:

- maintain reliability of supply by ensuring that all ECI and mechanical equipment replacement programs are undertaken in line with the AMP, end of life cycle and manufacturer requirements; and
- maintain good industry practice in relation to prevention of corrosion of pipeline and MLV assets through preventative and corrective programs, thereby minimising the likelihood of leakage and/or explosion.

Rule 79(1)

The option is consistent with the requirements of NGR 79(1), specifically we consider that the capital expenditure is:

- Prudent – the expenditure is necessary in order to address the identified ongoing operational requirements. The program is also broadly consistent with the approach adopted in AA4. 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 historical average actuals and tender contract values. 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 considers industry learned lessons from the Varanus Island incident and focuses on preventative measures to ensure the long-term health of the asset. It also follows good industry practice by ensuring that critical infrastructure is maintained within its useful life and to current technological standards, therefore the proposed capital 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 proposed option achieves the lowest sustainable cost delivery of services by undertaking works that reduce risks to as low as reasonably practicable while maintaining reliability of supply. This mitigates the costs of reactive works and penalties resulting from asset failure. We are undertaking works in a proactive, planned and scheduled manner, with the volume of activity based on useful life and in line with manufacturer's guidance and associated support. It also considers continuous improvement in the way we manages assets throughout their lifecycle by introducing new and emerging techniques and technologies, which may reduce costs over the medium-to-long term.

1.7.2 Estimating the Efficient Costs

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

- Where possible, the unit rate used to determine the cost of the program in AA5 is based on a three-year average actual cost incurred in AA4.

- Where this has not been possible activities have been estimated based on the historical cost of the same or similar programs of work. The cost of these activities would usually be determined through a competitive tender process. Where a competitive tender has not yet occurred, the associated cost is estimated in two ways:

  1. where the work is sufficiently comparable to other work – the most recent historical average unit rate or actual cost and matched to similar locations where the program is delivered externally; and

  2. where the work is unique or greater than $5 million – an estimate is developed based on internal estimates from different engineering disciplines or from external engineering specialists.

Specialist engineering disciplines, procurement and construction management (EPCM) activities are provided utilising internal resources, supplemented by external specialist input as required.

Key assumptions which have been made in the cost estimation for the pipeline and MLV program include:

- cost based on historical expenditure noting that these works are not new;

- estimates derived from contractual rates of vendors to be utilised;

- resource cost based on other similar projects ongoing at present or in previous AA periods; and

- OEM contractual rates for spares and labour that are part of our services agreements.

Table 0.16 summarises the unescalated costs for pipeline and MLV by cost category. Table 0.17 shows the escalation applied to December 2020 which includes labour cost escalation of 0.69% per annum.

Table 0.16: Pipeline and MLV Cost Estimate, by cost category

	2021	2022	2023	2024	2025	Total
Internal labour	283	231	286	238	238	1,276
Contractors / consultants	847	728	826	617	442	3,461
Materials & services	754	602	1,170	1,025	833	4,384
Travel & other costs	120	82	63	13	7	285
Total	**2,005**	**1,644**	**2,345**	**1,893**	**1,520**	**9,407**

1.7.3 Escalated costs in real dollars Dec 2020

Table 0.17: Pipeline and MLV Cost Estimate, by cost category

	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	2,005	1,644	2,345	1,893	1,520	9,407
Escalation	51	46	73	64	55	289
Total	**2,056**	**1,690**	**2,418**	**1,957**	**1,575**	**9,696**

Appendix A – Risk assessment

Figure 0.6: Summary of Pipeline and MLV risk assessment

Integrity	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	Unlikely	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	426
Maintain AA4 volume of activity and expenditure	Major	Unlikely	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Unlikely	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	426
Move to a replacement on failure policy for all Compressor Stations projects	Major	Unlikely	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Unlikely	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	426
Do the volume and activities that AMP has identified as required exploring a small number of emerging techniques/technologies	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

Reliability/Performance	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	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	42
Maintain AA4 volume of activity and expenditure	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	42
Move to a replacement on failure policy for all Compressor Stations projects	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	42
Do the volume and activities that AMP has identified as required exploring a small number of emerging techniques/technologies	Severe	Remote	LOW	5	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	10

Appendix B – Project details

B.1. Electrical control and instrumentation (ECI)

ECI equipment along the pipeline and at MLVs includes multiple assets with different approaches for repair and replacement. Asset replacement and maintenance is performed consistent with manufacturer recommendations and useful life expectations. The key ECI projects are discussed below.

B.1.1. Lister GEA control system replacement

The gas engine control systems will reach their design life in AA5 and the plan proposes to commence the replacement program with a new engine control system between 2023 and 2025. While the actual gas engines have been in operation for 35 years, they have experienced relatively low utilisation as they are the secondary source of power supply. The gas engines are still in a maintainable condition. However, the electronic engine control system has become obsolete and can no longer be repaired, hence requires replacement.

B.1.2. RTU replacement

The remote terminal units are devices that communicate between the SCADA Master Station and all locally controlled equipment. The plan is to commence the RTU 15-year replacement program and installation of a new control system for remote valve operation at MLVs to eliminate uncommanded valve closure. The RTUs receive commands from the control room in Perth and in turn develop an executive command to enable local equipment to act as directed. These include:

- Closing and opening of main line valves
- Isolating gas supply to equipment
- Starting back up power generators
- Commanding the operation of Impressed Current System
- Responding to a fire and gas system where applicable
- Managing battery voltage and
- Alerts on building security

The RTU replacement program is scheduled to commence in 2023 and includes 52 MLVs and meter stations that are not co-located with MLVs. Note that no replacement program for RTUs were scheduled in AA4. The cost of replacement was based on a tender process conducted in 2018 and as part of PMO delivery process, the work scope and costing will be tested by the Contracts and Procurement team to ensure prices are competitive before installation.

B.1.3. Replacement of solar panels

Whilst CCVTs and GEAs are installed with batteries at repeater sites, given their greater level of power consumption, at the nine spur sites (where the power consumption is less) solar panels and a bank of batteries are installed. It is planned to replace solar panels as part of a 10-year program consistent with their useful life. The AA4 allocation was not implemented as planned because the solar panels were still fit for ongoing service and was premature to replace. It was prudent based on our annual business planning process to defer the replacement program to AA5.

B.1.4. Replace batteries at MLV and meter stations

The power supply system adopted on the DBNGP is to generate reliable AC power to charge DC banks of batteries. Site equipment is powered from the DC supply output of the batteries. The current brand of batteries available on the market and utilised on the DBNGP in the north have a forecast 5-year life compared to 8 years for batteries installed in the south based on historical actual performance. There is a total of 53 sites (44 repeaters and 9 spur sites). This business case proposes to complete replacement of the 53 sites over a three-year period as the batteries at some sites have reached design life.

B.1.5. DC power upgrade MLV6

An additional project for a DC power upgrade is scheduled for MLV6 in 2021. The change has been made since the decommissioning of the Rocky Ridge Meter Station, which has not operated since the closure of the RTIO Dampier Power Station.

B.2. Mechanical replacement program

Mechanical equipment along the pipeline and at MLVs includes multiple assets with different approaches for repair and replacement. Asset replacement and maintenance is performed consistent with manufacturer recommendations and useful life expectations. The key mechanical equipment replacement projects are discussed in the following sections.

B.1.6. Replacement of original DBNGP signage

We propose to replace DBNGP signage along the pipeline which are no longer legible, hence pose safety and security risks to the pipeline. We are required to maintain legible signage as per the requirements of AS2885.3. In addition, signs are noted in the Safety Case Formal Safety Assessment (FSA) as a procedural control for the elimination of Major Accident Events caused by third party damage resulting in pipeline rupture causing multiple fatalities.

Original mainline signage installed and commissioned in 1984 has a lifespan of 30 years and loop line signs were installed progressively between 2000 and 2008. Signs are exposed to weather, UV, bush fire and public damage with signs used as target practice. Pipeline signs from CS03 to CS04, CS04 to CS05, and CS05 to CS06 are being replaced in the current AA4 period with further replacement carried out (to cover full length of the DBNGP) in AA5 spread evenly across 2021 to 2023.

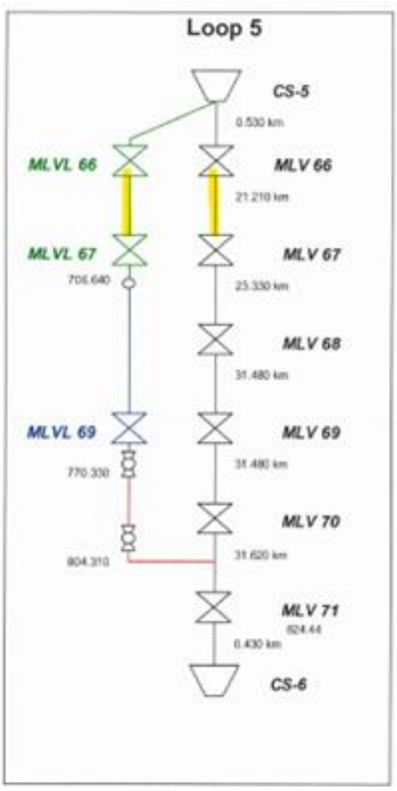
Photo of deteriorated warning markers

Photo of replacement warning markers

B.1.7. Pig barrel isolation valve replacement

Replacement of ten pig barrel isolation passing valves over a ten-year period starting in 2023. The pig barrel isolation valve is required for positive isolation to launch and remove the pigging equipment during the inline inspection program.

Failure of these valves to effect safe isolation will result in pipe sections have to be vented from nearest MLV to accommodate pig launch and retrieval. This is a safety risk and the costs associated with vented gas are approximately $200,000. As shown in this diagram – venting the first sections downstream of CS5 for example equates to 42 TJ of gas when offline or 48 TJ when on line. This equates to approximately $250,000 of gas – as fuel burdening the DBNGP expenses costs. Venting the CS5 station pipework equates to about 2 TJ.



As the pipeline has now reached its 35 years of continuous service, and the number of ILI projects undertaken to date, the sealing capability of these valves can no longer support the safety requirements to provide positive isolation from mainline pressure when installing pigging equipment. ILI is a license and Safety Case requirement to be conducted to be conducted at the earliest 8 years and latest 10 years on all licensed pipelines. The AA4 ILI program and lessons learnt have driven this requirement to commence the controlled replacement based on degree of deterioration in readiness for the next ILI program.

B.3. Cathodic protection program

The DBNGP below ground gas transmission system has been designed with corrosion protective systems to ensure it will last its design life. These engineering design features include the following:

- the pipeline is coated with Fusion Bonded Epoxy for the mainline and a three layer coating system for the loops both applied in the factory where the pipes were manufactured;
- the weld areas of the two pipelines have coating systems that were applied in the field;
- the coatings are designed to be the primary protective system employed to eliminate corrosion; and
- as there are always imperfections in any coating system, and in line with standard industry practice, the DBNGP is also equipped with ICS (TRUs and ground beds) that are installed at MLVs spaced every 30 km apart on the whole pipeline length. These ICS are designed with their ground beds to inject cathodic protection current into the pipeline to stop metal areas exposed to the environment from coating defects from corroding causing leaks and ruptures. There are over 63 TRUs installed on the DBNGP.

In addition to these engineering measures, the DBNGP is annually tested to determine the adequacy of the cathodic protection system as determined from the potential and current flow measured at respective test points installed along the pipeline. The testing methodologies are deemed inferential hence why good and prudent pipeline operators conduct regular excavation programs annually to assess the adequacy of the controls in place are working and that the exposed metal at coating defects are well protected from corrosion.

The annual dig up allocation has been included in the program and allows the operator to determine best locations to be excavated to test that the CP system is adequate based on the following conditions:

- the results of the annual CP survey may identify areas where there has been a change and showing in the depletion of potentials and increasing current demands;
- the areas that coincide with defects from the ILI programs;
- known areas of low level of soil resistivity – salt pans, river crossings, wet lands, coastal areas;
- known areas of high level of soil resistivity – sand dunes, desert;
- areas exposed on foreign interference from other pipelines; and
- areas exposed to Telluric and AC Induction from high voltage transmission lines.

These factors optimised and drive the locations of areas to be excavated noting the spread of the DBNGP from Dampier to Bunbury traversing the state from pastoral, wheat belt and the south west.

The cathodic protection programs required in AA5 are summarised in the following sections.

B.1.8. Annual dig up program based on Runcom results

The annual dig up program is designed to test the adequacy of the cathodic protection system and that we are meeting our Safety Case obligations. Note that the running of the ILI program is every 8 years whereas annual excavations are design to inspect selected locations along the pipeline based on data collected from the annual surveys, ILI results and known high risk areas to integrity. This approach is considered prudent – as opposed to just monitoring the CP readings and results.

B.1.9. TRU replacement

The current TRUs are forecast to reach design life during the AA4 period and the plan is to commence their replacement program from 2021 to 2025. These devices control the level of cathodic protection injected into the pipeline and will not be supported. The program will cover 47 TRUs on the mainline and will include the phased replacement of 9 units per year.

B.1.10. Impressed current groundbeds replacement

The associated ground beds will also be due for replacement as most of these have been in service since 1984. The ground beds are designed to have loop resistances that allow for the efficient injection of current from the TRU. Continuous use of these ground beds after over 35 years of current injection has resulted in the gradual drying out of the ground bed backfill material resulting in high loop resistances and driving TRU power requirements higher. It is forecast that two ground beds (MLV94 and CS7) that have high loop resistances will commenced to be replaced in 2021 to 2022.

B.1.11. CP visibility

One of the improvement programs to ensure reliability of the cathodic protection system is to make all impressed current systems visible to the Control Room. This is so the reliability of its power supply and hence its continuous operation can be monitored by the SCADA system and responses can be deployed to sites that have power supply failures. This is deemed prudent, particularly when frequencies between visits to remote sites can be up to three months. Having a TRU offline for three months without any knowledge is not acceptable and poses a high risk to the long-term integrity of the buried assets. Installation of CP visibility in nonvisible sites is proposed for 2021.

B.1.12. Piping interface wrap removal

Many facilities on the DBNGP have been in service since 1984. An inspection campaign conducted after the Varanus Island incident in 2008 highlighted that interface areas between above and below ground pipework pose the highest risk to corrosion, and cannot be protected by the cathodic protection system.

An inspection regime was instigated in AA4 to assess the areas of the DBNGP that are deemed high risk to this phenomenon and it was confirmed that the following areas require close monitoring:

- facilities located along the DBNGP from Dampier Facilities to CS2 and facilities from CS9 to Bunbury; and
- facilities that suffer from the Joule Thompson (JT) effect common at meter stations in the metro areas and the south west where sections of pipework are at low temperatures and induces icing and condensation. Corrosion is rife along these sections in particular at the interface between above and below ground. This was the same phenomenon that

caused the Varanus incident albeit it was the tidal changes at the interfaces that caused the uncontrolled corrosion resulting in failure by rupture.

We have put in place a program of inspection and removal of the tape wrap system used at the interface that encourages and accelerate this phenomenon. We have deemed the best solution is to remove the root cause and allows more effective inspection to be carried out visually. It is proposed that all tape wraps installed on above/below ground transitions will be removed and replaced with the current transition coating specification. This will remove the risk of creating a corrosive environment underneath the tape, and also improve the ability to detect defects at the soil/air interface by visual inspection.

B.1.13. Long range ultrasonic testing of unpiggable pipes

There are sections along the DBNGP that are not piggable (either pig launchers or receivers were not installed during construction of the pipe, or flow conditions or the telescopic nature of the pipeline do not support pigging). For these pipes total reliance is on selective excavations and DCVG coating surveys to drive the direction of integrity management. These are traditional tools used before ILI became a reliable and economical tool to use on piggable lines.

A tool is available called 'Long Range UT' where a probe is placed on the pipe wall, sends a signal into the pipe wall and bounces back to the probe. The signal can be used to assess the integrity of the pipe wall up to a distance of six metres. This is useful for unpiggable pipes at facilities, particularly in meter stations where a significant portion of unpiggable pipes are buried. These pipes are protected through the cathodic protection system with solid bonded or decoupled earthing system. There are complications with other buried structures within the facilities including civil foundations, rebars in concrete and of course the earthing system.

This program has been introduced to drive more efficient use of technology to assess areas that are unpiggable. The forecast expenditure in AA5 is spread evenly over the five years has been allowed for 10 compressor stations and more than 60 meter stations, where this program will be implemented.

SCADA Business Case – Capex DBP03

1.1 Project Approvals

Table 0.1: SCADA DBP03 – Project approvals

Prepared By	Allan Butler, Senior SCADA Engineer
Reviewed By	Hugo Kuhn, Head of Engineering
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 0.2: SCADA DBP03 – Project overview

Description of Issue/Project	This business case outlines the ongoing replacement and upgrade program for Supervisory Control and Data Acquisition (SCADA) assets. • Aligned with the SCADA Asset Management Plan this business case proposed: • Hardware replacements - these are based on different replacement frequencies, depending on the component and their useful life; and • Software upgrades - 5 to 7 year upgrade program There are a total of 21 servers (hardware) servicing the Master Station and is forecast with good business practice for servers to be replaced every 4 to 5 years in line with the useful life identified in the AMP supported by the manufacturer[redacted] SCADA switches have an 8 to 10 year replacement cycle. 14 switches require replacement in AA5. SCADA firewall hardware has an 8 year useful life and is replaced in line with this cycle. There are no firewall replacements required in AA5. We also invest in SCADA related software to ensure the software embedded in SCADA servers is current, patched and supported. Maintenance activities are undertaken throughout the software's useful life, with bug fixes, patching and other software functionality releases guided to maintain and improve the software's performance. Periodically, a full software refresh is required, to avoid obsolescence and to ensure integration and alignment with other tools in the business is achieved. A periodic software upgrade is forecast to occur in the AA5 period.
Project Name	SCADA
Estimated Cost	Total forecast capex for the next Access Arrangement (AA5) is $1.9 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 – Undertake volume and activities consistent with the AA4 program ($1.8 million); • Option 2 – Move to a replacement on failure policy (upwards of $1.8 million); and • Option 3 – Proactively replace consistent with the AMP ($1.9 million) (this is the recommended option).

Variation from AA4	The proposed AA5 expenditure is $0.1 million more than the forecast expenditure for AA4. For hardware, the cost estimate is based on identifying the number of server replacements required and the appropriate unit cost of each. For software, the cost estimate is based on a quote provided by the software provider [redacted] The AA5 forecast assumes the following activities will be undertaken: • 4 to 5 yearly replacement of servers – 4 per year • 7 yearly refresh of software – scheduled for 2024 • 8 to 10 year switch replacement – 14 in 2025 The frequency of replacement is guided by our AMP, good industry practice and manufacturer's guidelines.
Consistency with the National Gas Rules (NGR)	NGR 79(1) – The proposed volume of replacement in AA5 is in line with the end of life of these assets, aligned with both our AMP and industry practice. The unit rates reflect the actual historical rates based on commercially negotiated terms and for the software upgrade, where the refresh is less standard, the estimate has been based on a quote provided by the relevant software developer. SCADA forecast expenditure in AA5 and is therefore consistent with NGR 79(1)(a), which requires the expenditure to be prudent, efficient and in line with good industry practice to achieve the lowest sustainable cost of delivering pipeline services. NGR 79(2) – SCADA assets are relied upon to feed information from our assets back to the control centre to support safe and reliable pipeline control and monitoring. Replacement of SCADA servers and upgrade of associated software in line with their respective useful lives is required to maintain and improve the safety and integrity of services as per NGR 79(2)(c)(i) and (ii). NGR 74 – the forecast costs are based on the latest actuals and advice from our support partner. Project options consider the asset management requirements as per the latest Asset Management Plan. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
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 SCADA 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 SCADA 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 – SCADA Master Station (TEB-001-0024-08); 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. These controls are sometimes 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.

SCADA is universally recognised as critical to the operation of the DBNGP, communicating all operational and billing information from remotely-located assets to the Control Centre (TSCC) in Perth. SCADA is ring fenced, protected by a DMZ and firewalls to minimise the probability of cyber security threats.

The SCADA network is interconnected by a wide area network (1,600 kilometres in length) and consists of processing equipment (servers, Remote Terminal Units and operator stations) as well as network equipment (routers, switches, firewalls, terminal servers and protocol converters).

Communication between the main control site and disaster recovery site at Jandakot is via a fiber ring, established to achieve security and resilience of service in the event of an emergency requiring the control room to move to Jandakot.

A failure of SCADA hardware or software can result in the loss of visibility of the asset. In the event of a loss of visibility to a remote site, decisions and protocols developed to maintain safety and efficiency at the affected area are impeded or shut down.

1.3.1 Development of program

There are 21 physical servers located between the main control centre in Perth and the disaster recovery site in Jandakot. The servers contain an operating system, with up to date patching certified by [redacted] to ensure they meet fit for purpose requirements.

1.3.1.1 Development of program – hardware

Hardware replacement is made up of servers and switches for AA5, with no replacement needed for firewall hardware in the period.

The SCADA servers are [redacted] and typically come with a 4 year manufacturer's warranty, after which time [redacted] recommendation is to either purchase an extension of warranty or replace the aged asset.

In consultation with [redacted], we have adopted a replacement program standard of 4 yearly for servers, aligned with the expiration of the [redacted].

We can sometimes extend the life of the lowest used servers, allowing us to maintain a smooth profile of proactive replacements at four per year.

With scheduled (proactive) hardware replacement, aligned with manufacturer's warranty, the likelihood of failures of SCADA servers is reduced and the cost associated with their maintenance is more easily and accurately forecast.

Service level agreements are in place with [redacted] to serve as security to delivery of spare parts and service agents. Without a service level agreement, spare parts and service will be deemed to be non-operational and take a lesser priority to other companies with an agreement in place.

Table 0.3: SCADA servers

Location	Unit	Last replaced	Next replaced
Allendale	[redacted]	2017	2022
Allendale	[redacted]	2017	2022
Allendale	[redacted]	2018	2023
Allendale	[redacted]	2018	2023
Allendale	[redacted]	2019	2024
Allendale	[redacted]	2019	2024
Allendale	[redacted]	2020	2026
Allendale	[redacted]	2020	2026
Allendale	[redacted]	2019	2024
Allendale	[redacted]	2018	2023
Allendale	[redacted]	2018	2025
Jandakot	[redacted]	2017	2021 and 2025
Jandakot	[redacted]	2017	2025
Jandakot	[redacted]	2017	2022
Jandakot	[redacted]	2017	2022
Jandakot	[redacted]	2018	2023
Jandakot	[redacted]	2019	2021
Jandakot	[redacted]	2019	2021
Jandakot	[redacted]	2018	2021
Jandakot	[redacted]	2018	2024
Jandakot	[redacted]	2018	2025

Almost all SCADA servers are scheduled for replacement in AA5, with one scheduled to be replaced twice – in 2021 and 2025 due to its high usage.

Procurement of the servers is conducted in line with our Procurement Policy and Purchasing Procedure which requires a written quote from multiple vendors to secure the most competitive price for the [redacted] equipment.

The vendors most recently engaged are those with a proven track record in delivering reliable services and support, including [redacted]. The lowest price vendor is selected in all instances for the procurement of [redacted] servers.

14 switches have additionally been identified for replacement in AA5, at a unit rate of [redacted] per switch, in line with the end of their useful life. These were last replaced in 2011 as part of a major SCADA upgrade.

1.3.1.2 Development of program - software

We have used [redacted] software as the SCADA software package since 1984. Our agreement with [redacted] is a 'Customer First' agreement, which includes annual maintenance and support patches and minor upgrades to the current version.

In 2024 our SCADA software will be upgraded to the [redacted] software with a perpetual enterprise license. This will replace the current version of [redacted] which has been deployed since 2011. A cost estimate has been received from [redacted] for the 2024 upgrade which we have used as the basis for the forecast expenditure in AA5.

The cost of this periodic upgrade includes all hardware, software, security and regression testing. Where professional services are required, we use [redacted] who work as integrators for [redacted].

The 2024 upgrade is significant because enhancements to the SCADA application and user interface are required.

1.4 AA5 forecast

In AA5, a total expenditure of $1.9 million is forecast as shown in Table 0.4. The forecast is based on identifying the units that will require replacement and the unit cost for servers and based on the quote provided by [redacted] for the software upgrade.

Table 0.4: Summary of AA5 forecast spend - SCADA

($'000)	2021	2022	2023	2024	2025	AA5
Servers	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Switches	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Software	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	132	132	132	1,132	342	1,870

As noted in Table 0.3 above, [redacted] servers are scheduled for replacement each year of AA5, with the software upgrade scheduled for 2024.

1.4.1 AA4 comparison

Our AA5 forecast total expenditure of $1.9 million compares to $1.8 million, as shown in Table 0.5: Summary of actual and forecast spend across AA4 and AA5.

Table 0.5: Summary of actual and forecast spend across AA4 and AA5

($'000)	Year 1	Year 2	Year 3	Year 4	Year 5	AA
AA4 estimate	123	550	560	451	100	1,784
AA5 proposed	132	132	132	1,132	342	1,870
Variance	**(9)**	**418**	**428**	**(681)**	**(242)**	**(86)**

The hardware replacement program will remain stable into the future, with a continuation of the four per year replacement cycle for servers, firewall hardware replacement every 8 years and switch replacements every 8 to 10 years.

Software upgrades are more challenging to predict and are often driven by the software provider rather than internal drivers.

Table 0.6 below shows the actual and approved expenditure for SCADA in AA4.

Table 0.6: Actual vs approved SCADA expenditure in AA4

($'000)	2016	2017	2018	2019	2020	AA4
Actual	162	550	560	451	100	1,823
Approved	39	-	-	-	-	39
Variance	123	550	560	451	100	1,784

There was no approved forecast for SCADA in AA4 apart from $39,000 for Alarm Management at compressor stations.

The following investments were made in AA4 to ensure the integrity of the Master Station:

- hardware (servers, firewall, switches) - $1.0 million of replacement. This was driven by Microsoft as they upgraded their operating systems from 32-bit to 64-bit requiring all DBNGP servers to be replaced with 64-bit equivalents;
- master station security and resilience - $0.5 million, delivering stronger protection for the DBNGP from external disturbances in response to audit findings on the resilience of our Operational Technology system; and
- simulation hardware (including alarm management) - $0.2 million, which enabled the operation of compressors to be simulated and changes made without compromising the integrity of the operating systems. The simulation exercise was adopted on compressor stations events and alarms as part of a process safety initiative and resulted in a safer and more structured approach to alarm rationalization and simplifications. The Control Room now has a clearer focus on the alarms and events that impact integrity and can address these earlier.

During AA4, we negotiated an extended support agreement with [redacted] for some of our servers, increasing their warranty period to seven years for the least stressed units. This supported us as we prioritised replacement of equipment failures and transitioned to a more controlled replacement profile, which is now in place.

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

Figure 0.1: 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 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 is presented in Figure 0.2. Three elements of risk are rated as high, two low risk and one negligible. This results in a high risk ranking for these assets in an untreated scenario.

Figure 0.2: Risk rating – SCADA

	Trivial	Minor	Severe	Major	Catastrophic
Frequent			DBP / Outrage		
Occasional				Asset damage	
Unlikely					
Remote			Loss of supply		
Hypothetical	People			Environmental	

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

Table 0.7: Risk rating

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

SCADA assets are high risk and high priority.

- **DBP** – Untreated, a failure of SCADA assets would impact effective operations where pipeline monitoring and control relies on information feeds from our assets to our control centre;
- **Reputation/Outrage** – Untreated, a failure of SCADA assets results in lost visibility and would cause widespread complaints and anger from our Shippers, regulators and employees;
- **Asset Damage** – Untreated, a failure of SCADA assets could result in asset damage of between $10 and $25 million where our pipeline monitoring, control and maintenance is not able to respond appropriately given a lack of information being fed back from our assets in the field.

1.6 Options Considered

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

- Option 1 – Undertake volume and activities consistent with the AA4 program;
- Option 2 – Move to a replacement on failure policy; and
- Option 3 – Proactively replace consistent with the AMP.

1.6.1 Option 1 – Undertake volume and activities consistent with the AA4 program

Under this option, the volume of hardware replacement and software upgrade expenditure that were delivered in the AA4 period would be committed to for the AA5 period.

This would mean hardware replacements that were not aligned with end of life replacement cycles would occur in AA5, while the required software upgrade would not be undertaken.

1.6.1.1 Achievement of objectives

Table 0.6 outlines how Option 1 would support the achievement of our vision objectives in AA5.

Table 0.8: 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	-
A Good Employer – Employee Engagement	-
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 our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient or reflect good industry practice.

This option does not support the SCADA software upgrade. This would mean we would be operating within an unsupported SCADA software environment, increasing the likelihood of system bugs or even malicious penetration which could cause interruptions to safety, reliability, throughput and performance information reaching the control room.

1.6.1.2 Cost assessment

The cost of this program is $1.8 million in AA5.

1.6.1.3 Risk assessment

Table 0.9 shows that undertaking the same volume and activities as AA4 in AA5 does not 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.9: Risk rating impact– Option 1

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

Specifically, the major risks to DBP, Reputation and Asset Damage identified in the risk assessment remain.

1.6.2 Option 2 – Move to a replacement on failure policy

Under option 2, proactive replacements or upgrades would not be done on SCADA hardware or software.

1.6.2.1 Achievement of objectives

Table 0.8 outlines how option 2 will support the achievement of our vision objectives in AA5.

Table 0.10: 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	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 the vision objectives for delivering for customers, being a good employer and being sustainably cost efficient.

Replacement on failure increases the likelihood and duration of system interruptions, impacting on essential information reaching the control room.

Loss of visibility in the control room could mean compressor stations and meter stations need to be manned with commands (such as valve closures or engine starts) undertaken on site, introducing additional expenditure and the potential for unnecessary disruption.

1.6.2.2 Cost assessment

We estimate the cost for Option 2 will be in excess of Option 1. It is reasonable to assume that unit rates for replacement of servers would increase as it would be done in an emergency (corrective) scenario. It is also reasonable to expect that operating unsupported software could also introduce additional costs, with the potential for a security threats and system instability increasing.

1.6.2.3 Risk assessment

Table 0.11 shows that replacing on failure in AA5 does not 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.12: Risk rating impact - Option 2

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

Specifically, the major risks to DBP, Reputation and Asset Damage identified in 1.5 above remain.

1.6.3 Option 3 – Proactively replace consistent with the AMP

Under this option, we would replace 4 servers per year in line with warranty period expiration and complete a major software upgrade in 2024 as required by the software provider. This reflects the volume and associated expenditure identified by the AMP and manufacturer's guidelines. It also aligns with good industry practice and ensures service level agreements in place with providers can be relied upon to deliver spare parts and ensure availability of service agents when needed.

1.6.3.1 Achievement of objectives

Table 0.10 outlines how proactive replacement will support the achievement of our vision objectives in AA5.

Table 0.13: 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	Y
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

This option does deliver against our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient, as it replaces and upgrades SCADA hardware and software in a planned and proactive way to support the 24/7 remote control of the DBNGP from Perth also ensuring that effective, safe and reliable operations is maintained.

1.6.3.2 Cost assessment

With this option, the total cost incurred in AA5 is $1.9 million.

The planned nature of replacements, aligned with the AMP, good industry practice, manufacturer's and support vendors guidelines allows us to accurately forecast costs and achieve optimal unit rates for hardware replacements and software support.

1.6.3.3 Risk assessment

Table 0.11 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 0.14: Risk rating impact - Option 3

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

1.7 Summary of Cost/Benefit Analysis

Table 0.15: Summary of Cost Benefit analysis

Option	Objectives	Cost	Risk
Option 1 – Undertake volume and activities consistent with the AA4 program	This option does not achieve our objective of delivering for customers, being a good employer or sustainably cost efficient	$1.8m	This option does not adequately address the high risks to DBP, Reputation and Asset Damage
Option 2 – Move to replacement on failure policy	This option does not achieve our objectives of delivering for customers, being a good employer or sustainably cost efficient	>$1.8m	This option does not adequately address the high risks to DBP, Reputation and Asset Damage
Option 3 – Proactively replace consistent with the AMP	This option achieves our objectives of delivering for customers, being a good employer and sustainably	$1.9m	This option appropriately addresses the high risks to DBP, Reputation and Asset Damage and is considered ALARP

1.8 Proposed solution

1.8.1 Why are we proposing this solution?

Option 3 to proactively replace consistent with the AMP is the recommended option due to its alignment with our Operational Risk Framework, asset management principles and the Safety Case, the conditions of our operating licence and accepted good industry practice.

Option 1 to undertake the same volume and activities as AA4 does not support the SCADA software upgrade. This would mean we would be operating within an unsupported SCADA software environment, increasing the likelihood of system bugs or even malicious penetration which could cause interruptions to safety, reliability, throughput and performance information reaching the control room.

Option 2 to move to a replacement on failure policy could result in catastrophic failure of an asset due to poor or no visibility of important information and data from remotely located assets, which would result in loss of revenue as well as reputational impact should a failure result in an inability to meet our contractual obligations to our customers.

1.8.1.1 Consistency with the National Gas Rules

Rule 79(2)(c)

SCADA assets are relied upon to feed information from our assets back to the control centre to support safe and reliable pipeline control and monitoring. Proactive replacement of SCADA servers and upgrade of associated software in line with their respective useful lives is required to maintain and improve the safety and integrity of services as per NGR 79(2)(c)(i) and (ii).

Rule 79(1)

The proactive replacement of SCADA hardware and software is also consistent with the requirements of Rule 79 of the National Gas Rules, specifically the capital expenditure is:

- Prudent – The project will proactively replace SCADA equipment and upgrade software which has arrived at the end of its useful life. SCADA is key in the operation and monitoring of the DBNGP and hence the proposed expenditure is of a nature that would be incurred by a prudent service provider;

- Efficient – The forecast expenditure is based on the actual unit cost incurred by DBP in the delivery of similar work undertaken in AA4. DBP purchases hardware through a range of vendors based on quotes received. The design and operational delivery of the software upgrade is forecast for completion by the (sole) software provider [redacted]. Therefore, the proposed expenditure is consistent with that a prudent service provider acting efficiently would incur.

- Consistent with accepted and good industry practice – The proposed project follows good industry practice of aligning replacement activity with commitments embedded within the AMP and manufacturer's recommendations therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the replacement program in a proactive, planned and scheduled manner with the most appropriate volume of activity based on useful life and in line with manufacturer's guidance and associated support.

1.8.2 Estimating efficient costs

For all replacements, recent historical actuals are used as the basis for future forecasts. These have all been achieved based on commercially negotiated rates secured in line with our Procurement Policy and Purchasing Procedure.

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.

Project management and installation of servers is undertaken by internal resources. The other activities and supply of required materials will be undertaken by external providers. External resources are [redacted]. Project management of software upgrades is done by internal resources, with related activities and supply of required materials undertaken by external providers. External resources are supplied by [redacted]

Table 0.16 below summarises the total unescalated costs for SCADA in real dollars June 2019.

Table 0.17: SCADA cost estimate

($'000)	2021	2022	2023	2024	2025	AA5
Servers	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Switches	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Software	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**132**	**132**	**132**	**1,132**	**342**	**1,870**

Table 0.18 below summarises the total unescalated costs by cost type. Table 0.19 below shows the escalation applied to escalate the SCADA costs to real dollars of December 2020 including labour cost escalation of 0.69% per annum.

Table 0.20: SCADA cost estimate, by cost type

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	-	-	-	-	-	-
External Contractors/ Consultants	-	-	-	-	-	-
Materials & Services	132	132	132	1,132	342	1,870
Travel & Others	-	-	-	-	-	-
Total cost	**132**	**132**	**132**	**1,132**	**342**	**1,870**

Table 0.21: SCADA total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total cost ($ 2019)	132	132	132	1,132	342	**1,870**
Escalation	3	4	4	38	12	**62**
Total ($ 2020)	**135**	**136**	**136**	**1,170**	**354**	**1,932**

Appendix A – Risk Assessment

Figure 0.3: Summary of SCADA 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	Severe	Frequent	HIGH	125	Trivial	Hypothetical	NEGLIG BLE	1	Major	Hypothetical	LOW	5	Severe	Frequent	HIGH	125	Major	Occasional	HIGH	125	Severe	Remote	LOW	5	386
Option 1 - Maintain AA4 volume of activity and expenditure	Severe	Occasional	NTERMEDIATE	25	Trivial	Hypothetical	NEGLIG BLE	1	Major	Hypothetical	LOW	5	Severe	Frequent	HIGH	125	Major	Occasional	HIGH	125	Severe	Remote	LOW	5	286
Option 2 - Move to a replacement on failure policy	Severe	Frequent	HIGH	125	Trivial	Hypothetical	NEGLIG BLE	1	Major	Hypothetical	LOW	5	Severe	Frequent	HIGH	125	Major	Occasional	HIGH	125	Severe	Remote	LOW	5	386
Option 3 - Proactively replace consistent with the AMP	Severe	Remote	LOW	5	Trivial	Hypothetical	NEGLIG BLE	1	Major	Hypothetical	LOW	5	Severe	Remote	LOW	5	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	46

GEA Control System Replacement Business Case – Capex DBP06

1.1 Project approvals

Table 0.1: GEA Control System Replacement DBP06 – Project approvals

Prepared By	Jignesh Shah, Senior Electrical Control and Instrumentation Engineer
Reviewed By	Hugo Kuhn, Head of Engineering
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project overview

Table 0.2: GEA Control System Replacement DBP06 – Project overview

Description of issue/project	This business case considers the capital replacement program of eighteen (18) end of life gas engine alternator (GEA) control system assets that were installed during stage 4 and 5 of the DBNGP expansions between 2005 and 2008. GEAs provide power at compressor stations. The GEA control system is a supervisory system that we use to control multiple GEAs, and ensure compressor stations power requirements are being met. There are four different brands of GEA control systems used on the DBNGP. All four brands require replacement approximately every 15 years in accordance with the Asset Management Plan (AMP) and manufacturer recommendations. Once 15 years has been reached, assets are prioritised for replacement via a staged works program. The last major replacement cycle occurred in AA2 and AA3, hence the requirement to replace these assets again falls predominantly over AA5 and AA6. If GEA control systems fail, it can result in the shut down and isolation of compressor sites, with no site power. It also means we cannot receive site information or performance data. Restoration of the site may take weeks to months, depending on fault finding and replacement equipment availability. The current GEA control systems use obsolete control system hardware. The legacy architecture severely restricts effective integration into our compressor station control system, leading to loss of event history. The inability to create history logs in the existing system results means we cannot retain critical data on faults and performance, which are required for failure analysis. An independent FEED study conducted in 2012 recommended that GEA power management systems be standardised, with the same equipment being installed across all GEAs. This will simplify and optimise future asset management, while also improving equipment power management, saving fuel and reducing emissions. Rather than initiating replacements at the time of the FEED study recommendation in 2012 and therefore prior to the various units' end of life, we decided to maximise our initial investment in the GEA assets, and commence the replacement/standardisation program once the assets reach their end of life. That time has now arrived, with all the Stage 4 and 5 GEA control and power management systems due to be replaced and standardised by the end of the AA6 period.
Project name	GEA Control System Replacement
Estimated cost	Total forecast capex for the AA5 period is $8.1 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 – Upgrade all unit control systems to the latest version by end of AA5 ($12.2 million);

	• Option 2 – Move to a replacement on failure policy for all systems ($12.2 million); • Option 3 – Scheduled replacement as per the AMP ($8.1 million) (this is the recommended option).
Variation from AA4	The proposed AA5 expenditure is $7.6 million (real 2019) more than the actual expenditure incurred on GEA control systems during AA4 ($462,000). There was an allowance of $5.8 million (real 2019) in AA4 for GEA controls, allowing for upgrades and rationalisation projects. However, the majority of GEA expenditure during AA4 was deferred to allow resources to be focused on other emerging priorities across the broader capital works program. The $462,000 that was incurred needed to replace key components the GEA at CS8, which was experiencing deterioration in performance. We were able to defer most of the AA4 works by using obsolete spares that have been recovered from other units. This has provided a temporary fix. However, this short term reactive approach is not a sustainable strategy for AA5.
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the proposed asset replacement, proactive works and upgrade program is consistent with accepted good industry practice, several practicable options have been considered, and market/unit rates have been tested to achieve the lowest sustainable cost of providing pipeline services. **NGR 79(2)** - GEAs provide primary power at compressor stations. They are controlled remotely and switched on and off to meet the immediate power needs of the compressor station in support of the gas requirements of our customers. The control systems monitor the performance and operating conditions of the GEAs, with automated fail-safe procedures in place should any abnormal, adverse or extreme conditions be detected. Therefore, the proposed expenditure on the replacement of GEA control systems is required to maintain and improve the safety and maintain the integrity of services as per NGR 79(2)(c)(i) and (ii). **NGR 74** – the forecast costs are based on the latest market rate testing, and project options consider the asset management requirements as per the latest Asset Management Plan. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Stakeholder engagement	Our Shippers advised 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 GEA control system replacement program will continue to replace GEA control systems as they reach end of life to ensure they are reliable, control processes accurately and protect equipment in the case of abnormal conditions such as fire. During shipper roundtables, we presented key areas of planning, including proposed capex and opex. Shippers were broadly comfortable with both the approach and high-level program in AA5. We then outlined our proposed capex in our AA5 Draft Plan. There were no questions specifically raised in relation to GEA unit control systems. In response to shippers' general interest in key areas and drivers of increased spend, and how we deals with changing business needs during an AA period, this business case outlines: • reasons for changes in expenditure between AA4 and AA5, and • what approaches 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: • Asset Management Plan General (TEB-001-0024-07) • Asset Management Plan – Electrical Control and Instrumentation (TEB–001–0024-05) • Risk Management Policy and Operational Risk Model (together our Risk Management Framework).

1.3 Background

GEAs are used to provide reliable power at compressor stations. The GEA control systems are the 'brains' of these units, therefore it is important the control systems are fit for purpose and do not fail.

The GEA control systems are linked to our station control system, and allow us to activate units in a structured manner and start up the compressors remotely when required. If the control systems fail, then the GEA will not start and there will be insufficient AC power to start the compressor units. If the GEAs fail when the compressor is running, the compressor units are designed to shut down safely. GEAs also provide AC power to supply all equipment and buildings at the compressor stations.

GEA control systems protect the GEA, its environment and the people who work on or otherwise engage with or near the GEA. GEA control systems monitor the GEAs and in the event of an adverse condition or identification of an incident, ensure the GEA is safely shut down or returned to a safe and stable state. Having accurate and consistently reliable GEA control system data enhances the controllability and operability and ultimately improves the stability of the DBNGP compressor station power generation and power management systems.

There are four different types of GEA control systems currently in use on the DBNGP:

- [redacted] control systems for GEA Waukesha engines
- [redacted] control systems for GEA Deutz engines and GEA Waukesha engines
- [redacted] control systems for GEA Waukesha engines
- [redacted] control systems for DEA Cummins engines

For all four, a replacement cycle of 15 years is recommended by the AMP as well as the respective manufacturers. Replacement of a GEA control system includes replacing the control panel, including HMI, fire and gas system, programmable logic controller, relays, isolators, push buttons and any other items requiring replacement as per the OEM recommendations.

Within the DBNGP, there are 25 fixed GEAs, four fixed diesel engine alternators (DEAs) and one transportable DEA. Eighteen (18) of the GEAs and DEAs are reaching their 15-year replacement cycle during the AA5 period, with a further nine due for replacement in AA6.

Unlike all other GEAs the GEA at Dampier is used as standby power to the grid power provided by [redacted] and therefore is not critical for remote control. The [redacted] control system of the unit was installed in 2007 will be replaced on failure as the grid network is reliable. The transportable DEA located at CS9 and its control will be replaced as required.

The proposed replacement activities for GEA control systems are presented in Table 0.3.

Table 0.3: Replacement activities for GEA control systems

Facility	Unit	Manufacturer	Initial installation	Last replaced	AMP Replacement	Age when replaced
Dampier	1	[redacted]	2007	n/a	On failure	>14
CS01	1	[redacted]	1991	2010	2023	13
CS01	2	[redacted]	1991	2010	2023	13
CS01	3	[redacted]	2006	n/a	2025	19
CS02	1	[redacted]	1997	2011	2026	15
CS02	3	[redacted]	2006	n/a	2025	19
CS02	4	[redacted]	1999	2010	2025	15
CS03	1	[redacted]	1991	2010	2024	14
CS03	2	[redacted]	1991	2010	2024	14
CS03	DEA/1	[redacted]	1991	2010	2025	15
CS04	1	[redacted]	1997	2011	2026	15
CS04	2	[redacted]	1991	2006	2021	15
CS04	3	[redacted]	2006	n/a	2026	20
CS04	4	[redacted]	1999	2010	2026	16
CS05	1	[redacted]	1991	2010	2024	14
CS05	2	[redacted]	1991	2010	2025	15
CS05	DEA/1	[redacted]	1991	2010	2025	15
CS06	1	[redacted]	1997	2011	2026	15
CS06	2	[redacted]	1997	2011	2026	15
CS06	3	[redacted]	2006	n/a	2026	20
CS07	2	[redacted]	2006	n/a	2021	15
CS07	3	[redacted]	2006	-	2024	18
CS07	4	[redacted]	2006	-	2024	18
CS08	1	[redacted]	1991	2010	2023	13
CS08	2	[redacted]	2006	2017	n/a	>13
CS09	1	[redacted]	1997	2011	2026	15
CS09	2	[redacted]	1997	2011	2026	15
CS09	DEA/1	[redacted]	1997	2009	2024	15
CS10	DEA/1	[redacted]	2000	2008	2024	16
Transportable DEA	1	[redacted]	n/a	- 2011	2026	15
AA5 scheduled replacements = 18						**Average of 15 years**
AA6 scheduled replacements = 9 (excluding transportable DEA)						

The proposed AA5 replacement program for GEA control systems will not only replace the end of life assets currently in place, but will also transition to a standardised power management system for all GEA control systems.

The standardised power management system program is in line with the recommendations of a FEED study undertaken in 2012 [redacted]. The current power management systems were identified as having older control system hardware which has become obsolete. The legacy architecture was also identified as severely restricting effective integration into the compressor station control system, leading to loss of event history.

The FEED study recommended our GEA control systems should all use the same technology, with a standardised control system. With standardised and integrated systems, control and system stability will be optimisd, while the ability to generate deep analytics will be significantly increased. This will allow us to monitor GEA performance more closely and identify when proactive intervention (or replacement) is required.

1.4 AA5 forecast

In AA5, a total of 18 GEA control systems are forecast for replacement in AA5 at a total cost of $8.1 million.

Table 0.4: AA5 forecast units and expenditure, $'000 real 2019

Replacement ($'000)	2021	2022	2023	2024	2025	AA5
Replacement units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Replacement unit rate	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Program total	**900**	**-**	**1,350**	**3,150**	**2,700**	**8,100**

Table 0.5 shows the individual assets identified for replacement.

Table 0.5: AA5 and AA6 replacement program

System type	2021	2022	2023	2024	2025	2026
[redacted] control system for [redacted] engines (7 units)			CS1 GEA1&2 CS8 GEA1	CS3 GEA1&2 CS5 GEA1	CS5 GEA2	
[redacted] control system for GEA [redacted] engines (6 units)						CS2 GEA1 CS4 GEA1 CS6 GEA1&2 CS9 GEA1&2
GE control system for GEA [redacted]- 250KW engines (2units)	CS4 GEA2 CS7 GEA2					
ESM control system for GEA [redacted] engines (8 units)				CS7 GEA3&4	CS1 GEA3 CS2 GEA3&4	CS4 GEA3&4 CS6 GEA 3
[redacted] control system for DEA [redacted] engines (4 units)				CS9 DEA CS9 Temp DEA	CS3 DEA CS5 DEA	
Total	**2**	**-**	**3**	**7**	**6**	**9**

1.4.1 AA4 variance

The proposed GEA controls system replacement program for AA5 is $7.6 million higher than capital expenditure incurred on GEA systems during AA4. However, the scope of work for the AA5 period is significantly greater than in AA4, and will address a different family of assets (Stage 4 and 5 GEA control systems).

During the AA4 period, a capital program of around $5.8 million on a range of GEA and energy management systems was forecast. However, due to emerging priorities elsewhere, and further assessment of short-term asset performance, we were able to prudently defer most of the GEA program and reallocate resources to other programs.

Table 0.6 shows the variation between AA4 actuals and the amounts approved in the AA4 Final Decision.

Table 0.6: AA4 actual v approved ($'000)

Actual v budget	2016	2017	2018	2019	2020	AA4
AA4 actual	26	436	-	-	-	462
AA4 approved	868	882	1,168	1,442	1,415	5,775
Variance	**842**	**446**	**1,168**	**1,442**	**1,415**	**5,313**

The decision to extend the life of assets in the short term was based on their in service and support performance coupled with the risk ranking model. The deferred GEA works from the AA4 period are being delivered as part of the broader AA5 capital program.

One GEA systems project was undertaken during the AA4 period, at a total cost of $462,000. During our review of GEA system performance and risk, we identified that the risk of failure at CS8 was high and that the GEA was experiencing deteriorated performance. We therefore determined the CS8 GEA works could not be deferred, and replaced a number of critical components.

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

Figure 0.1: 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 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'.

Six areas are considered for each type of risk:

1. DBP – corporate/financial risk
2. People – safety risk to the public and employees
3. Environmental – risk of adverse impact on environment/local ecosystems
4. Reputation/Outrage – risk of customer anger and DBP reputational damage
5. Asset Damage – dollar impact on assets
6. Supply – risk of supply interruption to customers

The untreated risk rating associated with GEA control systems is presented in Figure 0.2.

Figure 0.2: Untreated risk rating – GEA control systems

	Trivial	Minor	Severe	Major	Catastrophic
Frequent		Outrage			
Occasional			DBP		
Unlikely		Asset Damage Supply	People		
Remote		Environmental			
Hypothetical					

Negligible	Low	Intermediate	High	Extreme

The replacement of GEA control systems are a requirement of the AMP and the AMP – Electrical Control and Instrumentation, in order to appropriately manage the inherent risk associated with the core functions of these assets.

Table 0.7 shows the untreated risk for each risk area.

Table 0.7: Risk assessment

Risk area	Untreated
DBP	Intermediate
People	Intermediate
Environmental	Negligible
Reputation/Outrage	Intermediate
Asset Damage	Low
Supply	Low
Overall rating	**Intermediate**

Failure to appropriately plan for the replacement of GEA control systems poses the following risks:

- **DBP** – failure in the GEA system results in the station shutting down and rendering compressor sites non-operational. Impacts the effective operation of the DBNGP, and poses unacceptable costs to DBP. More critical sites such as CS8, CS9 and CS10 will have an immediate impact on customer demands.

- **People** – interrupt power supply to the accommodation and other buildings at the affected compressor station. Staff will have to relocate to other sites or temporary power supply will have to be brought in to provide temporary power to the accommodation building while the system is repaired.

- **Reputation/Outrage** – the Control Room will lose control of the site resulting in zero visibility with no remote access. The Control Room will not able to remotely start or operate the compressor unit as loss of AC and hence DC power will essentially remove the effectiveness of the station to despatch the required capacity from this station to meet customer demands. Rendering the station out of service poses unacceptable risks to continuity of supply and the efficient management of safety hazards and emerging risks on remote sites. Resulting supply and/or power interruptions on site are likely to cause complaints and anger as the DBNGP is unable to accept shipper nominations to their producers. Producers will have to change their production process or worst-case vent gas if they cannot store or divert elsewhere in their system. System wide failures and hence unreliable operation will cause uncertainties for producers and shippers will be required to revert to their alternative fuels.

- **Asset Damage** – impacted equipment at the compressor stations would have been shut down and gas vented as per emergency shut down procedures. Inadequate power can cause equipment damage, particularly post lubrication of units while the equipment is shut down safely. The impressed current system that provides cathodic protection to below ground station pipe and the mainline upstream and downstream will cease to operate.

- **Supply** – inability to run the compressor station will result in supply interruption both for the shippers as well as producers who can't export their gas into the DBNGP. These events will lead to contractual breaches for failure to supply Shippers with their contracted capacities. The compressor station will remain isolated and bypassed as the main line flow is redirected outside of the station using the emergency bypass line. Restoration can only be done by responding to site to activate power commencing with the recommissioning of fuel gas to the GEAs, repairing/replacing the fault and starting up the GEAs manually, re energising the rectifiers to charge the batteries and the Station Controls to revert all equipment ready for operation. Allowing this type of event to occur is unprecedented in the operation of the DBNGP and undermines all intents designed to avoid such consequences. The outage may last for weeks, or months, depending on the availability of equipment and/or spares.

1.6 Options considered

Several options for volumes of replacement for the GEA control system replacement for the AA5 period have been considered:

- Option 1 – Upgrade all unit control systems to the latest version by end of AA5;
- Option 2 – Move to a replacement on failure policy for all systems;
- Option 3 – Scheduled replacement as per the AMP (this is the recommended option).

These options are discussed in the following sections.

1.6.1 Option 1 – Upgrade all unit control systems to the latest version by end of AA5

With this option, the GEA control system replacements from 2023-2026 would be accelerated, with an additional replacement for Dampier, so that all replacements were delivered within the AA5 period.

This would allow standardisation of power control across the DBNGP and a realisation of system benefits from 2025 onwards. This would result in the replacement of 28 GEA control systems in AA5.

1.6.1.1 Achievement of objectives

This option would achieve objectives in terms of system reliability and safety, as the identified risks associated with the GEA controls would be addressed.

However, this option is not the most sustainably cost efficient as it replaces 9 GEA control systems earlier than their end of life, and the Dampier GEA would be replaced proactively rather than on failure.

This strategy would not align to the AMP in fully utilising existing assets and replacing infrastructure at the most prudent time to do so, which in this case is to upgrade at the end of life of the existing assets. Although there are diminishing spares and obsolete equipment, we consider that during AA5 we can manage the risks associated with the 9 GEA systems scheduled for replacement in AA6, without compromising the standards of service required by customers.

Table 0.8: Alignment to vision objectives – Option 1

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	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

1.6.1.2 Cost assessment

With this option, expenditure of $4.05 million currently forecasted for AA6 would be brought forward into AA5, and would therefore increase the overall forecast for the project to $12.2 million.

The economies of scale achieved in delivering ten additional sites, compared to the 18 forecast in the preferred option, would have a negligible impact on the unit rates, with the rates of replacement in the years 2024 and 2025 providing an achievable level of replacement going into AA6 for the remainder of the works program.

1.6.1.3 Risk assessment

Table 0.9 shows the residual risk associated with GEA control systems under Option 1.

Table 0.9: Risk assessment – Option 1

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

1.6.2 Option 2 – move to replacement on failure policy for all GEA control systems

With this option, the volume of GEA control system replacements undertaken in the AA5 period would be directly driven by the number of breakages/outages experienced on these assets, with a reactive rather than proactive approach to the overhaul management.

While it is not possible to predict with accuracy the number of failures that will occur over the next five years, given many assets are approaching their 15 year replacement cycles during the AA5 period, the likelihood of failure is expected to be higher than during AA4 if not treated proactively. Given the higher cost of reactive replacement compared with proactive replacement (potentially two to five times higher per asset depending on asset type and location), the potential cost of works during AA5 is significantly greater than the proposed works program if widespread asset failure arises.

Should asset failure be lower than expected, though the overall cost of reactive GEA control system replacements may be less than forecast, the replacement program identified in the AMP would not be delivered in full. The program identified in the AMP is the prudent level of activity required to manage the integrity and reliability/performance risk associated with GEA assets. Therefore the risks identified would not be addressed.

Neither of these outcomes are tolerable for us and our customers. An entirely reactive 'replace on failure' approach to managing GEA control systems is not consistent with good asset management practice, and therefore not consistent with NGR 79(1)(a).

1.6.2.1 Achievement of objectives

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. As 27 of the 28 GEA control systems are integral to power supply at compressor stations, including to power gas turbines, this option is not consistent with delivering for our customers and customer service.

A replace on failure option could also impact throughput and contracted supply obligations. It would also increase frequency of remote travel to address ad-hoc failures occurring, which is considered one of the highest risk activities on the DBNGP.

Unplanned availability of compressor units may also require changes to the pipeline operation that do not represent an optimised case for the level of supply and demand. This would result in extra fuel gas consumption and costs, which would not have been incurred had the units been available.

Further, entirely reactive replacement is not consistent with good asset management practice and is not sustainably cost efficient.

Option 2 also does not align to our contractual obligations of 98% reliability for gas supply.

Table 0.10: Alignment with vision objectives – Option 2

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	-

1.6.2.2 Cost assessment

With this option, the unit costs incurred would almost certainly be higher. Corrective activities are likely to incur higher costs than planned alternative due to:

- additional travel costs (planned activities allow us to share travel costs across different activities at the same location);

- increased likelihood of overtime and shift penalties (planned activities allow us to optimise staff rostering);
- additional costs for expediated freight; and
- additional costs for removing crews from other planned work to address a corrective maintenance requirement and then remobilising to complete the previous planned work.

We may also incur unplanned operating expenditure, as failures could lead to interruption to supply and associated contract delivery breaches. Interruption to supply to major industrial sites could result in a refund of [redacted] and does not include any cost related to damage to customers' plant due to loss of gas supply.

While it is not possible to estimate precisely how many asset failures will occur during the AA5 period, broad cost estimate can be developed based by escalating the cost of the proposed works program if delivered reactively. It is a generally accepted asset management principle that delivery of works reactively is significantly more expensive that undertaking proactive or preventative works. Various sources cite the increase in reactive costs compared with proactive can be between two and five times[11] more than undertaking the same works proactively.

For the DBNGP the cost escalation for reactive vs proactive works varies depending on the type (and scarcity) of asset being replaced, as well as the remoteness of the asset from the Perth Metropolitan area.

Taking a conservative approach, if we assume a weighted average increase of only 1.5 times the material and labour/contractor costs if the work program were to be undertaken entirely reactively[12], we estimate the GEA replacement works program would cost approximately $12.2 million to deliver.

In any event, costs associated with a predominantly replace on failure works program would not *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 providing services.*[13]

[11] Marshall Institute, Omega engineering, ARMS reliability.

[12] This is a rule of thumb estimate, noting that some aspects of the compressor program would be undertaken reactively anyway, and assuming that in this scenario 'proactive' maintenance works are all undertaken as assets/components fail.

[13] NGR 79(1)(a)

1.6.2.3 Risk assessment

Table 0.11 shows the residual risk associated with GEA control systems under Option 2.

Table 0.11: Risks assessment – Option 2

Risk area	Untreated	Treated risk
DBP	Intermediate	Intermediate
People	Intermediate	Intermediate
Environmental	Negligible	Negligible
Reputation/Outrage	Intermediate	Intermediate
Asset Damage	Low	Low
Supply	Low	Low
Overall Rating	**Intermediate**	**Intermediate**

By moving to replacement on failure for all GEA control systems, none of the identified risks to DBP, People, Reputation/Outrage, Asset Damage and Supply are mitigated. This is inconsistent with our Operational Risk Framework.

1.6.3 Option 3 – Scheduled replacement as per AMP

With this option, the volume of GEA control system replacements undertaken in AA5 would be based on the criteria identified in the AMP, and supported by the manufacturers' guidelines. The replacements would appropriately stage based on priority and optimised delivery in line with existing resourcing capability.

1.6.3.1 Achievement of objectives

This option would address all of the assets which need to be replaced in the period due to arriving at end of life, minimising risk associated with a potential failure and any subsequent potential impact on the quality (accuracy and timeliness) of data available to support decisions relating to the pipeline. It will also allow standardisation in power control and management across the entire system by 2027.

This option achieves our vision objectives of delivering for customers (in term of public safety and reliability), being a good employer (in terms of health and safety) and is sustainably cost efficient (in terms of working within industry benchmarks).

Table 0.12: Alignment to vision objectives – Option 3

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	-

1.6.3.2 Cost assessment

A total of 18 GEA control systems would be replaced at a total cost of $8.1 million.

The unit rates for planned replacements is estimated as $0.45 million. This comprises $0.05 million labour, $0.2 million materials and $0.2 million external contractors.

1.6.3.3 Risk assessment

Option 3 represents the lowest residual risk, as it is targeting the individual assets in line with the in service experience and the AMP. By adopting a proactive, planned approach to replacement for these assets, we can best manage the efficient delivery of the program, minimising the need for unplanned and disruptive repair work on the system, which can result in compressor station outage.

Table 1.13: Risk assessment – Option 3

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

1.7 Summary of cost/benefit analysis

Table 0.13 presents a summary of how each option compares in terms of achieving our objectives, the estimated cost, and the residual risk rating.

Table 0.13: Summary of cost/benefit analysis

Option	Achievement of objectives	Estimated cost	Treated residual risk rating
Option 1	This would achieve safety objectives, but compromise reliability objectives in the short-term, is not the most sustainably cost efficient, nor does it meet industry standards	$12.2m	Intermediate
Option 2	This would fail to achieve safety and reliability objectives or meet industry standards	$12.2m	Low
Option 3	This is the only option which supports the achievement of objectives and meets industry standards	$8.1m	Low

1.8 Proposed solution

1.8.1 Why is the recommended option prudent?

Option 3 is the recommended solution due to its alignment with our Risk Management Framework, asset management principles and the relevant manufacturers' specification. It supports our vision and values and delivers for our customers on public safety, reliability of performance and customer service.

Failure to proactively plan for the replacement of GEA systems at compressor station assets could result in catastrophic failure of an asset which would result in loss of through-put, unreliable AC power generation on site, excessive operating expenditure and impact on reliability and the ability to meet contractual obligations.

Failure of GEA systems would also remove visibility of site operations from the control room. This would put the site at risk from events such as fires, whereby there would be no knowledge of the fire in real time and therefore no ability for an effective response.

Although Option 1 would result in the benefits of the project being realised sooner, the approach does align with good industry practice in replacing assets in advance of their full asset life where the current risks can be managed over the short term.

Option 2 is forecast to be more expensive, however regardless of the costs, taking a replace on failure asset management approach for ageing assets would not be aligned to regulatory rules, in particular 79(1) "*as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice*…"

1.8.1.1 Consistency with the National Gas Rules

Option 3 is the proposed solution and recommends that we proceed with the replacement of the assets in line with AMP and manufacturer's guidelines.

Rule 79(2)(c)

The GEA control systems replacement program is required to maintain or improve the safety of services and maintain the integrity of services consistent with NGR 79(2)(c)(i) and (ii). GEAs provide primary power at compressor stations and are automatically controlled to adjust to the power needs of the station, including the accommodation facilities and the gas turbines demand.

The control systems also monitor the performance of the GEAs and in the event of an adverse condition or identification of an incident, ensure the GEA is safely shut down or returned to a safe and stable operating state.

Further, standardised power control across the system will improve data on performance and event history of the GEAs, which supports efficient operational and asset management decisions going forward.

Rule 79(1)

The option is also consistent with the requirements of NGR 79(1)(a). Specifically, we consider that the capital expenditure is:

- Prudent – The project is based on the replacement of an existing asset which has arrived at the end of its useful life. 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 the actual unit replacement cost incurred in the replacement of similar unit control system. The unit rates reflected in the AA5 forecast reflect the most recent similar work undertaken in AA3. 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 project follows good industry practice by standardising systems for GEA control and aligning replacement activity with commitments embedded within the AMP and manufacturer's recommendations. Therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the replacement program in a proactive, planned and scheduled manner with the most appropriate volume of activity based on useful life and in line with manufacturer's guidance and associated support.

NGR 74

NGR74(2) requires that a forecast of estimate:

a) must be arrived at on a reasonable basis; and
b) must represent the best forecast or estimate possible in the circumstances.

The forecast costs in this business case are based on the latest market rate testing, and project options consider the asset management requirements as per the latest AMP. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

1.8.2 Estimating efficient costs

As noted in the Final Plan Attachment 8.7 - Cost Estimation Methodology, the unit rate for the replacement GEA control systems includes the internal labour, external labour and materials/other costs forecast.

As the program is relatively new, the forecast is based on the most recent (and only) replacement undertaken to date, which was the replacement of the GEA 2 at Compressor Station 8 completed in 2017.

Equipment will be supplied by the various manufacturers, with the OEMs directly engaged.

The installation will be done by a third-party service provider, who will be engaged following a commercial process to identify the most appropriate provider from a commercial and technical experience perspective.

Table 0.14 presents a breakdown of the turbine control system upgrades program by cost category. Table 0.15 provides the cost escalation applied to December 2020 and includes labour cost escalation of 0.69% per annum.

Table 0.14: GEA control system replacement cost estimate, by cost category

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	88	-	132	308	264	792
Contractors / consultants	334	-	501	1,168	1,001	3,004
Materials & services	475	-	713	1,663	1,425	4,276
Travel & other	3	-	4	10	9	26
Total	**900**	**-**	**1,350**	**3,150**	**2,700**	**8,100**

Table 0.15: GEA control system cost estimate ($'000 real 2020)

	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	900	-	1,350	3,150	2,700	8,100
Escalation	23	-	42	106	98	269
Total escalated ($ Dec 20)	**923**	**-**	**1,392**	**3,256**	**2,798**	**8,369**

Appendix A – Risk assessment

Figure 0.3: Summary risk assessment - GEA controls

	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	Severe	Occasional	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	Minor	Remote	NEGLIGIBLE	1	Minor	Frequent	INTERMEDIATE	25	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	86
Option 1 - Upgrade all unit control systems to the latest version in AA5	Severe	Unlikely	INTERMEDIATE	25	Severe	Remote	LOW	5	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	34
Option 2 - Move to a replacement on failure policy	Severe	Occasional	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	Minor	Remote	NEGLIGIBLE	1	Minor	Frequent	INTERMEDIATE	25	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	86
Option 3 - Do the volume that AMP has identified as required (upgrade as obsolete)	Severe	Remote	LOW	5	Severe	Remote	LOW	5	Minor	Remote	NEGLIGIBLE	1	Minor	Unlikely	LOW	5	Minor	Remote	NEGLIGIBLE	1	Minor	Unlikely	LOW	5	22

Compressor Station Accommodation – Capex DBP07

1.1 Project Approvals

Table 0.1: Compressor Station Accommodation DBP07 – Project approvals

Prepared By	Henry Muharemovic, Head of Mainline - Transmission Operations
Reviewed By	James Smith, GM Transmission Operations
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 0.2: Compressor Station Accommodation DBP07 – Project overview

Description of Issue/Project	This business case covers the refurbishment of compressor station accommodation which are located within the DBNGP compressor station compounds. The compressor stations are located in remote areas and, because of the distance involved and the amount of time and costs that would be spent in travelling to and from the sites, accommodation is provided onsite. The accommodation units provide a space within the compressor station where personnel can sleep, eat, and recuperate. It can also provide essential respite for those employees exposed to high noise levels and excessive heat during their working day. Excessive noise and heat within the accommodation area can have an adverse impact on recuperative activities and thereby affect the health and welfare of employees. This can lead to lower performance and productivity as well as potential safety issues, particularly when noise affects sleep or communication. Therefore, controlling noise levels within accommodation areas is essential in providing a safe and healthy environment for employees. Furthermore, many existing accommodation units are nearing the end of their useful life and it is anticipated that by 2021 it will be inefficient to incur the increased maintenance cost without appropriate capital investment. This project provides for all Compressor Station Accommodation units to be progressively refurbished in order to: • Improve the safety of the accommodation units by reducing noise and heat exposure for personnel; • Bring the facilities into contemporary standards consistent with our obligations under the Petroleum and Pipeline Act 1969 (WA), good industry practice and provide a private and fit for purpose environment for staff who are required to stay onsite to complete maintenance, repairs and operational work; and • Increase the safety and security of the accommodation by reducing the ability of snake and vermin access to accommodation units.
Project Name	Compressor Station Accommodation
Estimated Cost	Total forecast capex for the next Access Arrangement (AA5) is $5.0 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 – Continue to operate existing accommodation without investment or upgrade ($0.5 million) • Option 2 – Refurbish existing accommodation ($5 million) (this is the recommended option); and • Option 3 – Install new accommodation ($16.3 million)

Variation from AA4	The forecast expenditure for AA5 is 46% or \$2.7 million more than the forecast expenditure in the current Access Arrangement (AA4) of \$2.3 million. The reasons for the increase in AA5 are: • Continuing/completing the refurbishment of accommodation at all compressor stations over a 10 year period which is expected to end by 2025; • The accommodation facilities need renovating and the structural integrity needs to be checked to ensure the high velocity winds that they sustain are not gradually weakening the structures. Additional to this the sealing of the structure to outside snakes and vermin needs to be improved to maintain adequate amenities for the safety and health of all members of the workforce; and • While this paper talks about accommodation facilities it will also support the other buildings on site that need refurbishment.
Consistency with the National Gas Rules (NGR)	NGR 79(1) – The proposed expenditure for compressor station accommodation in AA5 will bring the accommodation up to modern standards, ensure structural integrity and address key noise, heat and pest issues which impact the health and safety of employees. Where possible forecast costs are based on historical actual costs for similar work. The investment will also curb the increasing operating costs associated with maintaining aged accommodation units. Therefore the proposed expenditure is prudent, efficient and in line with good industry practice to achieve the lowest sustainable cost of delivering pipeline services. NGR 79(2) - The proposed expenditure for accommodation units will maintain and improve the safety of services, maintain the integrity of services and ensure we comply with our obligations for accommodation under the *Pipeline and Petroleum Act 1969 (WA)* as it will: • Remove unnecessary operating costs associated with maintaining ageing accommodation units and refurbishing them as 'fit for purpose' units, thereby improving the overall economic value of the expenditure; • Confirm integrity of existing structures; • Address noise and heat complaints of staff working at compressor stations and along the pipeline, thereby providing a positive economic benefit through reducing the general liability of unsafe work environments; and • Reduce costs associated with high staff attrition as a result of improved working conditions that improve staff retention. Therefore, the refurbishment is consistent with NGR 79(2)(c)(i)-(iii). NGR 74 – Cost assessments have been conducted for each option based on the best information available at the time of developing this business case, including historical actual costs for similar works where possible. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
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 compressor station accommodation program continues the major refurbishments at compressor station accommodation and control room buildings to ensure the health and safety of employees and contractors working along the pipeline. 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 compressor station accommodation. 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) • Risk Management Policy and Operational Risk Model (together our Operational Risk 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 sometimes supported by the relevant manufacturer's warranty and/or maintenance guidelines.

We currently locate our accommodation units within the nine compressor station compounds located along the approximate 1,500 km route of the pipeline. These units are typically utilised at on average 50% occupancy rates and provide accommodation for operational staff and subcontractors whist they undertake necessary operational, maintenance, repair and/or replacement work onsite.

1.3.1 Safety of accommodation (noise and heat)

The current condition and configuration of accommodation is resulting in noise and heat complications for staff who work and stay in the compressor station.

Noise surveys were completed in 2009 and 2010 and are attached as Appendix B. The noise survey found noise levels at all stations are above the maximum levels recommended by AS 2107:2000[14] for the worst affected rooms (i.e. those rooms directly facing plant areas), with noise levels ranging from 41 dB(A) to 45 dB(A). Actions were taken to reduce the noise level at the source including installing silencing material such as mufflers and centralised air conditioning. Even with these actions employees are still experiencing elevated noise levels in the sleeping areas.

Ambient temperatures for six months of the year average about 40-45 degrees Celsius at the compressor stations environs. It is important to provide cool areas for rest breaks to minimise the risk of heat stress.

We have started installing a Heat Index Monitoring temperature device at all compressor sites which will be completed by 2020. This device monitors temperature, moisture content and provides a guide for staff working in the environment on wellbeing by plotting against an index to advise them on the rest and hydration strategies that need to be taken. Due to the harsh conditions our staff need safe refuge from these elements.

[14] AS2107:2000 has now been superseded by Australian Standard 2107:2016 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors. This Standard provides guidance on acceptable noise levels within offices and recommended reverberation times. The standard recommends that private offices a satisfactory noise level of 35 dB(A) and maximum of 40 dB(A).

In accordance with the *Petroleum Pipeline Act 1969* (WA) (Act) Schedule 1, Division 1 cl. 5 accommodation provided to employees forms part of the Occupational Safety and Health requirements of the Act. The Act Schedule 1, Division 2, cl 7 (2) requires:

> *"…..the licensee for a pipeline operation must —*
>
> *(a) provide and maintain a physical environment at the place where the pipeline operation is carried out that is safe and without risk to health;*
>
> *(b) provide and maintain adequate amenities for the safety and health of all members of the workforce engaged in the pipeline operation;"*

Maintaining the safety of our workforce is front and centre in all our activities. When developing our work programs our aim is to do everything we can to meet the legislative requirements and asset management strategies.

Furthermore, the existing accommodation units at CS1, 2, 3, 4, 5 are nearing the end of their useful life. These facilities have been subject to many years of cyclonic activity where building structures have been impacted. CS1 and CS5 were installed in 1991, CS2, CS3, and CS4 were installed in 1984 during the original construction and then in 2004 an additional building was installed adjacent to the accommodation to act as the kitchen facilities.

All the accommodation facilities listed have had demountable buildings installed to cater for the additional staff now required to maintain the facilities. The age of the facilities and the environmental impacts are all contributing to additional maintenance costs. It is anticipated that by 2021 it will be inefficient to incur the increased maintenance cost without undertaking corrective works.

Refurbishment would improve the overall safety by improving the accommodation to protect from excessive noise and heat conditions, as well and reinforce accommodation to ensure it withstands environmental conditions and protects the safety of those accommodated within.

At times shift cycles are introduced to enable quick down time response. The refurbishment program will ensure additional ensuited rooms are upgraded to cater for this.

1.3.2 Industry standard for contemporary accommodation

As noted above, the compressor station accommodation is nearing 40 years old in some sites and is no longer considered to meet industry standards for fly in fly out (FIFO) workers, especially when compared to other FIFO accommodation in Western Australia.

The *Mines Safety and Inspection Act 1994* sets the minimum standard for mining sites FIFO accommodation in Western Australia. These employers are required to provide residential accommodation to ensure that:

- The building is in good repair and separated from noise, heat, dirt and atmospheric contaminants;
- The building is adequately secured to protect the occupants and their belongings;
- Electrical outlets are safe to use and protected by residual current devices where appropriate;
- Hard-wired smoke alarms are installed where practicable;
- Precautions are in place to prevent fires, and portable fire extinguishers are provided and regularly maintained;
- Buildings in cyclonic areas are constructed to cyclone proof specifications;
- People can enter and exit safely, particularly in an emergency;
- There is an emergency evacuation plan and residents are familiar with it;

- There are adequate facilities for showering, handwashing and laundering, along with an adequate number of toilets;
- Clean, cool drinking water is available at a location separate from the toilet area;
- Cooking and refrigeration facilities are adequate and safe to use;
- The building is regularly cleaned;
- If appropriate, hygienic areas are provided for preparing and eating meals;
- Sleeping furniture and fittings are structurally sound and well maintained;
- Occupants are protected from extremes of heat and cold; and
- There is adequate ventilation and lighting.

The above conditions are now standard industry conditions for accommodation facilities across remote locations.

Mental health investigation reports have indicated that the facilities are ageing and do not provide for modern day needs of people. Ensuite rooms are now standard in the industry and the current facilities at compressor stations are communal.

Furthermore, while the 2015 Inquiry into mental health for FIFO workers[15] is not directly comparable to the situation of DBP's employees and contractors, there are findings that can be applied in DBP's situation, including reference to the practice known as "modelling" (or sharing accommodation and facilities on a rotation, not permanent, arrangement) where it "had the potential to increase stress and the sense of isolation in workers".

Further, given the remote location of our compressor stations and the rotating rosters, staff are required to prepare their own meals. Modernised kitchen and recreational facilities, located away from sleeping quarters, would greatly improve the wellbeing of staff while they working at the compressor stations.

Refurbishment of the accommodation to modernize kitchen and recreational facilities (away from sleeping quarters) and provision of ensuite bathrooms would help address the current issues and bring the accommodation in line with current industry standards for FIFO workers.

1.3.3 Safety and security of accommodation (snakes and vermin)

Numerous safety reports as detailed in Table 0.3 below have highlighted that current accommodation configuration results in issues related to vermin and reptiles entering the accommodation facility and living underneath the main accommodation concrete slab.

The risk increases as a result of the remoteness of many of the compressor station accommodation units, as the resultant time to seek medical attention for snake bites increases significantly in remote areas of Western Australia.

[15] Available on https://www.aph.gov.au › House_of_Representatives_Committees › chapter4

Table 0.3: Summary of recent Safety Reports relating to vermin and snakes

Date	Reference	Event Type	Event Subtype	Work group	Description
16-Feb-2019	13323	Incident	Safety	Facilities – Roster B	Snake sighted
26-Oct-2018	13000	Incident	Environment	Tubridigi Gas Storage Operations	Snake sighted
12-Mar-2018	12314	Hazard	Safety	Mainline – B Roster, Hub 2	CS07 – Small snake sighted inside the control room
08-Feb-2018	12225	Hazard	Environment	Mainline – I & S Roster	Alcoa Kwinana Meter Station snake sighted moving between earth ground pit and underneath hut
27-Mar-2017	11345	Hazard	Safety	Mainline – A Roster, Hub 2	Large pile of empty boxes dumped in store room and instrument workshop, home to vermin and creating fire fuel hazard
09-Nov-2017	12019	Hazard	Other	Mainline – A Roster, Hub 2	Accommodation block kitchen under stove floor surfaces uncleaned, containing dead vermin, breeding micro-organisms/bacteria and growing mold
06-Jan-2016	10221	Hazard	Environment	Planning, includes Stakeholder Specialist	Snake sighted by Facilities I & S Building
27-Dec-2015	10208	Hazard	Safety	Mainline – A Roster, Hub 1	Vermin activity increasing
09-Oct-2015	9989	Hazard	Environment	Mainline – A Roster, Hub 2	Snake sighted

Refurbishment would incorporate new technology that can be installed to prevent snake and vermin entering buildings and thus reducing the safety risk for employees. The below Figure 0.1 provides a number of examples of the poor condition of bathrooms within the accommodation area prior to refurbishment and standard after refurbishment.

Figure 0.1: Examples of condition of bathrooms before refurbishment and after refurbishment

1.4 AA5 forecast

In AA5 it is forecast that there will be a total of $5 million spent on our compressor station accommodation refurbishments as shown across the following years in Table 0.4 below.

Table 0.4: Total AA5 expenditure

Forecast spend ($'000s)	2021	2022	2023	2024	2025	Total AA5
CS Accommodation	1,000	1,000	1,000	1,000	1,000	5,000
Total	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**5,000**

The refurbishment activities proposed to be undertaken include:

- Building reinforcement in cyclone prone areas and demountable refurbishment, which accounts for just over half of the value of the program;
- Improved amenity consistent with the recommendations and findings within the 2015 inquiry to promote mentally healthy workplaces; and
- Improved standard of living conditions by making the kitchen, bathroom and bedroom areas more contemporary, functional and private in order to create a mentally healthier workplace.

Table 0.5 below summarise the activities that have occurred in AA4 and are proposed to occur in AA5.

Table 0.5: Summary of accommodation refurbishments by year

Compressor Station	External Fitness	Kitchens, carpets, curtains and painting	Demountable accommodation improvements	Bathrooms
CS1	2018	2018	2022	2015
CS2	2018	2021	2021	2016
CS3	2019	2020	2022	2015
CS4	2019	2020 and 2021	2023	2016 and 2017
CS5	2019	2018 and 2019	2023	2013
CS6	2019	2019	2024	2016 and 2017
CS7	Nil Required	Nil Required	2024	2016 and 2017
CS8	2018	2018	2025	2016 and 2017
CS9	2018	2022	2021	2016 and 2017

1.4.1 AA4 comparison

A total of $2.4 million will be spent directly on accommodation facilities in AA4 as detailed in Table 0.6. This includes:

- $0.3 million to refurbish bathrooms and toilets at CS4, CS6, CS7, CS8 and CS9;
- $1.2 million to refurbish kitchens at CS1, CS3, CS5 and CS8, replace carpet, paint and replace curtains at CS1, CS3, CS4, CS5 and CS8; and
- $0.9 million to build, install and equip external fitness rooms at CS1, CS2, CS3, CS4, CS5, CS8 and CS9.

Also, additional expenditure was incurred which is not directly related to accommodation (and therefore not included in the above), but which enabled us to pursue a more cost effective accommodation solution. These were:

- Upgrade to newer technologies such as silencing material including mufflers, centralised air conditioning and other heat mitigation initiatives at our compressor stations have enabled us to reduce noise and heat at the source, at a cost-effective price; and
- Process safety initiatives for inspection of below ground pipework and interface corrosion inspections within our compressor stations have been introduced as additional controls to reduce the risk of catastrophic failure to ALARP

As an example, the changes made to air intake of Stage 4 units to reduce noise at compressor stations cost approximately [redacted] million per unit, but are not included in the accommodation expenditure.

The original approved scope for AA4 was predicated on shifting the accommodation outside of the compressor stations facilities. The above initiatives, coupled with the fact that acquiring land outside of the compressor stations was far more costly and difficult than initially envisaged, meant we have not achieved the approved allowance for AA4 of $9 million.

Table 0.6: Actual v Approved expenditure

Actual v budget ($'000s)	2016	2017	2018	2019	2020	AA4
AA4 Actual	200	100	1,000	800	300	2,400
AA4 Approved	100	1,400	2,600	2,500	2,400	9,000
Variance	**(100)**	**1,300**	**1,600**	**1,700**	**2,100**	**6,600**

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

Figure 0.2: 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'.Figure 0.2. One element of the risks are rated as high, three as intermediate and one negligible. This results in a high risk ranking for these assets in an untreated scenario.

Figure 0.3: Risk rating – accommodation

	Trivial	Minor	Severe	Major	Catastrophic
Frequent		Environment / Reputation / Outrage			
Occasional			People		
Unlikely				DBP	
Remote					
Hypothetical	Asset Damage / Loss of Supply				

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

Table 0.7 below shows the untreated risk rating for the compressor station accommodation.

Table 0.7: Risk Rating

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

The proposed refurbishment of compressor station accommodation will improve the safety, liveability and security of personnel onsite. Major risks associated with not investing in the refurbishment of accommodation include:

- DBP – Major risk to the effective operations of the DBNGP where we are unable to provide safe and secure accommodation for staff and contractors operating and performing routine maintenance at compressor stations, as well as unacceptable cost impacts related to increased operational and maintenance costs associated with maintaining infrastructure that is beyond its useful life.

- People – Potential for lost time injuries to personnel while working and accommodating on site at compressor stations, either through incident of snake bites, lack of sleep from noise and heat, or mental health related injuries from provision of inadequate amenities onsite.
- Reputation/Outrage – Widespread complaints and anger from employees and contractors lodging at compressor stations and the inability to effectively compete in a constrained resource market, where DBP gains a reputation for accommodation that is below industry standard for FIFO workers.
- Environment – Potential for adverse impact to fauna during relocating fauna (such as snake) to a safe location outside of accommodation area at compressor station.

1.6 Options Considered

A number of options have been considered in relation to improving the accommodation facilities at compressor stations.

- Option 1 – Continue to operate existing accommodation without investment or upgrade
- Option 2 – Refurbish existing accommodation
- Option 3 – Install new accommodation

These options are discussed below.

1.6.1 Option 1 – Continue to operate existing accommodation without investment or upgrade

Under this option DBP would continue to house personnel in existing compressor station accommodation units and undertake reactive and preventative maintenance works consistent with current levels of operating expenditure.

The current levels of operating expenditure at the Compressor Station facilities is $0.078 million.

1.6.1.1 Achievement of objectives

Table 0.8 below outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.8: Achieving Objectives

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

In particular not investing in the existing accommodation facilities is not sustainably cost efficient as the old facilities cost more and more to maintain through ad hoc repairs, creates a wider gap between the standard of accommodation provided to FIFO workers compared with good industry practice (and even across our other sites given some refurbishments completed over the last five years), and does not align with our vision objectives as a good employer as it compromises the health and safety of employees and contractors and jeopardises employee engagement (which in turn can lead to lower performance outcomes impact our operations) and effective retention of skilled staff.

1.6.1.2 Cost assessment

Over the AA4 period we have been able to reduce the operating expenditure from $120,000 per year to its current level of $78,000 per year. Had the refurbishment not commenced then the escalation of the annual operating expenditure would have occurred. To not do anything in AA5 will see these costs begin to escalate again on the basis that the demountable buildings are beginning to increase costs associated with deterioration of the buildings as detailed in Table 0.9 below.

Table 0.9: Capex/Opex Split

($000's)	2021	2022	2023	2024	2025	Total
Capex	-	-	-	-	-	-
Opex	80	90	100	100	120	490
Total	80	90	100	100	120	**490**

1.6.1.3 Risk assessment

As identified in 1.5.1 above, the major risks associated with not investing in compressor station accommodation are to DBP, People, Environment and Reputation/Outrage. None of these risks are mitigated if there is no investment in compressor station accommodation.

1.6.2 Option 2 – Refurbish existing accommodation

This approach assumes that the necessary refurbishment works are undertaken to bring the compressor station accommodation into line with current industry standard for FIFO style accommodation, as well as rectifying the safety related issues for noise, heat and snake exposure.

The refurbishment would include:

- Building reinforcement in cyclone prone areas and demountable refurbishment, which accounts for just over half of the value of the program;
- Improved amenity consistent with the recommendations and findings within the 2015 inquiry to promote mentally healthy workplaces;
- Improved standard of living conditions by making the kitchen, bathroom and bedroom areas more contemporary, functional and private in order to create a mentally healthier workplace; and
- Refurbishment of the demountable accommodation facilities adjoining the main accommodation buildings.

Achievement of objectives

Table 0.10 below outlines how refurbishing the existing accommodation will support the achievement of our vision objectives in AA5.

Table 0.10: 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	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	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

Specifically, the refurbishment of compressor station accommodation aligns with our vision objectives of being a good employer by providing modernized and secure amenities to promote health and safety, employee engagement and skills development (through retention of skilled workforce).

1.6.2.1 Cost assessment

The estimated costs associated with this option total $5.0m for the AA5 period and include costs as shown in Table 0.12 below.

Table 0.13 details the refurbishment expenditure by activity across the AA5 period

Table 0.12: Capex/Opex Split

($000's)	2021	2022	2023	2024	2025	Total
Capex	1,000	1,000	1,000	1,000	1,000	5,000
Total	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**5,000**

Table 0.13: Accommodation refurbishment - cost by activity

Activity	AA5 total
Noise & heat mitigation on the accommodation units	1,000
Building reinforcement in cyclone prone areas and demountable refurbishment.	2,700
Finish kitchen, carpets, curtains, painting and any outstanding bathroom issues	1,600
Total	**5,000**

1.6.2.2 Risk assessment

Table 0.14 below shows that refurbishing the accommodation at the compressor stations in AA5 does 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.14: Risk Rating – Option 2

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

Under the proposed refurbishment program all risks associated with compressor station accommodation are reduced to ALARP by the end of AA5.

1.6.3 Option 3 – Install new accommodation

This approach assumes the construction of new build accommodation at compressor station sites, within the existing compressor compound, or outside where appropriate land can be acquired. Accommodation units would be equipped with all enhancements included in Option 2, such as soundproofing, heat barriers and retaining walls, and would also make provision for individualised accommodation consistent with current industry practice, where each individual suite has an adjoining bathroom.

All common use and recreational facilities would be located at one end of the building, and sleeping quarters at the other, with the aim of located them furthest away from the operational assets that create heat and noise issues. Once new accommodation facilities are commissioned, old facilities will be decommissioned and/or repurposed as suited to each location.

This option assumes further work to find suitable land outside of compressor compounds, and where this proves to be unfeasible, new built accommodation facilities within the existing compressor station compounds.

1.6.3.1 Achievement of objectives

Table 0.15 below outlines how installing new accommodation will support the achievement of our vision objectives in AA5.

Table 0.15: 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	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	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

Specifically, the new build compressor station accommodation aligns with our vision objectives of being a good employer by providing modernized and secure amenities to promote employee health and safety, engagement and skills development (through retention of skilled workforce).

1.6.3.2 Cost assessment

The estimated costs associated with this option total $16.3m for the AA5 period and include:

- $2.5 million per site for construction;
- $0.3 million per site for demolition across five sites; and
- $0.45 mllion pa for annual upgrades/refurbs i.e. to beds, appliances and other furnishing at sights not yet upgraded.

Costs were calculated based on the construction and demolition costs for comparable works at CS9 and are shown in Table 0.16 below.

Table 0.16: Capex/Opex Split

($'000)	2021	2022	2023	2024	2025	Total
Capex	3,250	3,250	3,250	3,250	3,250	16,250
Opex						
Total	**3,250**	**3,250**	**3,250**	**3,250**	**3,250**	**16,250**

1.6.3.3 Risk assessment

Table 0.17 below shows that the construction of purpose built accommodation at compressor stations in AA5 does not modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.17: Risk Rating – Option 3

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

The major risk associated with constructing new accommodation related the following risk area:

- DBP – Increased capital costs to construct new facilities at more than three times the forecast cost under Option 2. There is also a significant risk that additional legal expenses are incurred during protracted land acquisition negotiations.

1.7 Summary of Cost/Benefit Assessment

To assess the options, the costs, objectives and risk are considered for each option. A summary of the option assessment is shown in Table 0.18 below.

Table 0.18: Summary of Cost/Benefit Analysis

Option	Objectives	Costs	Risks
1. Continue to operate existing accommodation without investment or upgrade	Does not align with objectives of being a good employer and sustainably cost efficient, also not in line with good industry practice	Increasing maintenance of $0.5m over AA5	Does not address high risk to DBP of increased opex to maintain infrastructure beyond useful life, or intermediate risks to People, Environment and Reputation/Outrage
2. Refurbish existing accommodation (completed by 2025)	Aligns with objectives of being a good employer and sustainably cost efficient, in line with good industry practice	$5.0m	Reduces risk to ALARP
3. Install new accommodation	Aligns with objectives of being a good employer, however is the most expensive (but could provide more flexibility going forward), in line with good industry practice	$16.3m	Introduces new risk of failure to deliver the program where land acquisition negotiations are protracted, and therefore will not achieve ALARP within AA5

1.8 Proposed Solution

1.8.1 What is the Proposed Solution?

It is proposed that the existing accommodation be refurbished (Option 2) is the preferred option as it mitigates the risks related to safety and security of personnel onsite, as well as bringing the accommodation up to a standard that reflects good industry practice.

The proposal is to progressively refurbish all compressor station accommodation units as follows:

- Identify the high priority sites that require immediate attention; and
- Competitively tender for packages of work (note some are already started) such as kitchen upgrades and air conditioner replacements, to be progressively rolled out across all compressor station sites in order to gain economies of scale whilst minimizing interruption and impact at each individual site.

The benefits of the project include:

- Improved amenity consistent with the recommendations and findings within the 2015 inquiry to promote mentally healthy workplaces;
- Improved standard of living conditions by making the kitchen, bathroom and bedroom areas more contemporary, functional and private in order to create a mentally healthier workplace and support the functioning of optimized staff rosters;
- Installation of soundproofing, heat barriers, and retaining walls; and
- Improved employee morale, safety and general security.

1.8.2 Why are we proposing this Solution?

Option 2 is the preferred option as it mitigates the safety risks and exposure to noise, heat and snakes, whilst also upgrading the accommodation consistent with good industry practice at the lowest cost. By adopting an approach to staging the works, we are able to secure economies of scale and minimise disruption to sites.

Option 1 is not considered a viable option due to the remaining high safety risks for personnel, as well as the increasing opex related to maintaining infrastructure beyond its useful life. This option also does not align with our vision objectives.

Option 3 is not preferred option as it is significantly higher capex than deemed prudent and efficient, and is heavily reliant on the ability to secure additional land, where previous negotiations have not yielded positive outcomes. Additional construction at existing compressor compounds also introduces new safety risks and puts even further stress (capacity) on existing accommodation to accommodate construction crews.

1.8.2.1 Consistency with the National Gas Rules

Rule 79(2)

The refurbishment/remodeling of existing accommodation at compressor stations is required to improve the safety of services and maintain the integrity of services, which is consistent with NGR 79(2)(c)(i) and (ii). Specifically the refurbishment/remodeling will provide employees and contractors with suitable, safe and modernised compressor station accommodation, thereby ensuring that we can attract and retain staff necessary to ensure safe and reliable operations and supply.

Rule 79(1)

The refurbishment/remodeling of existing accommodation at compressor stations is consistent with the requirements of NGR 79(1), specifically DBP considers that the capital expenditure is:

- Prudent – The expenditure is necessary in order to address the identified safety and operational risks and requirements of compressor station accommodation and is therefore of a nature that would be incurred by a prudent service provider.
- Efficient – The forecast expenditure is based current and historical average actuals for similar work completed in line with DBP's purchasing policy and therefore is 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 in terms of remote accommodation provided for a FIFO workforce, based on what other companies are already providing (and also what we have provided for other AGIG commercial projects) therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs by effectively managing and maintaining the condition of assets over their useful life.

1.8.3 Estimating the Efficient Costs

The forecast expenditure for the compressor station accommodation upgrade is outlined in Table 0.19 below.

Note the proposed upgrades to recreational areas and digital connectivity rely on the Northern Communications project to provide appropriate bandwidth for personnel at Compressor Stations to be able to use social platforms such as FaceTime and Skype to connect with home, and streaming services such as Netflix and YouTube in their downtime.

Table 0.19: Compressor Station Accommodation – AA5 forecast expenditure

Forecast expenditure ($'000)	2021	2022	2023	2024	2025	AA5
CS Accommodation	1,000	1,000	1,000	1,000	1,000	5,000
AA5 forecast	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**5,000**

Costs are based on comparable actuals incurred during AA4 as follows:

- $0.3m - Refurbish bathrooms and toilets;
- $0.4m - Refurbish kitchens, replace carpet, paint and replace curtains; and
- $0.5m - Build & install external fitness rooms. All Completed.

The cost estimates for additional refurbishment activities further noise and heat mitigation, building reinforcement in cyclone prone areas and pest control are based on replacing air-conditioning units as the units are approximately 30 years old and no longer serviceable. These units are replaced with today's technology which are also more efficient (less power demand) and use system gases that are not harmful to the environment.

Table 0.20 summarises capex by cost category. Table 0.21 shows the escalation applied to escalate the costs to real dollars of December 2020 including labour cost escalation of 0.69% per annum.

Table 0.20: Compressor Station Accommodation, by cost category

Forecast expenditure ($000's)	2021	2022	2023	2024	2025	Total
Internal Labour	100	100	100	100	100	500
Contractors / Consultants	60	60	60	60	60	300
Materials & Services	800	800	800	800	800	4,000
Travel & Others	40	40	40	40	40	200
Total	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**5,000**

Table 0.21: Compressor Station Accommodation total escalated cost real dollars December 2020

($'000's)	2021	2022	2023	2024	2025	Total
Total unescalated ($ 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 0.4: Summary risk assessment for Accommodation

	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	Severe	Occasional	INTERMEDIATE	25	Minor	Frequent	INTERMEDIATE	25	Minor	Frequent	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	202
Do Nothing	Major	Unlikely	HIGH	125	Severe	Occasional	INTERMEDIATE	25	Minor	Frequent	INTERMEDIATE	25	Minor	Frequent	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	202
Refurbish existing accommodation	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	Minor	Remote	NEGLIGIBLE	1	Minor	Unlikely	LOW	5	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	38
Install new accommodation	Major	Unlikely	HIGH	125	Severe	Remote	LOW	5	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	134

Appendix B – Noise Reports and Ambient Temperatures at Compressor sites

Memo DBP
Compressor Station:

Memo re
Accommodation

Ambient Temps all
sites Scada.xlsx

Replacement of Northern Communications System Business Case – Capex DBP08

1.1 Project approvals

Table 0.1: Replacement of northern communications DBP08 – Project approvals

Prepared by	Mike Leahy, Senior Communications Engineer
Reviewed by	Hugo Kuhn, Manager Engineering and Operational Projects
Approved by	Tawake Rakai, GM Transmission Asset Management

1.2 Project overview

Table 0.2: Replacement of northern communications DBP08 – Project overview

Description of issue/project	Telecommunications infrastructure across the DBNGP communications network was installed 10-30 years ago. The majority of these assets are now at the end of their technical design lives, with many equipment manufacturers no longer offering product/system support or supplying spare parts. The growing number of technologically obsolete assets, coupled with the poor condition of a number of critical infrastructure components, means the reliability of DBNGP's communications network has deteriorated. This is evidenced by the significant communications outage experienced in July 2017. When there is a communications outage, our operations and field staff have no remote visibility of the pipeline as they cannot connect to the SCADA system. Communications outages pose a risk to the safe and reliable operation of the pipeline, as we would not have access to data on pressure, temperature, flows, and alarms across the DBNGP. We have limited spares for many assets, therefore we have commenced a substantial and efficient communication replacement program, which commenced with replacement of communications in the southern part of the pipeline (Perth to Bunbury) over the past five years. This business case covers the replacement of end of life communications equipment for the northern section of the DBNGP (Perth to Dampier, around 1,500 km) over the next five years. The proposed northern communications asset replacement program is necessary to ensure our communications system supports the reliable operation of the network, provides information promptly to customers on gas usage, and meets the requirements of the Australian Communications and Media Authority (ACMA) and the Radio Communications Licensing Act. The replacement program overall has been split geographically to ensure the necessary communications links are maintained through a timely, sequential installation and switch-over program of works. The communications backhaul for the section north of Perth to Dampier is currently different to that south of Perth to Bunbury. The northern section uses microwave radio as the transmission backhaul while the southern section uses a combination of Western Power backhaul (microwave and fibre) and third party carrier services. During AA4, we focused on replacing communications infrastructure at six repeater sites south of Perth. Over the next five years, we will need to replace the network north of Perth. This comprises replacing equipment at 42 repeater sites. As part of assessment of the required works, we identified we also needed to address the insufficient capacity of the current copper cables used to connect communications repeater sites to nine compressor stations. We engaged an independent expert [redacted] to assess the current performance and quality of the DBNGP communications network, and provide an estimate of the associated costs to replace the failing/obsolete

	communication equipment. [redacted] highlighted the poor condition of a number of critical assets and outlined two options for asset replacement. We considered the recommendations put forward by [redacted] and has further refined the two options. We have sought to defer capital works where safe and prudent to do so, however, it is clear that a significant northern communications replacement program is required over the next five years. This business case recommends replacing the communications network north of Perth with modern, fit for purpose equipment over two years starting as soon as practicable after the southern communications network replacement is completed (expected 2021). We will also replace the current copper cables used to connect repeater stations and nine compressor stations with optic fibre to increase the capacity and speed of data transferred.
Project name	Replacement of Northern Communications System
Estimated cost	Total forecast capex for the next Access Arrangement (AA5) is $30.0 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 - Take a reactive approach to addressing issues with the system as they arise ($39.0 million); • Option 2 - Replace the northern communications system with modern, fit for purpose equipment ($30.0 million) (this is the recommended option); and • Option 3 - Replace the northern communications system with fibre optic cable ($99.6 million).
Variation from AA4	The replacement program for the northern communications system will cost $20.9 million more than was incurred to replace the southern communications system during AA4. The higher cost is because the northern communications system is significantly larger than the southern system, requiring six times as many repeater sites to be addressed (42 compared with seven). However, the cost per location for addressing the northern network is approximately 45 per cent lower than the southern network as new towers and other infrastructure does not need to be built. The northern communications system contains more data intensive assets (such as compressors) than the southern system, which means the new equipment will be more expensive. However, the higher equipment costs are offset by efficiencies achieved by being able to use existing structures that we wholly own. In the southern communications project, old equipment was installed on shared towers, which we could no longer use. This meant we had to erect new towers as well as install the new equipment. All of the communications equipment north of Perth is installed on existing assets we own, the majority of which are in good condition. The northern communications project also includes $1.5 million to improve the quantity of data transferred between repeaters and nine compressor stations by installing optic fibre at each location. This was not required for locations south of Perth.
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the proposed asset replacement program is consistent with accepted good industry practice, and the legislated communications requirements. Several practicable options have been considered, and market/unit rates have been tested and verified by an independent expert to achieve the lowest sustainable cost of providing pipeline services. **NGR 79(2)** – the replacement of end of life communications equipment is necessary to maintain the long-term performance and reliability of the communications network and consequently the continued operation of the pipeline, and the safety and integrity of services. The communications network provides visibility of the network to our operations and field staff, as well as access to data related to the pressure, temperature, flows, alarms across the DBNGP, and customer information. Therefore, the proposed expenditure is conforming capex based on the grounds of NGR 79(2)(c)(ii). **NGR 74** – the forecast costs and are based on the latest market rate testing, and project options consider asset management requirements as per the latest

	Asset Management Plan. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case and verified by an independent expert. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
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 Northern Communications Replacement project will replace outdated, unsupported and failing equipment in the communications network to ensure we provide a reliable source of data on the network including customer information. During shipper roundtable meetings, we presented key areas of our planning, including our proposed capex and opex. We provided a short summary of the Northern Communications Replacement project given its high value (around 20% of total forecast capex). Shippers were broadly comfortable with the approach and high-level program in AA5, and acknowledged that there are periodic increases and decreases in capex programs associated with energy transmission assets. Our approach was then outlined in its Draft Plan. There were no questions specifically raised in relation to the Northern Communications Replacement project. 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 outlines: • reasons for changes in expenditure between AA4 and AA5; and • what alternatives 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: • Asset Management Plan in 2016 (TEB-001-0024-07) • Telecommunications Asset Management Plan Jan 2019 (TEB-001-0024-07) • Replacement of Ageing Communications Equipment Study (CICP18153-REP-H-001) • Risk Management Policy and Operational Risk Model (together our Risk Management Framework)

1.3 Background

All physical Dampier to Bunbury Natural Gas Pipeline (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.

The DBNGP communications network provides Supervisory, Control and Data Acquisition (SCADA) for all compressor stations, main line valves, meter stations and other associated facilities between Dampier and Bunbury. It also provides all telephony, mobile voice radio, corporate ethernet and maintenance LAN (CSN) connections between these facilities including the head stations located at The Esplanade and Jandakot.

The system can be best described in two parts: the northern communications network and the southern communications network.

The northern communications network runs from Dampier to Perth while the southern network runs from Perth to Bunbury. The northern network, which we fully own and support, was upgraded from an analogue to a digital system in 2009.[16] Until recently, the infrastructure and support for the southern network was shared between us and [redacted]. However, during the AA4 period the southern network is being moved onto standalone infrastructure which we will fully own and support (due to [redacted] advising it would no longer permit the infrastructure assets to be shared).

Communications equipment has an expected useful design life of around 10 years, with technical assets having a shorter design life, and structures lasting longer. The communications network that currently supports the DBNGP parallels the pipeline easement, with various components installed 10 to 30 years ago.

The majority of the northern communications assets are at or are reaching the end of their technical design lives. Assets and associated infrastructure are in poor condition, and many equipment manufacturers are no longer offering product/system support or supplying spare parts. The growing number of technologically obsolete assets, coupled with the poor condition of a number of critical infrastructure components, means the reliability of DBNGP's communications network has deteriorated. This is evidenced by the significant communications outage experienced in July 2017, summarised below.

Communications outages in July 2017

At 10pm on 7 July 2017 SCADA communications failed to MLV45 and MLV46 (located south of CS3). This was caused by a failure of the multiplexer (a key component in the communications network). Backup communications kicked in restoring communications to all sites north of MLV45 and south of MLV46.

At around 7am on 8 July 2017 SCADA communications to MLV7 failed, again due to a failure of the multiplexer. As MLV7 supports multiple communications connections, SCADA visibility was now lost between MLV1 and MLV46 (480km of pipeline including three compressor stations).

Later that day metering field officers attended MLV7 but could not restart the multiplexer. They were able to provide a temporary bypass to restore communications between MLV7 and MLV45 (MLV1-7 and MLV45-46 were still black). An electrical control and instrumentation field officer also attended MLV45 and restored both primary and backup SCADA communications paths, however there was still no visibility of MLV1-7 or MLV45 and 46.

On 9 July 2017 a communications field officer attended the MLV and restored the failed multiplexer – SCADA visibility was restored to all sites except MLV45 and 46. Two further sites (Karratha and MLV8) had stopped communicating with the Network Management System (NMS) in Perth. These sites were also attended. Although the multiplexers were functioning it was feared this could lead to similar outages as MLV7 and MLV45.

At 11am on 10 July the multiplexer at MLV45 (and all visibility) was restored.

Investigations show that all issues were caused by multiplexer units with no warning presented on the NMS. The supplier of the multiplexers no longer operates in the telecommunications industry worldwide.

[16] The 2009 northern communications upgrade was relatively minor, with only the components required to make the system digital replaced. The infrastructure (towers/huts), microwave equipment, dishes, and other equipment proposed for replacement during AA5 was not part of the 2009 upgrade.

Current northern communications performance

The number of alarms in relation to failures in the communications also system provides an indication of the overall condition and therefore reliability of the communications network. Table 0.3 shows the number of alarms generated over the last four years has almost doubled, signalling a significant deterioration in the reliability of the network, despite the reactive capital and southern communications system replacement works. The particularly large spike in 2017 coincides with the outages in July 2017.

Table 0.3: Northern communications equipment alarms over the last four years

	2016	2017	2018	2019
Total number of communications alarms	25,960	65,881	44,816	45,045

The telecommunications system is designed to achieve an overall availability of any 64kbits circuit as:

- Average annual availability of 99.99%
- Worst Month availability of 99.997%
- Design availability for any backbone connection will be at a minimum 99.999%

The predicted annual average unavailability of the northern microwave is 0.01781145 per cent[17], signalling that the performance of the northern communications network is already well below the design standards.

Further information on the condition and performance of various equipment types and including by location is provided in the Communications Asset Management Plan.

Some manufacturers no longer support existing assets, or are unable to supply spare parts for the assets installed in the communications network. We have historically relied on the procurement of stocks of spare assets and asset parts to ensure we can repair or replace equipment as required. However, we now have limited spares for many assets and asset parts.

We were able to defer full replacement for a time by undertaking repairs in-house using spare parts from unrepairable units. However, it is no longer possible due to the limited number of assets and associated parts in sufficient condition to continue.

We established an asset replacement program in 2011 to retard the increasing failure rate of the communications network. The majority of the communications equipment south of the Perth metropolitan area has been replaced during the AA4 period. It is therefore recommended that the network north of Perth be replaced during AA5.

We engaged an independent engineering expert [redacted] to undertake an assessment of the existing field communications systems, network management system and associated infrastructure. [redacted] was asked to provide options and cost estimates to upgrade and/or replace existing communications infrastructure where required.

[redacted] highlighted that "[a]ll this equipment has exceeded it's designed life expectancy and the microwave, multiplex, power supply and voice mobile radio equipment are now no longer

[17] Page 25, Communications Asset Management Plan Jan 2019 (TEB 001 0024 07)

supported by the original equipment manufacturer. The ongoing performance and availability of this system is solely reliant on [our] slowly diminishing spares holdings."[18]

In response to [redacted] findings, we have undertaken a number of projects during the AA4 period, amending the scope of the original southern communications upgrade. For example, we have addressed the discontinuation of the shared services provided by Western Power. In 2019, we also took the initiative to commission point to point communication via satellite and Telstra, which allows the control room to communication directly with compressor stations in the event of primary communications failure.

In its report, [redacted] also noted the following major and more urgent issues with the northern communications systems:

- rusting microwave dishes that are failing, with 168 in total that require attention;
- limited data capacity on the microwave system is hindering the introduction and use of advanced technologies and remote operations, particularly considering the move towards mobilised field crews[19];
- old transmission technologies limit the flexibility to adapt to dynamic changes in field site requirements;
- fading of the microwave link signals can cause the older microwave equipment to fail, with modern equipment better able to handle these events;
- the current voice mobile radio system is underutilised as it has very limited flexibility in the way it can be used or configured and is unable to make use of many new technological advancements that could improve productivity and safety;
- the existing equipment shelters are 35 years old and have rusting outside walls and roofs to the point where certain parts of the external cladding are starting to fall away. At least 25% of shelters are in a significant state of damage and require immediate repair;
- some of the repeater cabling is now 35 years old and becoming brittle and difficult to maintain; and
- the 50-pair copper cable connections from the compressor stations to the repeater sites are also 35 years old and are deteriorating, which significantly limits the capacity between the two sites. This is the major bottle neck for data capacity and currently operates at a maximum of 10Mb.

We have considered the various issues and activities recommended in [redacted] report and has developed two options for replacing the northern communications network (as well as the option of taking a replace-on-failure approach). We have modified [redacted] recommendations, deferring non-critical works where prudent and safe to do so (for example rectification works on equipment shelters). However, it is clear that significant investment in the northern communications system is required within the next five years to ensure DBNGP's communications system continues to provide seamless data transfer to:

[18] Page 7, Replacement of Aging Communications Equipment Study, [redacted] January 2019

[19] Refer to business case: Mobilisation of Field Crews

1. meet the requirements of the Australian Communications and Media Authority (ACMA) and the Radio Communications Licensing Act;
2. ensure the reliable operation of the network by providing data related to the pressure, temperature, flows, alarms; and
3. provide information promptly to our customers on gas usage.

The forecast costs for the AA5 communications equipment replacement program, and a comparison to the AA4 expenditure is provided in the following section.

1.4 AA5 forecast

In AA5, a total expenditure of $30.0 million is forecast to be required to replace assets in the northern communications system.

Table 0.4: AA5 forecast Replacement of northern communications system expenditure, compared with Southern Communications System expenditure during AA4

Activity ($'000)	2021	2022	2023	2024	2025	AA5 Total	AA4
Southern comms	n/a	n/a	n/a	n/a	n/a	n/a	6,826
Northern comms	14,996	14,996	-	-	-	29,992	n/a

The replacement program for the northern communications system will cost $23.2 million more than was incurred to replace the southern communications system during AA4. The higher cost is because the northern communications system is significantly larger than the southern system, requiring seven times as many repeater sites to be addressed (42 compared with 6). However, the total cost for the northern network is just over four times the cost of the southern network (as opposed to seven), as there are fewer infrastructure costs associated with the northern communications network. This is because we already own the various towers and assets on which the communications systems are installed, whereas in the southern communications project we had to build new towers.

Figure 0.1 provides a map of the DBNGP, which spans over 1,600 km across Western Australia. The communications network runs parallel to the pipeline. The pipeline (and therefore the communications network) south of Perth is only around 180 km or 11 per cent of the total network.

Figure 0.1: Map of the DBNGP

As the northern communications network includes more data intensive assets, the communications solutions will also need to meet higher performance standards, and therefore replacement equipment will be more expensive.

For example, we will need to upgrade the current copper cables connecting nine compressor stations and repeater sites to increase the transfer capacity and speed of data transfer to remove the current bottleneck. This type of investment was not required in the southern communications network as there is only one compressor station, and it is already connected using dark fibre. The upgrade of nine sections of the network to fibre optic is expected to cost around $1.5 million.

While the number of sites being addressed has increased significantly from AA4 and the specification requirements are higher, the cost per location is expected to be approximately 40 per cent lower. This is largely due to the use of existing structures and economies of scale in procurement.

The southern section of our communications network uses a combination of [redacted] backhaul (microwave and fibre) and third-party carrier services. As part of a legacy arrangement, our equipment south of Perth was installed on shared towers. Several issues, including overly restrictive access availability made it necessary to install the replacement communications equipment on our own standalone assets, and where necessary install new structures. The construction of seven new towers and six poles increased the overall cost of the southern communications project by around $4.8 million. However, the northern communications network is not installed on shared towers/assets, and we do not anticipate the need to erect new infrastructure to hold the new communications assets.

It is important that the northern communications network be replaced over a relatively short timeframe, in order to minimise the risk of a significant network failure. While the need to maintain communications links means the replacement works must be undertaken as an end-to-end sequential program, we will benefit from the economies of scale associated with bulk purchasing and bundling of equipment installation works.

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

Figure 0.2: 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'.*

Six areas are considered for each type of risk:

1. DBP – corporate/financial risk
2. People – safety risk to the public and employees

3. Environmental – risk of adverse impact on environment/local ecosystems
4. Reputation/Outrage – risk of customer anger and reputational damage
5. Asset Damage – dollar impact on assets
6. Supply – risk of supply interruption to customers

The untreated risk rating associated with northern communications is presented in Figure 0.2.

Figure 0.3: Untreated risk rating – Northern communications

	Trivial	Minor	Severe	Major	Catastrophic
Frequent	Asset Damage		DBP Outrage		
Occasional					
Unlikely					
Remote					
Hypothetical	People Environmental Supply				

Negligible	**Low**	**Intermediate**	**High**	**Extreme**

Table 0.5. shows the untreated risk for each risk area.

Table 0.5: Northern communications network risk rating

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

The replacement of the northern communications network is high risk and high priority. The risk is high for two of the six key risk areas:

- **DBP** – the communications network is critical to public safety and customer service/delivery as it provides data related to the pressure, temperature, flows, alarms about the pipeline to our operational and field staff. Failure of the communications network removes the essential connection to the SCADA system. The continued operation of the pipeline without sufficient communications risks safe and reliable operations within business as usual parameters.

Reduced operation of the pipeline could potentially cost millions of dollars in penalties and foregone revenue for both us and our customers. The consequence of a communications network failure issue is ranked severe as it can threaten the effective operation of the DBNGP. The likelihood is frequent. Undertaking the proposed capex program will reduce the likelihood of such an event to unlikely.

- **Reputation/Outrage** – the communications network is critical to customer service/delivery. Inconsistent or unreliable performance due to underinvestment can lead to unplanned outages of the communications network, and subsequent reduced operation of the pipeline. Any reduced supply may lead to reputational damage and outrage.

1.6 Options considered

Different options have been considered to address the issues presented by the aging and failing northern communications network infrastructure. The options are:

- Option 1 - Take a reactive approach to addressing issues with the system as they arise;
- Option 2 - Replace the northern communications system with modern, fit for purpose equipment; and
- Option 3 - Replace the northern communications system with fibre optic cable.

These options are discussed in the following sections.

1.6.1 Option 1 – Take a reactive approach to addressing issues with the system as they arise

With this option, the volume of replacements undertaken during the AA5 period would be directly driven by the number of failures experienced in the northern communications network, with a reactive rather than proactive approach to asset management.

A reactive approach is currently in place for the northern communication system. Under this approach, we relied on the procurement of stocks of spare assets and asset parts to ensure that we can repair or replace equipment as required. However, as the production of these replacements by manufacturers has stopped, we now have limited spares for many assets and asset parts.

We were able to defer full replacement for a time by undertaking repairs in-house using spare parts from unrepairable units. However, because there are few assets and associated parts in sufficient condition, it is no longer feasible to continue this practice.

Given the higher cost of manufacturing bespoke assets and asset parts together with the higher cost of reactive replacement compared with proactive replacement (potentially two to five times higher per asset depending on asset type and location), the cost of reactive works during AA5 will be significantly greater than the proposed proactive works program if widespread asset failure arises.

Should asset failure be lower than expected, though the overall cost of reactive replacements may be less than forecast, all high and intermediate risks identified through the AMP would not be addressed. The northern communications replacement program identified in the [redacted] report and AMP is the prudent level of activity required to manage the integrity and reliability/performance risk associated with communications assets. If it is not delivered, then all the high and intermediate risks identified would not be addressed.

Failure to address the risks associated with the northern communications network is not tolerable for us and our customers. As demonstrated by the communications outage event in July 2017, the current system is not fit for purpose.

An entirely reactive 'replace on failure' approach to managing the communications system is not consistent with good asset management practice, and therefore not consistent with NGR 79(1)(a).

1.6.1.1 Achieving objectives

This option would address only the assets that have actually failed, with a focus on returning them to being operational as quickly as possible, rather than proactively managing and planning for them. Operating under a replace on failure strategy is not efficient, particularly given the age and obsolescence risk of the current communications systems.

As discussed in section 1.3, the current replace-on-failure approach led to a significant communications outage in 2017, which could have been avoided had proactive replacement/refurbishment been undertaken. Recent data also shows that the number of communications alarms is increasing, which indicates the performance of the northern communications network is deteriorating.

This deterioration in performance will likely lead to a significant number of assets failing within the next five years, which will drive a high volume and high cost reactive replacement program. We consider a reactive approach is not sustainable, and incidents such as the 2017 outage will occur more frequently if the current asset risk is not addressed proactively.

Communications outages can impact pipeline operations and subsequently throughput and contracted supply obligations. A replace on failure approach also increases frequency of remote travel to address ad-hoc failures occurring, which is considered one of the highest risk activities on the DBNGP.

Unplanned availability of the northern communications system may also require changes to the pipeline operation that do not represent an optimised case for the level of supply and demand. This may result in extra fuel gas consumption and costs that would not have been incurred had the pipeline had been able to operate under normal conditions.

There would also be potential for non-compliance with Safe Work Australia recommendations[20] and employers duty of care[21], whereby minimum break requirements are not met when trying to get crew to reactive works promptly. To avoid this, a replacement on failure approach would require us to increase the size of its field work force to respond in peak times. However, this would reduce the overall utilisation of the field workforce.

Table 0.6 outlines how this option will support the achievement of our vision objectives in AA5.

[20] Safe Work Australia, Guide for Managing the Risk of Fatigue At Work, 2013.

[21] Section 19(1), *Occupational Safety and Health Act 1984* (WA).

Table 0.6: Alignment with DBP vision – Option 1

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	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

1.6.1.2 Cost assessment

As previously noted, many of the assets and associated parts are no longer manufactured. This means that where a repair or replacement is required, we are reclaiming parts from unrepairable units. However, this is no longer practicable due to the limited asset and associated parts in sufficient condition to continue. For example, all the electronic equipment installed as part of the microwave communications system upgrade in 2008 have reached the end of their design lives and no spare is available.

The cost of the in-house manufacturing of bespoke, communications equipment and parts to facilitate reactive replacement makes it uneconomical.

With this option, the unit costs incurred would almost certainly be higher. Corrective activities are likely to incur higher costs than planned alternative due to:

- additional travel costs (planned activities allow us to share travel costs across different activities at the same location);
- increased likelihood of overtime and shift penalties (planned activities allow us to optimise staff rostering);
- additional costs for expediated freight; and
- additional costs for removing crews from other planned work, or mobilising external crews to address a corrective maintenance requirement and then remobilising to complete the previous planned work.

We will also incur unplanned operating expenditure, as failures could lead to interruption to supply and associated contract delivery breaches. Interruption to supply to major industrial sites could result in a refund of around [redacted] and does not include any cost related to damage to customers' plant due to loss of gas supply.

While it is not possible to estimate precisely how many asset failures will occur during the AA5 period, broad cost estimate can be developed based by escalating the cost of the proposed works program if delivered reactively. It is a generally accepted asset management principle that delivery of works reactively is significantly more expensive that undertaking proactive or preventative works. Various sources cite the increase in reactive costs compared with proactive can be between two and five times[22] more than undertaking the same works proactively.

For the DBNGP the cost escalation for reactive vs proactive works varies depending on the type (and scarcity) of asset being replaced, as well as the remoteness of the asset from the Perth Metropolitan area. For example, assets located in remote areas of the Pilbara and Gascoyne regions require more travel time, and manufacturing new, bespoke components will extend the time taken to account for its production. In our experience, material costs can increase significantly where products are bespoke and/or have to be fast-tracked, while overtime, transport and additional resources can lead to labour costs more than tripling in a reactive/emergency scenario.

It is difficult to estimate the additional cost of reactive vs proactive replacement, however, even adopting a conservative rule-of-thumb escalation shows that reactive works are less efficient than a planned, prudent replacement program. For example, if we take [redacted] estimates, which are developed on a +/- 30% basis, it is reasonable to assume that the cost of the northern communications program if delivered reactively, would be at the upper end of [redacted] cost estimate (+30%). This would be consistent with the well-accepted asset management principle that reactive works cost more than proactive works.

By this rationale, if the northern communications program was undertaken on a reactive basis, with costs escalated by 30%, we estimate the full replacement of the northern communications system would cost approximately $39 million to deliver.

It is also important to note that this estimated cost of a replace-on-failure approach does not include costs associated with penalties and foregone revenue for us and our customers that result from supply outages . Penalties we are charged for non-supply are as high as [redacted]. The cost impact of asset failure that leads to a 4-5 day supply outage, noting the likelihood of failure under this option is higher, can be tens of millions of dollars in addition to the higher cost of reactive works.

In any event, costs associated with a predominantly replace on failure works program would not *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 providing services.*[23]

1.6.1.3 Risk assessment

Table 0.7 shows the residual integrity and performance/reliability risk associated with the northern communications system if the capital works program is delivered via a replace on failure approach.

[22] Marshall Institute, Omega engineering, ARMS reliability.

[23] NGR 79(1)(a)

Table 0.7: Risk assessment – Option 1

Risk category	Untreated risk	Treated risk
DBP	High	High
People	Negligible	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	High	High
Asset Damage	Low	Low
Supply	Negligible	Negligible
Overall rating	**High**	**High**

1.6.2 Option 2 – Replace the northern communications system with modern, fit for purpose equipment

This option is a modified version of [redacted] recommended option and includes the following works:

- replacement of the existing microwave radio system in 2+2 split system configuration with both space and frequency diversity and IP aggregation;
- replacement of the existing SDH/PDH transmission systems designed: with IP and Ethernet based technology; to support the MPLS-TP routing protocol; and to interface with legacy serial data communications and VF interfaces;
- replacement of 50-pair copper cables connecting repeater sites to the nine compressor stations with fibre optic cables;
- replacement of the existing analogue VHF voice mobile radio with DMR digital trunked voice mobile radio system;
- replacement of the existing rectifiers and converters with new equivalent equipment; and
- repair the outer skin and roofs on existing shelters.

We considered the various issues and activities recommended in [redacted] report and have modified [redacted] recommendations, deferring non-critical works where prudent and safe to do so.

Calibre's report estimates the total cost of the northern communications replacement project is $34.3 million (+/- 30%). Our revised estimate is $4.3 million lower, at $30.0 million, as we consider a number of non-critical recommendations such as upgrading the voice communications network upgrades and SCADA network back-up communications can be prudently deferred.

1.6.2.1 Achieving objectives

This option would address all the assets that need to be replaced in the AA5 period. It will reduce the risk associated with a potential failure and any subsequent potential impact on the quality (accuracy and timeliness) of data available to support decisions relating to the pipeline.

Replacing the northern communications system will enable us to achieve contracted level of customer service and reliability. The proposed works program is fully resourced and deliverable, and will promote optimal workforce utilisation.

The estimated cost of this program is $30.0 million.

Table 0.8 outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.8: Alignment with our vision – Option 2

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

1.6.2.2 Cost assessment

The estimated cost of this option is $30.0 million. Refer to section 1.4 for the detailed cost breakdown.

By adopting a proactive, planned approach to the management of these assets, we can best manage the efficient delivery of the program, minimising the need for unplanned and disruptive repair work on the communications network, which might otherwise result in a failure or a production loss. A continuous improvement culture is embedded, constantly looking at doing things better and more effective, taking advantages of technological advances.

1.6.2.3 Risk assessment

This option lowers the treated risk to ensure there is no risk category above intermediate and addresses the issues identified in line with the asset strategy in the AMP. It is therefore consistent with our Operational Risk Framework.

This option also presents the lowest sustainable cost to provide a reliable communications network.

Refer to section 1.5 for more detail.

Table 0.9: Risk assessment – Option 2

Risk category	Untreated risk	Treated risk
DBP	High	Intermediate
People	Negligible	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	High	Low
Asset Damage	Low	Negligible
Supply	Negligible	Negligible
Overall rating	**High**	**Intermediate**

1.6.3 Option 3 – Replace the northern communications system with fibre optic cable

Under this option the northern communications network would be replaced with fibre optic cable between Dampier and Perth.

[redacted] estimated the cost of installing a long haul fibre optic cable along the entire length of the DBNGP to be $112.6 million. Around $13 million of this is associated with the 125 km between Kwinana and Bunbury. We have removed this amount from the total as a proxy for the southern communications network, as this business case is only considering the replacement of the northern network.

1.6.3.1 Cost assessment

The various components of [redacted] estimate (excluding the Bunbury to Kwinana section) are summarised in Table 0.10.

Table 0.10: Cost estimate ($ million) – Option 3

Component	Estimated cost
Kwinana – Neerabup	14.4
Neerabup – Eradu	14.4
Eradu – R1 (Karratha)	52.9
R1 – Dampier	2.5
Upgrade of IP switches	1.0
Remote works costs (eg accommodation)	3.
Planning and project management	9.7
Earth moving equipment	1.2
Testing and reporting	0.5
Total	**99.6**

The estimated $99.6 million required to install optic fibre to replace the northern communications network is almost four times the cost of the replacement of the recommended works program, and nearly 15 times the cost of upgrading the microwave system.

The data throughput improvement would be significantly improved, and we could leverage the fibre optic capabilities to introduce additional telecommunications service offerings, thus introducing competition to remote areas along the DBNGP. However, we consider:

- the cost of replacing the northern communications system with fibre optic cable is significantly higher than the cost of replacing the current microwave communications system (option 2);
- installing optic fibre in the northern communication network is not in line with the AMP and would lead to inconsistencies between the north and south communications networks;
- the change in technology would mean there is a significant amount of historical data that would no longer be available in a consistent series; and
- although there are opportunities to seek alternative revenue streams, this is a significant shift away from our core business or gas transportation and is not part of the current strategy.

1.6.3.2 Achieving objectives

This option would address all the assets that need to be replaced in the AA5 period. It will reduce the risk associated with a potential failure and any subsequent potential impact on the quality (accuracy and timeliness) of data available to support decisions relating to the pipeline. However, at a cost of $99.6 million is not the lowest sustainable cost.

Table 0.11 outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.11: Alignment with our vision – Option 3

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	Y
A Good Employer – Skills Development	Y
Sustainably Cost Efficient – Working within Industry Benchmarks	-
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

1.6.3.3 Risk assessment

This option represents the lowest treated risk.

However, the solution is not consistent with the asset strategy in the AMP. It is therefore consistent with our Operational Risk Framework. Moreover, this option does not achieve the lowest sustainable cost to provide a reliable communications network.

Table 0.12: Risk assessment – Option 2

Risk category	Untreated risk	Treated risk
DBP	High	Low
People	Negligible	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	High	Low
Asset Damage	Low	Negligible
Supply	Negligible	Negligible
Overall rating	**High**	**Low**

1.7 Summary of cost/benefit assessment

Table 0.13 presents a summary of how each option compares in terms of achieving our objectives, the estimated cost, and the residual risk rating.

Table 0.13: Summary of cost/benefit analysis

Option	Achievement of our objectives	Estimated cost	Risk
Option 1 – reactive approach	This option does not support the achievement of our objectives of delivering for customers, being a good employer and being sustainably cost efficient.	$39.0 million	Does not adequately address the high risks to DBP and Reputation
Option 2 – replace northern communications with modern, fit for purpose equipment	This option aligns with our objectives of delivering for customers, being a good employer and being sustainably cost efficient.	$30.0 million	Adequately reduces risks to DBP and Reputation, to intermediate and low and is considered ALARP
Option 3 – replace northern communications with fibre optic cable	This option aligns our objective of being a good employer, but does not align with our objectives of delivering for customers or being sustainably cost efficient as it is not the lowest cost solution	$99.6 million	Reduces risks to DBP and Reputation to low, but at a high cost

1.9 Proposed solution

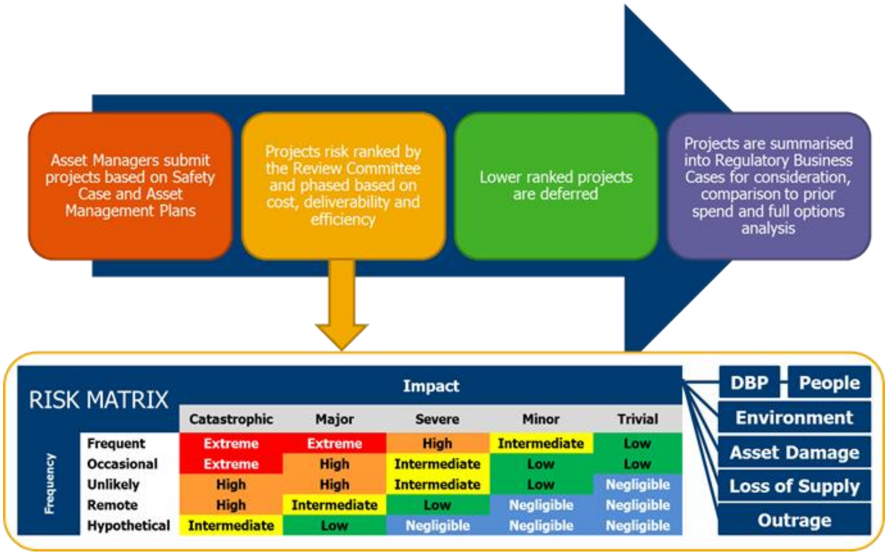
1.7.1 Why is the recommended option prudent?

Option 2 is the recommended option due to its alignment with our Risk Management Framework, asset strategy and the primary manufacturer's specification. It supports our vision and values and delivers for its customers on reliability of performance and customer service.

Figure 0.4 summarises how we develop our capital expenditure plans, and highlights that risks identified as intermediate or higher are prioritised, with lower risks removed or deferred from the capital program. Option 2 is consistent with this approach as it focuses on treating all intermediate or higher risks as soon as is reasonably practicable (by the end of the AA5 period). Option 1 (continue with a reactive approach) would not address the identified risks within the AA5 period and would increase the overall risk associated with the DBNGP as projects get pushed into AA6, leading to an even larger capital works program in the future.

Option 3, while addressing the communications system risks, represents a cost increase that we consider is not prudent and would significantly impact customers.

Figure 0.4 DBP capex plan development process



Failure to proactively plan for the management and maintenance of the communications network assets could result in catastrophic failure of the system which would result in loss of through-put, excessive operating expenditure and impact on reliability and the ability to meet contractual obligations.

1.7.1.1 Consistency with the National Gas Rules

Option 2 is the proposed solution and recommends that we proceed with the management and maintenance of the northern communications network in line with the relevant AMP guidelines.

NGR 79(1)

Option 3 is consistent with Rule 79(1)(a), which requires that *capital 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 providing services.*

We consider that the capital expenditure is:

- Prudent – the project is based on replacement of existing assets are arriving at the end of their useful lives. Assets are scheduled to be replaced ahead of failure, minimising disruption to customers, mitigating pipeline operations risks, and allowing for efficient resource scheduling. The proposed expenditure is there consistent with such that would be incurred by a prudent service provider.
- Efficient – forecast expenditure is based on an options assessment and study undertaken by an independent engineering expert with access to our asset information. The design and operational delivery of the program is forecast for completion by internal staff and external resources. External resources are engaged as a result of formal contracts in place following the tender process as per our Procurement Policy. These services are reviewed annually by our Contracts and Procurement functions, and new rates negotiated accordingly. 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 project involves providing modern communications equipment to facilitate the reliable and timely flow of data and information across the entire network. It also follows good industry practice by ensuring that critical infrastructure is maintained within its useful life and to current technological standards, therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the upgrade in one project.

NGR 79(2)(c)(ii)

The proposed replacement of the northern communications network is necessary to maintain integrity of pipeline services. Replacing, repairing and/or managing these assets satisfies the grounds under Section 79(2)(c) of the National Gas Rules (NGR), which states capex is justifiable if:

(c) the capital expenditure is necessary:

> *(i) to maintain and improve the safety of services; or*
>
> *(ii) to maintain the integrity of services; or*
>
> *(iii) to comply with a regulatory obligation or requirement; …*

There is a clear need to maintain the integrity of services, which would otherwise be compromised should these assets not be replaced, repaired or managed in line with the AMP and/or at the end of their useful life.

NGR 74

NGR 74 (2) requires that a forecast of estimate:

c) must be arrived at on a reasonable basis; and
d) must represent the best forecast or estimate possible in the circumstances.

The forecast costs in this business case are based on estimates developed by an independent engineering expert using our specific asset information. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

1.7.2 Estimating efficient costs

The cost estimates for options 1, 2 and 3 were underpinned by a FEED study conducted by an independent engineering expert [redacted].

[redacted] has conducted numerous similar studies, and was also involved in the first upgrade carried out as part of the last expansion program.

Whilst the cost estimates are based on current scope and market conditions, the estimates will be fully tested, and parcels of work tendered using our contracting and procurement process prior to the commencement of the work.

Table 0.14 presents a breakdown of the compressor stations capital works program by cost category. Table 0.15 provides the escalation to December 2020 dollars and includes labour cost escalation of 0.69% per annum.

Table 0.14: Northern communications system replacement cost estimate, by cost category

	2021	2022	2023	2024	2025	Total
Internal labour	2,249	2,249	-	-	-	4,499
Contractors / consultants	1,200	1,200	-	-	-	2,399
Materials & services	11,397	11,397	-	-	-	22,794
Travel & others	150	150	-	-	-	300
Total	**14,996**	**14,996**	**-**	**-**	**-**	**29,992**

Table 0.15: Escalated northern communications system replacement cost estimate

	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	14,996	14,996	-	-	-	29,992
Escalation	383	424	-	-	-	807
Total escalated ($ Dec 20)	**15,379**	**15,420**	**-**	**-**	**-**	**30,799**

Appendix A – Risk assessment

Figure 0.5: Summary of northern comms 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	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Frequent	HIGH	125	Trivial	Frequent	LOW	5	Trivial	Hypothetical	NEGLIGIBLE	1	258
Continue to take a reactive approach to addressing issues with the system as they arise	Severe	Frequent	HIGH	125	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Frequent	HIGH	125	Trivial	Frequent	LOW	5	Trivial	Hypothetical	NEGLIGIBLE	1	258
Replace the Northern Communications System with modern, fit for purpose equipment	Severe	Unlikely	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Remote	LOW	5	Trivial	Unlikely	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	34
Replace the Northern Communications System with fibre optic cable	Severe	Remote	LOW	5	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Remote	LOW	5	Trivial	Remote	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	14

Compressor Package Control System Replacement Business Case – Capex DBP09

1.1 Project approvals

Table 0.1: Compressor Package Control System replacement business case DBP09 – Project approvals

Prepared by	Jignesh Shah, Senior Electrical Control and Instrumentation Engineer
Reviewed by	Hugo Kuhn, Manager Engineering and Operational Projects
Approved by	Tawake Rakai, GM Transmission Asset Management

1.2 Project overview

Table 0.2: Compressor package control system replacement business case DBP09 – Project overview

Description of issue/project	This business case covers the capital works necessary to replace eight of the 20 turbine compressor package control systems (turbine control systems) over the next five years. Turbine control systems allow us to control, protect and monitor the turbine compressors situated along the DBNGP. The control systems also enable us to optimise system efficiency and availability, and enhance compressor function and pipeline and process stability. Deterioration in compressor performance can impact pipeline integrity and compromise our's ability to fulfil customers' contracted gas supply. The turbine control systems have a technical design life of 18 years. At the end of the technical design life, the original equipment manufacturer (OEM) no longer provides technical support or spare parts, and the equipment quickly becomes incompatible with current systems. The systems are therefore replaced on an 18-year cycle. In 2015, we commenced a turbine control system upgrade program, replacing those controls systems that had reached the end of their technical design life. Three turbine control systems were replaced during AA4. [24] During the AA5 period, eight turbines will reach the end of their design life and therefore requirement replacement. The unit rates for replacing the control systems in AA5 are broadly the same for AA5 (a marginal reduction to $2.3 million from $2.53 million). Therefore, the AA5 turbine control system replacement, which is approximately three times the size of the AA4 program, is forecast to cost three times as much ($18.4 million compared with $6.3 million in AA4). We consider continuing the turbine control system replacement program through AA5 is a prudent and efficient investment, as having consistent turbine control systems along the DBNGP will allow optimisation of unit control operation. This will optimise system efficiency, reliability and performance objectives, ultimately providing improved service for customers.
Project name	Compressor Package Control System Replacement
Estimated cost	Total forecast capex for the next Access Arrangement (AA5) is $18.4 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.

[24] The replacement of unit 2 at compressor station 7 began in 2015 but was not completed until 2016. Therefore, part of the associated cost was incurred in the AA4 period. In effect, the costs associated with replacing 2.5 control systems was incurred during AA4.

Options considered	• Option 1 - Upgrade all remaining turbine control systems to the latest version in AA5 ($39.1 million); • Option 2 - Move to a replacement on failure policy ($27.6 million); and • Option 3 - Upgrade the number of turbine control systems identified in the AMP (eight) with new technology as they become obsolete/reach end of life ($18.4 million) (this is the recommended option).
Variation from AA4	The works program for AA5 will cost $18.4 million for eight control systems, compared with $6.3 million for two-and-a-half systems in AA4. The unit rate is forecast to reduce slightly to $2.3 million (from $2.5 million) into AA5 due to the reduced unit rate of the equipment purchases, partially offset by the forecast market rates for project delivery.
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the proposed asset replacement program is consistent with accepted good industry practice, several practicable options have been considered, and market/unit rates have been tested to achieve the lowest sustainable cost of providing pipeline services. **NGR 79(2)** – the renewal of turbine control systems is necessary to ensure the continued operation of compressors to maintain the safety and integrity of services along the DBNGP. Compressor station functionality is a core process in the transportation of gas required to meet contracted obligations. Therefore, the proposed expenditure is conforming capex based on the grounds of NGR 79(2)(c)(ii). **NGR 74** – the forecast costs are based on the latest market rate testing, and project options consider asset management requirements as per the latest AMP. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
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. The turbine control system replacement program is necessary to the continued operation of compressors to maintain the safety and integrity of services along the DBNGP. During shipper roundtable meetings, 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, and acknowledged that there are periodic increases and decreases in capex programs associated with energy transmission assets. Our proposed approach was then outlined in our AA5 Draft Plan. There were no questions specifically raised in relation to the turbine control system replacement 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 outlines: • reasons for changes in expenditure between AA4 and AA5, and • what alternatives 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: • Asset Management Plan in 2016 (TEB-001-0024-07) • Asset Management Plan – Electrical Control and Instrumentation (TEB–001–0024-05) • 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.

Turbine compressor package control systems (turbine control systems)[25] enable our operations staff to control, protect and monitor the 20 turbine compressors installed along the DBNGP. The control systems provide an interface for displaying the current and historical status of the plant, and allow the compressors to be operated remotely from out Control Centre. More recently, turbine control systems can also be used to optimise system efficiency and availability, and enhance compressor function and pipeline and process stability.

Turbine control systems are critical to maintain:

- a reliable supply of gas to be transported along the pipeline. Without a fully functioning turbine control system, both the turbine and compressor cease to operate even if they are fully functional. A turbine control system failure could therefore compromise the supply gas along the DBNGP and to customers;

- the safe operation of the pipeline. For example, failure to automatically shut down the turbine and/or compressor when needed (placing the assets in a safe state in the event of abnormality or operational concerns) could risk asset damage and injury to people who may be operating on or near this equipment and

- data capture on turbine performance and alarms. A turbine control system failure could prevent historical logs being stored and therefore limit the analysis and diagnostics able to be performed.

The DBNGP has 20 turbine control systems, two at each of the ten compressor stations. Each turbine control system has a technical design life of around 18 years. At the end of the technical design life, the OEM no longer provides technical support or spare parts and the equipment quickly becomes incompatible with current systems.

We hold stock of a certain number of critical and frequently used spare parts, which are then run-down to extend the life of assets further. Subsequently, as we replace equipment, any useful parts are re-purposed for the repair of in-service equipment until parts are unavailable. At this point, equipment must be upgraded to the latest model following the manufacturer's recommended upgrade path.

Our turbine control system replacement program started in 2015. Three turbine control systems have reached the end of their technical design life and been replaced to date, with the costs for two-and-a-half of those incurred during the AA4 period. [26]

The next five years (AA5) will see a further eight turbine control systems replaced, with the remaining nine needing to be replaced over AA6. The timing of the replacement program aligns

[25] A turbine control system upgrade as recommended by the original equipment manufacturer would include the removal and replacement of the Human Machine Interface (HMI), Programmable Logic Controller (PLC), fire and gas systems, relays, push buttons, isolators and any other associated hardware. More information is provided in the Asset Management Plan – Electrical Control and Instrumentation.

[26] The replacement of unit 2 at compressor station 7 began in 2015 but was not completed until 2016. Therefore, part of the associated cost was incurred in the AA4 period.

with the various stages of the historical DBNGP expansion, with turbine control systems lasting around 18 years from installation.

This business case sets out a proposal to continue the turbine control system replacement program during AA5 in order to meet the asset management requirements set out in the AMP. This business case also considers options to replace all the remaining units, or to move to reactive replacement only.

1.3.1 Technology upgrades

Eighteen of the 20 turbine control systems are manufactured by Solar. Recently, Solar has upgraded its standard control systems to include a new control optimisation package. The additional functionality will improve the efficiency of turbine compressors and will also standardise data analytics and improve our fault investigation process.

While there are many benefits of the new control optimisation package, it is not compatible with our existing control system. We will need to upgrade each of our turbine control systems to fully monetise the benefits of the optimisation package through achieving asset uniformity.

As part of this business case, we have considered the time over which we should undertake the replacement program so as to ensure the maximum useful life of these assets is achieved, while exploiting maximum benefit from the optimisation package. Option 1 considers the merits of replacing all outstanding control systems (17) within the next five years, while Option 3 considers replacing the control systems over the next ten years as they each reach the end of their technical design lives.

1.3.2 Turbine control systems replacement program

Based on the remaining technical life and risk associated with each turbine control system, the replacement schedule over AA4 to the end of AA6 is summarised in Table 0.3.

Table 0.3: Replacement cycle for turbine control systems

Facility	Unit	AA4	AA5	AA6
CS1/1	[redacted]			✓
CS1/2	[redacted]		✓	
CS2/2	[redacted]	✓		
CS2/3	[redacted]		✓	
CS3/1	[redacted]			✓
CS3/3	[redacted]		✓	
CS4/2	[redacted]	✓		
CS4/3	[redacted]		✓	
CS5/1	[redacted]			✓
CS5/2	[redacted]			✓
CS6/2	[redacted]			✓
CS6/3	[redacted]		✓	
CS7/2	[redacted]	✓		
CS7/3	[redacted]		✓	
CS8/1	[redacted]			✓
CS8/2	[redacted]			✓

Facility	Unit	AA4	AA5	AA6
CS9/1	[redacted]			✓
CS9/2	[redacted]		✓	
CS10/3	[redacted]		✓	
CS10/4	[redacted]			✓

1.4 AA5 forecast

This proposed AA5 capital program will ensure obsolete hardware is changed in a proactive and controlled manner without affecting the safe operation of compressor units, reliability of supply for customers or exposing us to unnecessary expenditure, which a reactive rather than proactive replacement plan might create.

In AA5, a total of eight turbine unit control systems are forecast for replacement at a total cost of $18.4 million. This is an increase of $12.1 million compared to what was incurred during the AA4 period. The increase in AA5 is a direct result of there being more turbine control systems reaching the end of their technical design life in AA5 (eight) than did in AA4 (three).

Table 0.4: AA5 forecast units and expenditure

Replacement	2021	2022	2023	2024	2025	AA5	AA4
Unit control system (units)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit control system unit rate ($'000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Program total ($'000)	**-**	**4,600**	**4,600**	**4,600**	**4,600**	**18,400**	**6,314**

The individual assets identified for overhaul are shown in the Table 0.5. The most critical units are prioritised for replacement earlier in the period, with consideration also given to operational requirements for turbine unit availability.

Table 0.5: AA5 turbine control system replacement schedule

Facility	Unit	2021	2022	2023	2024	2025
CS1	2	-	-	-	-	✓
CS2	3	-	-	-	✓	-
CS3	3	-	✓	-	-	-
CS4	3	-	-	-	✓	-
CS6	3	-	✓	-	-	-
CS7	3	-	-	✓	-	-
CS9	2	-	-	✓	-	-
CS10	3	-	-	-	-	✓
			2	**2**	**2**	**2**

Table 0.6 shows the age of each of the turbine control systems identified for replacement during AA5.

Table 0.6: Turbine unit control systems scheduled for replacement

Facility	Unit	Installation	Replacement	Age at replacement
CS1	2	2006	2025	19
CS2	3	2006	2024	18
CS3	3	2006	2022	16
CS4	3	2006	2024	18
CS6	3	2006	2022	16
CS7	3	2006	2023	17
CS9	2	2006	2023	17
CS10	3	2006	2025	19

1.4.1 AA4 variance

At the time of the AA4 review process (2015-2016), two compressor stations were forecast to require replacement during the AA4 period; CS7/2 and CS2/2. Approximately half of the costs for replacing CS7/2 ($1.2 million) were incurred during 2015 (which was the AA3 period), therefore the AA4 determination including capex provision for replacing 1.5 turbine control systems.

During the AA4 period, the replacement of control systems at CS7/2 and CS/2 were undertaken as planned. However, upon inspection we identified that an additional unit (CS4/2) also required a control system upgrade.

The CS4/2 turbine control system had originally been forecast for replacement during the AA5 period, however, it was replaced in 2019 because:

- the obsolete operating system of HMI (used at CS4/2) was highlighted as a serious cyber security risk; and
- it was not possible to implement software changes recommended by OEM to optimise its operation due to obsolete software. Also, component control system and associated spare parts for CS4/2 are not supported by OEM anymore.
- it was nearing the end of its technical design life, as it was one of the units installed as part of Stage 3 expansion.

Table 0.7 shows the AA4 actual expenditure compared with forecast.

Table 0.8: AA4 actual v approved ($'000)

Actual v budget	2016	2017	2018	2019	2020	AA4	No. unit replaced
AA4 actual	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AA4 approved	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Variance	**(68)**	**1,435**	**573**	**2,445**	**1,492**	**3,386**	**1.0**

Note that the AA4 approved forecast was based on turbine control system replacement rates established in 2006, which were $1.9 million per unit in 2010 dollars. However, during the AA4 period, the unit rate rose to ~$2.5 million, which means the cost of replacement per unit increased. The drivers for this increase were:

- negative affect of the foreign exchange rate for AUD with respect to USD compared to 2006 and AA3 (2011-2015);
- 3% cost increase per year imposed by the OEM; and
- an increase in the scope of works, in particular some units require more changes than other units i.e. new starter motor, gas driven to electric variable frequency drive (VFD) motors, new oil pumps, changes to fuel gas valves and venting, whereby these activities were captured separately from unit controls in the initial installation.

The forward-looking unit rate for AA5 however, is ~$2.3 million per unit.

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

Figure 0.1: 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 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’.

Six areas are considered for each type of risk:

1. DBP – corporate/financial risk
2. People – safety risk to the public and employees
3. Environmental – risk of adverse impact on environment/local ecosystems
4. Reputation/Outrage – risk of customer anger and DBP reputational damage
5. Asset Damage – dollar impact on assets
6. Supply – risk of supply interruption to customers

The untreated risk rating associated with turbine control systems is presented in Figure 0.2.

Figure 0.2: Untreated risk rating – Compressor package control systems

	Trivial	Minor	Severe	Major	Catastrophic
Frequent		Outrage			
Occasional			DBP		
Unlikely			People	Asset Damage Supply	
Remote		Environmental			
Hypothetical					

Negligible	Low	Intermediate	High	Extreme

Table 0.9 shows the risk for each risk area.

Table 0.9: Compressor package control systems risk rating

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

Turbine unit control systems which are not replaced at the end of their useful life and for which there is minimal or no support from the manufacturer are classed as high risk, so require intervention to reduce the risk rank to intermediate of lower. The timely replacement of turbine unit control systems is a requirement of the AMP and further supported by the manufacturer.

1.6 Options considered

Alternatives options for volumes of replacement for the turbine unit control system replacement for the AA5 period which have been considered are:

- Option 1 - Upgrade all unit control systems to the latest version in AA5;
- Option 2 - Move to a replacement on failure policy; and
- Option 3 - Upgrade the number of turbine control systems identified in the AMP with new technology as they become obsolete (the recommended option).

1.6.1 Option 1 – Upgrade all unit control systems to the latest version in AA5

With this option, there would be 17 turbine unit control system replacements in AA5. This option would address all of the end of life issues and would also align all Solar packages to allow utilisation of [redacted] optimisation upgrades sooner.

1.6.1.1 Achievement of objectives

While this option delivers for customers in terms of public safety and in terms of ongoing reliability, the delivery of 17 units in a five-year period is likely to have impacts to their short-term supply to allow for shut downs and bypasses when the control systems are installed.

It is unlikely we could deliver 17 units over five years without a significant uplift in outsourced resourcing, which is likely to come at a cost premium. Replacing such a large volume of systems may also affect supply, as compressor units are typically offline for at least four weeks while the controls and associated components are being replaced.

In terms of efficiency, while having all Solar turbine control systems utilising the OEM's latest optimisation upgrades should lead to enhanced operations, it is difficult to quantify the potential efficiencies that would result from the upgraded systems. Most significantly, bringing forward replacement of the nine control systems would mean they are being upgraded before their technical design life is over, and would not represent efficient use of the assets. It is unlikely the access to standardised compressor package control systems earlier than planned would outweigh the additional benefits of maximising the existing asset life.

Early upgrades would not align to our strategy of fully utilising existing assets and replacing infrastructure at the most prudent time to do so, which in this case is to upgrade at the end of technical design life. Although there are diminishing spares for the current turbine control systems, we forecast we can manage these risks over the next five-year period without compromising the standards of service required by customers

This approach would also exacerbate the peaks and troughs in capital expenditure and resource requirements, with all the units requiring replacement again between 2032 and 2043. Good asset management and delivery optimisation is to spread the installations across a more even profile throughout the period and proactively manage any associated risks.

Table 0.10 summarises how Option 1 will support the achievement of our vision objectives in AA5.

Table 0.10: Alignment to vision objectives – Option 1

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

1.6.1.2 Cost assessment

With this option, based on the current $2.3 million unit rate, expenditure for planned turbine unit control system replacements would be $39.1 million, with a corresponding saving of $20.7 million in AA6.

However, there is also likely to be additional cost incurred to deliver a program of 17 units over five years, including potential supply interruptions, that would not be outweighed by the efficiencies in bulk equipment purchase. Additionally, extra equipment will require additional short-term storage.

1.6.1.3 Risk assessment

Table 0.11 shows the residual risk associated with turbine control systems under Option 1.

Table 0.12: Risk assessment – Option 1

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

Specifically, the risk of upgrading all units in AA5 is:

- **DBP** – the delivery of 17 units in a short period would require a significant uplift in outsourced resourcing, which is likely to come at a cost premium that is unacceptable to DBP.
- **Asset Damage** – the risk frequency of asset damage from control system failure is reduced to remote
- **Supply** – delivering 17 replacements in a short period will have greater impacts to short term supply to allow for shut downs and bypasses when the control systems are installed.

1.6.2 Option 2 – Move to replacement on failure policy

With this option, the volume of turbine unit control system replacements undertaken in the next AA period would be directly driven by the number of failures experienced on these assets, with a reactive rather than proactive approach to the overhaul management.

While it is not possible to predict the exact number of failures that will occur over the next five years, the fact that many assets are approaching their 18-year replacement cycles during the AA5 period, the likelihood of failure is expected to significantly increase. Given the higher cost of reactive replacement compared with proactive replacement (potentially two to five times higher per asset depending on asset type and location), the potential cost of works during AA5 is significantly greater than the proposed proactive turbine control system upgrade program if widespread asset failure arises.

Should asset failure be lower than expected, though the overall cost of a reactive compressor station may be less than forecast, the upgrade program identified in the AMP would not be delivered in full. The program identified in the AMP is the prudent level of activity required to manage the integrity and reliability/performance risk associated with compressor package control systems. Therefore all the risks identified would not be addressed.

Neither of these outcomes are tolerable for us and our customers. An entirely reactive ‘replace on failure’ approach to managing turbine control systems is not consistent with good asset management practice, and therefore not consistent with NGR 79(1)(a).

1.6.2.1 Achievement of objectives

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. This option does not align with our vision objectives.

Delivering for customers in terms of public safety and reliability as unit control is not a “plug and play” replacement, rather it requires significant engineering investment in the design and build of hardware. Hardware is not “off the shelf” and is built overseas and is shipped, with installation taking a minimum of four weeks.

Our objective of being a good employer would not be met as a reactive program would require additional unplanned remote travel to be incurred and potentially that some compressor units are manned or ‘manually’ operated. Further, reactive replacement is not consistent with good asset management practice and is not sustainably cost efficient.

Table 0.13: Alignment to vision objectives – Option 2

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	-

1.6.2.2 Cost assessment

With this option, the unit costs incurred would almost certainly be higher. Corrective activities are likely to incur higher costs than planned alternative due to:

- additional travel costs (planned activities allow us to share travel costs across different activities at the same location);
- additional costs for expediated freight; and
- additional costs for removing crews from other planned work to address a corrective maintenance requirement and then remobilising to complete the previous planned work.

We would also incur unplanned operating expenditure, as failures could lead to interruption to supply and associated contract delivery breaches. Interruption to supply to major industrial sites could result in a refund of [redacted] and does not include any cost related to damage to customers' plant due to loss of gas supply.

Financial penalties could also be incurred due to curtailment of pipeline supply capacity while resources are mobilised to remote locations, and we await the arrival of spare parts. We could increase our supply of spare parts, however this would result in an additional cost, and would only reducing the time of potential supply interruption, not the instance of interruption itself.

While it is not possible to estimate precisely how many asset failures will occur during the AA5 period, broad cost estimate can be developed based by escalating the cost of the proposed works program if delivered reactively. It is a generally accepted asset management principle that delivery of works reactively is significantly more expensive that undertaking proactive or preventative works. Various sources cite the increase in reactive costs compared with proactive can be between two and five times[27] more than undertaking the same works proactively.

[27] Marshall Institute, Omega engineering, ARMS reliability.

For the DBNGP the cost escalation for reactive vs proactive works varies depending on the type (and scarcity) of asset being replaced, as well as the remoteness of the asset from the Perth Metropolitan area. For example, compressor stations located in remote areas of the Pilbara and Gascoyne regions require more travel time, while control systems have a minimum one-month installation period following overseas procurement of equipment. In our experience, material costs can increase significantly where products are bespoke and/or have to be fast-tracked, while transport and additional resources can lead to labour costs more than tripling in a reactive/emergency scenario.

Taking a conservative approach, if we assume a weighted average increase of only 1.5 times the material and labour/contractor costs if the turbine control system upgrades were to be undertaken entirely reactively, we estimates the would cost approximately $27.6 million to deliver.

1.6.2.3 Risk assessment

Table 1.12 shows the residual risk associated with turbine control systems under Option 2.

Table 0.14: Risks assessment – Option 2

Risk area	Untreated	Treated risk
DBP	Intermediate	Intermediate
People	Intermediate	Intermediate
Environmental	Negligible	Negligible
Reputation/Outrage	Intermediate	Intermediate
Asset Damage	High	High
Supply	High	High
Overall	**High**	**High**

The option to replace on failure does not treat any of the risks outlined in the risk assessment and therefore is not consistent with our Risk management Framework.

1.6.3 Option 3 – Upgrade the number of turbine control systems identified in the AMP with new technology as they become obsolete

With this option, the volume of turbine unit control system replacements undertaken in AA5 would be based on the criteria identified in the AMP, consistent with good asset management practice. This would replace the remaining eight units originally installed in 2006 as part of the Stage 4 expansion, which have arrived at end of life. The replacement of the units would be staged based on operational requirements.

The replacement is in line with the recommendations of the manufacturer of the control systems, who advised customers to plan for system replacement following the recommended upgrade path as the assets will no longer be supported and spare parts can no longer be sourced.

The equipment is not off the shelf, is shipped from overseas, and is not plug and play, taking a minimum of four weeks to complete a replacement. Therefore a planned proactive replacement is necessary to ensure availability of compressor units to meet customer demand as these units cannot be operated without the unit control system.

1.6.3.1 Achievement of objectives

This option would address all of the assets which need to be replaced in the period due to arriving at end of life to ensure the availability of all compressor units to meet customer demand. This achieves our vision objectives of delivering for customers in terms of public safety and reliability, being a good employer in terms of health and safety, and is sustainably cost efficient in terms of working within industry benchmarks.

Table 0.15: Alignment to vision 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	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

1.6.3.2 Cost assessment

The estimated cost of this option is $18.4 million.

Unit rates for planned replacements has been estimated as $2.3 million. This includes $0.4 million labour, $1.3 million materials, $0.5 million contractors and $0.1 million travel and other.

By adopting a proactive, planned approach to replacement for these assets, 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 on the turbine or a capacity loss.

Planned replacement programs can be managed with improved commercial outcomes, with the ability to negotiate favourable terms for the acquisition and delivery of parts from suppliers.

1.6.3.3 Risk assessment

Option 3 represents the lowest residual risk, as it is targeting the individual assets in line with the manufacturers' recommendation and the AMP.

Table 1.14: Risk assessment – Option 3

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

1.7 Summary of cost/benefit analysis

Table 0.13 presents a summary of how each option compares in terms of achieving our objectives, the estimated cost, and the residual risk rating.

Table 0.16: Summary of cost/benefit analysis

Option	Achievement of objectives	Estimated cost	Treated residual risk rating
Option 1	This would achieve safety objectives, but compromise reliability objectives in the short-term, is not the most sustainably cost efficient, nor does it meet industry standards	$39.1m	High
Option 2	This would fail to achieve safety and reliability objectives or meet industry standards	$27.6m	High
Option 3	This is the only option which supports the achievement of objectives and meets industry standards	$18.4m	Intermediate

1.8 Proposed solution

1.8.1 Why is the recommended option prudent?

Option 3, planned proactive replacement of unit controls, is the recommended solution due to its alignment with our Risk Management Framework, asset management principles and the manufacturer's specification.

Any deliberate increase or decrease in volume of replacement 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 driven by ulterior motivators.

This replacement volume directly mirrors the volume of installation of these assets approximately 18 years previously. The useful life of the assets as per the AMP is 18 years. The proposed volume of replacement, two per year, is considered deliverable as it has already been done at the end of AA3 and beginning of AA4. Any deferral puts the units at risk of becoming non-operational and given the lead time required to design, build, ship and install unit controls, it is not possible to complete this work reactively without major impacts to supply.

Any arbitrary increase in volume of replacement activity for these assets might result in the generation of unnecessary additional expense, and major interruption to the availability of compressor units to meet customer demand. The useful economic life of 18 years is used as the guide for replacement, and then replacement is planned around criticality of units and other operational requirements to ensure deliverability of the replacements with minimal impact to customer supply. While we aim to achieve the full 18-year estimated life, deliverability and operational considerations may override this.

Failure to proactively plan replacements for the turbine unit control systems might result in catastrophic failure of an asset which would result in capacity compromise and potential for curtailment to the customer and associated financial penalty for failure to deliver as per contractual commitments.

1.8.1.1 Consistency with the National Gas Rules

Rule 79(2)

Turbine unit control systems provide critical safety and control functions for effective compressor station operation. Their replacement and upgrade, in line with manufacturer specifications and obsolete equipment, maintains the safety and integrity of our transportation services and is therefore consistent with NGR 79(2)(c)(i) and (ii).

Rule 79(1)

The option is also consistent with the requirements of Rule 79(1) of the National Gas Rules, specifically we consider that the capital expenditure is:

- Prudent – The project is based on the replacement of an existing asset which has arrived at the end of its useful life, specifically the control system is obsolete, no longer supported by the manufacturer and spare parts are not readily available. The history of failures for the CS4/3 control system demonstrates the deterioration of these assets as they approach twenty years in service. 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 the actual unit replacement cost incurred in the replacement of similar unit control system in AA4. The OEM-provided equipment will be purchased in bulk where possible under existing contracts to ensure optimised unit pricing and minimised foreign exchange exposure and/or the need for multiple engineering design engagements also. 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 project follows good industry practice of aligning replacement activity with commitments embedded within the AMP and manufacturer's recommendations therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the replacement program in a proactive, planned and scheduled manner with the most appropriate volume of activity based on useful life and in line with manufacturer's guidance and associated support.

1.8.2 Estimating efficient costs

As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology 2021-2025', the unit rate for the replacement of turbine unit control systems includes the internal labour, external labour and materials/other costs forecast.

The unit rate used to determine the cost of the program in AA5 is based on historical experience and actual costs have been further tested against a recent formal quote from [redacted] for a unit replacement cost, their contractual yearly increase and the cost for local resources.

Specialist engineering disciplines, procurement and construction management (EPCM) activities are provided utilising both internal and external resources.

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

- all units in AA5 will reflect most recent unit rates estimates – uniformity of unit cost across [redacted] and [redacted] replacements;
- market estimated rates for project management and delivery;
- no allowance for impact of foreign exchange fluctuation ([redacted] equipment is purchased in USD, so the AUD equivalent is recorded here);
    - we do not currently undertake any foreign currency hedging activities or otherwise seek to manage potential currency fluctuation impacts. This is assumed to be unchanged in AA5, so the unit rate in AUD for the purchase of equipment may change.

Table 0.15 presents a breakdown of the turbine control system upgrades program by cost category. Table 0.18 provides the costs escalated to December 2020 and includes labour cost escalation of 0.69% per annum.

Table 0.17: Compressor package control system replacement cost estimate, by cost category

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	-	754	754	754	754	3,017
Contractors / consultants	-	1,056	1,056	1,056	1,056	4,222
Materials & services	-	2,598	2,598	2,598	2,598	10,394
Travel & other	-	192	192	192	192	767
Total	**-**	**4,600**	**4,600**	**4,600**	**4,600**	**18,400**

Table 0.18: Escalated compressor package control system cost estimate

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	-	4,600	4,600	4,600	4,600	18,400
Escalation	-	130	142	155	168	595
Total escalated ($ Dec 20)	**-**	**4,730**	**4,742**	**4,755**	**4,768**	**18,995**

Appendix A – Risk assessment

Figure 0.3: Summary of Compressor Package Controls 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	Severe	Occasional	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	Minor	Remote	NEGLIGIBLE	1	Minor	Frequent	NTERMEDIATE	25	Major	Unlikely	HIGH	125	Major	Unlikely	HIGH	125	326
Option 1 - Upgrade all unit control systems to the latest version in AA5	Severe	Unlikely	INTERMEDIATE	25	Severe	Remote	LOW	5	Minor	Remote	NEGLIGIBLE	1	Minor	Unlikely	LOW	5	Major	Remote	INTERMEDIATE	25	Major	Occasiona	HIGH	125	186
Option 2 - Move to a replacement on failure policy	Severe	Occasional	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	Minor	Remote	NEGLIGIBLE	1	Minor	Frequent	NTERMEDIATE	25	Major	Unlikely	HIGH	125	Major	Unlikely	HIGH	125	326
Option 3 - Do the volume that AMP has identified as required (upgrade as obsolete)	Severe	Remote	LOW	5	Severe	Remote	LOW	5	Minor	Remote	NEGLIGIBLE	1	Minor	Unlikely	LOW	5	Major	Remote	INTERMEDIATE	25	Major	Remote	NTERMEDIATE	25	41

Jandakot Site Redevelopment Business Case DBP10

1.1 Project Approvals

Table 0.1: Jandakot Site Redevelopment Business Case DBP10 – Project approvals

Prepared By	James Smith, GM Transmission Operations
Reviewed By	Tawake Rakai, GM Transmission Asset Management
Approved By	James Smith, GM Transmission Operations

1.2 Project Overview

Table 0.2: Jandakot Site Redevelopment Business Case DBP10 – Project overview

Description of Issue/Project	Construction of a purpose-built facility in Jandakot to provide backup SCADA control room, server and communications facilities, warehousing, modern office and training facilities, and accommodation for the Transmission Operations division. This redevelopment will replace existing 30 year old facilities which no longer meet business requirements, operational or safety needs. Work will commence in 2024 and be completed in 2025.
Project Name	Jandakot Site Redevelopment
Estimated Cost	Total forecast capex for the next Access Arrangement (AA5) is $8.3 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 – Reactive approach to addressing issues; • Option 2 – Redevelop facilities on existing site (this is the recommended option); • Option 3 – Lease a new facility; • Option 4 – Build new facilities at a different location; and • Option 5 – Staged redevelopment
Variation from AA4	No allowance was made in AA4 for this expenditure as this is a new project for AA5.
Consistency with the National Gas Rules (NGR)	Jandakot is a critical operational and training facility for DBP with extensive warehousing for necessary equipment to ensure the safe and reliable operation of the DBNGP. The current facility experiences significant safety, security and operational constraints which will best be mitigated through redevelopment on the existing site, therefore is consistent with 79(2)(c)(iii) to comply with a regulatory obligation or requirement. The proposed redevelopment 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 Jandakot redevelopment project will improve warehousing, office

	space, parking, site access and amenities to ensure it can continue to meet the needs of the business. 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 approach was then outlined in our Draft Plan. There were no questions specifically raised in relation to the Jandakot Redevelopment. The City of Cockburn has been engaged to obtain preliminary advice in relation to planning approval. Verbal advise was provided indicating this expansion would be acceptable.
Other relevant documents	This Business Case should be read in conjunction with: • DBNGP Safety Case (TEB-003-0004-01) • Risk Management Policy and Operational Risk Model (together our Risk Management Framework).

1.3 Background

The Jandakot depot accommodates the Transmission Operations Team which consists of:

- Technical and Operational Support, Planning, Supply and Administration teams including the Planners, Schedulers, Reception, Warehousing and Stores services;
- Office facilities for Transmission Operations support functions, training and hand over of Roster Work Teams;
- a demountable training facility;
- a workshop facility;
- Transmission Operations base for local services and Transmission Operations teams;
- a central warehouse facility containing strategic and operational spares of the DBNGP;
- storage of strategic pipes, fittings and equipment; and
- Light Vehicle, mobile plant and heavy vehicle parking areas.

The facility also serves as an Incident Command Centre, offsite Disaster Recovery (DR) site, Backup Control Room and Emergency Operations Centre when required.

The existing facilities were constructed in the late 1980's by the State Energy Commission of Western Australia and has been used by DBP since. From 1982 conceptual planning was for a small depot that housed local support teams consisting of engineers, supervisor and trades persons. An estimated 30 staff were allocated in the original designs. Over each period of expansion of the DBNGP, additional staff were located to Jandakot requiring extra office space utilising transportable buildings.

When the DBNGP was privatised in 1998 and acquired by Epic Energy, two major operational changes were undertaken with the closure of two northern depots (based in Geraldton and Karratha) and introduction of a roster work pattern, each of which saw consolidation of operational activities at Jandakot.

Figure 0.1 shows the Jandakot facility which is located in proximity to good road transport access for major customers in the Kwinana industrial area.

This location was selected by SECWA to locate all of its Gas Distribution (now acquired by ATCO) and Transmission Lines Division (now operated by Western Power) adjacent to each other before privatisation.

The Jandakot Site Redevelopment is a new project, with expenditure estimated to be incurred in 2024 and 2025.

Figure 0.1: Jandakot Depot Aerial View

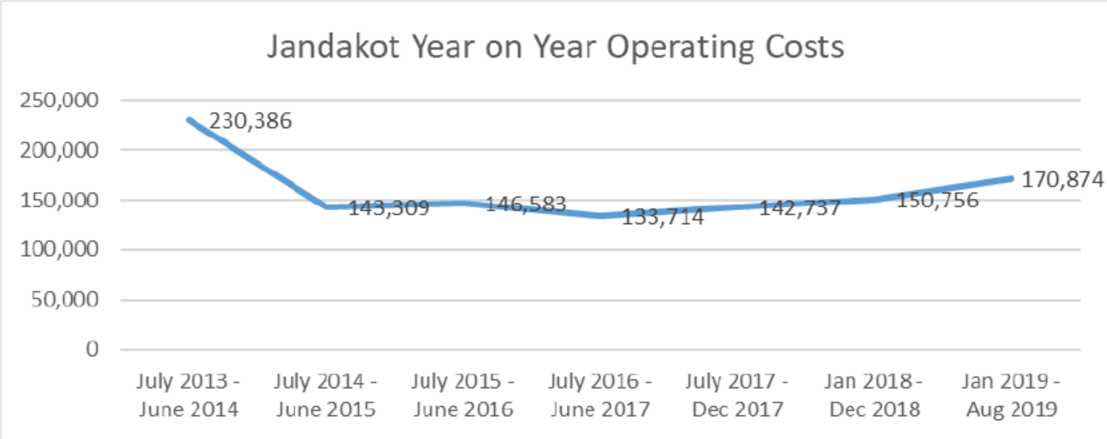
While it has undergone minor and ad hoc modifications over time to incrementally increase the capacity and improve the facilities, it is considered that further incremental improvements will not be sufficient to appropriately accommodate staff, vehicles or materials without a deterioration in the safety of staff, work flow management within the facilities and ongoing efficiencies of the facility's functionality to meet ongoing business requirements including improved training facilities.

Over the past 10 years a further $0.25 million in capital expenditure has occurred, specifically for the construction of a demountable building in 2017. It is expected that the ongoing costs of maintaining the facility will increase, as is typical with ageing buildings, with no corresponding improvement in the work environment.

Security has been a major issue in AA4 with several break in due to the substandard security protection measures currently in place within the facility. It is outdated and requires significant reinforcement particularly as this is the DBNGP's DR site and contains its back up control room.

The Jandakot year on year operating expenditure is detailed in the Figure 0.2 below. The 2013/2014 costs were higher, driven by an extensive clean-up program. Since June 2017 the incremental cost are growing at the facility and as indicated in the chart below the 2019 year to date costs have surpassed the full year 2018 expenditure.

Figure 0.2: Jandakot operating expenditure over the last seven years



1.4 AA5 forecast

In AA5, a total expenditure of $8.3 million is forecast distributed as follows.

Table 0.3: Summary of AA5 forecast spend for Jandakot Redevelopment

($'000)	2021	2022	2023	2024	2025	Total AA5
Jandakot Redevelopment	517	-	-	4,000	3,800	8,317
Program total	517	-	-	4,000	3,800	8,317

1.4.1 AA4 comparison

In AA4, we estimate expenditure on this program will be $0.28 million, which is $0.27 million higher than the approved budget.

Table 0.4: Summary of actual and approved spend in AA4

($'000)	2016	2017	2018	2019	2020	Total AA4
Actual	4	277	003	-	-	284
Approved	14	-	-	-	-	14
Variance	**(10)**	**277**	**3**	-	-	**270**

The reason for the overspend of the approved budget in AA4 was driven by the need to urgently replace one of the demountables that housed people at the depot.

1.4.2 What are the drivers for the AA5 proposal?

Since its construction in the late 1980's, the operational focus of the Jandakot facilities has evolved from a small depot servicing the southern area of the DBNGP to a Facility and now provides office space, warehousing, vehicle management and maintenance, training facilities, Control Room back up and the base for incident and emergency response. The expanding role and functions mean that the accommodation and warehouse facilities are now beyond their capacity, resulting in increasing work place health and safety issues, security risks and stock loss and growing safety incident risk as work patterns and work flows have changed and increased over time.

The facilities have a substandard training facility that houses the operational staff every 11 days for meetings and regular training events, and substandard security for the backup control room and DR facilities. Additionally, there is inadequate space in the office environments to house staff which impacts on the ability to manage a safe workplace. If there is to be incremental growth then the Jandakot facility is at full capacity and limits the amount of transient staff at any one time.

The following sections describe the issues associated with each function.

1.4.2.1 Asbestos management

The site contains asbestos and the risk of exposure is increasing, with a number of incidents arising in recent years in relation to the asbestos cable pit and the incinerator. Due to the age of the facility and the extent of asbestos present throughout the site, some of which was removed in 2017, there is a need to undertake significant remediation works in order to decontaminate the site completely.

While this work could be undertaken without a complete redevelopment of the site, the likely cost of removal, disposal and repair of the existing facility is estimated to be $0.05 million yet there will be no improvement in the site’s functionality, traffic safety or other factors, thereby earning a poor cost/benefit analysis.

1.4.2.2 Office space

The current office space does not appropriately accommodate the 65 existing staff numbers and 55 transient staff. The staff are housed in deteriorating transportable building and converted past electrical/mechanical workshops that do not have adequate space for their duties. The current total office floor area is 1,185sqm. The total area is between four buildings and is to house 65 permanent staff, 55 transient staff, office equipment, meeting rooms and a reception area.

The current office space further fails to meet the existing and future needs and expectations of staff, contractors and visitors due to shortcomings which relate to:

- Safety and wellbeing;
- Training and development; and
- Adequate space for meeting rooms, equipment storage and testing, and additional functions (like our “Zero harm” business function) in line with newer practices.

1.4.2.3 Warehousing

The current warehousing of inventory is through a combination of a purpose built shed, temporary domes and open lay down areas. Figure 0.3 provides an example of the existing warehouse facility.

The warehousing is a combination of emergency spares required for the pipeline, repairable items and consumable spares which have long lead times that can’t be sourced locally. The balance of this storage method is reviewed annually with a view to continuously improve our storage efficiency[28]. Due to the storage facility exceeding capacity, we have purchased mobile dome storage to ensure inventory is kept in a ready to use state.

However, these units require constant maintenance and repair. Both of the dome facilities have had the rear wall replaced on average every six months due to wear and tear. Each time the rear wall is replaced the opex expenditure is $0.01 million. It is proposed that the temporary inventory storage is replaced with a purpose built addition to the current permanent storage to reduce opex expenditure and remove the partial weather damage to the items being housed.

It is conservatively estimated that the cost in relation to damaged goods (in most instances corrosion) as a result of inadequate warehousing facilities is approximately $0.07 million per annum.

Figure 0.3: Existing Jandakot Warehouse Facility

The material management and logistics practices currently in situ in the Jandakot depot are sub optimal due to:

- Unsuitable storage for materials which exposes materials to degradation and theft;
- Unsuitable access for deliveries, forklifts and other vehicles;
- Insufficient existing warehouse racking and access requirements; and
- Inability to accommodate expansion of our assets and different emergency equipment such as [redacted].

[28] A recent example of our ongoing approach to optimise inventory management is decision to order as required replacements for the end of life [redacted]. They have been stored since 2009 and are now out of date, however, can be delivered within 3 weeks therefore do not require onsite storage.

1.4.2.4 Vehicle management

One of the primary drivers for the Jandakot Site Redevelopment is the risk mitigation strategy for existing safety and well-being risks facing employees, contractors and visitors.

Jandakot traffic consists of at least 20 movements per day of:

- heavy vehicles for logistics and transport;,
- service vehicles with vehicle storage requirements for light and heavy vehicles and mobile plant; and
- light vehicles for staff and visitors.

Current traffic ingress and egress represent an identified safety risk which we do not consider tolerable as it exposes pedestrians to high levels of risk. All changes to traffic flow, management and control have been identified and ALARP practices with the existing site layout have been put in place. To address the risk requires re-engineering of the whole site vehicle movements, which includes offices, people, traffic movements, parking and vehicle requirements.

A long-term plan detailing office locations, staff parking, logistics deliveries and storage, light and heavy vehicle movements and vehicle and mobile plant storage all need to be identified so that the best solution can be developed. Proposed concept designs are included at Figure 0.4.

1.4.2.5 Training and Meeting Facilities

We have an extensive training program coordinated by our in-house training and development team. Employees and contractors receive all mandatory training required of their role to ensure our strict safety requirements are met. Additionally, training that is identified as necessary for the employee’s role, current capabilities and skills requirements will then be arranged as part of an individual development plan.

The training facilities available to employees and contractors in Jandakot are limited to:

- An existing transportable building with limited digital media systems, and
- The workshops that facilitate hands-on training on specialised equipment.

Jandakot has several small and medium sized meeting rooms, two of which are equipped with digital media systems. However, the current facilities are insufficient to accommodate training for the Transmission Operation division, or to hold large staff sessions that are held on a regular basis.

A purpose built facility that would satisfy meeting and training requirements would be included in the development project that would allow for catering for large staff meetings and be able to be divided into smaller meeting rooms as required.

It would also be set up to train our people in specific Transmission Pipeline skills that are not found anywhere else. Conducting training this way ensures our staff have relevant materials and equipment for education purposes, improves the utilisation of staff time and reduces the costs associated with training and travel.

1.4.2.6 Backup Control Room

The DBNGP back up control room is located in Jandakot Facility. This control room uses a SCADA system to monitor and control the pipeline operation, and the collection and storage of pipeline data required for the physical and commercial operation.

In an emergency, the SCADA backup is used for extended periods and requires suitable security and facilities to support the SCADA staff. This equipment supports the DBNGP emergency control room, satisfying the requirement to be in hot standby 24/7 where we remain able to operate the pipeline assets remotely in the event of an emergency evacuation from the CBD.

The back up control room is not purpose built and to date, it has accessed rooms that were used for Logistics management and tool rooms in the past to accommodate the 'emergency back up control room'. It is sub optimal and requires upgrading to support the operation of the DBNGP.

1.4.2.7 New overnight accommodation facility

A recent review of the current accommodation costs expensed in the Perth Metropolitan area in support of operating the DBNGP revealed significant costs and risks to the business. We historically employ staff from the Perth Metropolitan area, however the home location of our employees is changing, and now include people living in rural and remote areas of WA or interstate.

Further, our roster teams stay in the metropolitan area when servicing local compressor stations and mainline valves and when attending critical training, including safety training. One way of minimising this cost is to build an accommodation facility at Jandakot.

A summary of the cost outline is shown in Table 0.5.

Table 0.5: Accommodation facility cost estimates

Item	Demand	Opex ($'000)	Capex ($'000)	Total ($'000)
Accommodate personnel in hotels	1513 nights per year	212	-	**212**
Construct purpose-built accommodation facility	1513 nights per year	33	500	**533**

1.4.2.8 Incident and Emergency Response site

Below sets out the registered safety reporting captured in the Safety Management System since 1 January 2015. Some of the hazards identified below will be mitigated by the proposed Jandakot redevelopment, which hazards are identified in table 1.6.

Hazard Report Summary

Date	Reference	Event Type	Event Subtype	Workgroup	Description	Actions Total / Open	Actual / Potential	Status	Close Out
10-Jun-2019	13657	Hazard	Environment	Field Technical Services - A roster	Flooding of the TPS building breezeway at Jandakot during a short heavy rain downpour	1/0	Minor / Minor	InProgress	
08-Apr-2019	13496	Hazard	Environment	Facilities - Metropolitan	Snake sighting and removal form Jandakot Depot.	0/0	Trivial / Severe	Closed	15-Apr-2019
23-Oct-2018	13018	Hazard	Safety	Facilities - Roster B	Old, damaged & worn out safety signage within the greater Jandakot area	0/0	Minor / Minor	Closed	20-Feb-2019
15-Sep-2018	12891	Hazard	Environment	Mainline - A Roster, Hub 2	Jandakot - Arum Lillies (invasive species) found growing in native bush along western gate entry road adjacent to water tanks.	0/0	Trivial / Minor	Closed	20-Sep-2018
31-Jul-2018	12751	Hazard	Security	Facilities - Lands	Jandakot depot boundary fence insecure	0/0	Trivial / Minor	InProgress	
02-Jul-2018	12649	Hazard	Safety	Facilities - Lands	Flooding in breezeway near kitchen entrance, Jandakot depot.	0/0	Minor / Minor	Closed	29-Nov-2018
28-Feb-2018	12279	Hazard	Safety	Maintenance Administration	Jandakot Facilities Building - Workstation Light levels too low	0/0	Minor / Minor	Closed	19-Jul-2018
11-Dec-2017	12103	Hazard	Safety	TOS - Project Interface	Dropped object hazard in Jandakot stores	0/0	Trivial / Severe	Closed	12-Dec-2017
12-Sep-2017	11875	Hazard	Security	Maintenance Administration	Jandakot DEA - Incorrect type of padlock on changeover switch panel.	0/0	Trivial / Trivial	Closed	11-Jan-2018
24-Jul-2017	11702	Hazard	Safety	Facilities - Infrastructure Security, Day Roster	Duress Button on RWS failed to respond at Jandakot Depot.	0/0	Trivial / Minor	Closed	18-Aug-2017
12-Jul-2017	11671	Hazard	Safety	Facilities - Metropolitan	Jandakot Projects workshop, Step on stairway to mezzanine level has broken.	0/0	Trivial / Severe	Closed	28-Jul-2017
03-Mar-2017	11276	Hazard	Safety	Facilities - Metropolitan	Jandakot DEA shelter sways and does not appear to be structually sound.	0/0	Trivial / Minor	Closed	26-Jun-2017
24-Jan-2017	11175	Hazard	Safety	Facilities - Metropolitan	Jandakot DEA Test - Poor access to inspect coolant level	0/0	Trivial / Minor	Closed	15-Mar-2017
19-Jan-2017	11132	Hazard	Safety	Facilities - Metropolitan	Jandakot Asbestos Cable pit has been damaged and has exposed fibres	0/0	Trivial / Severe	Closed	06-Feb-2017
20-Nov-2016	10999	Hazard	Environment	Field Technical Services - B roster	Jandakot Depot - Large Dugite seen entering storm water pipe outside FTS lunchroom	0/0	Trivial / Minor	Closed	13-Dec-2016
04-Nov-2016	10955	Hazard	Safety	Maintenance Administration	Uneven paving slabs throughout Jandakot depot, which create a potential trip hazard.	1/0	Minor / Severe	Closed	26-Apr-2017
20-Oct-2016	10909	Hazard	Safety	Supply	Damaged pallet Jandakot warehouse"B"	0/0	Trivial / Minor	Closed	14-Nov-2016
26-Aug-2016	10794	Hazard	Safety	Maintenance Administration	Power point in Jandakot lunch room is faulty.	1/0	Trivial / Severe	Closed	24-Oct-2016
17-Aug-2016	10778	Hazard	Safety	Maintenance Administration	Jandakot Facility Loss of Power & Site Communications	2/0	Trivial / Trivial	Closed	08-Sep-2016
28-Jun-2016	10690	Hazard	Safety	Facilities - Infrastructure Security, Day Roster	Jandakot main kitchen area requires attention in regard to possible safety issues.	1/0	Minor / Minor	Closed	05-Sep-2016
24-May-2016	10626	Hazard	Safety	Maintenance Administration	Jandakot - Water leaking from Light Fitting in Facility Day Crew Office	0/0	Trivial / Severe	Closed	13-Jun-2016
10-Dec-2015	10148	Hazard	Environment	Planning, includes Stakeholder Specialist (also Maintenance Administration)	Small Dugite snake seen near the ladies amenities in the breezway opposite First Aid Room at Jandakot Facility	0/0	Trivial / Trivial	Closed	11-Dec-2015
17-Nov-2015	10167	Hazard	Safety	Facilities - Metropolitan	Incinerator located at Jandakot from CS09 has been inspected and results confirm it contains an asbestos gasket and fragments	0/0	Trivial / Severe	Closed	29-Dec-2015
16-Oct-2015	10008	Hazard	Safety	Facilities - Roster B	Asbestos communication pits at Jandakot	5/0	Trivial / Major	Closed	03-Apr-2017
16-Sep-2015	9938	Hazard	Safety	Facilities - Metropolitan	Jandakot Facility Communications pit at rear door of front office has been identified as Asbestos	0/0	Minor / Severe	Closed	08-Jan-2016

Incident Report Summary

Date	Reference	Event Type	Event Subtype	Workgroup	Description	Actions Total / Open	Actual / Potential	Status	Close Out
05-Aug-2019	13853	Incident	Other	Mainline - I & S: A Roster	Minor Traffic Accident on Berrigan Drive Jandakot DBP 128	0/0	Minor / Minor	Closed	19-Aug-2019
29-Mar-2019	13468	Incident	Security	Maintenance Administration	Potential intruders at Jandakot rear fence line	0/0	Trivial / Trivial	Closed	09-Apr-2019
14-Mar-2019	13506	Incident	Safety	Maintenance Administration	Jandakot Facility Evacuation Drill	0/0	Trivial / Trivial	InProgress	
14-Feb-2019	13312	Incident	Security	Maintenance Administration	Intruders cut the rear fence at two locations and entered Jandakot Facilities	0/0	Trivial / Trivial	Closed	18-Feb-2019
10-Feb-2019	13305	Incident	Security	Maintenance Administration	Potential intruder activity at Jandakot rear fence line	0/0	Trivial / Trivial	Closed	18-Feb-2019
05-Feb-2019	13297	Incident	Security	Maintenance Administration	Rear fence at Jandakot cut by suspected intruders	0/0	Trivial / Trivial	Closed	18-Feb-2019
01-Feb-2019	13282	Incident	Security	Maintenance Administration	Thieves cut rear fence of Jandakot facilities	0/0	Trivial / Trivial	Closed	18-Feb-2019
31-Jan-2019	13275	Incident	Security	Maintenance Administration	Break in and cable theft from Jandakot facility	1/0	Trivial / Trivial	Closed	20-Feb-2019
23-Jan-2019	13264	Incident	Other	Mainline - I & S: Day Roster	Jandakot- light contact with vehicle bumper when parking	0/0	Trivial / Trivial	Closed	15-Feb-2019
20-Dec-2018	13192	Incident	Security	Facilities - Metropolitan	Jandakot Facility rear fence cut and evidence of batteries attempted to be removed	0/0	Trivial / Minor	Closed	28-Dec-2018
15-Nov-2018	13070	Incident	Security	Supply	Jandakot facility - north fence line partially damaged	0/0	Trivial / Trivial	Closed	18-Feb-2019
28-Oct-2018	13012	Incident	Security	Maintenance Administration	West security gate Jandakot facility in 3/4 open position	0/0	Trivial / Minor	Closed	11-Dec-2018
03-Oct-2018	12932	Incident	Security	Facilities - Roster B	Courier vehicle piggy backing through DBP vehicle access security gate at Jandakot	0/0	Minor / Minor	Closed	22-Oct-2018
03-Oct-2018	12931	Incident	Security	Maintenance Administration	Jandakot Facility Communications room door unlocked	0/0	Trivial / Minor	InProgress	
01-Oct-2018	12925	Incident	Security	Maintenance Administration	Jandakot depot west gate open without DBP personnel on site (Approx 0650).	0/0	Trivial / Minor	InProgress	
20-Aug-2018	12808	Incident	Environment	Facilities - Lands	Litter blowing into Jandakot Depot from ATCO side of new fence.	0/0	Trivial / Trivial	Closed	28-Dec-2018

28-Mar-2018	**12374**	Incident	Quality	Facilities - Lands	SPOT device issue when testing at Jandakot.	0/0	Trivial / Trivial	Closed	19-Apr-2018
04-Jan-2018	**12157**	Incident	Asset/Equipment	Facilities - Metropolitan	Vehicle crane made contact with Jandakot administration building covered parking area.	0/0	Trivial / Trivial	Closed	26-Feb-2018
24-Mar-2017	**11336**	Incident	Asset/Equipment	Facilities - Roster B	Struck pole while reversing vehicle into parking bay at Jandakot	0/0	Trivial / Trivial	Closed	12-Apr-2017
22-Mar-2017	**11327**	Incident	Environment	Supply	Jandakot Domes contain signs of oil release to the ground from stored equipment	0/0	Trivial / Severe	Closed	03-Apr-2017
19-Nov-2016	**11000**	Incident	Security	Planning, includes Stakeholder Specialist	Door of Operations Server Room at Jandakot Facility unlocked and ajar	0/0	Trivial / Minor	Closed	06-Feb-2017
19-Oct-2015	**10049**	Incident	Asset/Equipment	Facilities - Metropolitan	Vehicle gull-wing door collided with Jandakot east gate receiver post.	0/0	Trivial / Trivial	Closed	29-Dec-2015
15-Oct-2015	**10000**	Incident	Asset/Equipment	Supply	Dump valve on Jandakot Facility RO plant in open position.	0/0	Trivial / Trivial	Closed	23-Oct-2015
10-Jul-2015	**9763**	Incident	Environment	Maintenance Administration	Ant larvae in Jandakot facility gas meter	0/0	Trivial / Trivial	Closed	21-Aug-2015
11-Mar-2015	**9439**	Incident	Environment	Field Technical Services - Day Crew	Small snake located under filing cabinet in Jandakot TPS building.	0/0	Trivial / Minor	Closed	30-Mar-2015
01-Jan-2015	**9220**	Incident	Security	Field Technical Services - Day Crew	Jandakot Depot insecure on public holiday (NYD)	0/0	Minor / Minor	Closed	10-Feb-2015

Near Miss Summary

Date	Reference	Event Type	Event Subtype	Workgroup	Description	Actions Total / Open	Actual / Potential	Status	Close Out
16-Nov-2018	**13084**	Near Miss	Safety	Facilities - Lands	Just avoided a traffic accident in DBP221 when leaving Jandakot Depot on Prinsep Road	0/0	Trivial / Trivial	Closed	19-Nov-2018
25-Aug-2017	**11803**	Near Miss	Safety	Mainline - I & S: B Roster	Taxi almost collided with truck leaving Jandakot	0/0	Trivial / Minor	Closed	31-Aug-2017
18-Jul-2017	**11690**	Near Miss	Environment	Facilities - Metropolitan	Jandakot Diesel engine Fire Pump found to be leaking diesel	0/0	Trivial / Minor	Closed	24-Jul-2017
10-Nov-2016	**10976**	Near Miss	Safety	Corporate Services	Commenced journey from Jandakot to Perth with flat tyre.	1/0	Trivial / Severe	Closed	13-Nov-2017

1.4.3 AA5 proposal summary

A summary of the requirements for the Jandakot Redevelopment as proposed for AA5 is shown in Table 1.6.

Table 0.6: Requirements of the Jandakot Redevelopment

Category	Initial design capacity (1980's)	Current capacity (2019)	Forecast requirements (2025)
Increase capacity of office space	250sqm fixed office space to accommodate 8 staff, plus 2 temporary buildings 266sqm to accommodate 14 staff	250sqm fixed office plus 562sqm converted workshop space accommodating 40 staff plus 2 x temporary buildings 373sqm accommodating 25 staff, with an additional transient staff of 55	1,200sqm office space to accommodate a 90 staff and 90 transient staff
Increase capacity and security of warehouse	288sqm of covered secure warehouse plus 664sqm open area uncovered storage not secure and 7,290sqm laydown yard	2,281sqm of covered warehouse, 90sqm external in dome storage and 7,290sqm in laydown yard	2,371sqm of secure covered warehouse while maintaining the current uncovered warehouse. 7,290sqm in laydown yard retained
Improve traffic management	Entry and exit designed around significantly less staff, operational vehicles and pedestrians	55 staff vehicles and 93 operational vehicles with no dedicated pedestrian access	Re-designed entry and exit for staff and operational vehicles with dedicated pedestrian walkways to office space away from operational areas
Introduce training facility	Not in initial design	Existing temporary accommodation used for training and warehouse used for all staff briefings.	Purpose built training facility to meet current and future training and development of DBP staff and contractors.
Improve SCADA Backup facility	Not in initial design	Accommodated in existing buildings	Purpose built room with appropriate security and climate control

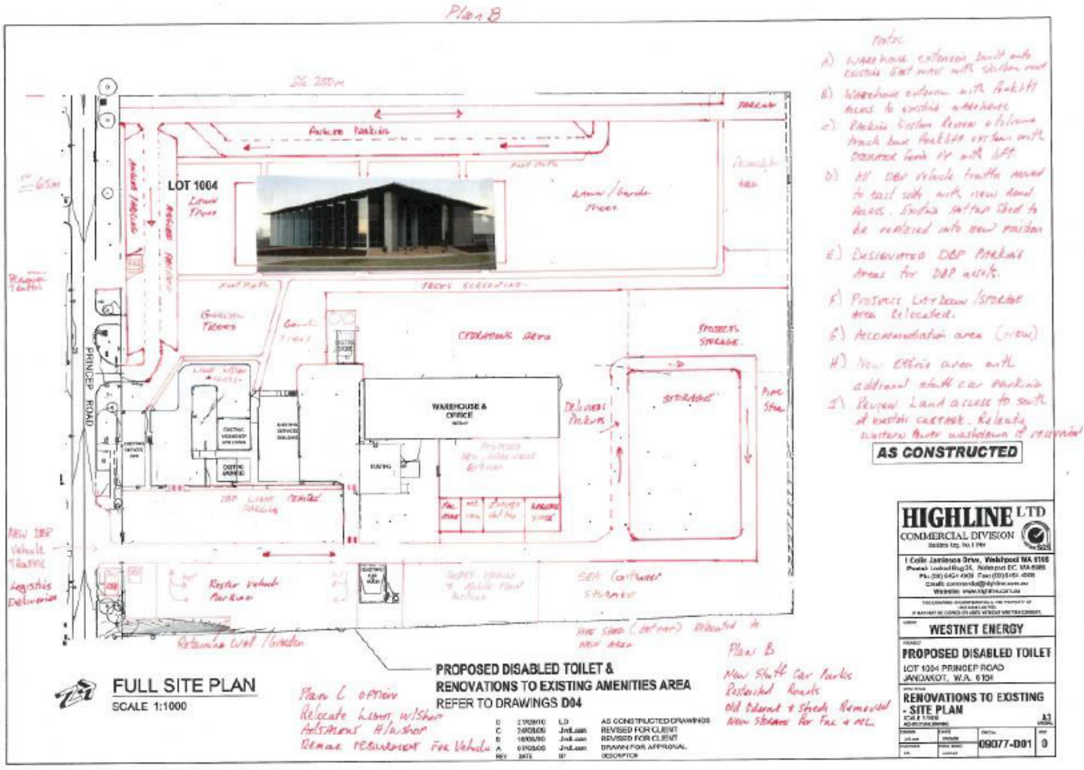
Category	Initial design capacity (1980's)	Current capacity (2019)	Forecast requirements (2025)
Improve incident and emergency response site	Not in initial design	Accommodated within site general meeting rooms	Dedicated area with appropriate storage, communications and access
Improve safety	A consideration in initial design (albeit with asbestos present at time of construction)	No longer compliant, specifically for disability access, traffic management and office conditions	Design mitigates safety risk and improves mental health management
Risk Ranking	**Low**	**Intermediate**	**Low**

Of the 5 options assessed (and discussed further below), option 2 is the proposed solution because it achieves all the objectives at the lowest cost and reduces the market, safety and stock loss risk to the target level.

The Jandakot depot will be redeveloped, resulting in the construction of new office and warehouse facilities, which include training rooms and improved traffic management solutions.

This solution will mitigate risks which have been identified and which relate to the safety and wellbeing of employees, contractors and visitors, the security and safety of materials stored and address the potential for poor staff engagement and productivity.

Figure 0.4: Concept design for Jandakot Redevelopment



It is proposed that the redevelopment would require the following program:

- March - May 2022 – Conduct survey;
- June 2022 – Engage the City of Cockburn to commence the environmental, heritage, and class A water mound approvals process;

- January 2023 - Engage with staff to gather ideas and suggestions on operational requirements and functional/aesthetic requests for the redevelopment;
- May 2023 – Finalise design;
- June 2023 - Issue Request for Tender for the construction of the redevelopment;
- September 2023 – Award contract following competitive tender process;
- December 2023 – Design complete, approvals obtained and early works commence;
- February 2024 – Commence relocating staff from Jandakot to facilitate construction works to commence; and
- June 2025 – Redevelopment complete and facility fully operational.

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

Figure 0.5: 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 *'Moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.*

The overall risk rating of Jandakot Redevelopment is outlined in Figure 0.2. As displayed, there is one high risks, three intermediate risks, one low risk and one negligible risk associated with the redevelopment of Jandakot. This results in an overall high risk rating in an untreated scenario.

Figure 0.6: Risk rating – Jandakot Redevelopment

	Trivial	Minor	Severe	Major	Catastrophic
Frequent		Reputation / Outrage			
Occasional	Asset Damage		Loss of supply		
Unlikely			People	DBP	
Remote	Environment				
Hypothetical					

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

Table 0.7: Risk rating - untreated

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

The Jandakot Redevelopment is required to mitigate safety, security and operational risks and hazards currently experienced on site. The overall risk rating of not undertaking the redevelopment is identified as high in Figure 0.2.

- **DBP** - Risks to security, safety and degradation associated with materials stored on site. The current warehouse does not provide sufficient cover or effective protection from either inclement weather or theft. Failure to appropriately store materials and equipment has resulted in approximately $0.50 million of materials being written off in the last 12 months, which is neither a prudent nor efficient cost for a service provider to incur.

- **People** - Failure to meet today's modern office requirements which include adequate space allocated for certain staff areas, thermal comfort, noise control, privacy, concentration, social and spatial comfort. The current office environment exposes employees to excessive noise, distractions, temperature variations and lack of privacy. Further, there are risks to employees, contractors and visitors due to the current traffic flow. There is potential for a vehicle incident resulting in an increased frequency or severity of a safety incident, noting that safety incidents currently account for 14% of reported safety incidents at Jandakot.
- **Outrage** – The risk to our reputation of not providing office accommodation that meets the expectations the public have of a good employer.
- **Supply** – We currently rely on our spares holding for the majority of repairs and maintenance work in order to continue to provide 100% service reliability. Continued risk of loss to the required spares jeopardises our ability to continue with this supply standard, particularly in consideration of the ageing nature of its assets, which result in increasing reactive repairs and maintenance (hence ready access to spares stored at Jandakot).

1.6 Options Considered

Alternative options for the redevelopment of the Jandakot facility for the AA5 period which have been considered are:

- Option 1 – Continue to take a reactive approach to addressing issues with the facility as they arise;
- Option 2 – Redevelop facilities on existing site;
- Option 3 – Lease a new fit-for-purpose facility;
- Option 4 – Build new facilities at different location; and
- Option 5 – Staged redevelopment over longer period.

1.6.1 Option 1 – Continue to take a reactive approach to addressing issues with the facility as they arise

Under this option minor ongoing repairs and maintenance would continue on a reactive (corrective) basis, and compliance with both WorkSafe and City of Cockburn environmental requirements may not be met. Given the ongoing degradation of facilities, the annual costs of maintaining the site and addressing issues is expected to increase considerably. Further, there is no ability to increase the capacity of the facility or reduce the safety risk arising from increasing movement of vehicles, machinery and people around the site. The working conditions for staff would continue to deteriorate, training of employees and contractors would need to occur off site, and accommodation would need to be sourced all of which incur additional opex.

1.6.1.1 Achievement of objectives

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

Table 0.8: Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	N
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	N
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	N
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

This option does not deliver against our vision objectives of being a good employer as it leaves safety hazards and operational constraints unmitigated. It does deliver for customers as there is little to no direct impact experienced by our customers as a result of this redevelopment. While this option does achieve sustainable cost efficiency by working within industry benchmarks of a building facility's useful life, it results in ongoing inefficient opex to maintain a site that does not provide the safety, security and operational needs required into AA5.

1.6.1.2 Cost assessment

The annual cost of the facility is currently $0.2 million of opex and $0.25 million in capex was incurred 2017. The costs have been increasing since July 2016 at a rate of approximately 26% per year. This is expected to continue to do so as the reactive maintenance costs of an ageing facility will continue.

Each year approximately $0.07 million in stock is lost due to degradation.

Table 0.9: Summary of AA5 forecast spend for Jandakot Redevelopment - Capex/Opex Split

($000)	2018	2019	2020	2021	2022	Total
Capex	-	-	400	-	300	700
Opex	150	183	230	289	365	1,217
Stock loss	70	70	70	70	70	350
Total	**220**	**253**	**700**	**359**	**735**	**2,267**

1.6.1.3 Risk assessment

Table 0.10 shows that not redeveloping the Jandakot facility does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 1.10: Risk assessment Option 1

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

1.6.2 Option 2 – Redevelop facilities on existing site

With this option, the Jandakot depot would undergo significant redevelopment to address the current issues as well as support future needs, including:

- Construction of a contemporary office space to accommodate existing and future planned workforce, including parking and other vehicle access resources designed and managed in a way that minimises exposure to the potential for harm.
- Construction of an additional warehouse facility to house materials and equipment safely and securely in a weather resistant environment, with improved boundaries and security to reduce current potential for theft. The improved facilities, removal of demountables and improved vegetation management will also contribute to better safeguarding against snakes (with almost 10% of safety incidents raised related to this danger).
- Training rooms to better upskill staff and contractors.
- Construction of appropriate facilities to ensure the continued use of the depot for incident and emergency response, including appropriate housing for SCADA and Control Centre back-up systems.
- Construction of onsite accommodation for roster staff who require accommodation whilst working in Perth.

1.6.2.1 Achievement of objectives

Table 1.11 outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.11: 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 our vision objectives as it provides a safe and secure facility for staff, contractors, visitors and customers, whilst upgrading the facilities to meet current and future operational requirements, including unique staff training requirements.

1.6.2.2 Cost assessment

The capital cost of delivering the changes required to address existing issues and future needs is estimated to be $8.3 million as detailed in Table 0.12. The ongoing operating and maintenance expenditure is expected to reduce due to improved efficiencies of energy ratings for newly constructed buildings.

A formal procurement process will be undertaken to ensure expenditure is based on the results of a competitive tender process to ensure the works are delivered at an efficient cost.

There will be costs associated with disruption and temporary housing of employees, which will be expected to be costed into the tender process. A detailed design and plan of the construction phase is needed before the decision to move to a new (temporary) location versus remaining in the current facilities as a slower process of redevelopment is undertaken can be considered.

Table 0.12: Summary of AA5 forecast spend for Jandakot Redevelopment

($000)	2021	2022	2023	2024	2025	Total
Capex	517	-	-	4,000	3,800	8,317
Total	**517**	**-**	**-**	**4,000**	**3,800**	**8,317**

1.6.2.3 Risk assessment

Table 0.13 shows that redeveloping the Jandakot facility does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.13: Risk assessment Option 2

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

1.6.3 Option 3 – Lease a new fit-for-purpose facility

This option requires the identification of a facility to lease that will meet the current and future needs of the Jandakot facility. The existing Jandakot site would be sold and the operations would re-locate to the new facility. The new site would require already constructed office and warehouse space that meets the operational and back office needs of the business at a competitive rate in a similar location.

1.6.3.1 Achievement of objectives

Table 0.14 outlines how this option will will support the achievement of our vision objectives in AA5.

Table 0.14: 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	Y
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 deliver against our vision objective of delivering for customers as the new facility would provide the level of service otherwise expected of a service provider, assuming the facilities were fit for purpose. It does not deliver as a good employer were relocations are very disruptive for staff and there would be the lost opportunity to design and build a purpose built facility with staff input and engagement. It also does not deliver profitable growth as unless a NPV assessment on the ongoing lease costs presents a positive outcome.

1.6.3.2 Cost assessment

The cost of this option is estimated as $6.6 million, with significantly lower capex of $3.4 million and $3.2 million opex over the AA5 period as detailed in Table 0.15.

Key activities required for transitioning to a new lease area would involve significant truck movements to cater for stock transfer. This is estimated at 300 movements and estimated cost of $0.2 million.

Staff movements would need planning to ensure desks and consumable items are also transitioned to the new facility. This is estimated at 70 staff members 10 trucking movements at an estimated cost of $0.02 million.

Based on prior experience, no one lease taken on will satisfy the needs of the operation and therefore there would be a requirement to do rework on the accommodation setup and layout. This is estimated at $3 million, which is inclusive of IT/OT transitioning for SCADA to support the back up control room, Compressor Station Network to support the fault investigation and response of the operation, safety signage, line marking, fire alarm and escape management, safety assessment implementation, security improvements, insurance assessments and rectification, hygiene setup and management, branding and communication installation.

Additional to this is the lost time of employee's efficiency impacting the operation. This is estimated at 2,600hrs (based on 5 days impact for 65 people) at $70/hr average, to cost a total estimate of $0.2 million.

Table 0.15: Summary of AA5 forecast spend for Jandakot Redevelopment

($000)	2021	2022	2023	2024	2025	Total
Capex	-	-	-	-	-	-
Opex	289	365	459	579	200	1,892
Lease costs	-	-	-	1,140	2,060	3,200
Re-location/disruption costs	-	-	-	3,402	-	3,402
Total	**289**	**365**	**459**	**5,121**	**2,260**	**8,494**

1.6.3.3 Risk assessment

Table 0.16 shows that leasing a new facility does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.16: Risk assessment Option 3

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

1.6.4 Option 4 – Build new facilities at different location

Under this option a new site would be identified and purchased, and new facilities would be built. The existing Jandakot site would be sold. This option would only be viable if the new site could be purchased at a lower price than the existing site could be sold or offers a preferred location operationally. This option would be explored further at the time of the detailed planning. Given the property market can be volatile this option has not been progressed any further.

1.6.4.1 Risk assessment

Table 0.17 shows that building a new facility does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.17: Risk assessment Option 4

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

1.6.5 Option 5 – Staged redevelopment over longer period

This option comprises a staged re-development of the Jandakot depot with the office and traffic management issues being addressed in AA5 and the construction of the warehouse facility being deferred until the AA6 period.

Although, the capital costs would be lower in the AA5 period, the operating and maintenance expenditure would reduce more slowly and stock loss would continue in to AA6. The staff issues would still remain and on this basis this option has not been progressed.

1.6.5.1 Risk assessment

Table 0.18 shows that staging the redevelopment does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.18: Risk assessment Option 5

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

1.7 Summary of Cost/Benefit Analysis

To assess the options, the costs, objectives and risk are considered for each option. A summary of the option assessment is shown in Table 0.19 below.

Table 0.19: Summary of Cost/Benefit Analysis

Option	Objectives	Cost	Risk
Option 1 – Reactive approach to addressing issues	This option does not achieve our objective of being a good employer	$2.3m	This option does not reduce the overall rating to Intermediate
Option 2 – Redevelop facilities on existing site	This option achieves our objectives of being sustainably cost efficient, delivering for customers and being a good employer	$8.3m	This option addresses the high risk to DBP
Option 3 – Lease a new facility	This option does not achieve our objective of being a good employer or being sustainably cost efficient	$8.5m	This option addresses the high risk to DBP
Option 4 – Build new facilities at a different location	Not Assessed	Not Assessed	This option addresses the high risk to DBP
Option 5 – Staged redevelopment	Not Assessed	Not Assessed	This option does not reduce the overall rating to Intermediate

1.8 Proposed solution

1.8.1 Why are we proposing this solution?

The proposed solution Option 2 is recommended because it is the only option that will comprehensively address the identified safety and other risks identified in an efficient and prudent manner.

Option 1 retains facilities that are over 30 years old, non-compliant with current industry requirements, including disability access, and does not provide mitigation for the traffic risks related to vehicle and pedestrian movements. It retains the additional opex costs associated with external hire costs for training and accommodation, and will result in ongoing costs related to loss and/or degradation of materials on site.

Option 3 is not preferred as it would deliver higher ongoing costs (i.e. annual lease costs), but still incur capex related to construction of buildings to meet our unique requirements, and that significant modification costs would be incurred.

Option 4 is not considered prudent or efficient as sourcing alternate land to purchase and construct a purpose build facility and warehouse will likely result in additional costs higher than our preferred Option 2, as well as increased disruption to staff and operations.

Option 5 is not considered effective in addressing the issues via staging the works, as the existing risks will remain for a longer period of time.

1.8.1.1 Consistency with the National Gas Rules

Option 2 is the preferred solution and mitigates the safety, security and operational risks currently experienced on site while addressing our future operational requirements.

Rule 79(2)

The option is consistent with Rule 79(2)(c)(i) as the capex is necessary to maintain and improve the services, specifically by:

- Improving the surety that all materials stored for pipeline maintenance and/or repairs are available and in good condition (without risk of theft or weather damage) and can be used safety consistent with the intended use.
- Improving the safety for all staff and contractors through improved ingress and egress conditions on site, enabling the overall supply chain of services (which includes transportation and storage of materials and provision of office facilities for field crew) to be safer, more efficient and more reliable.

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 safety concerns as soon as reasonably possible. The project is also based on the replacement of an existing asset which has arrived at the end of its useful economic life. 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 an estimate only. A formal procurement process will be undertaken once in principle support of the strategic intent is secured, which will ensure efficient prices are offered based on a competitive tender process. 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 project involves providing a work environment to employees, contractors and visitors which is safe from harm, and which is justified on the basis of a positive NPV. It also follows good industry practice and design specifications for comparable utilities and for employers of choice who offer contemporary work spaces , therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the redevelopment in one project (not staged as per Option 4).

1.8.2 Estimating efficient costs

Each of the options considered have required estimates as detailed in the paper for:

- Capital costs associated with design and build of facilities;
- Ongoing operating and maintenance costs;
- Estimate of lease costs;
- Estimate of re-location and disruption costs;
- Estimate of the sale price for the Jandakot site and associated sale costs; and
- Estimate of the sale price of an alternative property including stamp duty.

Table 1.21 summarises the total unescalated costs by cost type. Table 1.22 shows the escalation applied to escalate the Jandakot Redevelopment to real dollars of December 2020 including labour cost escalation of 0.69% per annum.

Table 0.20: Jandakot Redevelopment cost estimate by cost category

($000)	2021	2022	2023	2024	2025	Total
Internal Labour	246	-	-	164	155	564
Contractors / Consultants	22	-	-	305	289	615
Materials & Services	250	-	-	3,529	3,353	7,132
Travel & Others	0	-	-	3	2	5
Total	**517**	**-**	**-**	**4,000**	**3,800**	**8,317**

Table 0.21: Jandakot Redevelopment total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	517	-	-	4,000	3,800	8,317
Escalation	13	-	-	135	138	286
Total escalated ($ Dec 20)	**530**	**-**	**-**	**4,135**	**3,938**	**8,603**

Appendix A – Risk Assessment

Figure 0.7: Summary of Jandakot Redevelopment 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	Occasional	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	Trivial	Remote	NEGLIGIBLE	1	Minor	Frequent	INTERMEDIATE	25	Trivial	Occasional	LOW	5	Severe	Occasiona	INTERMEDIATE	25	206
Option 1 - Continue to take a reactive approach to addressing issues with the facility as they arise	Major	Occasional	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	Trivial	Remote	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Trivial	Occasional	LOW	5	Severe	Occasiona	INTERMEDIATE	25	186
Option 2 - Redevelop facilities on existing site	Major	Unlikely	HIGH	125	Severe	Remote	LOW	5	Trivial	Remote	NEGLIGIBLE	1	Minor	Unlikely	LOW	5	Trivial	Unlikely	NEGLIGIBLE	1	Severe	Hypothetic	NEGLIGIBLE	1	138
Option 3 - Lease a new fit-for-purpose facility	Major	Unlikely	HIGH	125	Severe	Remote	LOW	5	Trivial	Remote	NEGLIGIBLE	1	Minor	Unlikely	LOW	5	Trivial	Unlikely	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	138
Option 4 - Build new facilities at different location	Major	Unlikely	HIGH	125	Severe	Remote	LOW	5	Trivial	Remote	NEGLIGIBLE	1	Minor	Unlikely	LOW	5	Trivial	Unlikely	NEGLIGIBLE	1	Severe	Hypothetic	NEGLIGIBLE	1	138
Option 5 - Staged redevelopment over longer period	Major	Unlikely	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	Trivial	Unlikely	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Trivial	Occasional	LOW	5	Severe	Unlikely	INTERMEDIATE	25	186

Maximo and DMZ Business Case – Capex DBP11

1.1 Project Approvals

Table 0.1: Maximo and DMZ DBP11 – Project approvals

Prepared By	Gerard Donaldson, Business Systems Specialist
Reviewed By	Tawake Rakai, GM Transmission Asset Management
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 0.2: Maximo and DMZ DBP11 – Project overview

Description of Issue/Project	Maximo and DMZ are components of our operational technology (OT) which directly supports the safe and reliable operations and control of the DBNGP. The primary OT tools are: • DMZ or demilitarised zone – which is a perimeter network used to ensure appropriate separation and cyber security controls of OT tools and system from the broader IT tools and system; and • Maximo – which is an IBM tool, used for asset management and maintenance management (including planning and documentation). Similar to other core IT systems, the OT systems need ongoing application renewal to maintain the integrity of the OT environment and manage technology risks. In AA5, the following key activities for these core OT systems are forecast: • DMZ upgrade; • Maximo reconfiguration and upgrade; • Maximo patching; and • Firewall and server replacement. These are required in order to maintain systems that are fit for purpose and meet the needs of the business. This business case also outlines the cost and how the need for upgrades to these core systems have been identified and estimated.
Project Name	Maximo and DMZ
Estimated Cost	Total forecast capex for the next Access Arrangement (AA5) is $2.2 million.
Basis of costs	All costs in this business case are expressed in real June 2019 dollars unless otherwise stated.
Variation	The proposed AA5 expenditure is $0.9 million more than the estimated expenditure for AA4. For business as usual OT activities (patching, end of life replacement and ongoing maintenance), historical actual information is used as the basis for future forecasts. For upgrades, forecast expenditure is guided by manufacturer's guidance on cost. For once off initiatives, forecast expenditure is based on commercially negotiated rates secured in line with our Procurement Policy and Purchasing Procedure. The AA5 forecast allows for: • Core system upgrades; • Standard annual patching; and

	• End of life asset replacement. The lower level of expenditure in AA4 was due to core system upgrades not being required and periodic replacement of assets not scheduled in the period.
Consistency with the National Gas Rules (NGR)	DMZ and Maximo are critical OT tools which are relied upon to effectively deliver on reporting requirements (to the AEMO and customers) as well as to document and schedule maintenance activities. Management and maintenance of OT assets is considered critical to our core operations and is 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 advised 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 Maximo and DMZ program in AA5 will maintain current levels of IT services that support operations and mitigate risks associated with core business systems through a prudent cycle of system upgrades and replacements in line with standard industry practice. During Shipper Roundtables, we presented key areas of planning, including proposed capex and opex. Shippers were broadly comfortable with the approach and high-level program in AA5 noting they would be supportive of IT investment to improve the customer experience where there is a business case demonstrating customer benefits. Our proposed capex was then outlined in its Draft Plan. There were no questions specifically raised in relation to the Maximo and DMZ program.
Other relevant documents	This Business Case should be read in conjunction with: • AMP TEB-001-0024-10 (Maximo); and • Risk Management Policy and Operational Risk Model (together our Risk Management Framework).

1.3 Background

All DBNGP assets – whether physical or intangible - 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 sometimes supported by the relevant manufacturer's warranty and/or maintenance guidelines.

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

We separate OT from corporate IT due to the criticality of the systems and the sensitivity of information contained within.

Whilst there is some interdependency with corporate IT assets - such as the platform Maximo runs on - these OT projects are specifically classified as such due to their impact on business operations and the sensitivity of the data contained within the systems as well as the systems themselves.

The OT program for AA5 is primarily made up of two projects:

1. DMZ upgrade; and
2. Maximo data re-configuration and upgrade.

Standard end of life replacement of the Cisco firewall and server is also forecast for AA5 along with annual patching for Maximo.

1.3.1 Development of program

The need to appropriately maintain OT systems (and associated hardware and software) is a priority activity for us to support the safe and reliable operations and control of the DBNGP.

1.3.1.1 DMZ Upgrade

The DMZ (demilitarised zone) is a security solution used to create a perimeter, to ensure there is appropriate separation and control between the OT systems and environment that are integral to the safe and reliable operations of the DBNGP and other IT systems and environment (including the internet).

The DMZ is independently audited each year and regular upgrades are required to ensure the environment remains robust. DMZ is the key system that separates the SCADA operational systems from the corporate systems and is essential for maintaining system based security within our business.

Maintaining security and serviceability requirements requires ongoing upgrades to firewalls and monitoring applications to ensure they fall within normal limits.

The DMZ upgrade project will include:

- Security driven upgrades in 2021 and 2024 associated with upgraded firewalls and monitoring application to fall within normal service levels;
- Ongoing serviceability of security software including monitoring and patching requirements in 2022, 2023 and 2025; and
- Extending and upgrading hardware firewall and routing equipment in 2024 to allow continued security defences.

1.3.1.2 Maximo patching, upgrade and data re-configuration

Maximo is the computerised maintenance management system and is used to plan and record both planned and corrective maintenance activities. Maximo is an IBM system and needs to be upgraded regularly in line with IBM guidelines, to remove bugs, latest maintenance management practices/methodology are embedded and that reliability and resilience of the system and its performance is not compromised.

IBM regularly releases updates and patches to its Maximo software which we apply annually.

In addition to the standard maintenance investment for Maximo, in AA5, we will also complete our Maximo Business Process Redesign project which will realign asset and maintenance activity structures in Maximo with our AMPs, introducing additional functionality to track critical safety elements.

The Maximo Business Process Redesign project began in 2019 and is forecast for completion in 2021. With this project, data capture will change to better reflect data reporting requirements, so Asset Managers and Maintenance Managers will be able to review costs and budgets at a micro or macro level, with improved transparency and alignment within and across financial periods.

This Maximo re-configuration project specifically includes:

- Replacement of the instrument index and back fill asset data into the new hierarchy;
- Re-work asset management plans to align completely with the Maximo structure; and
- Alignment of internal KPIs target with newly available data.

The 2019 trial of the re-configured Maximo was rolled out across two compressor stations, four metering facilities and several main line valve sites to ensure the best workable philosophy and associated business processes could be embedded within the tool to maximise benefit for us.

1.3.2 Cisco firewall and server

An investment in the replacement of the Cisco firewall and CISCO server on the CSN network is also scheduled for 2021.

Replacement of firewalls and servers at the end of their life is considered standard practice within the IT industry, with failure to appropriately manage essential security assets leading to unacceptable risk profiles for organisations.

1.4 AA5 forecast

In AA5, a total expenditure of $2.2 million is forecast as shown in Table 0.3. The forecast is based on the completion of upgrades for both DMZ and Maximo, annual patching and end of life asset replacement for the Cisco firewall and server.

Table 0.3: AA5 OT projects

OT project	AA5					
	2021	2022	2023	2024	2025	TOTAL
DMZ upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Maximo upgrade and reconfig	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Maximo annual patching	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Cisco firewall and server	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total cost ($'000)	**1,495**	**155**	**155**	**295**	**155**	**2,255**

1.4.1.1 AA4 compared to AA5

In AA4, we forecast total expenditure of $1.4 million. This is $0.9 million less than our forecast for AA5, as shown in Table 0.4

Table 0.4: Summary of actual and forecast spend across AA4 and AA5

($'000)	Year 1	Year 2	Year 3	Year 4	Year 5	AA
AA4 forecast	215	72	249	316	505	1,357
AA5 proposed	1,495	155	155	295	155	2,255
Variance	**(1,280)**	**(83)**	**94**	**21**	**350**	**897**

The increase in AA5 is driven by:

- Completion of the Maximo re-configuration project in Year 1 of AA5 ($1.2 million);
- DMZ upgrade initiative; and
- Periodic replacement of end of life firewall and server assets.

The increase in expenditure in AA5 was partially offset by the expenditure incurred in AA4 on the upgrade of the control room ($0.3 million) which will not be required in AA5.

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

Figure 0.1: 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 of an event associated with failure of an OT 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 OT is presented in Figure 0.2. Three elements of risk are rated as high, two low and one negligible. This results in a high risk ranking for these OT assets in an untreated scenario.

Figure 0.2: Risk rating – OT

	Trivial	Minor	Severe	Major	Catastrophic
Frequent			Outrage		
Occasional				DBP	
Unlikely				Asset damage	
Remote			Loss of supply		
Hypothetical	People			Environmental	

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

The table below summarises the untreated risk rating for the failure of OT assets.

Table 0.5: Risk rating

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

OT driven initiatives are high risk and high priority.

- **DBP** – Untreated, a failure of OT tools would threaten the effective operation for a substantial period, including its ability to raise capital, or have a significant effect on how we will operate in the future;
- **Reputation/Outrage** – Untreated, a failure of OT tools could result in widespread complaints and anger; and
- **Asset Damage** – Untreated, a failure of OT tools could result in asset damage of between $10 million and $25 million.

1.6 Options Considered

Alternatives options for management and maintenance of Maximo and DMZ for the AA5 period which have been considered are:

- Option 1 – Adopt a replacement on failure policy;
- Option 2 – Undertake replacement consistent with the AMP; and
- Option 3 – Defer everything to AA6 apart from annual patching.

1.6.1 Option 1 – Adopt a replacement on failure policy

With this option, we would replace or upgrade OT only in the event of total obsolescence/failure.

Maintenance, patching, upgrades and asset replacement of OT tools would be deferred until there was a failure, at which time the technical failure and any subsequent operational impact would be assessed and addressed in a reactive (probably emergency) manner.

1.6.1.1 Achievement of objectives

Table 0.6 outlines how Option 1 would support the achievement of our vision objectives in AA5.

Table 0.6: Option 1 - Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	-
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 or being sustainably cost efficient by working within industry benchmarks.

Under this option OT would only be replaced when it can no longer be patched or upgraded by the provider, essentially adopting an approach to run the systems until they are obsolete. It is expected that this approach would result in our relying on OT that is not supported by the provider as it would be beyond its useful life and likely operating with redundant hardware and software.

This option would leave assets that have been identified by both the business and their relevant manufacturer as outside maintenance norms, in the knowledge that the likelihood of a failure and its subsequent impact on the safe and reliable operation of services would increase.

1.6.1.2 Cost assessment

The forecast cost in AA5 cannot accurately be estimated for a replace on failure policy scenario, but we could reasonably expect to incur higher costs if this policy were to be adopted due to the increased likelihood of cyber incidents and system incompatibilities resulting in extended outages prompting the need for emergency responses.

1.6.1.3 Risk assessment

Table 0.7 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 0.7: Risk rating impact - Option 1

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

1.6.2 Option 2 – Undertake replacements consistent with the AMP

With this option, the maintenance, upgrade and end of life replacement of OT would be done in accordance with the AMP and good industry practice.

It also provides for full and effective implementation of the Maximo upgrades and process improvement initiative that commenced in AA4, as well as upgrades to DMZ so that it continues to receive vendor support and provides accurate and reliable reporting to customers and the AEMO.

1.6.2.1 Achievement of objectives

Table 0.8 outlines how option 2 will support the achievement of our vision objectives in AA5.

Table 0.8: Achieving objectives – option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	Y
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	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

This option delivers for customers in terms of reliability and customer service and is not sustainably cost efficient in terms of working with industry benchmarks.

Option 2 provides for OT maintenance and upgrade in line with industry standards to ensure their ongoing performance, integrity, capability and supportability.

1.6.2.2 Cost assessment

The forecast cost of this option is $2.2 million.

By adopting a proactive, planned approach to OT asset management, we can best manage the efficient delivery of the program, minimising the need for unplanned and disruptive repair work.

The cost has been estimated by identifying the activities required and estimating the cost based on relevant historical information or information provide by supplier.

1.6.2.3 Risk assessment

Table 0.9 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 0.9: Risk rating impact - Option 2

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

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 – Defer everything to AA6 apart from annual patching

Under this option, the upgrade of DMZ, upgrade and re-configuration of Maximo and the end of life asset replacement projects would be deferred to AA6 with only the annual patching of Maximo completed in AA5.

This ignores the useful life of the asset as defined in the AMP and relies on the continued effectiveness of the current DMZ system.

1.6.3.1 Achievement of objectives

Table 0.10 outlines how option 3 will support the achievement of our vision objectives in AA5.

Table 0.10: Achieving objectives – option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	-
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 relevant vision objectives of delivering for customers, being a good employer and being sustainably cost efficient it does not support maintenance and management of OT assets in line with our AMP, manufacturer's guidelines or industry practice.

1.6.3.2 Cost assessment

The planned cost of this option is $0.4 million in AA5.

Similar to option 1, however, it is likely that in a 5 year period an unmaintained tool (ie Cisco server) will either fail or be compromised, prompting an unplanned financial impact which cannot be accurately quantified at this time.

1.6.3.3 Risk assessment

Table 0.11 shows that option 3 in AA5 does not moderate the threat, the frequency and/or the consequence to reduce the risk rank to intermediate or lower.

Table 0.11: Risk rating impact - Option 3

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

Option 3 does not appropriately address risks, leaving the inherent risk of these assets as high, disregarding manufacturer's guidance, support availability, AMP and industry norms which could compromise 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 0.12: Summary of Cost Benefit analysis

Option	Objectives	Cost	Risk
Option 1 – Adopt a replacement on failure policy	This option does not achieve our objectives of delivering for customers or working within industry benchmarks	>$2.2m	This option does not treat the identified risk at all.
Option 2 – Do replacements identified in the AMP	This option achieves our objective of delivering for customers and working within industry benchmarks	$2.2m	This option appropriately moderates all high/intermediate risks to ALARP
Option 3 – Defer upgrades, reconfiguration and asset replacement to AA5	This option does not achieve our objectives of delivering for customers or working within industry benchmarks	>$0.4m +	This option does not adequately address the high and intermediate risks

1.8 Proposed solution

1.8.1 Why are we proposing this solution?

The recommended option is Option 2 – undertake replacements consistent with the AMP as required to appropriately mitigate the risk identified under our Operational Risk Framework, and manage the OT assets consistent with asset management principles and the relevant manufacturers' specification. Option 2 also provides for full and effective implementation of the Maximo upgrades and process improvement initiative that commenced in AA4, as well as upgrades to DMZ so that it continues to receive vendor support and provides accurate and reliable reporting to customers and the AEMO.

Running the assets to failure as per option 1, or deferring essential maintenance activities until AA6 as per option 3 is likely to result in catastrophic failure of an asset which gives rise to 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 expectations.

Options 1 and 3 are not considered viable due to the high risks related to inaccuracy of asset information in Maximo and lack of separation and control of systems in DMZ. Not only would these risks place us at risk of losing our licence to operate, it would cause significant reputational damage and potentially result in curtailment of service where system inaccuracy or unreliability is extreme.

1.8.1.1 Consistency with the National Gas Rules

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 Maximo and DMZ 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 OT tools. The proposed expenditure can therefore be seen to be of a nature that would be incurred by a prudent service provider.
- **Efficient** – For OT projects where they are business as usual activities (patching, end of life replacement and ongoing maintenance), historical actuals are used as the basis for future forecasts. For upgrades, forecast expenditure is guided by manufacturer's guidance on cost. For once off initiatives, forecast expenditure is based on commercially negotiated rates secured in line with our Procurement Policy and Purchasing Procedure. 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 ensuring that OT tools are appropriately maintained and tools are optimised and modernised in line with technology and data availability and capture developments. 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.

1.8.2 Estimating efficient costs

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

1.8.2.1 Estimating efficient costs

For OT projects where they are business as usual activities (patching, end of life replacement and ongoing maintenance), historical actuals are used as the basis for future forecasts.

For upgrades, forecast expenditure is guided by manufacturer's guidance on cost.

For once off initiatives, forecast expenditure is based on commercially negotiated rates secured in line with our Procurement Policy and Purchasing Procedure.

With OT initiatives, there is a heavy reliance on external contractors for the delivery of this specialist work. This is quite standard within the IT industry as it is less efficient to engage employees with such specific, specialist technical skills directly due to the need for these skills being so intermittent.

Table 0.13 below summarises the total unescalated costs for Maximo and DMZ in real dollars June 2019.

Table 0.13: Maximo and DMZ cost estimate

OT project	2021	2022	2023	2024	2025	Total
DMZ upgrade	[redacted]					
Maximo upgrade and reconfig.						
Maximo annual patching						
Cisco firewall and server						
Total cost ($'000)	**1,495**	**155**	**155**	**295**	**155**	**2,255**

Table 0.14 below summarises the total unescalated costs by cost type. Table 0.15 below shows the escalation applied to escalate the Maximo and DMZ costs to real dollars of December 2020 including labour cost escalation of 0.69%.

Table 0.14: Maximo and DMZ cost estimate, by cost type

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
External Contractors/ Consultants	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Materials & Services	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Travel & Others						
Total cost	**1,495**	**155**	**155**	**295**	**155**	**2,255**

Table 0.15: Maximo and DMZ total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	1,495	155	155	295	155	2,255
Escalation	38	4	5	10	6	63
Total escalated ($ Dec 20)	**1,533**	**159**	**160**	**305**	**161**	**2,318**

Appendix A – Risk Assessment

Figure 0.3: Summary of Maximo and DMZ 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	Trivial	Hypothetical	NEGLIG BLE	1	Major	Hypothetical	LOW	5	Severe	Frequent	HIGH	125	Major	Unlikely	HIGH	125	Severe	Remote	LOW	5	386
Move to a replacement on failure policy	Major	Occasional	HIGH	125	Trivial	Hypothetical	NEGLIG BLE	1	Major	Hypothetical	LOW	5	Severe	Frequent	HIGH	125	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	286
Do the replacements identified in the AMP	Major	Remote	NTERMEDIATE	25	Trivial	Hypothetical	NEGLIG BLE	1	Major	Hypothetical	LOW	5	Severe	Unlikely	NTERMEDIATE	25	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	86
Defer upgrades until AA6 (undertake annual patching)	Major	Occasional	HIGH	125	Trivial	Hypothetical	NEGLIG BLE	1	Major	Hypothetical	LOW	5	Severe	Occasional	NTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Remote	LOW	5	286

Safety Case Revisions – Capex DBP12

1.1 Project Approvals

Table 0.1: Safety Case Revisions DBP12 – Project approvals

Prepared By	Jeff Kong, Head of Transmission Asset Strategy
Reviewed By	Tawake Rakai, GM Transmission Asset Management
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 0.2: Safety Case Revisions DBP12 – Project overview

Description of Issue/Project	Legislation requires a Ministerial accepted DBNGP Safety Case, with comprehensive review on a 5 yearly basis. This business case considers the next review of the Safety Case which will: • consider outcomes and recommendations resulting from previously conducted risk and/or safety assessments; and • identify areas of potential exposure to risk that remain current as well as those that simply require reassessment. This review will also focus on the Formal Safety Assessment in detail, demonstrating that identified risks have been reduced to ALARP where appropriate, as well as a general update to the Facility Description and Safety Management System sections.
Project Name	Safety Case Revisions
Estimated Cost	Total forecast capex 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	The proposed AA5 expenditure is $0.06 million more than the estimated expenditure for AA4 of $0.4 million. However, it should be noted that a further $0.2m was incurred in AA3 that related to the AA4 period. The reasons for the increase in AA5 are: • requirements to incorporate changes resulting from the planned introduction of new Work Health and Safety (WHS) legislation to petroleum pipelines, if proclamation occurs in or before 2021; and • development of a revised training package is required, including possible new WHS legislation.
Consistency with the National Gas Rules (NGR)	The Petroleum Pipeline Act 1969 ("PPA") and the associated Petroleum Pipelines (Management of Safety of Pipeline Operations) Regulations 2010 ("MoSoPO Regulations") require submission of a revised safety case to the Minister at 5 yearly intervals. The revised safety case is required to "describe the means by which the licencee will continue to ensure that the pipeline, and the machinery, electrical systems and instrumentation controls used in the operation, are kept in good condition and fit for purpose". To ensure this a comprehensive review of the Formal Safety Assessment and Safety Management System is required to demonstrate that risks from any changes to pipeline safety continue to be systematically identified, risks from any new or altered threats assessed and controls are in place to maintain the risk levels at an acceptable level that is as low as reasonably practicable (ALARP). In addition, as part of the conditions of DBNGP Licences as well as in accordance with Safety Case accepted by the Minister via DMIRS, compliance with AS 2885 is required. AS 2885 requires a review of the safety management study (which is the main component of the Formal Safety Assessment section of the Safety Case). Review of Formal Safety Assessment is fundamental in ensuring that the risks impacting the pipeline integrity and people safety have been adequately assessed and continue to be

	effectively managed to an acceptable level and ALARP. The Safety Case is updated following the completion of Formal Safety Assessment review. The Safety Case is the primary document outlining how the operation of the DBNGP is conducted in compliance with legislative obligations under the PPA and MoSoPO Regulations and other licence conditions, therefore is consistent with 79(2)(c)(iii) to comply with a regulatory obligation or requirement. The proposed volume of replacement 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 Safety Case project will undertake a 5 yearly review of our Safety Case as required under our operating licence. 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 approach was then outlined in our Draft Plan. There were no questions specifically raised in relation to the Safety Case project. Further, there have been constant communication and consultation with the DMIRS in relation to safety case requirements and progress in the development of new WHS legislation applicable to petroleum pipelines. Whilst DMIRS is familiar with DBP's safety case review process, focused consultation will take place as part of planning for the review activity.
Other relevant documents	This Business Case should be read in conjunction with: • Asset Management Plan General (TEB-001-0024-07) • AMP TEB-003-0004-01 (Safety Case) • 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 DBNGP is operated and managed in accordance with the Petroleum Pipelines Act 1969, which requires a Ministerial approved DBNGP Safety Case that supports and directs the Safety Case to be kept current, with a comprehensive review and revision on a 5 year basis.

Petroleum Pipeline Act 1969 (PPA) and the associated Petroleum Pipelines (Management of Safety of Pipeline Operations) Regulations 2010 (MoSoPO Regulations) require a Safety Case to be in place for all petroleum pipeline operations. Accordingly, the DBNGP Safety Case is in place for the operation of the DBNGP and is subject to acceptance by the Department now known as DMIRS (as the Minister's delegate).

The DBNGP Safety Case demonstrates our ability to:

- systematically identify people safety hazards associated with the pipeline;
- assess the risks from the hazards; and
- control the risks to an acceptable level that is ALARP by implementing necessary risk reduction measures.

Therefore, the Safety Case provides detailed descriptions of systems and processes that have been established and employed to ensure safe operation from every aspect, with a focus on management of threats that could lead to a Major Accident Event (MAE – events with multiple fatality potential). This information is presented in three key sections of the Safety Case covering:

- physical safeguards incorporated in the design based on standards, codes and hazards identified;
- key hazards and threats that have been identified from the Formal Safety Assessment (FSA); and
- systems, policies and procedures in place to ensure effectiveness of safeguards as well as management of residual risks.

During its operation, the DBNGP is exposed to changes, some of which can have a significant impact on the risk levels, effectiveness of safeguards or introduction of new hazards. Such changes could include changes to land use around the pipeline, condition of asset, changes in technology, changes in regulatory requirements, changes in customer requirements and changes in work practices or processes.

To provide continued assurance of safe operation, the Safety Case is required to be current and as such, MOSOPO Regulations require a comprehensive review and submission of a revised Safety Case on a 5 yearly basis.

In addition, AS 2885, compliance with which is a condition of the DBNGP pipeline licences and a requirement of the Safety Case itself, requires a review of safety management study at a period not exceeding 5 years. Safety management studies conducted for the DBNGP make up the key component of the Formal Safety Assessment for systematic identification of hazards and control of their risks.

The current Safety Case was accepted by the Minister via DMIRS in November 2016. Therefore, We are required to submit a revised safety case no later than November 2021.

This business case covers the next 5 yearly review of the Safety Case which will:

- analyse changes that have occurred that impact on the safety of the pipeline as well as safety of people, and confirm that the risks are continued to be controlled to ALARP, ensuring no significant new risks from those changes that have not been assessed;
- review technical inspections that have occurred as part of the assessment of remaining life review as required by AS 2885;
- collectively update all non-significant changes that previously did not require a revision of the Safety Case to reflect the current practice; and
- redemonstrate that risks associated with the safety of the pipeline and safety of people from the pipeline operation are at an acceptable level and ALARP.

As part of providing assurance, the revision scope will also include an audit to verify the existence and evaluate the effectiveness of controls for management of hazards to ALARP. This is a critical aspect of the Safety Case submission process to verify the truthfulness of the document.

We must comply with the PPA requirements to maintain a current and relevant DBNGP Safety Case that requires 5 yearly revisions.

The proposed solution of undertaking the review with internal personnel will best satisfy the criteria and demonstrate that we "will continue to ensure that the pipeline, and the machinery, electrical systems and instrumentation controls used in the operation, are kept in good condition and fit for purpose" because:

- Only those people with the breadth and depth of experience in operating and maintaining the DBNGP will be able to contribute meaningfully to the discussions on key matters that influence the risk profile of the pipeline as well as understanding what 'fit for purpose' requirements there are on this unique pipeline; and
- We can retain high levels of ownership and understanding of the commitments and obligations included in the Safety Case by having its personnel undertake the review themselves.

1.3.1 Proposed approach to review and revisions

The proposed approach to undertake the review will be broadly consistent with the review undertaken in 2015/16 as follows:

- Conduct a review of FSA including:
  - Review of changes to the pipeline, land use, crossings, projects, etc;
  - Review of recent incidents; and
  - Review existing safety studies, such as HAZOPs and Pipeline Safety Management Studies;
- Review and revise the facility description with input from the FSA review; and
- Review of Safety Management System in light of the planned introduction of WHS legislation and incorporation of input from the FSA review.

1.4 AA5 forecast

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

Table 0.3: Summary of AA5 forecast spend for Safety Case Revisions

($'000)	2021	2022	2023	2024	2025	AA5
Safety Case Revisions	500	-	-	-	-	500
Program total	**500**	**-**	**-**	**-**	**-**	**500**

1.4.1 AA4 comparison

In AA4, we estimate expenditure on this program will be $0.4 million. Both in AA3 and AA4, we were not provided with an approved budget in relation to Safety Case revisions. Note the last revision process was undertaken within 2015-2016 financial year and as such it straddled over AA3 and AA4 ($0.207m in 2015 and $0.442m in 2016).

Table 0.4: Summary of actual and approved spend in AA4

($'000)	2016	2017	2018	2019	2020	AA4
Actual	442	-	-	-	-	442
Approved	-	-	-	-	-	-
Variance	**442**	**-**	**-**	**-**	**-**	**442**

The reason for the overspend of the approved budget in AA4 was that the 5 yearly revision of the Safety Case was reassessed to meet the criteria for a SIB project in 2015, which was subsequent to the finalisation of AA4 submission.

1.4.2 What are the drivers for this variation?

The cost of the Safety Case revision for this 5 year period is 20% lower than the total cost of the previous Safety Case revision ($0.6 million combined in 2015-2016). Therefore, decrease in forecast spend in AA5 is because:

- The Safety Management System was overhauled in 2015/16 and will not be required to the same extent in AA5. However, there is a planned introduction of new WHS legislation, hence a $0.04 million reduction is proposed in 2021 against this component;
- Project management has been reduced by 50% against 2016 spend as there will be less involvement of CEO and Executive members due to higher levels of confidence being built in the process and outcomes from 2016; and
- FSA, FD, Travel, Audit and Entertainment are expected to incur the same expenses as the 2016 revision as travel to site to do a compliance audit remains preferable to a desk top review in order to deliver higher certainty of safety compliance.

Table 0.5: Comparison of costs AA4 and AA5

	AA4 cost ($'000)	AA5 cost ($'000)	Variance cost ($'000)
Safety Case Revisions	442	500	58
Total	**442**	**500**	**58**

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

Figure 0.1: 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 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 Safety Case Revisions is outlined in Figure 0.2. As displayed, there are two high risks and four negligible risks associated with the Safety Case revisions. This results in an overall high risk rating in an untreated scenario.

Figure 0.2: Risk rating – Safety Case Revisions

	Trivial	Minor	Severe	Major	Catastrophic
Frequent					
Occasional				DBP Outage	
Unlikely					
Remote					
Hypothetical	People Environmental Asset Damage Loss of Supply				

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

Table 0.6: Risk rating - untreated

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

Revisions to the Safety Case is a legislative requirement. The overall risk rating of not undertaking a 5 yearly review is identified as high in Figure 0.2.

DBNGP Safety Case revisions ensure that the DBP operates compliant with the PPA to have in place a current Safety Case that reflects contemporary operational and safety requirements along with relevant industry practice. The Safety Case essentially contains descriptions that summarise the requirements of the AMP and well established safety processes.

Specifically:

- **DBP –** Untreated, DBP would risk non-compliance with the Safety Case and loss of its operating licence.

- **Reputation/Outrage –** Untreated, there is an increased likelihood of non-compliance and potential prosecution from DMIRS due to irrelevant content contained within the Safety Case if it isn't reviewed and updated by staff who best know the pipeline, its condition and operating environment.

1.6 Options Considered

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

- Option 1 – Undertake the Safety Case review with internal resources
- Option 2 – Undertake the Safety Case review with external resources

1.6.1 Option 1 – Undertake the 5 yearly Safety Case review and revisions with internal resources

Under this option DBP would undertake a comprehensive review of the current Safety Case with the view to ensuring there have been no changes that introduce additional risks or heighten existing risk levels and that the existing controls remains to be operational and effective. Any improvements identified that lead to better safety and/or operational performance will be crystallised in the AMP and relevant safety systems.

The review would be undertaken by knowledgeable staff who have in-depth and extensive experience in operating and maintaining the pipeline, thereby understanding its condition and operating environment. This will ensure the review process is meaningful and relevant.

1.6.1.1 Achievement of objectives

Table 0.6 outlines how option 1 will support the achievement of our vision objectives in AA5.

Table 0.7: 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 ensures compliance with the Safety Case and leverages the experience and expertise of DBP staff in keeping it current and relevant.

1.6.1.2 Cost assessment

The cost of this option in AA5 would be $0.5 million.

Table 0.8: Summary of AA5 forecast spend for Safety Case Revisions

($'000)	2021	2022	2023	2024	2025	AA5
Safety Case Revisions	500	-	-	-	-	500
Program total	**500**	**-**	**-**	**-**	**-**	**500**

1.6.1.3 Risk assessment

Table 0.9 shows that not maintaining and updating the Safety Case every 5 years with internal resources system does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.9: Risk assessment Option 1

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

1.6.2 Option 2 – Undertake the 5 yearly Safety Case review and revisions with external resources

Under this option DBP would undertake a comprehensive review of the current Safety Case with the view to ensuring there have been no changes that introduce additional risks or heighten existing risk levels and that the existing controls remains to be operational and effective. The review would be undertaken by external resources who have subject matter expertise in related fields. However, they are unlikely to have equivalent level of knowledge of operating and maintaining the DBNGP, thereby will likely not fully understand its condition and operating environment.

Staff would still be required to support the review and compilation of any recommended changes, and will likely participate in interviews, surveys and workshops with the external advisors in order to inject as much knowledge as possible.

1.6.2.1 Achievement of objectives

Table 0.10 outlines how option 2 will support the achievement of our vision objectives in AA5.

Table 0.11: 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	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option does not deliver against being a good employer as it removes the ownership and understanding of the importance and relevance of the commitments in the Safety Case, making it seen as a compliance tool rather than living document that reflects how the DBNGP is operated.

1.6.2.2 Cost assessment

The cost of this option in AA5 would be $0.6 million.

Table 0.12: Summary of AA5 forecast spend for Safety Case Revisions

($'000)	2021	2022	2023	2024	2025	AA5
Safety Case revisions	600	-	-	-	-	600
Program total	**600**	**-**	**-**	**-**	**-**	**600**

1.6.2.3 Risk assessment

Table 0.13 shows that option 2 does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.13: Risk assessment - Option 2

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

This option does not adequately mitigate the risk. The use of external resources may result in some residual risk associated with embedding changes in culture and the risk of adopting a more generic approach for the Safety Case that does not meet DBP's unique operating requirements.

1.7 Summary of Cost/Benefit Analysis

Table 0.14: Summary of Cost/Benefit Analysis

Option	Objectives	Cost	Risk
Option 1 – Review with internal resources	This option achieves our objectives of delivering for customers, being a good employer and being sustainably cost efficient	$0.5m	This option addresses the high risks to DBP/ Reputation
Option 2 – Review with external resources	This option achieves our objectives of being sustainably cost efficient and delivering for customers but does not achieve being a good employer	$0.6m	This option addresses the high risks to DBP/ Reputation

1.8 Proposed solution

1.8.1 Why are we proposing this solution?

Option 1 is the proposed solution as it complies with legislative requirements and supports a prudent approach to safety and risk management. Option 1 also ensures that any changes to operating conditions that occur within the 5 year period are taken into consideration in the Safety Case Revision at an individual and aggregate level. Ownership is retained within DBP, leading to maintained corporate knowledge and stronger safety outcomes overall.

Option 2 is not recommended as it is higher cost and reduces the level of ownership and 'buy-in' of internal staff by outsourcing the works. This option also requires time investment in educating external consultants on DBP's practice and preferences before undertaking the Safety Case Revision itself, which increases cost.

1.8.1.1 Consistency with the National Gas Rules

Option 1 is the preferred solution and ensures compliance with legislative requirements while building internal capability and understanding of the relevance of the Safety Case.

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 maintaining current and relevant content within the Safety Case and complying with the requirement to undertake a review and make revisions on a 5 yearly basis.

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, DBP considers 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 Safety Case. 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 adopting a 5 yearly review and leveraging the expertise of inhouse resources. 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.

1.8.2 Estimating efficient costs

The costs are estimated by using historical costs of undertaking previous reviews and revisions to the Safety Case, with the most recent expenditure incurred in 2015-2016.

As noted in the 'Final Plan Attachment 8.7 2021-2025 Cost Estimation Methodology', 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 0.15 summarises the total unescalated costs by cost type. Table 0.15 shows the escalation applied to escalate the Safety Case Revisions to real dollars of December 2020 including labour cost escalation of 0.69%.

Table 0.15: Safety Case Revisions cost estimate by cost category

	2021	2022	2023	2024	2025	Total
Internal Labour	194	-	-	-	-	194
Contractors / Consultants	30	-	-	-	-	30
Materials & Services	183	-	-	-	-	183
Travel & Others	93	-	-	-	-	93
Total	**500**	**-**	**-**	**-**	**-**	**500**

Table 0.16: Safety Case Revisions total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	500	-	-	-	-	500
Escalation	13	-	-	-	-	13
Total escalated ($ Dec 20)	**513**	**-**	**-**	**-**	**-**	**513**

Appendix A – Risk Assessment

Figure 0.3: Summary of Safety Case Revisions 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	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Major	Occasional	HIGH	125	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	254
Option 1 - Undertake the 5 yearly Safety Case review and revisions with internal resources	Major	Remote	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Major	Remote	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	54
Option 2 - Undertake the 5 yearly Safety Case review and revisions with external resources	Major	Unlikely	HIGH	125	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Major	Unlikely	HIGH	125	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	254

Meter Stations – Capex DBP15

1.1 Project approvals

Table 0.1: Meter Stations DBP15 – Project approvals

Prepared by	Tim Aujard, Senior Process Engineer
Reviewed by	Hugo Kuhn, Head of Engineering
Approved by	Tawake Rakai, GM Transmission Asset Management

1.2 Project overview

Table 0.2: Meter Stations DBP15 – Project overview

Description of issue/project	This business case covers the program of capital works necessary over the next five years to ensure metering facilities continue to operate safely, reliably, within acceptable risk tolerances and meet the gas delivery and remote operability requirements as specified by our commercial agreements and relevant legislation (*Petroleum Pipelines Act 1969* and *Petroleum Pipelines (Management of Safety of Pipeline Operations) Regulations 2010*). We own and operates 58 meter stations along the DBNGP, each designed to meet differing delivery specifications and with varying age profiles, depending on the timing of the associated customers connecting to the system. Meter stations need to be maintained in a way that is compliant with Australian Standards 2885, 3000 and 60079. Meter stations are subject to an ongoing capital works program, designed to ensure they are operating to a level of performance consistent with that expected by customers. This includes asset replacement, upgrades and preventative maintenance works. This business case outlines a program of work significantly lower in volume that was incurred during the AA4 period. This is because the AA4 period contained additional works driven by a number of unforeseen and one-off incidents ([redacted]), which are not expected to be required during AA5.
Project name	Meter Stations
Estimated cost	Total forecast capex for the next access arrangement period (AA5) is $7.7 million.
Basis of cost	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 - Maintain the volume of activity and expenditure levels undertaken during the AA4 period ($25.8 million); • Option 2 - Move to a replacement on failure policy for all meter station assets ($11.6 million); and • Option 3 - Deliver the volume and activities identified in the Asset Management Plan (AMP) as required, applying good asset management practice and adopting emerging techniques/technologies where appropriate ($7.7 million) (this is the recommended option).

Variation from AA4	The proposed AA5 expenditure is 70% or $18.1 million (real 2019) less than the actual $25.8 million spent in AA4. The significant decrease in expenditure proposed for AA5, for this portfolio of work, is following several unforeseen and one-off projects that occurred in AA4 which temporarily increased the associated works program from that forecast. In AA5, the profile of spending is expected to return to more historical levels, more aligned to the original AA4 forecast.
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the proposed asset replacement, proactive works and upgrade program is consistent with accepted good industry practice, several practicable options have been considered, and market/unit rates have been tested to achieve the lowest sustainable cost of providing pipeline services. **NGR 79(2)** – meter station assets are critical to ensure accurate billing and supply to all customers as per their contracts and our legislative requirements, as well as ensuring that gas meets all relevant specifications. Replacing and refurbishing end of life equipment at meter stations ensures safety (particularly in terms of delivered pressure and gas specification), accuracy (in delivery volumes and billing), reliability (of supply, pressure and specification) and compliance (as a gas market participant). Therefore, the proposed expenditure is conforming capex based on each of the grounds of NGR 79(2)(c)(i) to (iii). **NGR 74** – the forecast costs are based on the latest market rate testing, and project options consider the asset management requirements as per the latest AMP. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
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. The meter stations program comprises ongoing and periodic activities to ensure the integrity of our meter stations. During the 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 meter stations. 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: • Asset Management Plan in 2016 (TEB-001-0024-07) • Asset Management Plan – Metering (TEB-001-0024-06) • 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 sometimes 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.

Meter stations are located at inlet and outlet facilities. They include gas measurement and associated equipment to meet the gas delivery requirements as specified by Standard Shipper Contracts, Reference Service Contracts, relevant legislation, regulatory instruments and Australian Standards. Gas outlet and bi-directional (inlet and outlet) meter stations are normally located on the DBNGP easement or lateral easement immediately prior to the custody transfer point of the transported gas.

Gas metering facilities are also at the ten compressor stations along the DBNGP and at Kwinana Junction. These metering facilities are designed primarily to accurately measure the gas use at the compressor stations as well as mainline and compressor unit gas flows.

Typically, metering facilities contain the following equipment:

- remote isolation valves;
- gas filtration;
- flow meter;
- flow computer and access to gas chromatograph data;
- pressure control system;
- temperature control system including heaters;
- odorant injection;
- instrumentation;
- communication system;
- power supply (AC, DC and batteries); and
- compound fence, security and earthing.

It is a requirement to maintain meter stations appropriately in order to conform to our Shipper Standard Contracts and relevant Australian Standards (including AS2885, AS3000 and AS60079). Furthermore, each facility is bound by a unique set of compliance requirements for safety (as captured by the DBNGP Safety Case), gas specification (odorant content, gas quality, gas pressure, gas temperature) and gas measurement systems (measurement uncertainty and data quality).

All meter station equipment is relied upon to deliver gas at our agreed contractual standard reliability (98% uptime) and with tolerable levels of risk as calculated using A hazard and operability studies (HAZOP), hazard identification studies (HAZID) and other our formal risk assessment methods.

Meter station accuracy is critical to ensure all billing data is accurate and reliable, thereby being consistent with good industry practice and customer expectations.

Metering equipment is categorised as:

- gas measurement equipment;
- pressure and flow control;
- gas heating;
- odorant facilities;
- programmable logic controllers (PLC);
- tools and test equipment; or
- systems and compliance.

It is important to note that equipment located in a facility that is constructed with compounds that are fenced for security requirements, must be visible to the control room with remote terminal units and communication equipment, and must have reliable AC and DC power supply to power the equipment installed.

1.4 AA5 forecast

In AA5, a number of meter replacements, upgrades and overhauls are required at a total cost of $7.7 million. The proposed activities are based on the planned maintenance and replacement schedules included in the AMP, exploring a small number of emerging techniques and technologies.

Works proposed for AA5 consist predominantly of standard upgrades and asset replacement, which can be completed by replacing the core element where most of the supporting systems remain in situ.

An overview of the proposed meter station projects for the AA5 period is provided in Table 0.3. The forecast expenditure is consistent with the baseline volumes and expenditure for meter stations forecast for AA4, and reflect a level activities that would typically be undertaken to manage meter station assets over a five year period under normal circumstances[29].

Table 0.3: AA5 forecast meter stations program expenditure, ($'000)

Category	2021	2022	2023	2024	2025	AA5
Earthing replacement and AC mitigation of facilities	100	100	100	100	100	**500**
Meter station valves and control valves overhauls	922	740	740	740	740	**3,882**
Flow computer replacement	-	-	-	-	150	**150**
Coriolis meter replacement	160	-	-	-	-	**160**
Turbine meter replacement	-	-	-	-	225	**225**
Heater fuel gas train replacement at meter stations	240	240	240	240	240	**1,200**
MLV and meter station hazardous area inspection and rectification works	-	200	400	200	-	**800**
Meter station piping repair	80	80	80	80	80	**400**
Upgrade of gas chromatographs	123	-	-	-	-	**123**
Cockburn Power Station and PEPL flow meter	284	-	-	-	-	**284**
Program total	**1,909**	**1,360**	**1,560**	**1,360**	**1,535**	**7,724**

Broadly, the works required during AA5 are to:

[29] Normal circumstances excludes unforeseen events such as the Kwinana overpressure incident, valve failures and odorant spills that occurred during the AA4 period.

- replace or refurbish end of life flow measurement equipment including Ultrasonic flow meters, Coriolis flow meters and turbine flow meters;
- replace end of life gas quality analysis equipment (gas chromatographs);
- replace and refurbish gas heating equipment including gas fired water bath heaters, with gas electric immersion heaters, and replace or refurbish associated utilities (fuel gas trains and thyristors);
- replace and refurbish pressure, temperature and flow control equipment such as control valves, pressure regulators, safety control valves and pressure safety valves; and
- replace or refurbish electrical and instrumentation equipment required to monitor and control the field equipment. This includes flow computers, PLC's, process controllers, remote terminal units, IS barrier installations, power distribution and earthing systems.

The higher-than expected capital requirements, which were the result of a number of incidents during the AA4 period, are not expected to recur during AA5.

1.4.1 AA4 variance

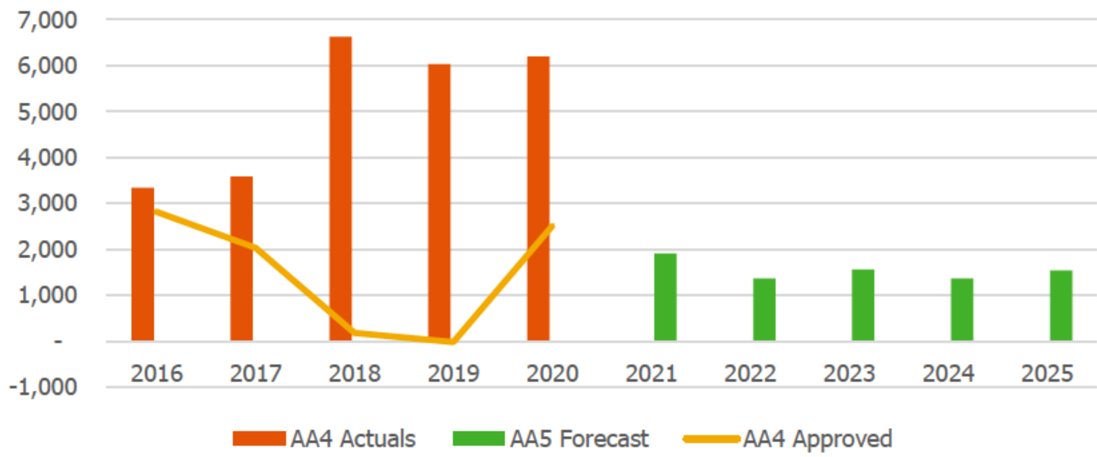
The actual expenditure for meter station repairs, upgrades and overhauls completed in AA4 was $18.1 million higher than the forecast prepared in 2015/16. Table 0.4 presents actual AA4 expenditure.

Table 0.4: AA4 actual meter station capital expenditure, ($'000)

	2016	2017	2018	2019	2020	Total
Meter station valves and control valves overhauls	1,242	1,447	2,401	2,366	840	**8,296**
Flow computer replacements	1,215	686	845	211	275	**3,233**
Coriolis meter replacement	29	27	227	-	-	**282**
Repairs to piping	93	517	2,672	2,487	2,040	**7,809**
Upgrade odorant injection facilities at meter stations	523	428	352	729	387	**2,418**
Upgrade of gas chromatographs	18	179	26	-	-	**224**
MLV meter stations hazardous area inspection and rectification work	157	68	-	-	-	**225**
Heater controls upgrades	57	86	-	-	-	**143**
Upgrade of heating	-	-	18	-	-	**18**
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Facilities pressure equipment remediation	-	-	83	34	-	**117**
Insulating joints replacement	-	-	-	240	-	**240**
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total actual AA4	**3,336**	**3,585**	**6,625**	**6,032**	**6,199**	**25,776**
ERA approved AA4	2,813	2,034	179	(19)	2,514	7,521

Figure 0.1 shows how actual AA4 expenditure compares with the AA4 ERA approved forecast and the AA5 forecast.

Figure 0.1: Comparison of capital expenditure, ($'000)



The works proposed for AA5 consist predominantly of standard upgrades that can be completed by replacing the core element where most of the supporting systems remain as is. During the AA4 period more complex projects were required, which required upgrading the core element, as well as most of the supporting systems.

The higher-than-expected AA4 expenditure was primarily due to three unforeseen events/projects that resulted in the redirection of resources and expenditure to address the identified risks. The three incidents are described below.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

We do not expect similar issues to arise in relation to meter stations during the AA5 period, which is why the proposed AA5 forecast is more consistent with the AA4 forecast level.

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

Figure 0.2: 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'.*

Six areas are considered for each type of risk:

1. DBP – corporate/financial risk;
2. People – safety risk to the public and employees;
3. Environmental – risk of adverse impact on environment/local ecosystems;
4. Reputation/Outrage – risk of customer anger and DBP reputational damage;
5. Asset Damage – dollar impact on assets; and
6. Supply – risk of supply interruption to customers.

Meter stations initiatives have been split into two categories for risk assessment:

1. those related to the integrity of meter stations; and
2. those related to the reliability and performance of meter stations.

The overall risk rating of managing and maintaining the integrity and the reliability and performance of meter stations in line with relevant AMPs is outlined in the following sections.

1.5.1 Integrity

The integrity risk rating associated with meter stations is presented in Figure 0.2. If the risk remains untreated, of the six risk areas, two are rated high risk and three are rated intermediate risks. As a result, the meter station integrity-driven initiatives are ranked high risk and high priority.

Figure 0.3: Integrity untreated risk rating – Meter stations

	Trivial	Minor	Severe	Major	Catastrophic
Frequent					
Occasional					
Unlikely			Outrage Supply Asset Damage	DBP	
Remote		Environmental			People
Hypothetical					

Negligible	Low	Intermediate	High	Extreme

Table 0.5 shows the untreated risk for each risk area.

Table 0.5: Meter station integrity risk rating

Risk area	Untreated
DBP	High
People	High
Environmental	Negligible
Reputation/Outrage	Intermediate
Asset Damage	Intermediate
Supply	Intermediate
Overall rating	**High**

Specifically, there is a risk to:

- **DBP** – inaccurate or incorrect data on pipeline operations presents a major risk to effective operations of the DBNGP. It has flow on impact on services to our customers who rely on reliable gas supplies to be available and validated daily.
- **People** – ineffective pressure and temperature controls presents a safety risk at customer supply points, which has the potential to cause rupture or explosion and result in fatalities. Reliable odorant injection is important to ensure dose of odorant in the gas streams can be detectable across the whole population that use natural gas.
- **Reputation/Outrage** – inaccurate meter, billing or supply issues, including breach of relevant gas specifications where control valves and associated equipment fail to adequately control temperature due to failure of meter equipment would lead to widespread complaints and anger from Shippers and regulators.
- **Asset Damage** – incorrect pressure or temperature control could lead to over-pressurisation at customer supply points and cause damage to their equipment and

failure of equipment could also damage other assets at meter stations. In 2014, we experienced an over-pressurisation event at a customer facility resulting in a rupture.

- **Supply** – failure of meter equipment could lead to severe loss of supply interruptions and/or serious incidents.

1.5.2 Reliability/Performance

The reliability/performance risk rating associated with meter stations is presented in Figure 0.4. If the risk remains untreated, of the six risk areas, one is rated an intermediate risk.

Figure 0.4: Reliability/performance untreated risk rating – Meter stations

	Trivial	Minor	Severe	Major	Catastrophic
Frequent					
Occasional		Outrage	DBP		
Unlikely		Asset Damage Supply			
Remote					
Hypothetical	People Environmental				

Negligible	Low	Intermediate	High	Extreme

Table 0.6 shows the untreated risk for each risk area.

Table 0.6: Meter station reliability/performance risk rating

Risk area	Untreated
DBP	Intermediate
People	Negligible
Environmental	Negligible
Reputation/Outrage	Low
Asset Damage	Low
Supply	Low
Overall rating	**Intermediate**

Meter stations reliability/performance driven initiatives are intermediate risk and medium priority, but are key in delivering a capex program which can be considered efficient and achieving the lowest sustainable cost of delivering services.

- **DBP** – meter stations reliability/performance driven initiatives do not pose a threat to the effective operation of the DBNGP, but do expose customers to unacceptable cost consequences through inaccurate metering leading to 'underbilling' as well as non-compliance issues in terms of inaccurate data sent to market.

1.6 Options considered

Different options have been considered to ensure meter station facilities continue to function safely, reliably and accurately. The options are:

- Option 1 - Maintain the volume of activity and expenditure levels undertaken during the AA4 period;
- Option 2 - Move to a replacement on failure policy for all meter station assets; and
- Option 3 - Deliver the volume and activities that AMP has identified as required, applying good asset management practice, and adopting emerging techniques/technologies where appropriate (this is the recommended option).

The options are discussed in the following sections.

1.6.1 Option 1 – Maintain the volume of activity and expenditure levels undertaken during the AA4 period

With this option, the volume of metering equipment replacement, upgrade and overhauls would be based on comparable expenditure and activities delivered in the AA4 period.

The total expenditure was $25.7 million over the AA4 period, and the works delivered within this budgeted allowance would be based on a prioritised set of activities as per the AMP as well as any necessary reactive works throughout the period.

1.6.1.1 Achievement of objectives

This option would provide for sufficient meter station upgrades, replacements and overhauls to ensure the ongoing performance of meter stations. The additional expenditure allowance would enable more upgrades to be delivered during the AA5 period than have been identified in the AMP, and would allow DBP to bring some future works forward from AA6 and beyond.

However, maintaining a level of expenditure that is above and beyond what is required to manage the high and intermediate risks associated with metering assets over the next five years, would not be consistent with the actions of a prudent asset manager seeking to efficiently minimise costs. DBP is aware of the impact of its capital expenditure requirements on haulage tariffs and does seek to pass through unnecessary costs to customers.

Further, given there are other areas of our overall capital works program that require an expenditure increase in AA5 compared to AA4 (such as compressor stations and main line valves), it would be prudent to offset AA5 increases elsewhere with a decrease in the meter stations program. DBP therefore considers, based on the latest information at the time of preparing this business case, that maintaining the AA4 level of expenditure is on meter stations is not justified.

Table 0.7 summarises how Option 1 will support the achievement of our vision objectives in AA5.

Table 0.7: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers - Reliability	N
Delivering for Customers – Customer Service	N
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	N
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

1.6.1.2 Cost assessment

Under this option to spend $25.7 million, expenditure would be split between three categories of work as follows:

- replacements and upgrades – $9.0 million;
- overhauls – $6.8 million; and
- repairs and rectification – $9.9 million.

With this option, the costs incurred for planned activities would be relatively similar to those experienced in AA4 and are significantly higher than those required under the AMP.

1.6.1.3 Risk assessment

Table 0.8 shows the residual integrity and performance/reliability risk associated with Option 1.

Table 0.8: Risk assessment – Option 1

Risk category	Integrity treated risk	Performance/Reliability treated risk
DBP	High	Intermediate
People	Intermediate	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	Intermediate	Low
Supply	Intermediate	Low
Overall rating	**High**	**Intermediate**

Maintaining the AA4 level of expenditure on meter stations in AA5, assuming similar unforeseen over-pressure and valve failure incidents do not occur, is beyond what a service provider acting prudently and efficiently in accordance with good industry practice would incur. This would be unfair to customers and cause DBP to be perceived negatively, ultimately damaging our reputation.

1.6.2 Option 2 – Move to a replacement on failure policy for all meter station assets

With this option, the volume of replacement undertaken in AA5 would be directly driven by the number of breakages/outages experienced on these meter assets, with a reactive rather than proactive approach to the investment in assets. The rate of required repairs would increase as the volume of activity and failures increase.

While it is not possible to predict with accuracy the number of failures that will occur over the next five years, given the age and condition of assets approaching their end of life during the AA5 period, the likelihood of failure is expected to be higher than during AA4 if not treated proactively. Given the typically higher cost of reactive replacement compared with proactive replacement (potentially two to five times higher per asset depending on asset type and location), the potential cost of works during AA5 is significantly greater than the proposed works program if widespread asset failure arises.

Should asset failure be lower than expected, while the overall cost of reactive works may be less than forecast, the ongoing meter station works program identified in the AMP would not be delivered in full. The works program identified in the AMP is the prudent level of activity required to manage the integrity and reliability/performance risk associated with meter stations. Therefore, all the high and intermediate risks identified would not be addressed until reactive replacement of capital assets was completed.

Neither of these outcomes are tolerable for DBP or customers. An entirely reactive 'replace on failure' approach to managing metersets is not consistent with good asset management practice, and therefore not consistent with NGR 79(1)(a).

A replace on failure strategy is also not prudent for our customers, who value current levels of safety and reliability, as well as the accuracy and timeliness with which DBP provides data for billing. Therefore, as a prudent asset manager, DBP would not recommend moving to a replacement on failure policy for the DBNGP metersets.

1.6.2.1 Achievement of objectives

Metering assets are critical to the safe, reliable and accurate delivery of gas from producers into the DBNGP at inlet points, to customer outlet points as well as other pipelines and the gas distribution network in Perth.

The option to move to a replacement on failure policy for all metering assets would significantly impact supply, billing, our compliance with its contractual and regulatory obligations, and would negatively impact our transmission operations workforce (in terms of health and safety and efficient utilisation). It would therefore not meet our objectives of delivering for customers, being a good employer and being sustainably cost efficient.

Further, a failure to inject odorant at the right level of dosage would lead to safety consequences with customers and the level of gas detection by smell as required under the Gas Standards Act and Regulations.

This approach will also cause non-compliance to the required standards AS60079, AS3000 and AS2885.

Failure of pipe work and other pressure containing equipment (heaters, filters) could lead to catastrophic failures, potential major asset damage and loss of life.

Table 0.9 summarises how moving to a reactive meter stations capital works program will support the achievement of our vision objectives in AA5.

Table 0.9: Alignment with vision – 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	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

1.6.2.2 Cost assessment

With this option, the costs incurred for meter station assets would be significantly higher than those required under the AMP. In addition, allowing the assets to fail prior to replacement would potentially lead to the following outcomes (and associated costs):

- potential manning of delivery points;
- penalties where breaches associated with Gas Standards Act and Regulations as a gas supplier not meeting its obligation to supply gas at the right standards of pressure, temperature and smell (odorant);
- inaccurate billing data leading to errors in invoicing for gas supplied;
- breaches of the gas specification due to inaccurate gas analysis by defective gas chromatographs;
- contractual breaches due to supply interruption which can cost up $1 million per day;
- increased likelihood of overtime and shift penalties (planned activities allow us and our contractors to optimise staff rostering);
- increased unit costs including additional costs for expediated freight; and
- additional costs for pulling crews off other planned work to address a corrective maintenance requirement, and then remobilising to complete the planned work they were doing.

While it is not possible to estimate the exact degree of asset failure that will occur during the AA5 period, broad cost estimate can be developed based by escalating the cost of the proposed works program if delivered reactively.

At a conservative estimate, delivery of works reactively can cost between two to five times more than undertaking the same works reactively. The escalation amount varies depending on the type (and scarcity) of asset being replaced, as well as the remoteness of the asset from the Perth Metropolitan area.

Taking a conservative approach, if we assume a weighted average increase of only 1.5 times the material and labour/contractor costs if the work program were to be undertaken entirely reactively, we estimate the works program would cost approximately $11.6 million.

Consideration is also not made as to the impact of future costs by taking a reactive maintenance approach for a five-year period, with future costs expected to escalate in remediated issues from poor asset management practices.

In any event, costs associated with a predominantly replace on failure works program would not *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 providing services.*[30]

1.6.2.3 Risk assessment

Table 0.10 shows the residual integrity and performance/reliability risk associated with the meter stations assets if a replacement on failure approach is taken.

Table 0.10: Risk assessment – Option 2

Risk category	Integrity treated risk	Performance/reliability treated risk
DBP	High	Intermediate
People	High	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	Intermediate	Low
Asset Damage	Intermediate	Low
Supply	Intermediate	Low
Overall rating	**High**	**Intermediate**

1.6.3 Option 3 – Deliver the volume and activities that AMP has identified as required, applying good asset management practice, and adopting emerging techniques/technologies where appropriate

With this option, the volume of work 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 our operational requirements and billing cycles.

A small number of replacements and refurbishments would be undertaken utilising new or emerging techniques and technologies in line with the continuous improvement objectives in our Asset Management Framework.

[30] NGR 79(1)(a)

1.6.3.1 Achievement of objectives

This option provides for appropriate investment in meter station upgrades and will implement a small number of new or emerging technologies and techniques, consistent with the AMP and continuous improvement.

This option delivers for customers in terms of safety, reliability and service, supports a good employer in terms of health and safety, and skills development and is sustainably cost efficient.

Table 0.11: Alignment with our vision – 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	Y
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

1.6.3.2 Cost assessment

With this option, the costs incurred for planned activities would be $7.7 million. Refer to section 1.4 for the detailed cost breakdown.

The level of expenditure is comparable to the AA4 forecast volumes and expenditure for the period, however it is significantly less than the AA4 actuals.

1.6.3.3 Risk assessment

This option represents the lowest treated risk, as it is targeting the individual assets in line with the AMP. It is therefore consistent with our Risk Management Framework and the only option that can achieve a 98% reliability contractual obligation at the lowest sustainable cost.

Refer to section 1.5 for more detail.

Table 0.12: Risk assessment – Option 3

Risk area	Integrity treated risk	Performance/reliability treated risk
DBP	Intermediate	Low
People	High	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	Low	Negligible
Asset Damage	Low	Negligible
Supply	Low	Negligible
Overall rating	**Intermediate**	**Low**

1.7 Summary of cost/benefit analysis

To assess the options, the costs, objectives and risk are considered for each option. A summary of the option assessment is shown in Table 0.13.

Table 0.13: Summary of cost/benefit analysis

Option	Achievement of our objectives	Estimated cost	Treated residual risk rating (integrity/reliability)
Option 1	Achieves reliability and capacity required. May lead to reputation/outrage risk.	$25.7m	High / Intermediate
Option 2	Does not deliver for customers, fails to achieve reliability standards	$11.6m	High / Intermediate
Option 3	Achieves all relevant aspects of vision to deliver for customers, be a good employer and be sustainably cost efficient	$7.7m	Intermediate / Low

1.8 Proposed solution

1.8.1 Why is the recommended option prudent?

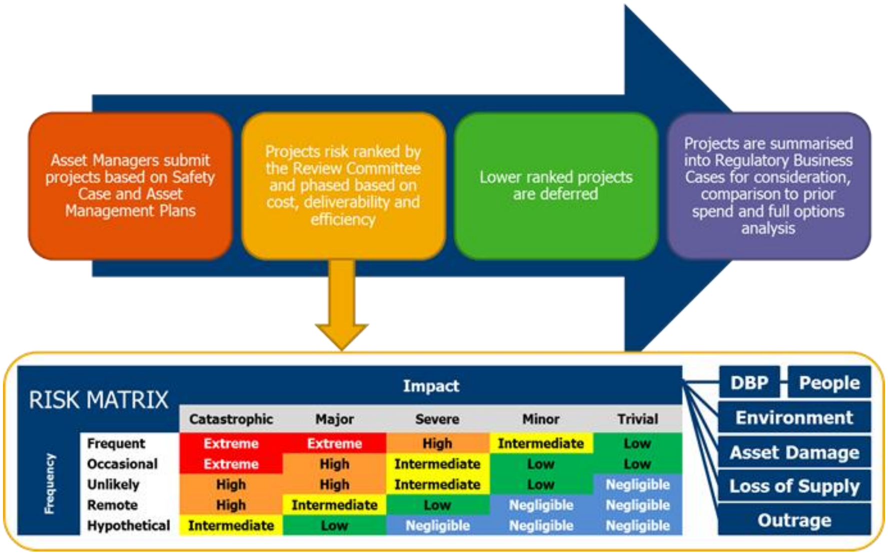
Option 3 is the recommended solution due to its alignment with our Risk Management Framework, asset management principles and the relevant manufacturers' specification. It also follows good industry practice in relation to metering across the utility sector and supports continuous improvement, whilst adhering to standards as required by the pipeline license, Safety Case requirements and Australian Standards.

Most significantly, Option 3 will achieve the necessary risk and customer outcomes for the lowest sustainable cost and without materially impacting haulage tariffs.

This option is also preferred as an appropriate approach to maintaining compliance with Australian Standards and site-specific compliance requirements whilst also ensuring the accuracy of customer billing, and overall safety and quality of supply. The forecast expenditure is consistent with the Asset Management Plan – Metering Facilities TEB-001-0024-06.

Figure 0.5 summarises how we develop our capital expenditure plans, and highlights that risks identified as intermediate or higher are prioritised, with lower risks removed or deferred from the capital program. Option 3 is consistent with this approach as it focuses on treating all intermediate or higher risks as soon as is reasonably practicable (by the end of the AA5 period).

Figure 0.5: Our capex plan development process



Failure to proactively plan for the management and maintenance of the meter stations assets could result in catastrophic failure of an asset which would result in loss of through-put, excessive operating expenditure and impact on reliability and the ability to meet contractual obligations.

1.8.1.1 Consistency with the National Gas Rules

Rule 79(2)

Undertaking proactive replacement and upgrades at meter stations is necessary to maintain the safety of services (e.g. pressure regulating and over-pressure protection equipment), maintain the integrity of services (e.g. earthing and telemetry replacements, piping repairs) and to comply with regulatory obligations (e.g. meter replacements and refurbishments). Therefore, this capex is consistent with NGR 79(2)(c)(i) to (iii).

Rule 79(1)

The proactive replacement and refurbishment of meter stations assets is consistent with the requirements of NGR 79(1)(a), Specifically, we consider that the capital expenditure is:

- **Prudent** – the expenditure is necessary in order to deliver gas safely and reliably to customer outlet points, as well as to ensure accurate measurement and billing of services occurs. 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 actuals and tender contract values. 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 follows good industry practice by ensuring that critical infrastructure is maintained within its useful life and to current technological standards, therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the works in line with the relevant useful life and adopting proven new and emerging technologies and techniques that reduce long-term costs.

1.8.2 Estimating the efficient costs

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

Where possible, the unit rate used to determine the cost of the program in AA5 is based on a three-year average actual cost incurred by us in AA4.

Where this has not been possible, due to infrequent or new activities identified for AA5, these activities have been estimated based on the historical cost of the same or similar program of work. These programs include replacing assets at the end of their useful life or what is referred to as 'one off' activities, which are expected to be required in the AA5 period but have not been required in the past and are not expected to be required in to the future (for example, the design change to cater for over pressure protection and the establishing of the infrastructure to accommodate the new odorant injection system).

The cost of these activities would usually be determined through a competitive tender process. Where a competitive tender has not yet occurred, the associated cost is estimated in two ways:

3. where the work is sufficiently comparable to other work – the most recent historical average unit rate or actual cost and matched to similar locations where the program is delivered externally; and

4. where the work is unique or greater than $5 million – an estimate is developed based on internal estimates from different engineering disciplines or from external engineering specialists.

Specialist engineering disciplines, procurement and construction management (EPCM) activities are provided utilising internal resources, supplemented by external specialist input as required.

Key assumptions which have been made in the cost estimation for the meter stations include:

- cost based on historical expenditure noting that these works are not new;
- estimates derived from contractual rates of vendors to be utilised;
- resource cost based on other similar projects ongoing at present or in previous AA periods; and
- original equipment manufacturer contractual rates for spares and labour that are part of our services agreements.

Table 0.14 summarises meter stations capex by cost type. Table 0.15 shows the escalation applied to dollars of December 2020 and includes labour cost escalation of 0.69% per annum.

Table 0.14: Meter stations estimate, by cost category

($'000)	2021	2022	2023	2024	2025	Total
Internal labour	275	191	237	191	188	**1,081**
Contractors / consultants	558	480	561	480	542	**2,621**
Materials & services	1,039	647	712	647	765	**3,810**
Travel & others	38	42	49	42	40	**212**
Total	**1,909**	**1,360**	**1,560**	**1,360**	**1,535**	**7,724**

1.8.3 Escalated costs in real dollars Dec 2020

Table 0.15: Escalated meter stations cost estimate

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	1,909	1,360	1,560	1,360	1,535	**7,724**
Escalation	49	38	48	46	56	**237**
Total escalated ($ Dec 20)	**1,958**	**1,398**	**1,608**	**1,406**	**1,591**	**7,961**

Appendix A – Risk assessment

Figure 0.6: Summary risk assessment

Integrity	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	Unlikely	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	326
Maintain AA4 volume of activity and expenditure	Major	Unlikely	HIGH	125	Catastrophic	Hypothetical	INTERMEDIATE	25	Minor	Remote	NEGLIGIBLE	1	Severe	Unlikely	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	226
Move to a replacement on failure policy for all Meter Stations projects	Major	Unlikely	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Unlikely	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	Severe	Unlikely	INTERMEDIATE	25	326
Do the volume and activities that AMP has identified as required exploring a small number of emerging techniques/technologies	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

Reliability/Performance	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	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	42
Maintain AA4 volume of activity and expenditure	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	42
Move to a replacement on failure policy for all Compressor Stations projects	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Occasional	LOW	5	Minor	Unlikely	LOW	5	Minor	Unlikely	LOW	5	42
Do the volume and activities that AMP has identified as required exploring a small number of emerging techniques/technologies	Severe	Remote	LOW	5	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	10

Tools – Capex DBP16

1.1 Project Approvals

Table 0.1: Tools DBP16 – 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 0.2: Tools DBP16 – Project overview

Description of Issue/Project	DBP resources carry out work on the DBNGP which includes planned and reactive maintenance, fault finding and installation of new/replacement equipment. Technicians, tradespeople and Engineers require tools specific to their role and the task at hand in order to perform their work in a safe manner. The tools have a limited useful life and need to be replaced periodically, consistent with AMP expectations. The useful life varies for different categories of tools. There are four categories of tool expenditure, namely: • TAM Tools • TOM Tools • Borescope replacement • Emergency Response
Project Name	Tools
Estimated Cost	Total forecast capex for the next Access Arrangement (AA5) is $1.6 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 $0.4 million more than the estimated expenditure for AA4 of $1.2 million. The increase in allocation for Tools relates to the following: 1. An increase in replacement for borescope equipment, which is required every four years and occurs twice in AA5 (2021 and 2025) but occurred only once in AA4 (2017); and 2. A change in actual cost reporting for TAM tools, which were previously captured under another cost code (2016 to 2018 actual expenditure was reported under subsequent costs). The level of expenditure forecast for AA5 is likely to continue across future AA periods consistent with useful life requirements contained within relevant AMPs.
Consistency with the National Gas Rules (NGR)	Providing a safe working environment for all staff and contractors is a critical obligation of any employer and ensuring that all tools are in safe working order is a key contributor to this. The provision of appropriate tools to its employees and contractors is therefore essential to maintain and improve the safety of services, maintain the integrity of services and/or comply with a regulatory obligation or requirement (r. 79(2)(c)(i)-(ii)). The proposed volume of replacement is also consistent with NGR 79(1)(a), which requires lowest sustainable cost of delivering pipeline services.

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 DBP to maintain a strong focus on operational issues as it is important for reliability and emergency management. DBP's Tools program will replace end of life tools and equipment required for operations and maintenance activities along the pipeline. 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 Tools. 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) • AMP TEB-001-0024-02 (Pipeline Mechanical) • 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 technicians, tradespeople and engineers who carry out work on the pipeline and related assets need reliable, fit for purpose tools to perform their work in a safe and efficient manner.

Consistent with the Rotating Equipment and Mechanical AMP, all tools must be inspected on a predetermined frequency to ensure they are in proper, safe working order and any tools deemed unsuitable or unsafe for use shall be tagged as out of service and replaced or repaired as soon as practicable.

As a minimum, the inspection frequency specified in the AMP is as follows:

- Inspection prior to use;
- 2 monthly electrical testing and tagging of mobile power tools;
- 6 monthly integrity inspection; and
- 12 monthly electrical testing and tagging of fixed power tools.

1.3.1 TAM Tools

TAM Tools include those relating to engineering, land management and system development activities.

They need to be inspected in line with AMP requirements and replaced consistent with OEM specifications, technology changes and due to normal wear and tear. TAM tools typically include:

- Hand tools – these are electrical and mechanical tool kits;

- Calibration equipment – specialised equipment to calibrate field equipment;
- Electronic testing equipment – as above but electronic test kits;
- Noise measurement equipment – tools to measure noise and vibration related noise from operating equipment;
- GPS trackers for GIS – GPS units that are used to accurately locate features on the pipeline and transmit to our GIS database;
- Portable Cathodic Protection (CP) Transformer Rectifier Unit (TRU) – a CP injection unit that is portable and used in detailed CP investigations;
- CP data loggers – loggers used to collect CP data during surveys and detailed investigations; and
- Process simulation software – used for modelling and process simulation activities.

1.3.2 TOM Tools

TOM Tools include the Mainline, Facilities and Field Technical and Services and Operations groups. Similar to TAM Tools, these need to be inspected in line with AMP requirements and replaced consistent with OEM specifications, technology changes and due to normal wear and tear. TOM tools typically include:

- A frames for turbine package removal;
- Pallecon Transport Units;
- Pancake Type Gearbox;
- [redacted] Turbines electrical test kit;
- Turbine Oil kidney filtration cart;
- Walkie stackers for CS5 & CS8 bulk sheds;
- Manual lifts for CS7 & CS8 aftercoolers;
- ZU4-Series Hydraulic Portable Electric Pump, hoses, torque cassette;
- Hand tools;
- Calibration equipment;
- Electronic testing equipment;
- Vibration measurement equipment;
- Rigging equipment; and
- Test gauges.

1.3.3 Borescope replacement

Borescope equipment is used to perform detailed inspections on internal components of turbines.

Condition based inspections are performed by borescope equipment to detect signs of premature failures. This early identification of issues enables proactive repairs to be undertaken by DBP, resulting in lower costs due to their preventative rather than corrective nature and avoided costs due to their ability to pre-empt catastrophic failures, which might otherwise require full turbine replacement.

DBP requires its borescope equipment to be highly reliable, fit for purpose and effective in order to mitigate these significant costs. This equipment has a relatively short life span due to extensive wear and usage and needs to be replaced every four (4) years consistent with the AMP.

Figure 0.1: Typical crack discovered with borescope on the CS7/2 first stage blade

1.3.4 Emergency response equipment replacement

As the DBNGP is considered critical infrastructure in Western Australia, any interruption to supply needs to be repaired as soon as possible.

For this reason, DBP maintains its pipeline emergency response containers and equipment at its Jandakot base so that all emergency responses are coordinated and managed by the Emergency and Incident Command Teams as per the DBNGP Emergency Response Plan.

These containers include essential tools and equipment to undertake likely emergency repairs work, such as welding equipment, split sleeve fittings and weld plus ends. Whilst hot tap and stoppling equipment is included in this package, these are also used for projects.

All tools and equipment held within the emergency response containers need to be maintained or replaced periodically in line with their identified useful life so emergency response crews have access to reliable tools that are in proper, safe working order.

1.4 AA5 forecast

In AA5 a total expenditure of $1.6 million is forecast and distributed as follows.

Table 0.3: Summary of AA5 forecast spend for Tools

($'000)	2021	2022	2023	2024	2025	AA5
TAM tools	75	75	75	75	75	375
TOM tools	200	200	200	200	200	1,000
Borescope replacement	100	-	-	-	100	200
Emergency response equipment replacement	-	-	-	-	70	70
Program total	**375**	**275**	**275**	**275**	**445**	**1,645**

1.4.1 AA4 comparison

We estimate expenditure of $1.2 million in AA4. This is $0.09 million higher than our approved forecast in AA4.

Table 0.4: Summary of actual and approved spend in AA4

($'000)	2016	2017	2018	2019	2020	AA4
Actual	129	368	490	132	100	1,219
Approved	307	211	207	203	200	1,129
Variance	(178)	156	283	(71)	(100)	90

1.4.2 What are the drivers for this variation?

The increase in expenditure from AA4 to AA5 is due to:

- An increase in TAM costs (previously captured under subsequent costs);
- Increase in number of tools required with more employees appointed due to an increase in the asset; and
- An increase in borescope replacement expenditure due to the requirement of two replacement cycles rather than one in the period.

Table 0.5: Comparison of costs AA4 and AA5

	AA4 cost ($'000)	AA5 cost ($'000)	Variance cost ($'000)
TAM tools	171	375	204
TOM tools	883	1,000	117
Borescope replacement	84	200	116
Emergency response equipment replacement	-	70	70
Other	81	-	(81)
Total	**1,219**	**1,645**	**426**

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

Figure 0.2: 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 Tools is outlined in Figure 0.3. As displayed, there are three intermediate risk, two low risks and one negligible risk associated with Tools replacement. This results in an overall high risk rating for these assets in an untreated scenario.

Figure 0.3: Risk rating – Tools

	Trivial	Minor	Severe	Major	Catastrophic
Frequent		DBP Outrage			
Occasional		Asset Damage	People		
Unlikely		Loss of Supply			
Remote					
Hypothetical	Environmental				

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

Table 0.6: Risk rating - untreated

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

The tools replacement program is required as per AMPs and the Safety Case, particularly where specific tools are required for the unique works on the pipeline. The overall risk rating of not replacing tools at the end of their useful life is identified as high in Figure 0.2.

Specifically:

- **DBP –** Untreated, there is the inability to undertake internal turbine internal inspections resulting in a potential increase in failures, causing inability to operate within reliability targets;

- **People –** Untreated, there will be an inability to perform routine and emergency works where and when needed in a safe manner, including undertaking emergency repairs; and

- **Outrage –** Untreated, there is likely to be an increase in supply interruptions where emergency response containers do not include fit for purpose tools.

1.6 Options Considered

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

- Option 1 – Replace tools on failure
- Option 2 – Proactive replacement of tools

1.6.1 Option 1 – Replace tools on failure

Under this option, DBP would only replace tools when they fail. This assumes that some tools will be used beyond their identified useful life and could include the use of tools that are not in safe working order.

1.6.1.1 Achievement of objectives

Table 0.7: Achieving objectives outlines how option 1 will support the achievement of our vision objectives in AA5.

Table 0.7: 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	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

This option delivers against sustainably cost efficient in the short term but risks medium to long term viability. It does not deliver against customer service as poorly maintained or unsafe tools will likely cause supply interruptions. It does not deliver against being a good employer as the risks associated with leaving tools 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

The likely costs associated with this option will be high, especially where faulty or unsafe tools cause damage to assets or where emergency response repairs cannot be undertaken consistent with the Emergency Management Plan. However, the magnitude of such an impact is impossible to accurately forecast.

There could also be additional costs where an incident occurs causes major impact to people, asset damage or loss of supply which is likely to exceed the forecast $1.6 million under option 2.

1.6.1.3 Risk assessment

Table 0.8: Risk assessment Option 1 shows that option 1 does not 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.8: Risk assessment Option 1

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

Under option 1 there would be no change to the untreated risk rating as a replacement on failure approach to tools could further lead to failure, resulting in asset and reputational damage. These tools also deteriorate to a point where they cannot be used safely by staff, exposing them to additional safety risks. Further, there is the potential for higher costs to be incurred in the long term, with inaccurate or ineffective borescope inspections and an inability to effective conduct emergency response works.

1.6.2 Option 2 – Proactive replacement of tools

This approach assumes that safe tools are always readily available and proactive inspections and management of replacement ensures all risks associated with inadequate tools are reduced to minimal levels, as prescribed in relevant AMPs and OEM manufacturer requirements.

1.6.2.1 Achievement of objectives

Table 0.8 outlines how option 2 will support the achievement of our vision objectives in AA5.

Table 0.9: 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 mitigates significant risks to safety, environment, operations and financial performance by leaving tools in service beyond their useful life.

1.6.2.2 Cost assessment

Under this option the cost would be $1.6 million in AA5.

Table 0.10: Summary of AA5 forecast spend for Tools

($'000)	2021	2022	2023	2024	2025	AA5
TAM tools	75	75	75	75	75	375
TOM tools	200	200	200	200	200	1,000
Borescope replacement	100	-	-	-	100	200
Emergency response equipment replacement	-	-	-	-	70	70
Program total	**375**	**275**	**275**	**275**	**445**	**1,645**

1.6.2.3 Risk assessment

Table 0.13 shows that option 2 does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.11: Risk assessment Option 2 Tools

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

This option reduces the risk exposure in each risk category by replacing tools consistent with AMP requirements and following manufacturer recommendations on asset useful life. The overall risk rating is reduced to Low.

1.7 Summary of Cost/Benefit Analysis

Table 0.12: Summary of Cost/Benefit Analysis

Option	Objectives	Cost	Risk
Option 1 – Replace on failure	This option does not achieve our objectives of delivering for customers, being a good employer or being sustainably cost efficient	>$1.6m	This option does not reduce any of the untreated risks to an acceptable level
Option 2 – Replace tools consistent with AMP	This option achieves our objectives of delivering for customers, being a good employer and being sustainably cost efficient	$1.6m	This option addresses the intermediate risks to DBP/ People/ Reputation.

1.8 Proposed solution

1.8.1 Why are we proposing this solution?

Option 2 is the proposed option as it is consistent with the historical requirements of the business and reflects good industry practice and includes replacement of tools either at the end of their useful life, as per the OEM and AMP or before, if identified as requiring early replacement as a result of a scheduled inspection. It also provides surety that the emergency response containers have sufficient equipment at all times that is safe and in proper working order for rapid deployment emergency situations.

Both options 1 and 3 expose DBP and its resources to unnecessary risk which can readily be reduced or removed with an appropriate management and replacement policy which is aligned with the AMP and OEM specifications.

1.8.1.1 Consistency with the National Gas Rules

Option 2 is the preferred solution and provides DBP with safe, sufficient and fit for purpose tools to utilise for all work undertaken on the DBNGP, including emergency response works.

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 tools management and replacement, thereby ensuring DBP tools can be used 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, DBP considers that the capital expenditure is:

- **Prudent** – The expenditure is necessary in order to address the identified ongoing operational requirement to provide safe and reliable tools of trade to core operational teams. 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 actuals, adjusted only for an increased frequency of replacement for borescope equipment which runs on a 4 yearly cycle. 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 relates to work broadly consistent with prior AA periods. It also follows good industry practice, therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the works in line with the relevant useful life.

1.8.2 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.

The expenditure forecast has been established based on analysis of historical actual expenditure and frequency of replacement.

Procurement of tools is undertaken in a manner which is consistent with the purchasing policy and includes a competitive tender process, where appropriate, such as for large value or volume items.

In limited circumstances where specific tools are produced by a limited amount of competitors, single source supplier/ OEM may be selected due to performance or quality of the tool

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 0.13 below summarises the total unescalated costs by cost type. Table 0.15 below shows the escalation applied to escalate the Tools costs to real dollars of December 2020 including labour cost escalation of 0.69%.

Table 0.13: Tools cost estimate by cost category

	2021	2022	2023	2024	2025	Total
Internal Labour	13	11	11	11	14	60
Contractors / Consultants	1	1	1	1	1	3
Materials & Services	360	261	261	261	429	1,572
Travel & Others	2	2	2	2	2	9
Total	**375**	**275**	**275**	**275**	**445**	**1,645**

Table 0.14: Tools total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	375	275	275	275	445	1,645
Escalation	10	8	9	9	16	51
Total escalated ($ Dec 20)	**385**	**283**	**284**	**284**	**461**	**1,696**

Appendix A – Risk Assessment

Figure 0.4: Summary of Tools 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	Minor	Frequent	INTERMEDIATE	25	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Frequent	INTERMEDIATE	25	Minor	Occasional	LOW	5	Minor	Unlikely	LOW	5	86
Option 1 - Move to a replacement on failure policy	Minor	Remote	NEGLIGIBLE	1	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Unlikely	LOW	5	34
Option 2 - Undertake a proactive replacement of tools	Minor	Remote	NEGLIGIBLE	1	Severe	Remote	LOW	5	Trivial	Hypothetical	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	Minor	Remote	NEGLIGIBLE	1	10

Fleet and civil equipment replacement Business Case – Capex DBP17

1.1 Project Approvals

Table 0.1: Fleet and civil equipment replacement DBP17 – Project approvals

Prepared By	Gary Fanderlinden, Contracts Administrator
Reviewed By	Hugo Kuhn, Manager Engineering and Operational Projects
Approved By	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 0.2: Fleet and civil equipment replacement DBP17 – Project overview

Description of Issue/Project	We own a fleet of vehicles and civil equipment which is used to inspect, maintain and repair the DBNGP. These vehicles are replaced regularly on an age and/or condition basis to ensure the safety and reliability of the fleet, minimise potential risk to employees and minimise whole of life costs. We have identified a target of between 150,000 and 250,000 km or 5 years as a trigger for fleet vehicle replacement based on an assessment of escalating maintenance costs and increased risk profile after these milestones. We have separately identified 8 years as a trigger for replacement of some civil equipment based on escalating maintenance costs and increased risk profile after these milestones. In both fleet and civil equipment management, however, we may elect to extend the useful life of a fleet vehicle and/or civil equipment asset if assessment of same identifies this to be a prudent act which does not compromise the safety or reliability of the asset. This business case outlines the replacement plan for both fleet vehicles and civil equipment in AA5. This business case also outlines the cost associated with the replacement program.
Project Name	Fleet and civil equipment replacement
Estimated Cost	Total forecast capex for the next Access Arrangement (AA5) is $4.7 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 $0.5 million less than the estimated expenditure for AA4. The AA5 forecast allows for: • Replacement of 9 x fleet vehicles each year; and • $0.6 million on civil equipment replacement in the period. The lower level of expenditure in AA5 reflects a conservative forecast for replacement need for both vehicles and civil equipment. With just over 50% of the fleet forecast for replacement in AA5, we have assumed the other 50% of the fleet will be assessed and found to be suitable for a useful life which is extended well beyond the 5 year benchmark. Based on the assumption that the oldest vehicles currently held will be replaced, by 2026, the age of the fleet which is not replaced in AA5 will be between 6 and 11 years old.

	For civil equipment, the forecast for AA5 is in line with actual expenditure for AA4 - $0.6 million.
Consistency with the National Gas Rules (NGR)	Providing a safe working environment for all staff and contractors is a critical obligation of any employer. Management and maintenance of fleet and civil equipment assets is therefore considered critical to our core operations and is consistent with 79(2)(c)(ii) and 79(2)(c)(i) to improve or maintain the safety of services. 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 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 Vehicles program will manage our fleet of operations vehicles and civil equipment required to operate and maintain the DBNGP. 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 Vehicles 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: • Asset Management Plan - TEB-001-0024-01; • Property, Plant and Equipment Policy; • Specification Guidelines for Vehicle Purchasing - DBP-PM.01.06; 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. These controls are sometimes 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.

We have a fleet of vehicles and civil equipment which is used to inspect, maintain and repair equipment installed on the DBNGP. These vehicles are replaced regularly on an age and/or condition basis as per the Property, Plant and Equipment Policy to ensure the safety and reliability of the fleet, minimise potential risk to employees and minimize whole of life costs.

1.3.1 Development of program

The program for fleet vehicles and civil equipment are developed separately, as they are managed separately and have very different maintenance and replacement needs.

1.3.1.1 Fleet replacement

Travelling by road is categorised as an 'extreme' risk activity in the AMP Significant Risk register, making it one of our highest risks to mitigate. With long distances and remote locations often the operational norm, maintaining a reliable fleet of vehicles is essential.

Our current fleet consists of 89 vehicles deployed across the different functions/disciplines as noted in Table 0.3. All our fleet vehicles are 4WDs with 24 Wagons and 65 Single/Dual Cab tray top utilities used for driving to remote locations to service the DBNGP.

Table 0.3: Fleet vehicles

Function/Discipline	Vehicles
Facilities Maintenance	28
Mainline Maintenance	33
Planning and Supply	1
Technical and Operational Services	4
Field Technical Services	12
Transmission Asset Management	9
Pigging and other	2
Total cost ($'000)	**89**

All utility vehicles are modified to accommodate operational requirements. The modifications mainly involve the installation of fit for purpose cabs to act as mobile workshops when working in remote locations with provision for work bench, space for tools and test equipment, fire extinguishers and facilities for handling loads.

We are proposing to replace nine (9) vehicles per year at a forecast expenditure [redacted] per vehicle across AA5.

1.3.1.2 Fleet management - process

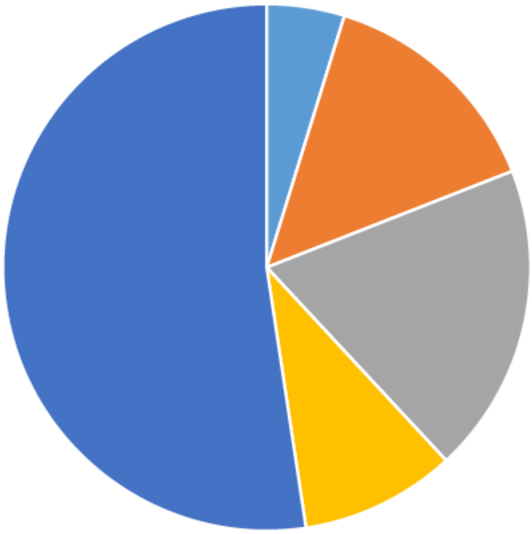
The process for identifying vehicles to replace involves the following steps:

- review all vehicles which have a history of safety or reliability concerns;
- identify all vehicles with over 150,000 kms or more than 5 years old;
- consider safety, maintenance costs and remote area exposure of these identified higher risk vehicles;
- where appropriate, reallocate aging or high kilometre vehicles to locations which are less vulnerable (due to geography or distances covered);
- identify vehicles for disposal; and
- confirm replacement need.

While we have identified a target of between 150,000 and 250,000 km or 5 years as a trigger for fleet vehicle replacement based on an assessment of escalating maintenance costs and increased risk profile after these milestones, the above process shows the proactive manner with which we seek to maximise use and value from each vehicle, almost uniformly achieving a useful life which exceeds the 5 year target. This can be seen in Figure 0.1 which shows the average age of fleet vehicles at time of disposal in AA4.

The average kilometres on vehicles disposed of in AA4 was 237,175.

Figure 0.1: Age of fleet vehicles at time of disposal in AA4



Vehicles are not disposed of every year, as older vehicles are relocated to lower risk projects or from remote to metropolitan locations to extend their useful life without compromising the safety of the person travelling in it. Vehicles which have been identified for disposal are then kept in Jandakot until auction, which occurs once they have been valued by an independent third party, supported by Red Book.

1.3.1.3 Fleet procurement and maintenance

We have trialled different 4WD models over time, including vehicles manufactured by [redacted] vehicles have consistently proven to be the most cost effective and reliable option for us and the fleet is now almost exclusively [redacted] vehicles are still held).

A competitive commercial procurement process was undertaken in April 2019. Three quotes were formally presented to us for consideration [redacted] was selected as representing the best value for money against criteria for fleet procurement. The fleet is maintained in line with vehicle manufacturer requirements by our selected fleet maintenance provider, [redacted]

1.3.1.4 Civil equipment replacement

Our civil equipment includes trailers, plant, heavy vehicles and equipment, which includes graders, front end loaders, forklifts, generators and more.

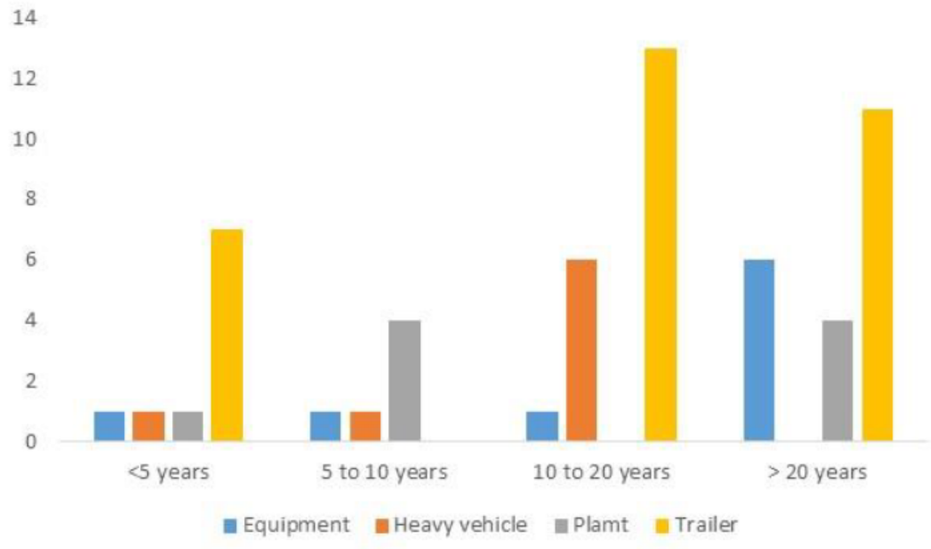
This equipment is utilised across the entire DBNGP as required for both scheduled works and when necessary, for reactive and emergency works.

We lease some machinery where that is an option for individual projects. Much of the DBNGP civil equipment requirements and very remote locations, are unusual in Western Australia, so outright purchase is preferred for core civil equipment to ensure availability when needed.

Heavy vehicles have a typical life of 8 years. This is based on escalating maintenance costs and increased risk profile after this time. Equipment, plant and trailers however require ongoing maintenance or major services rather than replacement in order to extend their useful life.

Figure 0.2 shows the average age of civil equipment by category, with all heavy vehicles under 10 years in age, and a large proportion of equipment, trailers and plant exceeding 10, and even 20 years in age.

Figure 0.2: Age of civil equipment assets



[redacted] (which are considered plant) were introduced in AA3 to facilitate materials handling and working at heights at compressor stations. These are versatile, multi-function plant that serve as:

- lifting pallets similar to fork lifts;
- buckets for small civil works;
- clamps for lifting odd shape equipment; and
- jibs and working at height platforms.

The advent of these multipurpose equipment has provided more efficient use of plant and equipment at compressor stations and the maintenance services of the plant is a function of the different components of their use.

1.4 AA5 forecast

In AA5, a total expenditure of $4.65 million is forecast as shown in Table 0.4. The forecast is based on the replacement of 9 fleet vehicles each year and the investment of $0.2 million per year in civil equipment replacement and/or major services in 2021, 2023 and 2025.

Table 0.5: AA5 Fleet and civil equipment replacements

OT project	AA5					
	2021	2022	2023	2024	2025	TOTAL
Fleet	810	810	810	810	810	4,050
Civil equipment	200	-	200	-	200	600
Total cost ($'000)	**1,010**	**810**	**1,010**	**810**	**1,010**	**4,650**

The proposed replacement program for vehicles in AA5 allows for the replacement of approximately 50% of the total fleet volume of 89.

Assuming that the oldest vehicles are replaced first and that the current fleet volume of 89 is maintained, our fleet at the beginning of AA6 would be between 1 and 11 years old, with almost have the fleet aged between 6 and 11 years old.

The AA5 expenditure for civil equipment includes:

- Replacement of the tipper, tag trailer and skid steer loader;
- Replacement of the flatbed truck; and
- Undertaking of major services of the eight (8) [redacted] plant pieces.

Table 0.6: AA5 civil equipment AA5 activity

Equipment ID	Date of Acquisition	AA5 activity
[redacted]	2012	Major service
[redacted]	2006	Major service
[redacted]	2006	Major service
[redacted]	2006	Major service
[redacted]	2006	Major service
[redacted]	2006	Major service
[redacted]	2010	Major service
[redacted]	2010	Major service
[redacted]	2015	Replacement
[redacted]	1995	Replacement
[redacted]	2015	Replacement
Flatbed truck	TBC	Replacement

1.4.1 AA4 v AA5 comparison

1.4.1.1 AA4 compared to AA5

In AA4, we estimate total expenditure of $5.2 million. This is $0.5 million more than our forecast for AA5, as shown in Table 0.7.

Table 0.8: Summary of actual and forecast spend across AA4 and AA5

($'000)	Year 1	Year 2	Year 3	Year 4	Year 5	AA
AA4 forecast	1,352	937	1,075	1,076	726	5,167
AA5 proposed	1,010	810	1,010	810	1,010	4,650
Variance	**342**	**127**	**65**	**266**	**(284)**	**517**

The decrease in AA5 is driven by:

- A reduction in volume of fleet vehicle replacement, as a result of proactive analysis of current state and future use estimates for the entire fleet as shown in Table 0.9; and
- Adoption of the lower average unit rate experienced in AA4 for all AA5 replacements

Table 0.9: Summary of actual and proposed fleet vehicle replacement across AA4 and AA5

Actual v Proposed (volume)	Year 1	Year 2	Year 3	Year 4	Year 5	AA
AA4 Actual	9	10	14	9	8	50
AA5 Proposed	9	9	9	9	9	45
Variance	-	1	5	-	(1)	5

No change is forecast for civil equipment, with $0.6 million forecast for both AA4 and AA5.

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

Figure 0.3: 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 of an event associated with failure of a fleet vehicle or civil equipment 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 fleet vehicles and civil equipment assets is presented in Figure 0.2. Three elements of risk are rated as high, one low and two negligible. This results in a high risk ranking for these fleet vehicle and civil equipment assets in an untreated scenario.

Figure 0.4: Risk rating – Fleet and civil equipment t

	Trivial	Minor	Severe	Major	Catastrophic
Frequent			DBP / Outrage		
Occasional				People	
Unlikely					
Remote			Loss of supply		
Hypothetical	Asset damage / Supply	Environmental			

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

The table below summarises the untreated risk rating for the failure of fleet vehicles and civil equipment assets

Table 0.10: Risk rating

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

Unmanaged and unmaintained fleet vehicles and civil equipment assets are high risk and high priority according to our operational risk framework and travelling by road has been identified as 'extreme' risk in our AMP Significant Risk register.

- **DBP** – Untreated, a failure of a fleet vehicle or civil equipment asset would not pose threat to our effective operation, but exposes us to unacceptable cost consequences;
- **People** - Untreated, a failure of a fleet vehicle or civil equipment asset could result in up to two fatalities; or up to four individuals with life threatening injuries or permanent disabilities; or more than four LTIs or MTIs; and
- **Reputation/Outrage** – Untreated, a failure of a fleet vehicle or civil equipment asset could result in widespread complaints and anger.

1.6 Options Considered

Alternatives options for management and maintenance of fleet vehicles and civil equipment assets in the AA5 period which have been considered are:

- Option 1 – Undertake volume and activities consistent with the AA4 program;
- Option 2 – Adopt a replacement on failure policy; and
- Option 3 – Replace consistent with the AMP.

1.6.1 Option 1 – Undertake volume and activities consistent with AA4 actuals

With this option, we would replace [redacted] vehicles in AA5, consistent with the volume replaced in AA4. Proposed replacement and major service activity for end of life civil equipment would remain as $0.6 million for the period.

1.6.1.1 Achievement of objectives

Table 1.9 outlines how Option 1 would support the achievement of our vision objectives in AA5.

Table 0.11: Option 1 - Achieving objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	-
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	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

This option delivers on the vision objectives of delivering for customers by ensuring the safety and reliability of fleet vehicles and civil equipment assets but is not sustainably cost efficient by working within industry benchmarks or being environmentally and socially responsible, as it would unnecessarily replace assets before they need to be replaced and introduce an avoidable expense to the business.

1.6.1.2 Cost assessment

The forecast cost in AA5 would be $5.1 million, reflecting the actual historical average cost of $0.09 million per vehicle for all [redacted] units forecast for replacement with this option as well as the unchanged $0.6 million for civil equipment replacement and major services.

This is $0.1 million less than the AA4 actual expenditure, reflecting lower unit rates for vehicle replacement secured during the AA4 period.

1.6.1.3 Risk assessment

Table 0.12 shows that option 1 in AA5 does 'moderate the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.13: Risk rating impact - Option 1

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

1.6.2 Option 2 – Move to a replacement on failure policy

With this option, the maintenance and management of fleet vehicle and civil equipment would move to a replace on failure policy.

1.6.2.1 Achievement of objectives

Table 0.14 outlines how option 2 will support the achievement of our vision objectives in AA5.

Table 0.15: Achieving objectives – option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	-
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 for customers in terms of public safety and does not deliver for employees in terms of health and safety. It also fails to operate within industry benchmarks and would result in non-compliance with our Safety Case and other workplace related legislative requirements.

1.6.2.2 Cost assessment

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 replacement, as the current contractual position with [redacted] could not be maintained. We could also be exposed to additional costs as a result of damage to other assets and higher unit and freight costs to expedite delivery for civil equipment.

1.6.2.3 Risk assessment

Table 0.16 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 0.17: Risk rating impact - Option 2

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

With this option, no risks are treated, so it is not aligned with expectations of AS 2885 or our operational risk management framework.

1.6.3 Option 3 – Proactively replace consistent with the AMP

Under this option, [redacted] fleet vehicles would be replaced in AA5, in line with the AMP and our assessment of useful life extension potential for existing vehicles. $0.6 million would additionally be spent on the replacement and/or major service for civil equipment assets.

1.6.3.1 Achievement of objectives

Table 0.18 outlines how option 3 will support the achievement of our vision objectives in AA5.

Table 0.18: Achieving objectives – option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	-
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	-

This option delivers on the vision objectives of delivering for customers by ensuring the safety and reliability of fleet vehicles and civil equipment assets and is sustainably cost efficient by working within industry benchmarks and being environmentally and socially responsible, as it replaces assets based on expected end of life assumptions, using a commercially negotiated unit rate, reflecting market conditions.

1.6.3.2 Cost assessment

The cost of this program is $4.7 million in AA5. By adopting a proactive, planned approach to fleet vehicle and civil equipment asset management, we can best manage the efficient delivery of the program, minimising the need for unplanned and disruptive repair work on the fleet, which might otherwise result in an incident or other expensive disruption.

1.6.3.3 Risk assessment

Table 0.19 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 0.19: Risk rating impact - Option 3

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

As with option 1, option 3 appropriately address identified (inherent) risks, reducing the risk of these assets by replacing and/or undertaking major services as needed.

1.7 Summary of Cost/Benefit Analysis

Table 0.20: Summary of Cost Benefit analysis

Option	Objectives	Cost	Risk
Option 1 – Undertake volume and activities consistent with AA4	This option does not achieve our objective of working within industry benchmarks	$5.1m	This option adequately addresses the high and intermediate risks
Option 2 – Adopt a replacement on failure policy	This option does not achieve our objective of delivering for customers and working within industry benchmarks	>$4.7m	This option does not treat the identified risk at all.
Option 3 – Do the volume identified in the AMP	This option achieves all our objectives	$4.7m	This option appropriately moderates high and intermediate risks to ALARP

1.8 Proposed solution

1.8.1 Why are we proposing this solution?

The recommended option is Option 3 – replace the volume consistent with the AMP 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.

Increasing the expenditure budget to reflect expenditure incurred in AA4 increases cost with minimal impact on risk.

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.

1.8.1.1 Consistency with the National Gas Rules

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 fleet replacement, thereby ensuring that our field crews can rely on safe and fit for purpose vehicles, plant and equipment.

Rule 79(1)

The option is 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. The program is also broadly consistent with the approach adopted in AA4. 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 historical average actuals and tender contract values. 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 relates to work broadly consistent with prior AA periods. It also follows good industry practice by ensuring that critical infrastructure is maintained within its useful life and to current technological standards, therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the works in line with the relevant useful life.

1.8.2 Estimating efficient costs

For all replacements and major services, recent historical actuals are used as the basis for future forecasts. These have all been achieved based on commercially negotiated rates secured in line with our Procurement Policy and Purchasing Procedure.

A competitive commercial procurement process was undertaken in April 2019. Three quotes were formally presented to us for consideration by [redacted] was selected as representing the best value for money against criteria for fleet procurement.

As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology 2021-2025', the forecast costs for all projects managed within this program are inclusive of internal labour, materials, travel and other costs. No external labour/contractor costs are forecast.

Table 0.21 below summarises the total unescalated costs for fleet vehicles and civil equipment replacement in real dollars June 2019.

Table 0.21: Fleet vehicle and civil equipment cost estimate

Project	2021	2022	2023	2024	2025	Total
Fleet vehicles	810	810	810	810	810	4,050
Civil equipment	200	-	200	-	200	600
Total cost ($'000)	**1,010**	**810**	**1,010**	**810**	**1,010**	**4,650**

Table 0.22 summarises the total unescalated costs by cost type. Table 0.23 below shows the escalation applied to escalate the fleet vehicles and civil equipment costs to real dollars of December 2020 including labour cost escalation of 0.69% per annum.

Table 0.22: Fleet vehicle and civil equipment cost estimate, by cost type

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	21	7	21	7	21	79
External Contractors/ Consultants	-	-	-	-	-	-
Materials & Services	986	802	986	802	986	4,562
Travel & Others	2	1	2	1	2	9
Total cost	**1,010**	**810**	**1,010**	**810**	**1,010**	**4,650**

Table 0.23: Fleet vehicle and civil equipment total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total ($ 2019)	1,010	810	1,010	810	1,010	4,650
Escalation	26	24	33	29	40	152
Total ($ 2020)	**1,036**	**834**	**1,043**	**839**	**1,050**	**4,802**

Appendix A – Risk Assessment

Figure 0.5: Summary of fleet vehicles and civil equipment 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	Major	Occasional	HIGH	125	Minor	Hypothetica	NEGLIGIBLE	1	Severe	Frequent	HIGH	125	Trivial	Unlikely	NEGLIG BLE	1	Trivial	Hypothetica	NEGLIGIBLE	1	378
Maintain AA4 volume of activity and expenditure	Severe	Frequent	HIGH	125	Major	Unlikely	HIGH	125	Minor	Hypothetica	NEGLIGIBLE	1	Severe	Unlikely	TERMEDIA	25	Trivial	Unlikely	NEGLIG BLE	1	Trivial	Hypothetica	NEGLIGIBLE	1	278
Move to a replacement on failure policy	Severe	Frequent	HIGH	125	Major	Occasional	HIGH	125	Minor	Hypothetica	NEGLIGIBLE	1	Severe	Frequent	HIGH	125	Trivial	Unlikely	NEGLIG BLE	1	Trivial	Hypothetica	NEGLIGIBLE	1	378
Proactively replace in line with AMP	Severe	Occasional	TERMEDIA	25	Major	Unlikely	HIGH	125	Minor	Hypothetica	NEGLIGIBLE	1	Severe	Occasional	TERMEDIA	25	Trivial	Unlikely	NEGLIG BLE	1	Trivial	Hypothetica	NEGLIGIBLE	1	178

Turbine Exhaust Replacement – Capex DBP18

1.1 Project Approvals

Table 0.1: Turbine Exhaust Replacement DBP18 – 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 0.2: Turbine Exhaust Replacement DBP18 – Project overview

Description of Issue/Project	This business case covers the replacement of seven turbine exhaust systems which have reached end-of-life. The turbine exhaust system directs exhaust gases safely to protect the compressor station and pipeline assets from excessive heat and/or pressure. Therefore the condition of the turbine exhaust system impacts the performance of the compressor unit. As the exhaust ages it can be susceptible to thermal stress corrosion and cracking resulting in failure. Failure of the exhaust system can expose the compressor station and pipeline to excessive heat or pressure. A turbine unit cannot be safely operated without an effective exhaust system, therefore we are proactively planning to replace our ageing turbine exhaust systems over the next ten years. The exhaust system, and useful life, differs among turbine units installed during the different stages of expansion of the DBNGP. The stainless steel systems installed during ACS have a useful life of 35 years, which may be extended a further two years by patching. The stainless steel lined (plain steel outer) systems installed during Stages 2 and 4 have a useful life of 17 years. The newer stainless steel exhausts installed during Stages 3 and 5 have a useful life of 20 years. There are ten compressor stations on the DBNGP, each with two operational gas turbine driven centrifugal compressor units. Compressor units are critical assets that enable gas to be transported along the pipeline. They run based on customers' gas requirements and must be ramped up or down quickly to meet these requirements. Deterioration in compressor unit performance can impact pipeline integrity and compromise our ability to fulfil customers' contracted gas supply.
Project Name	Turbine exhaust replacement
Estimated Cost	Total forecast capex for the next Access Arrangement (AA5) is $4.8 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 – Proactively replace turbine exhausts on condition once they have reached end-of-life as per AMP ($4.8 million) (this is the recommended option); • Option 2 – Replace all turbine exhausts that have reached 20 years in age in AA5 ($10.0 million); and • Option 3 – Move to a replacement on failure policy ($3.4 million).

Variation from AA4	There was $1.7 million approved in AA4 to repair and replace the turbine exhaust system at CS6/2. We are forecasting to actually spend $0.4 million in AA4, which includes replacement at CS4/2 ($0.3m) and repairs at CS7/2 ($0.1m). Patchwork undertaken in 2008 has successfully maintained the integrity of the exhaust system at CS6/2 allowing us to defer the replacement. We will inspect the exhaust stack in 2021 and expect it will require replacement. Other systems are also showing signs of deterioration. The replacement of all turbine exhaust systems will be undertaken across AA5 and AA6.
Consistency with the National Gas Rules (NGR)	NGR 79(1) - the proposed asset replacement is consistent with accepted good industry practice, several practicable options have been considered, and market/unit rates have been tested to achieve the lowest sustainable cost of providing pipeline services. NGR 79(2) - Turbine exhaust systems are critical to performance and safe operation of compressor units at compressor stations. Proactively repairing, upgrading and/or replacing turbine exhaust systems is required to ensure the integrity and availability of these assets to deliver the gas requirements of our customers. Therefore, the proposed replacement of end-of-life exhaust systems is consistent with NGR 79(2)(c)(i) and (iii). NGR 74 - the forecast costs are based on the latest market rate testing, and project options consider the asset management requirements as per the latest Asset Management Plan. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
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 turbine exhaust replacement program will replace end of life/failing turbine exhausts which are critical to the safe and efficient operation of turbine units. 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. Shippers were keen to understand the activities included in this scope of work and how they relate to turbine overhauls, key areas and drivers of increased spend, and how we deal with changing business needs during an AA period. In response to these queries, this business case clearly outlines: • what activities are included in this scope of work and what activities are included in other capex or opex Business Cases, • 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) • AMP TEB-001-0024-03 (Rotating Equipment) • Risk Management Policy and Operational Risk Model (together our Operational Risk 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 sometimes 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 turbine engines are heat engines in which energy is generated by combustion and then converted into mechanical energy. A key component of the gas turbine engines is the turbine exhaust, which includes collectors, expansion joints, transition pieces, ducts and attenuators. The purpose of a turbine exhaust is to direct exhaust gases safely thereby protecting the compressor station and pipeline assets from excessive heat and/or pressure.

Turbine exhausts used on the DBNGP vary as a result of differing designs and materials used during the various stages of the DBNGP expansion. The stages are shown in Table 0.3.

Table 0.3: Summary of DBNGP expansion stages

DBNGP expansion stage	Year	Years in service (as at 2019)
ACS project (CS1/1, CS3/1, CS5/1, CS5/2, CS8/1, CS8/2)	1987	32
Stage 2 (CS6/2, CS9/1)	1997	22
Stage 3A (CS2/2, CS4/2, CS7/2)	2000	19
Stage 4 (CS1/2, CS2/3, CS3/3, CS4/3, CS6/3, CS7/3, CS9/2 CS10/3)	2004-6	15
Stage 5A	2007	12
Stage 5B (CS10/4)	2010	9

The AMP provides comprehensive detail about the maintenance and replacement requirements of all rotating equipment. A summary of the turbine exhaust equipment is detailed in Table 0.4 below.

Table 0.4: Summary of turbine exhausts

Stage of development	Equipment type	Number of units	Useful life	Unit cost ($m)	Total cost ($m)	Install date
ACS	Stainless steel	6	35 years	$0.85	$5.1	1987
Stage 2	Stainless steel liner, Plain Steel outer	1	17 years	$0.85	$0.85	1997
		1	17 years	$0.85	$0.85	1996 & 2008*
Stage 3	Stainless steel	331	20 years	$0.25	$0.75	2000
Stage 4	Stainless steel	2	20 years	$0.5	$1.0	2004
Stage 4	Stainless steel liner, Plain Steel outer	6	17 years	$0.5	$3.0	2006
Stage 5	Stainless steel	1	20 years	$0.5	$0.5	2010
Total		**20**			**$12.05**	

* the CS9/1 exhaust stack was replaced in 2008 and CS6/2 patched due to deterioration of these units

Replacement of the turbine consistent with their recommended useful life is important for the integrity and safety of services. This is evidenced in the catastrophic failure of the turbine exhaust at CS7/2 in 2018 caused by increased cracks that arose as a result of excessive operations and exhaust expansion typical with thermal fatigue. It was repaired at a total cost of $0.1m, deferring its replacement two years to 2021.

1.4 AA5 forecast

In AA5 it is forecast that there will be a total of $4.8 million spent on turbine exhaust replacement, with replacement of seven turbine exhaust systems as shown in Table 0.5 below. A further seven replacements are anticipated in AA6. These replacements are driven by the useful life of these assets, with only two replaced and two repaired/patched since they were first installed.

Table 0.5: Turbine exhaust replacements in AA5 ($'000)

CS unit	Stage	Installed	2021	2022	2023	2024	2025
CS2/2	Stage 3	1999		[redacted]			
CS5/1	ACS	1991				[redacted]	
CS5/2	ACS	1991					[redacted]
CS6/2	Stage 2	1997	[redacted]				
CS7/2	Stage 3	1999	[redacted]				
CS8/1	ACS	1991		[redacted]			
CS8/2	ACS	1991			[redacted]		
Total			**1,100**	**1,100**	**850**	**850**	**850**

We have also forecast $0.1 million to inspect the patchwork undertaken in 2008 at CS6/2 before replacing it. The total expenditure for this program is shown in Table 0.6.

[31] It should be noted that an additional 2 exhausts are located at CS10 but are mothballed with no plan to re-commission them.

Table 0.6: Total AA5 expenditure

($'000)	2021	2022	2023	2024	2025	Total AA5
Exhaust replacement	1,100	1,100	850	850	850	4,750
Inspection	85	-	-	-	-	85
Total	**1,185**	**1,100**	**850**	**850**	**850**	**4,835**

1.4.1 AA4 comparison

A total of $0.4 million was spent in AA4 to replace the exhaust at CS4/2 and undertake repairs at CS7/2. This is $1.4 million below what was approved in AA4.

Table 0.7: AA4 actual and approved expenditure

($'000)	2016	2017	2018	2019	2020	Total AA4
AA4 Actual	101	115	187	-	-	403
AA4 Approved	890	873	-	-	-	1,763
Variance	**(789)**	**(758)**	**(187)**	**-**	**-**	**(1,360)**

The reasons for the underspend of the approved capex in 2016 and 2017 were:

- In 2008 one of the Stage 2 exhausts was replaced due to severe deterioration (CS9/1), we also completed patchwork on the other (CS6/2) that has allowed us to defer its replacement until 2021.
- This is offset by repairs and replacement undertaken for two of the Stage 3 turbine exhausts in AA4, just prior to these assets reaching their 20 year useful life.

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

Figure 0.1: 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 framework for consequence assessment across a number of elements the framework for likelihood assessment is shown in Appendix A – Risk Assessment.

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 turbine exhausts is presented in Figure 0.2. 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 0.2: Risk rating – turbine exhausts

	Trivial	Minor	Severe	Major	Catastrophic
Frequent					
Occasional					
Unlikely			Outrage/ Loss of supply	DBP/ Asset Damage	
Remote					People
Hypothetical				Environment	

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

Table 0.8 below shows the untreated risk rating for turbine exhausts.

Table 0.8: Untreated risk rating

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

Specifically, risks Major risks associated with deferment of replacement of turbine exhausts include are:

- DBP – there is a risk of unacceptable cost consequences where maintenance costs escalate when turbine exhausts are run past their deemed useful life, with diminishing returns on the expenditure the older the equipment gets.
- People - failing exhaust systems can adversely affect the temperature and/or pressure within the pipeline, causing potential safety incidents and disruption to supply. Uncontrolled release of 700 degree air to manned sites could result in fatalities if failure occurs.
- Reputation/Outrage – "Sweating" such critical assets to the safe, effective and reliable operation of our compressor stations is likely to cause major concern with our safety regulator
- Asset Damage – Failure of the exhaust systems also has a high potential to cause significant damage to other compressor station equipment, such as piping and buildings through excess temperature and/or pressure; and
- Supply – the likelihood of failure of turbine exhausts increases as the assets are operated beyond their useful life, this increases the risk of supply interruptions where failure of the exhaust system occurs. Compressor units cannot be operated without an operational exhaust system putting the unit out of service for up to a month where it can be repaired, and for 4-6 month where it requires reactive replacement.

1.6 Options Considered

A number of options have been considered for the end-of-life turbine exhaust assets in AA5.

- Option 1 – Proactively replace turbine exhausts on condition once they have reached end-of-life as per AMP;
- Option 2 – Replace all turbine exhausts that have reached 20 years in age in AA5; and
- Option 3 – Move to a replacement on failure policy.

These options are discussed in turn below.

1.6.1 Option 1 – Proactively replace turbine exhausts on condition once they have reached end-of-life as per AMP

This approach assumes turbine exhaust systems are assessed for proactive replacement at their deemed end of life (ranging from 17-35 years depending on the equipment), with life extension applied where condition allows. The approach is consistent with good industry practice in comparable industries, where reliable exhaust systems are required to adequately control temperature and pressure in gas transmission systems for safe and uninterrupted supply. It is also consistent with the approved AMP and manufacturer requirements.

1.6.1.1 Achievement of objectives

Table 1.9 below outlines how this option will support the achievement of our vision objectives in AA5.

Table 1.9: 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	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option aligns with our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient by proactively replacing turbine exhausts which have reach end-of-life to reduce the likelihood of failure which could jeopardise public and employee safety, reliability and increased costs over the life of these assets.

1.6.1.2 Cost assessment

The forecast capex under this option is $4.8 million for the AA5 period and includes the replacement of seven turbine exhaust systems based on age and condition assessment as shown below.

Table 0.10: Summary of costs - Option 1

($'000)	2021	2022	2023	2024	2025	Total
Capex	1,185	1,100	850	850	850	4,835
Opex	-	-	-	-	-	-
Total	**1,185**	**1,100**	**850**	**850**	**850**	**4,835**

1.6.1.3 Risk assessment

Table 1.11 below shows that proactively replacing turbine exhausts in AA5 does 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.11: Risk Rating - Option 1

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

This option appropriately addresses the major risks to DBP, People, Reputation, Asset Damage and Supply associated with turbine exhausts by proactively replacing turbine exhausts on condition once they have reached end-of-life as per the AMP.

1.6.2 Option 2 – Replace all turbine exhausts that have reached 20 years in age in AA5

This approach assumes that all turbine exhausts which have reached 20 years in age are replaced in AA5. This ignores the condition of the assets and the potential for life extension and would require 17 turbine exhaust replacements in AA5.

1.6.2.1 Achievement of objectives

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

Table 0.12: Achieving objectives - Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
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	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option does not support achievement of our objective of delivering for customers in terms of reliability and customer service (it would be difficult to undertake 17 exhaust replacements without impacting reliability or requiring customers to change their behavior to enable units to be taken offline while replacements are undertaken). It also is not sustainably cost efficient as it doesn't provide for prudent life extension of assets leading to higher capital costs over the medium to long term.

1.6.2.2 Cost assessment

As outlined in Table 0.3, the estimated costs associated with this option total $10.0 million in AA5.

Table 0.14: Summary of turbine exhaust replacements that have reached 20 years by the end of AA5

Stage of development	Number of units	Age by end 2025	Unit cost ($'000)	# replaced AA5	Total cost
ACS	6	35 years	[redacted]	[redacted]	[redacted]
Stage 2	1	29 years	[redacted]	[redacted]	[redacted]
	1	18 years	[redacted]	[redacted]	[redacted]
Stage 3	2	27 years	[redacted]	[redacted]	[redacted]
	1	9 years	[redacted]	[redacted]	[redacted]
Stage 4	2	20 years	[redacted]	[redacted]	[redacted]
Stage 4	6	20 years	[redacted]	[redacted]	[redacted]
Stage 5	1	16 years	[redacted]	[redacted]	[redacted]
	20			[redacted]	[redacted]

Note these replacements are likely to come at a cost premium as we would need to get in additional external resources to allow for this level of replacement activity over a five year period.

1.6.2.3 Risk assessment

Table 1.14 below shows that replacing all turbine exhausts which reach 20 years in age in AA5 does 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower' but also introduces new risks to DBP, Reputation, Asset Damage and Supply.

Table 1.14: RISK RATING – Option 2

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

Specifically new risks related to the replacement of 17 turbine exhausts in AA5 are:

- DBP – unacceptable cost consequences related to higher replacement costs from getting in additional costs external resources to deliver the large program and higher total capital costs over the life of the assets where prudent life extension might have been available.

- Reputational – our Shippers expect us to undertake required maintenance and replacements with minimal impact to their supply. Where this large replacement program requires supply interruption that could've been avoided through prudent deferral, there would be major concern and anger from our Shippers and gas producers.

- Asset Damage – in terms of assets that are replaced earlier than may have been necessary through prudent life extension.

- Supply - it would be difficult to undertake 17 exhaust replacements without impacting reliability or requiring customers to change their behaviour to enable units to be taken offline while replacements are completed.

1.6.3 Option 3 – Move to a replacement on failure policy

Under this option turbine exhausts would only be replaced when they can no longer be repaired, essentially adopting a 'run to fail' approach. The cost of required repairs is expected to increase as the number of failures increases where turbine exhausts are operated beyond their useful life.

Based on our experience with Stage 2 and Stage 3 turbine exhausts, we have assumed one third of turbine exhausts due for replacement in AA5 will fail and require reactive replacement, one third will fail and require repairs and one third will not fail. A repair typically lasts two years so we have also assumed this applies for a second failure of repaired exhausts in AA5. This translates to 1.8 replacements and 1.8 repairs for ACS systems, 0.4 replacements and 0.4 repairs for Stage 2, and 0.9 replacements and 0.9 repairs for Stage 3.

1.6.3.1 Achievement of objectives

Table 0.5 below outlines how moving to a replacement on failure approach for turbine exhausts will support the achievement of our vision objectives in AA5.

Table 0.15: 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	-
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 our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient.

1.6.3.2 Cost assessment

Under this option, allowance has been made for 3.1 replacements and 3.1 repairs due to failure at a total cost of $3.4 million. The forecast expenditure is based on extrapolating the costs incurred in AA4 relevant to reactive replacement and repair works at CS4/2 and CS7/2, where reactive replacement is 120% of planned replacement costs and average repair costs are 40% of replacement cost.

Table 0.96: Turbine exhaust replacements in AA5 ($'000)

Stage	# at end-of-life	Assumed # replacements	Assumed # repairs	Cost per reactive replacement	Cost per repairs	Total replacement costs	Total repair costs
ACS	4	[redacted]					
Stage 2	1	[redacted]					
Stage 3	2	[redacted]					
	7	3.1	3.1			2,533	844

In addition to the capex costs outlined, we would also expect increasing maintenance and operating costs associated with the maintenance requirements and deteriorating compressor unit performance related to the turbine exhaust assets which have reached end-of-life in AA5, but have not been replaced under a replacement on failure approach.

Further, under this option there are still four ACS, Stage 2 and Stage 3 units which will require replacement in AA6.

1.6.3.3 Risk assessment

Table 0.107 below shows that moving to a replacement on failure approach in AA5 does not 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.107: Risk Rating - 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**

As identified in 1.5 above, the major risks associated with introducing a 'run to fail' approach for turbine exhaust assets are:

- DBP – there is a risk of unacceptable cost consequences where maintenance and operating costs escalate for turbine exhausts which are run past their deemed useful life, with diminishing returns on this expenditure the older the equipment gets.
- People - failing exhaust systems can adversely affect the temperature and/or pressure within the pipeline, causing potential safety incidents. Uncontrolled release of 700 degree air to manned sites could result in fatalities if failure occurs.
- Reputation/Outrage – "Sweating" such critical assets to the safe, effective and reliable operation of our compressor stations is likely to cause major concern with our safety regulator.
- Asset Damage – Failure of the exhaust system has a high potential to significantly damage other compressor station equipment, piping and buildings through excess temperature and/or pressure.

- Supply – the likelihood of failure of turbine exhausts increases as the assets are operated beyond their useful life, this increases the risk of supply interruptions where failure of the exhaust system occurs. Compressor units cannot be operated without an operational exhaust system putting the unit out of service for up to a month where it can be repaired, and for 4-6 months where it requires reactive replacement.

1.7 Summary of Cost/Benefit Assessment

To assess the options, the costs, objectives and risk are considered for each option. A summary of the option assessment is shown in Table 0.118 below.

Table 0.118: Summary of Cost/Benefit Analysis

Option	Objectives	Costs	Risks
1. Proactive replacement on age and condition as per AMP	Aligns with our objectives of delivering for customers, being a good employer and being sustainably cost efficient	$4.8m	Adequately addresses identified high and intermediate risks to DBP, People, Reputation, Asset Damage and Supply reducing them to ALARP
2. Replace all that have reached 20 years in age	Does not align with our objectives of delivering for customers (likely supply interruptions) or being sustainably cost efficient (higher costs over asset life)	$10.0m	Introduces new risks to DBP, Reputation, Asset Damage and Supply
3. Move to a replacement on failure policy	Does not align with any of our objectives of delivering for customers, being a good employer or being sustainably cost efficient	$3.4m	Does not adequately address identified high and intermediate risks to DBP, People, Reputation, Asset Damage and Supply

1.8 Proposed Solution

1.8.1 What is the Proposed Solution?

It is proposed seven turbine exhausts are proactively replaced in AA5 based on their age and condition. This is consistent with the AMP and good industry practice. Each of the exhausts are now overdue for replacement, with utilisation of each asset maximised with an increasing risk of failure. Therefore deferring replacement would pose significant operational and safety risks.

It is proposed that the works be undertaken by:

- Initiating procurement of the long lead items at least 4-6 months prior to installation to ensure they are available when replacement work is scheduled;
- Scheduling replacement works during shoulder periods;
- Undertaking competitive procurement processes for the non-destructive testing, craneage, fabrication and transport services for each replacement to achieve value for money across the program of 7 replacements;
- Continue to undertake options and material selection analysis, similar to the assessment completed in 2008 where alternate materials were identified and assessed for CS6/2 but were ultimately dismissed due to the poor value for money comparative assessment;

- Following the proven approach to removal of existing aged assets, replacement with 'like for like' and commissioning them alongside operational crews, with a commitment to:
  - schedule other work in the same period that can be completed by the mechanical teams mobilised to each site, thereby gaining economies of scale; and
  - transfer lessons between each of the 7 scheduled replacement

1.8.2 Why are we proposing this Solution?

Option 1 is the preferred option as it is consistent with the AMP and manufacturer requirements, as well as reflecting good industry practice.

Option 2 is not preferred as it does not consider the condition of assets falling due for replacement before replacing them to determine if it would be prudent to extend its life. Further this option requires a significantly larger program of replacements in AA5 which would require getting in additional external resources and is unlikely to be delivered without material impact to customer supply. It is also more costly over the life of the assets.

Option 3 is not considered viable due to the high risks related to the safety of personnel working on or near compressor stations in the event that the failed turbine exhausts cause uncontrolled release of hot exhaust gasses, or secondary damage should the exhaust collapse onto other assets. Further, the potential to interrupt supply, thereby being non-compliant with the SSC obligations, and the high likelihood of further damage to other turbine components renders this option unviable.

1.8.2.1 Consistency with the National Gas Rules

Rule 79(2)

Turbine exhausts are critical for the required temperature and pressure controls at our compressor stations to ensure safe and reliable supply. The proactive replacement of turbine exhaust systems based on their age and condition, as outlined in our AMP and dictated by good industry practice, is necessary to maintain the integrity of services and is therefore consistent with NGR 79(2)(c)(ii).

Rule 79(1)

The proposed turbine exhaust replacements are also consistent with the requirements of NGR 79(1)(a), specifically we consider that the capital expenditure is:

- Prudent – The expenditure is necessary in order to address the identified ongoing operational requirements of our compressor units and includes consideration of age and condition before replacement. 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 historical average actuals and tender contract values. 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 relates to a two pronged approach to asset replacement at end of life. It also follows good industry practice by ensuring that critical infrastructure is maintained within its useful life and continues to perform as required, therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs by undertaking the works in line with the relevant useful life and condition.

1.8.3 Estimating the Efficient Costs

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

Where possible, the unit rate used to determine the cost of the program in AA5 is based on a three year average actual cost incurred in AA4.

Where this has not been possible, due to infrequent or new activities identified for AA5, these activities have been estimated based on the historical cost of the same or similar program of work. The cost of these activities would usually be determined through a competitive tender process.

Where a competitive tender has not yet occurred, the associated cost is estimated in two ways:

5. where the work is sufficiently comparable to other work – the most recent historical average unit rate or actual cost and matched to similar locations where the program is delivered externally; and

6. where the work is unique or greater than $5 million – an estimate is developed based on internal estimates from different engineering disciplines or from external engineering specialists.

Table 0.129 below summarises turbine exhaust capex by cost type. Table 0.20 shows the escalation to real dollars of December 2020 and includes labour cost escalation of 0.69% per annum.

Table 0.129: Turbine Exhaust Replacement Estimate, by cost category

($'000)	2021	2022	2023	2024	2025	Total
Internal Labour	190	176	136	136	136	774
Contractors / Consultants	237	220	170	170	170	967
Materials & Services	747	693	536	536	536	3,046
Travel & Others	12	11	9	9	9	48
Total	**1,185**	**1,100**	**850**	**850**	**850**	**4,835**

Table 0.20: Turbine exhaust replacement, total cost escalated to dollars of December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total cost (unescalated Jun 19)	1,185	1,100	850	850	850	4,835
Escalation	30	31	26	29	31	147
Total ($Dec 20)	**1,216**	**1,131**	**876**	**879**	**881**	**4,983**

Appendix A – Risk Assessment

Figure 0.3: Summary risk assessment - Turbine exhaust replacement

	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	Unlikely	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	426
Option 1 - Proactively replace turbine exhaust on condition beginning in 2021	Major	Remote	INTERMEDIATE	25	Major	Hypothetical	LOW	5	Minor	Remote	NEGLIGIBLE	1	Severe	Remote	LOW	5	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	66
Option 2 - Replace all turbine exhausts >20 years in age in AA5	Major	Remote	INTERMEDIATE	25	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Occasional	INTERMEDIATE	25	Major	Remote	INTERMEDIATE	25	Severe	Occasional	INTERMEDIATE	25	226
Option 3 - Move to a replacement on failure policy	Major	Unlikely	HIGH	125	Catastrophic	Remote	HIGH	125	Minor	Remote	NEGLIGIBLE	1	Severe	Unlikely	INTERMEDIATE	25	Major	Unlikely	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	426

CRS Business Case – Capex DBP20

1.1 Project Approvals

Table 0.1: CRS Business case DBP20 – Project approvals

Prepared By	Gerard Donaldson, Business Systems Specialist
Reviewed By	Brian McGinley, Head of Gas Accounting & Billing
Approved By	Andrew Staniford, Chief Customer Officer

1.2 Project Overview

Table 0.2: CRS Business case DBP20 – Project overview

Description of Issue/Project	Our Customer Reporting System (CRS) supports customer contract management, nominations, scheduling, gas accounting, reporting and billing. CRS utilises Java Technology which is not compatible with mobile devices. Under the current vendor support arrangements, our ability to make changes to functionality is constrained due to the resourcing, availability and prioritisation given by the vendor. We are looking to: • modernise this platform to allow employees and customers to access CRS on mobile devices, • control the source code in the event the vendor is unable/unwilling to support, and • Provide greater flexibility and response time to changing business and customer needs.
Project Name	CRS
Estimated Cost	Total forecast capex for 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 forecast expenditure for AA5 is $2.0 million higher than the forecast actual expenditure in AA4 of $0.8 million driven by: • Major technology upgrade of screens from Java technology to mobile friendly technology; and • Improved vendor support arrangements.
Options Considered	The following options were considered: • Option 1: Do nothing – continue with CRS and Energy One with current support and technology platform ($0.8 million); • Option 2: Continue with CRS and Energy One with enhanced support and technology platform ($2.8 million) (this is the recommended option); • Option 3: Continue with CRS and move to a new vendor with enhanced support and technology platform ($2.2 million); and • Option 4: Implement a replacement for CRS ($2.9 to 9.8 million).
Consistency with the National Gas Rules (NGR)	NGR 79(1) – It is prudent to ensure appropriate support and reliability for our customer billing platform and that it can continue to provide the functionality that is required by us and our Shippers into the future. We have undertaken options analysis and risk assessment to ensure we deliver a reliable and fit-for-purpose billing engine consistent with good industry practice and at the lowest achievable cost. NGR 79(2) - Securing ongoing support and reliability of our customer billing platform is required to maintain the integrity of services and meet our regulatory

	obligations for reporting to the AEMO and is therefore consistent with NGR 79(2)(c)(ii) and (iii). NGR 74 - the forecast costs are based on latest market testing, and project options consider a mix of options. Cost and risk assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
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. When discussing their customer service experience, Shippers noted billing could be simplified and modernised. Our CRS program proposes to modernize the platform to allow employees and Shippers to access it on mobile devices and will secure the continuing support of the system, while also providing for greater flexibility for upgrades and enhancements in line with business and customer needs. 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 noting they would be supportive of IT investment to improve the customer experience where there is a business case demonstrating customer benefits. Our proposed capex was then outlined in our Draft Plan. CRS was previously captured under the broader umbrella of Operational Technology. There were no questions specifically raised in relation to the Operational Technology program. In response to Shippers' general interest in understanding any benefits of IT investment, this business case clearly outlines: • drivers for expenditure in AA5, and • the expected benefits.
Other relevant documents	This Business Case should be read in conjunction with: • AMP TEB-001-0024-11 (CRS) • DBP IT Investment Plan 2021-25 • Other IT Business Cases: DBP21 IT Sustaining Applications • 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.

CRS is our contract management and gas accounting system developed by [redacted] specifically to manage the gas transmission. CRS integrates with existing systems such as SCADA and Microsoft Dynamics and manages the end-to-end business needs of gas transmission, including shipper nominations, scheduling and apportionment, invoicing and reporting. It provides the standardisation and auditing ability that is lacking in manual entry systems.

We use CRS to manage all of our gas transportation and gas storage contracts primarily on the DBNGP in Western Australia. It is also the key customer interface for billing and gas nominations.

CRS is maintained and upgraded on a regular basis in accordance with manufacturer recommendations, customer and business requirements, and good industry practice so that DBP can continue to provide customer contract management, nominations, scheduling, gas accounting, reporting and billing.

CRS has a number of 'cousins' which are all variations of the same application that have been developed by the vendor [redacted] for other gas transmission companies in the Eastern part of Australia. All versions are known within the industry as "pypIT".

Each version carries the same base architecture, the main difference between them lies with the business logic that is developed to suit each pipeline's needs.

Vendor / counter party risks have been identified highlighting finite resources and delayed functionality requests from the existing vendor as a business risk to DBP. The Source Code for the screens is held in escrow by the vendor and is in need of a technology update from JAVA to HTML5 to make it mobile friendly as well as becoming supportable by an alternative vendor.

In 2019, we have undertaken extensive market testing through a formal expressions of interest process to understand the likely costs and options of implementing a more modern/mobile CRS platform with adequate support to meet business requirements over the medium term (to the end of AA6). This Business Case assesses the three shortlisted options against maintaining the status quo and proposes to continue with CRS and [redacted] (the current vendor and support partner) with enhanced support and modernised technology platform.

1.4 AA5 forecast

We forecast total capex of $2.8 million for CRS in AA5 as shown in Table 0.3 below. This compares to $0.8 million in AA4.

Table 0.3: AA5 forecast expenditure

($'000)	2021	2022	2023	2024	2025	AA5
Capex - CRS platform improvements	603	250	150	1,635	150	2,787
Opex - CRS support	135	135	135	135	135	675
Total expenditure	**738**	**385**	**385**	**1,770**	**385**	**3,462**

The primary drivers for the change in expenditure between AA4 and AA5 relate to:

- Major technology upgrade of screens from Java technology to mobile friendly technology; and
- Improved vendor support arrangements.

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

Figure 0.1: 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 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 CRS is presented in Figure 1.2. Two elements of risk are rated as high and one low. This results in a high risk ranking for these assets in an untreated scenario.

Figure 1.2: Risk rating – CRS

	Trivial	Minor	Severe	Major	Catastrophic
Frequent			Outrage		
Occasional				DBP	
Unlikely					
Remote			Loss of supply		
Hypothetical	People/ Environmental/ Asset Damage				

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

Table 0.4 below shows the untreated risk rating for CRS.

Table 0.4: Untreated risk rating

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

Major risks associated with deferment of maintenance and upgrades of CRS include:

- DBP – CRS is critical to the effective operations of DBNGP.
  - A failure of the vendor being able to support CRS presents a high risk to ongoing operations as the inability to make changes to the existing system would result in a requirement for manual shipper nominations, scheduling and apportionment, invoicing and reporting, and ultimately a requirement to select and implement a new system.
  - CRS manages upwards of $30m in transactions every month. There is a major financial risk to DBP of not accurately managing shipper contracts and gas accounting.

  - Corporate non-compliance risk of not being able to meet our obligations as a pipeline operator, including reporting to the regulatory bodies including AEMO and IMO.

- Reputational – an inability to access CRS and accurate invoicing would cause major alarm and concern from our Shippers and our regulators (where data we provide to the gas market comes from CRS). Not being able to deliver for customers is also likely to cause major concern and anger among employees and lead to employee dissatisfaction.

- Supply - Operational risk where there is inadequate system support for the Contract Management and Gas Accounting package and therefore manual work a rounds are required increasing the risk of errors which, particularly in the case of nominations, could lead to localised customer supply impacts.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.6 Options Considered

A number of options have been considered to ensure CRS continues to support efficient customer contract management, nominations, scheduling, gas accounting, reporting and billing. They are:

- Option 1: Do nothing – continue with CRS [redacted] with current support and technology platform ($0.8 million);

- Option 2: Continue with CRS [redacted] with enhanced support and technology platform ($2.8 million) (this is the recommended option);

- Option 3: Continue with CRS and move to a new vendor with enhanced support and technology platform ($2.2 million); and

- Option 4: Implement a replacement for CRS ($2.9 to 9.8 million).

1.6.1 Option 1 – Do Nothing/Status Quo

Running to failure for CRS is not an appropriate option as it would result in an increase in manual work a rounds, system instability and potentially a catastrophic failure of the system leading to a complete system replacement. An Expression of Interest for other suitable Contract Management and Gas Accounting system replacements was undertaken in 2019 and identified an average replacement cost to provide the full system requirements of $5.0m, with responses ranging from $2.9m to $9.8m.

However, we could continue with the current CRS [redacted] with the current support and technology platform.

Under this option CRS would continue to utilise Java Technology, which is not compatible with mobile devices, and the current level of vendor support which restricts our ability to change functionality due to resourcing, availability, and prioritisation of the vendor.

The current level of vendor support is 1.5 FTE who understand the application and are shared between DBP and five other gas transmission businesses.

Our licence agreement with [redacted] grants us a right to use the software, but there is no formal support agreement in place currently despite efforts over the last six months to formalise this and put guaranteed service levels in place.

Long lead items such as the TGS functionality requested in Jan 2019 were delayed for DBP and were told that [redacted] were busy with other requests due to eastern states regulatory changes.

1.6.1.1 Achievement of objectives

Table 0.5: Achieving Objectives – Option 1 below outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.5: Achieving Objectives – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers - Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	-
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	-

The do nothing option does not align with our vision objectives of delivering for customers in terms of reliability and customer service, being a good employer in terms of employee engagement and being sustainably cost efficient in terms of working within industry benchmarks and delivering profitable growth.

It does not address significant feedback requesting the interface be mobile friendly to cater for out of hours nominations using CRS. It does not follow accepted good industry practice in terms of regular software updates, particularly where changes to legislation regarding data breaches has increased focus on Cyber Security and keeping systems up-to-date and in support. It means continued delays in required billing system changes to support any new or changing service offerings.

1.6.1.2 Cost assessment

When considering the cost of the do nothing approach, the following costs do not include any remediation of issues that would be expected to arise such as security vulnerability of out of date software or remediating any shortcomings of support.

We also expect direct operating inefficiencies through the need to undertake manual workarounds which is only increasing the longer insufficient support arrangements persist.

The following costs are the minimum to be incurred in AA5. These would significantly escalate should a material risk event occur.

Table 0.6: Total costs - Option 1

($'000)	2021	2022	2023	2024	2025	Total AA5	10yr NPC
Capex	150	150	150	150	150	**750**	**1,249**
Opex	60	60	60	60	60	**300**	**499**
Total	285	285	285	285	285	**1,050**	**1,748**

1.6.1.3 Risk assessment

Table 0.7 below shows that continuing with current support and Java technology platform for CRS in AA5 does not 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.8: Risk Rating - Option 1

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

As identified in section 1.5 above, the major risks associated with continuing with current support and Java technology platform for CRS are:

- DBP – There is a high risk under the do nothing scenario that the current vendor will provide inadequate support, or lose appropriate resourcing so that CRS is no longer supportable and will require full replacement (particularly as the Java technology it utilises is also out of extended support in 2025).

  Continuing with older technologies also poses an increasing risk that appropriately skilled resources are not available in the marketplace, or become increasingly more costly to engage.

- Reputation/outrage – there is a significant risk that not making CRS mobile friendly will cause anger and concern among our Shippers and mean we are not seen as a modern utility. Further, technology that is not updated or supported poses increased cyber risks which could lead to data breaches causing major anger and concern among Shippers, regulators and the general public.

- Supply - Operational risk where there is inadequate system support for the Contract Management and Gas Accounting package and therefore manual workarounds are required increasing the risk of errors which, particularly in the case of nominations, could lead to localised customer supply impacts.

1.6.2 Option 2 – Continue with CRS [redacted] with enhanced support and mobile friendly technology platform

Under this option, [redacted] will rebuild the user interface utilising a HTML or similar format that is suitable for mobile use. We will also formalise enhanced support arrangements with [redacted]

Enhanced support arrangements will are targeted to include a more favourable environment for the vendor to plan their resources long term and include a product life cycle with a staff succession and training plans. The agreement will also target a greater level of support with defined Service level agreements.

Under this option the CRS upgrade project will be fully scoped and awarded by the end of 2020. Support documentation will continue to be improved over the second half of 2019 and 2020. The CRS user interface will be implemented on a HTML or similar technology platform in 2021, with business as usual annual modifications and enhanced support arrangements to meet changing business and customer needs ongoing over the 2021 to 2025 period.

Internally facing screens of CRS are targeted to update in 2024 to allow the vendor to facilitate investment from other customers to allow the ability to share costs where possible.

Table 0.9: Option 2 Roadmap

Optoin 2. Project Roadmap	2019	2020	2021	2022	2023	2024	2025
Business case - Roadmap defined / approved							
Support Documentation improved							
Mobile Friendly CRS Screens for Shippers							
Business as usual							
Internal Screen Replacement							
Revise CRS costs for AA6							

1.6.2.1 Achievement of objectives

Table 0.10: Achieving Objectives – Option 2 below outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.10: Achieving Objectives – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers - Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
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	-

The option to continue with the current vendor with enhanced support and mobile friendly technology supports our vision objectives of delivering for customers in terms of reliability and customer service, being a good employer and being sustainably cost efficient. It provides a more modern and accessible CRS platform for us and our Shippers and ensures we have access to appropriate vendor support.

1.6.2.2 Cost assessment

The estimated capex associated with this option is $2.8 million in AA5. The additional $2.0 million compared to the do nothing option includes the upgrade of the CRS technology platform and modernisation of the user interface. This will make the application mobile friendly as well as provide major technology upgrades for unsupported software platforms.

Table 0.11 below shows the total costs of Option 2.

Table 0.11: Total costs - Option 2

	2021	2022	2023	2024	2025	Total AA5	10yr NPC
Capex	603	250	150	1,635	150	2,787	3,479
Opex	135	135	135	135	135	675	1,124
Total	**738**	**385**	**285**	**1,770**	**285**	**3,462**	**4,603**

1.6.2.3 Risk Assessment

As identified in section 1.5 above, the major risks associated with CRS are to DBP, Reputation and Supply.

Table 0.12 below shows that continuing with [redacted] with enhanced support and a new technology platform for CRS in AA5 does 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.13: Risk Rating - Option 2

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

Specifically:

- DBP – This option provides enhanced support and a new technology platform to ensure CRS remains current and fit-for-purpose and continues to support effective operations through efficient shipper nominations, scheduling and apportionment, invoicing and reporting.

- Reputation/Outrage – This option addresses address significant feedback requesting the interface be mobile friendly to cater for out of hours nominations using CRS. Further, it ensures the technology is updated and supported increasing its resilience to cyber threats, including data breaches.

- Supply - This option provides enhanced support and a new technology platform to ensure CRS remains current and fit-for-purpose and continues to support effective operations through efficient shipper nominations, scheduling and apportionment, invoicing and reporting, with limited need for manual workarounds which could lead to errors and potentially localised customer supply impacts.

This option is considered to achieve ALARP.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.6.3 Option 3 – Continue with CRS and move to a new vendor with enhanced support and technology platform

Under this option, we will move to a new vendor who will deliver the upgraded user interface utilising HTML or similar format that is suitable for mobile use and an enhanced support arrangement.

Our existing CRS licence agreement allows us to engage other vendors for the purpose of maintaining and supporting the software. Therefore this option explored a relationship with a local vendor [redacted] who not only have the capability to support a bespoke application such as CRS, but also have their own Gas Nominations system which has recently been implemented by [redacted] to manage gas nominations and allocations for the producers.

[redacted] performed a proof of concept exercise where they built a sample set of front end screens to prove they could create a brand new bolt on to replace the Java screens. This was a successful result and they have provided a detailed quote to replace all the screens along with ongoing support.

This option allows a commercial approach to negotiating terms and conditions that are more favourable to us including IP ownership, service level agreements, and minimum commitments for support and development year on year.

The technology refresh included by building new screens with a new vendor allows us to leave intact the contractual data of shippers including invoice calculations and refreshes the front end of the application with new mobile friendly screens which will address the Java end of life in 2025.

Under this option the CRS upgrade project will be fully scoped and awarded by the first half of 2021. Support documentation will continue to be maintained and improved over the second half of 2019 and 2020 to support a smooth transition beginning in 2021 to a new support vendor. The CRS user interface will be implemented on the mobile friendly technology platform beginning in 2021, with support transitioned to the new vendor over the second half of 2021. Business as usual annual modifications to meet changing business and customer needs will continue over the 2021 to 2025 period.

The cost of transitioning support is included in the cutover costs with the new vendor being onsite to perform their own learning of the system prior to developing the new screens. It is expected by developing the new screens as a major upgrade, the vendor will gain an increased understanding of the application and allow technical leads to emerge.

Table 0.14: Option 3 roadmap

Project Roadmap	2019	2020	2021	2022	2023	2024	2025
Business case - Roadmap defined / approved							
Support Documentation improved / maintained							
Mobile Friendly CRS Screens							
Support Transitioned to new vendor							
Business as usual							
Review CRS [redacted] product for AA6							

1.6.3.1 Achievement of objectives

Table 0.15 below outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.15: Achieving objectives - Option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers - Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
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	-

The option to move to a new vendor with enhanced support and a new mobile friendly technology platform supports our vision objectives of delivering for customers in terms of reliability and customer service, being a good employer and being sustainably cost efficient. It provides a more modern and accessible CRS platform for us and our Shippers and ensures we have access to appropriate ongoing vendor support.

1.6.3.2 Cost assessment

The estimated capex associated with this option is $2.2 million in AA5. The additional $1.4 million compared to the do nothing option includes the upgrade of the CRS technology platform and modernisation of the user interface. This will make the application mobile friendly as well as provide major technology upgrades for unsupported software platforms.

We note these costs have been estimated based on a proof of concept exercise undertaken by the potential new vendor and that the potential for variation in actual delivery costs is much higher under this option compared to Option 2 given the new vendor does not have the specific experience with CRS of the current vendor.

Further, this cost assessment does not include any costs associated with maintaining two systems and support vendors in parallel for a short time during transition.

Table 0.16: Total costs - Option 3

	2021	2022	2023	2024	2025	Total AA5	10yr NPC
Capex	1,540	250	150	150	150	2,240	3,090
Opex	135	135	135	135	135	675	1,124
Total	1,675	385	285	285	285	**2,915**	**4,214**

1.6.3.3 Risk Assessment

As identified in section 1.5 above, the major risks associated with CRS are to DBP, Reputation and Supply.

Table 0.10 below shows that moving to a new vendor with enhanced support and a new mobile friendly technology platform for CRS in AA5 does not adequately 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower', at least in the short-term.

Table 0.17: Risk Rating - Option 2

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

Specifically:

- DBP – This option provides enhanced support and a new technology platform to ensure CRS remains current and fit-for-purpose and continues to support effective operations through efficient shipper nominations, scheduling and apportionment, invoicing and reporting. However, the move to a new vendor creates unknowns and the potential for unforeseen costs and lost knowledge. It may also require two instances of CRS to continue in parallel during transition. The transition of support is also problematic where it is likely to take some time for the new vendor to develop a full understanding of the current system which is critical to them being able to provide ongoing support.

- Reputation/Outrage – Our Shippers use CRS to undertake gas nominations and access other important information about their gas supply contracts and invoicing. Any glitches or delays in the successful transition of front end and support of CRS to the new vendor is likely to impact our Shippers and cause concern and anger.

- Supply - This option provides enhanced support and a new technology platform to ensure CRS remains current and fit-for-purpose and continues to support effective operations through efficient shipper nominations, scheduling and apportionment, invoicing and reporting, with limited need for manual workarounds which could lead to errors and potentially localised customer supply impacts.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.6.4 Option 4 – Implement a replacement for CRS

Under this option, we will implement a replacement for CRS which will include a mobile friendly user interface and implement an appropriate arrangement for ongoing support.

This option would allow for a fresh approach to the entire billing process with a new vendor and new product.

The process of tendering for a new product would allow a commercial approach to engaging on terms and condition of new support agreements which would include service level agreements, minimum support and development efforts and understanding the product lifecycle, training and succession plans of the new vendor.

The user interface will be implemented on the mobile friendly technology platform beginning in 2021, with support transitioned to the new vendor over the second half of 2021. Business as usual annual modifications to meet changing business and customer needs will continue over the 2021 to 2025 period.

This option should also be considered along with the AGIG One IT Strategy & Roadmap where a "single billing system" has been set as a target. Although the One IT Roadmap is not complete at the time of this business case, this would allow synergies across the AGIG platform company wide and is currently under evaluation. However, it is likely there would be a much longer project delivery timeframe for this given the additional number of stakeholders and business requirements that need to be considered to deliver an enterprise wide solution.

1.6.4.1 Achievement of objectives

Table 0.18 below outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.18: Achieving objectives - Option 4

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

The option to replace CRS with a new system with enhanced support and a mobile friendly technology platform supports our vision objectives of delivering for customers in terms of reliability and customer service (in terms of accessibility of CRS, but not in terms of price impact) and being a good employer, but is unlikely to be sustainably cost efficient as it represents the most costly of the options to provide a more modern and accessible CRS platform for us and our Shippers.

1.6.4.2 Cost assessment

The average capex cost estimated with this option totals $5.7 million in AA5. This is $4.9 million above the do nothing option and $2.9 million above the recommended option. in Capex costs to the recommended option 2 for the AA5 period. These costs were the result of an Expression of Interest that was undertaken in 2019 and engaged six out of eleven prospective vendors to provide ball-park estimates based on the size and scope of the current system.

Table 0.19: Total costs - Option 4

	2021	2022	2023	2024	2025	Total AA5	10yr NPC
Capex	5,089	150	150	150	150	5,689	6,429
Opex	746	746	746	746	746	3,820	6,360
Total	5,853	914	914	914	914	**9,509**	**11,512**

1.6.4.3 Risk Assessment

As identified in 1.5 above, the major risks associated with CRS are to DBP, Reputation and Supply.

Table 0.20 below shows that implementing a replacement for CRS with enhanced support and a mobile friendly technology platform in AA5 does not adequately 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower', or creates new risks.

Table 0.21: Risk Rating - Option 4

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

Specifically:

- DBP – This option provides enhanced support and a new technology platform for a replacement to CRS to deliver a current and fit-for-purpose system to support effective operations through efficient shipper nominations, scheduling and apportionment, invoicing and reporting. However, the move to a new product creates unknowns and the potential for unforeseen costs and lost knowledge. It may also require CRS to continue as is, in parallel, during transition. It is also the most costly and unpredictable of the options exposing us to unacceptable cost consequences, particularly when considered with other large IT projects being delivered at a similar time (e.g. Finance system – see DBP21 IT Sustaining Applications Business Case).

- Reputation/Outrage – Our Shippers use CRS to undertake gas nominations and access other important information about their gas supply contracts and invoicing. Any glitches or delays in the successful transition to a new system is likely to impact our Shippers and cause concern and anger. Further our Shippers would not support the most costly option of providing a more modernised and stable "CRS".

- Supply - Any glitches or delays in the successful transition to a new system has the potential to cause localised customer supply impacts.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.7 Summary of Cost/Benefit Analysis

To assess the options, the costs, objectives and risk are considered for each option. A summary of the option assessment is shown in Table 0.22 below.

Table 0.22: Summary of cost/benefit analysis

Option	Objectives	Cost	Risks
Option 1 Do nothing	Does not support our objectives of delivering for customers (modern, supported, mobile friendly CRS), being a good employer or being sustainably cost efficient	$0.8m capex ($1.7 NPC over 10 years)	Does not adequately address high risk to DBP, intermediate risk to Reputation and low risk to Supply
Option 2 Continue with Energy One and enhanced support, rebuild mobile friendly screens	Supports our vision objectives of delivering for customers in terms of reliability and customer service, being a good employer and being sustainably cost efficient by providing a more modern and accessible CRS platform for us and our Shippers and ensures we have access to appropriate vendor support	$2.8m capex ($4.6m NPC over 10 years)	Adequately addresses high risk to DBP, intermediate risk to Reputation and low risk to Supply. This option is considered to achieve ALARP.
Option 3 Retain CRS with new vendor to provide enhanced support and major upgrade to make mobile friendly	Supports our vision objectives of delivering for customers in terms of reliability and customer service, being a good employer and being sustainably cost efficient. It provides a more modern and accessible CRS platform for us and our Shippers and ensures we have access to appropriate ongoing vendor support.	$2.2m capex ($4.2m NPC over 10 years)	Does not adequately address high risk to DBP, intermediate risk to Reputation and low risk to Supply, at least in the short term.
Option 4 Replace the existing CRS with a new product and a new vendor	supports our vision objectives of delivering for customers in terms of reliability and customer service (in terms of accessibility of CRS, but not in terms of price impact) and being a good employer, but is unlikely to be sustainably cost efficient as it represents the most costly of the options to provide a more modern and accessible CRS platform for us and our Shippers	$5.7m capex ($12.8m NPC over 10 years)	Does not adequately address high risk to DBP, intermediate risk to Reputation and low risk to Supply, and introduces some new risks in these areas

1.8 Proposed Solution

1.8.1 What is the Proposed Solution?

Option 2 to continue with the current vendor with enhanced support and mobile friendly technology is recommended and also involves:

- A new support agreement negotiated on our terms, no licence fee or restriction of our existing rights in any way;
- DBP approval of the architectural design to the Java screen updates so that the option to move to a new support vendor in future is available (this also aligns with AGIG "One IT" objectives);
- Dedicated resources provided to create content for the knowledge base (0.5 FTE moving forward); and
- Commitment to a long term resource plan from [redacted] with long term financial commitment from AGIG under our terms and conditions.

1.8.2 Why are we proposing this Solution?

Option 2 is recommended as it delivers against our objectives, responds to customer feedback by modernising the CRS application for mobile use, follows good industry practice in terms of ensuring core business applications are current, fit-for-purpose and supported, with the lowest combination of costs and risks, and impacts to effective operations.

Option 1 is not considered viable as the risk of a single point of failure in the Vendors Resource combined with the ageing technology is a growing risk that is currently a High risk to DBP which could ultimately result in a system replacement being required at an average cost of $5.0 million (with estimates ranging from $2.9 million and $9.8 million), as well as impact to effective operations.

Further Option 1 does not respond to customer demand for a mobile friendly platform or that the current Java platform will reach the end of extended support in 2025. It is also inconsistent with accepted good industry practice to maintain current systems.

Option 3 is a viable option, however comes at a higher risk to Option 2, particularly in the transition phase, with final costs being more unpredictable and there being a potential loss of knowledge. It is still considered as a potential option in the future.

Option 4 carries the highest risk in cutting over from the existing system to another as it is a complete replacement that will require significant effort to transition. It is not preferred as it carries the highest cost and the highest risk of all the options.

1.8.2.1 Consistency with the National Gas Rules

Rule 79(2)

The investment in a mobile friendly platform for CRS and enhanced support arrangements to ensure new business requirements can be met in a timely manner is necessary to maintain the integrity of services and to comply with regulatory obligations as per NGR 79(2)(c)(ii) and (iii). CRS is a key business tool that supports customer relationship management, billing and market reporting functions to ensure the effective operation of DBP.

Rule 79(1)

The proposed capex is consistent with the requirements of Rule 79(1) of the National Gas Rules, specifically the capital expenditure is:

- Prudent – The expenditure is necessary in order to address the identified ongoing operational and customer requirements for mobile access to CRS and more timely functional improvements. The proposed expenditure can therefore be seen to be of a nature that would be incurred by a prudent service provider.

- Efficient – The proposed costs for the recommended option is based on vendor quotes, with the proposed option selected after extensive market testing. Therefore the proposed expenditure is consistent with the expenditure that a prudent service provider acting efficiently would incur.

- Consistent with accepted and good industry practice – The proposed expenditure will ensure CRS remains current, fit-for-purpose and supported, in line with accepted good industry practice for core business applications. Further, other utilities have been investing significantly in their IT systems and digital capabilities and in particular to deliver a mobile workforce.

- To achieve the lowest sustainable cost of delivering pipeline services – mobile access to CRS and access to enhanced support arrangements that will allow more timely configuration changes to meet business needs will improve the efficiency of customer relationship management, market reporting and billing functions. Option 2 is the lowest cost and risk option for achieving this change, and therefore the investment will achieve the lowest sustainable cost of delivering pipeline services.

1.8.3 Forecast Cost Breakdown

Table 0.23 below shows AA5 capex by cost categories.

Table 0.23: AA5 capex, by cost type

($'000)	2021	2022	2023	2024	2025	Total AA5
Internal Labour	53	50	30	332	30	**494**
Contractors / Consultants	500	200	120	1,250	120	**2,190**
Materials and Services	50	0	0	50	0	**100**
Travel and Accommodations	0	0	0	3	0	**3**
Total	603	250	150	1,635	150	**2,787**

1.8.4 Estimating the Efficient Costs

As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology 2021-2025', the costs for this project include the internal labour, external labour, materials, travel and other costs forecast.

Where possible, the unit rate used to determine the cost of the program in AA5 is based on a three year average actual cost incurred in AA4.

Where this has not been possible, due to infrequent or new activities identified for AA5, these activities have been estimated based on:

- estimates from vendors (and prospective vendors);

- the historic cost of similar programs of work; and

- consultation with internal stakeholders, our IT support partner and external market specialists to determine the most likely implementation approaches and effort requirements to implement the program.

1.8.5 Escalated capex

Table 0.24 below shows the cost escalation applied to escalate to real dollars of December 2020 including labour cost escalation of 0.69% per annum.

Table 0.24: AA5 capex, including cost escalation

($'000)	2021	2022	2023	2024	2025	Total AA5
Unescalated Jun 19	603	250	150	1,635	150	2,787
Escalation	15	7	5	55	5	88
Escalated Dec 20	**618**	**257**	**155**	**1,690**	**155**	**2,875**

Appendix A – Risk Assessment

Figure 1.3: Summary risk assessment - CRS

	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	Occasional	HIGH	125	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Frequent	HIGH	125	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Remote	LOW	5	258
Option 1 - Do nothing (current technology and support)	Major	Occasional	HIGH	125	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Frequent	HIGH	125	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Remote	LOW	5	258
Option 2 - Stay with Energy One, enhanced support, new tech platform	Major	Remote	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Remote	LOW	5	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Remote	LOW	5	38
Option 3 - CRS with new vendor, enhanced support, new tech platform	Major	Unlikely	HIGH	125	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Unlikely	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Remote	LOW	5	158
Option 4 - Replace CRS	Major	Unlikely	HIGH	125	Trivial	Hypothetical	NEGLIGIBLE	1	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Occasional	INTERMEDIATE	25	Trivial	Hypothetical	NEGLIGIBLE	1	Severe	Remote	LOW	5	158

Appendix B – Detailed evaluation criteria

Table 0.25 below outlines the qualitative assessment of the CRS options which formed part of the evaluation.

Table 0.26: CRS evaluation criteria

Topic	Requirement		Stream 1: [redacted]	Stream 2: NEW Vendor with CRS	Stream 3: [redacted]
0. EOI Briefing Pack Response		*Score Out Of*			
A measure of the overall Briefing pack response	7.1) Submission form returned	10			
	7.2) Company Details returned	10			
	7.3) Company Profile	10			
	• Location of Head Office and operating sites	10			
	• Corporate governance structure	10			
	• Company $ turnover	10			
	• Major clients and nature of services provided	10			
	• Typical commercial arrangements	10			
	• Number of employees by category and attrition rate	10			
	• Continuous improvement culture	10			
	• Quality system/accreditation	10			
	• Value Added Services	10			
	• HS& E systems/ accreditation	10			
	• Management processes	10			
	• Completed contracts of similar nature (past 5 years)	10			
	• Other contracts of similar nature (current) within the energy industry	10			
	7.4) Provide an original of the recent annual report	10			

1. Contracts Management	**Question Total**		**0**	**0**	**0**
DBP generates revenue by transporting gas from Inlet Point(s) to Delivery Point(s) along the entire length of the pipelines it looks after	a) Describe how the system can record Company details (financial and business), Names and details of personnel who will use the system.	10	10	10	10
	b) Describe the system's ability to manage Gas transportation and gas storage contracts including but not limited to Type of contract (Full Haul, Part Haul, Back Haul, Interruptible, Firm)	10	10	10	10
	c) Describe the system's ability to manage Tariff details including how allocated gas (GJ's) are converted to $ by billing items and how each billing item calculates a specific charge. The billing items may be based on "fixed charge", "quantity of gas transported", or "imbalance charges"	10	10	10	10
2. Nominations	**Question Total**	**30**	**30**	**30**	**30**
DBP requires a system that has an ability to allow marketers to trade gas quantities using an internet based system..	a) Describe the system's ability to create and view nominations for gas transportation and gas storage based on contracted capacity.	10	10	10	10
	b) Describe the system's ability to allow shippers to bid for spare capacity that is made available at a daily level AND allow shippers to trade gas that they have available at receipt points.	10	10	10	10
3. Marketer Allocations	**Question Total**	**20**	**20**	**20**	**20**
DBP requires a system that has an ability to allocate daily producer allocations.	a) Describe the system's ability to allow any single marketer to offer other marketers daily quantities of throughput on a daily basis.	10	10	10	10
	b) Describe the system's ability to allow any single marketer to enter allocation to shippers at the inlet point using an internet based system.	10	10	10	10
4. Producer Nominations	**Question Total**	**20**	**20**	**20**	**20**
DBP requires a system that allows customers to enter gas nominations using an internet based system.	a) Describe the Production Facility operator to enter nominations for the amount of gas they are planning to inject at their production facility	10	10	10	10

	b) Describe how the system allows the Production Facility operator to enter nominations and allocations of gas to their JV partners (Marketers).	10	10	10	
5. Scheduling	**Question Total**	**20**	**20**	**20**	**20**
DBP requires a system which allows automated scheduling and approval of customers nominations based on priority and depending on the shippers contract configurations.	a) Describe the system's ability to create new schedules of nominations for each pipeline including the ability to amend/update a customer entered nomination.	10	10	10	10
	b) Describe the system's ability to operate a Curtailment where contracted capacities are amended for specific periods of time during interruptions to capacity and reflected as an invoice adjustment note.	10	10	10	10
	c) Describe the system's ability to allow for entry/editing of spare capacity that is made available at a daily level within the schedule	10	10	10	10
6. Metering Data	**Question Total**	**30**	**30**	**30**	**30**
DBP requires a system which allows data from the field to be imported	a) Describe the system's ability to manually import hourly metering data via a csv file or similar.	10	10	10	10
	b) Describe the system's ability to View/Edit hourly metering data	10	10	10	10
	c) Describe the system's ability to automatically have data imported from an external data source such as a SCADA historian.	10	10	10	10
	d) Describe the system's ability to Enter/Edit daily metering data that is setup to have their daily totals entered manually	10	10	10	10
	e) Describe the system's ability to validate, monitor and correct Metering data based on a minimum or maximum values.	10	10	10	10
7. Gas Accounting	**Question Total**	**50**	**50**	**50**	**50**
DBP requires a system that can generate invoices with supporting	a) Describe the system's ability to View and re-generate system created invoices and adjustment notes.	10	10	10	10
	b) Describe the system's flexibility in managing business rules	10	10	10	10

meter data energy values.	c) Describe the system's ability to View and re-generate system created invoices.	10	10	10	10
	d) Describe the system's ability to maintain different tariff adjustments per contract	10	10	10	[redacted]
	e) Describe the system's ability to interface with other systems such as a Financial System.	10	10	10	10
8. Reporting	**Question Total**	**50**	**50**	**50**	**45**
DBP requires the ability to automatically generate and distribute reports on a daily basis	a) Describe the system's ability to generate reports in CSV, HTML or PDF formats	10	10	10	10
	b) Describe the system's ability to view previously issued reports	10	10	10	10
	c) Describe the system's ability to maintain a list of email recipients of specific reports.	10	10	10	10
	d) Describe the system's ability to create or modify generic reports by business users.	10	10	10	10
9. Regulatory Data	**Question Total**	**40**	**40**	**40**	**40**
DBP requires the ability to transfer data to and from regulatory bodies such as the IMO and AEMO	a) Describe the system's ability to perform business to business transactions using web methods or similar API calls to send to or receive from other systems	10	10	10	10
	b) Describe the system's track record of communicating with AEMO / IMO	10	10	10	10
10. System Requirements	**Question Total**	**20**	**20**	**20**	**20**
DBP would like to understand your system requirements.	a) Describe the system's operating system and database requirements.	10	10	10	10
	b) Please provide any other information relating to the requirements of your products	10	10	10	10
	c) Describe what the front end user experience requirements will be expected (EG: HTML5 / Mobile Friendly / etc.)	10	10	10	10

	d) Describe any non-functional requirements or system boundaries. EG: number and types of users.	10	10	10	10
11. Application Security	**Question Total**	**40**	**40**	**40**	**40**
DBP prefers the system to be on premises or within their data centres and allow access for their customers over the internet	a) Describe the architecture of the system and show how it securely connects to the internet.	10	10	10	10
	b) Describe how user based security works between internal users on a Corporate domain and external users that are not part of a corporate domain	10	10	10	10
	c) Describe the data and user security model	10	10	10	10
13. Product Life cycle and roadmap	**Question Total**	**30**	**30**	**30**	**30**
DBP wishes to understand to current roadmap and regular software maintenance releases.	a) Describe your product roadmap	10	5	5	5
	b) Describe your product lifecycle including reference to dependant applications or utilities and tools.	10	5	5	5
	Question Total	**20**	**10**	**10**	**10**
	Show stoppers		No	No	No
	Grand Total	**370**	**360**	**360**	**355**
	Percentage Match		**97%**	**97%**	**96%**

Appendix C – Summary of benefits and risks Option 2 - 4

Table 0.27: Summary of benefits and risks

Option	Benefits	Risks
Option 2 Continue with [redacted] and enhanced support, rebuild mobile friendly screens	1) Very knowledgeable staff on not only the product but also Gas Transmission industry 2) Currently billing calculations are accurate and will not be compromised by change 3) CRS is currently fit for purpose and delivers the business requirements 4) Recent discussions with [redacted] have confirmed their willingness to openly share technical information to our knowledge base which assists in reducing resourcing risk.	1) Response time of [redacted] for Support has been deteriorating 2) Only 1.5 F/T Employees that understand the application
Option 3 Retain CRS with new vendor to provide enhanced support and major upgrade to make mobile friendly	1) Opportunity for fresh approach to support 2) Localised support from vendor based in Nedlands with industry exposure and some market share. 3) Retain existing "billing engine" lowers risk of calculating incorrectly after change over 4) Source code managed within DBP's control	1) [redacted] staff not as knowledgeable as [redacted] in CRS/pypIT or Gas Transmission industry or DBP's complicated GTA's 2) There is a risk that the new vendor cannot deliver ongoing support for CRS or decides it's too hard or takes longer than expected to come up to speed. 3) Large knowledge content to transfer down to a detailed programmer's level in order to achieve a completely smooth transition.
Option 4 Replace the existing CRS with a new product and a new vendor	1) Forces the business to start a fresh 2) Identifies possible vendors for "One IT" consideration	1) New system implemented may not cater for all scenarios and there is a risk of invoices not calculating correctly post implementation 2) Backfilling existing roles for project. May take longer than expected to do this. 3) Highest risk option as most amount of change is replacing the entire system 4) All Contracts, Contract services, Meters, Invoice Items, Reports and other major configuration items have to be re-entered and tested. 5) Highest cost option 6) New System implementation may not align with the One IT Roadmap for future ERP

IT Sustaining Applications Business Case – Capex DBP21

1.1 Project Approvals

Table 0.1: IT Sustaining Apps DBP21 - Project approvals

Prepared By	Amber Smith, Manager IT
Reviewed By	Kylie Stones, IT PMO Manager; Praveen Desari, Solution Architect
Approved By	Andrew Staniford, Chief Customer Officer

1.2 Project Overview

Table 0.2: IT Sustaining Apps DBP21 - Project overview

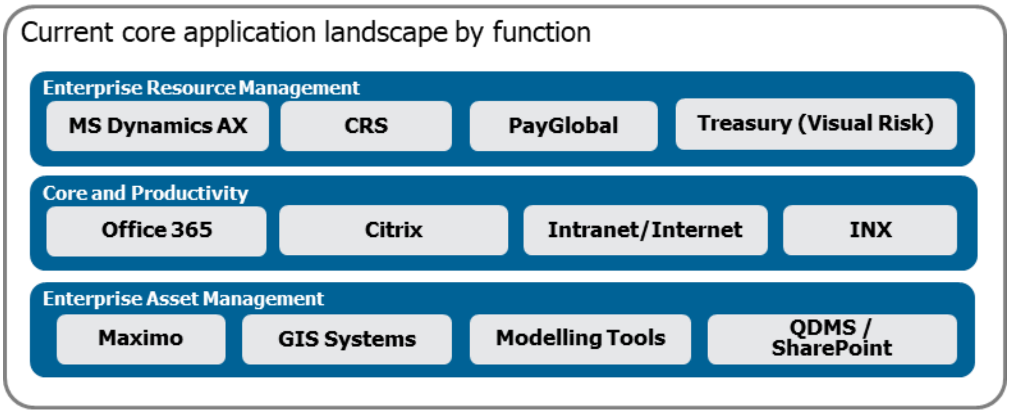
Description of Issue/Project	Maintain a stable set of Information Technology (IT) applications that is current and fit for purpose. Deliver ongoing application renewal to maintain the integrity of the overall IT environment, manage technology risks and prevent material outages that impact the ability of the business to function. This is a continuing program of work that is lower than the prior period due to an informed investment approach rather than an ad-hoc approach.
Project Name	IT Sustaining Applications
Estimated Cost	Total forecast capex for AA5 is $3.3 million. The costs have been estimated based on historic costs delivering the same or similar work and supplier pricing.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 – Do nothing differently – Continue with current IT applications and ad-hoc approach to maintaining them ($3.5 million); • Option 2 – Deliver proactive IT Sustaining Application initiatives ($3.3 million) (this is the recommended option); and • Option 3 – Deliver proactive IT Sustaining Application initiatives, but wait for the AGIG wide ERP solution ($5.7 million).
Expenditure incurred in AA4	Approved expenditure for similar works in AA4 was $2.9 million. We are forecasting to actually spend $6.5 million on our IT Sustaining Apps program in AA4. The largest contributor to this is our finance system. We spent $0.5 million in 2016 and 2017 to undertake critical updates which were not allowed for in AA4, plus the planned upgrade in 2020 (when the current version comes out of support) which is forecast to cost $3.0 million ($2.1 million more than what was allowed for in AA4). See section 1.3.1 for further details on this. The other $1 million increase is related to implementing an AGIG email system along with Office 365, undertaking updates for Pay Global, INX, CAD and Windows and SPOT journey management, offset by a delay in our Maximo upgrade.
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – Maintaining a stable IT set of Information Technology (IT) applications that is current and fit for purpose is critical to our business (it informs business decisions and helps us to efficiently manage our business processes). The proposed proactive IT Sustaining Applications initiatives are consistent with accepted good industry practice, several alternative options and have been considered and unit rates and timing of refreshes have been tested to achieve the lowest sustainable cost of delivering pipeline services.

	NGR 79(2) - The proposed expenditure on our IT Sustaining Applications project is required to maintain the integrity of services through current, supported and for purpose IT applications, managing technology risks and preventing material outages that impact the ability of the business to function (including tracking and reporting of business information to meet our regulatory obligations and requirements). **NGR 74** – the forecast costs are based on the latest market rate testing, and project options consider the requirements of our application environment. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Stakeholder engagement	<u>Customers</u> 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 IT Sustaining Applications program will ensure the ongoing stability of IT applications our operations dependent on and create the opportunity for new ways for Shippers to interact with our information. During our Shipper Roundtables we presented key areas of our planning, including our proposed capex and opex. We gave a high-level view of our IT capex to explain the step change in IT investment we are proposing in AA5. 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 IT Sustaining Applications program. In response to Shippers' general interest in key areas and drivers of increased spend this business case clearly outlines reasons for changes in expenditure between AA4 and AA5. <u>Other</u> We engaged with various key stakeholders across the business to develop our IT Strategy, Roadmap and Investment Plan for AA5. This included owners and users of key systems. As part of the proposed AGIG IT Strategy and Roadmap there is an initiative to ensure DBP addresses the current MS Dynamics AX issues as this is perceived as a significant risk.
Other relevant documents	This Business Case should be read in conjunction with: • DBP IT Investment Plan • Asset Management Plan (TEB-001-0024-07) • Other technology Business Cases: IT Enabling, IT Security, IT Sustaining Infrastructure, Maximo and DMZ, SCADA and CRS

1.3 Background

Our business processes and customer outcomes are based on reliable access to information. That information is all stored in, and accessed through our IT applications. The relationships between our information, business processes and IT applications is defined in Appendix B and a high level summary of the core applications is depicted in Figure 0.1 below.

Figure 0.1: Current application landscape



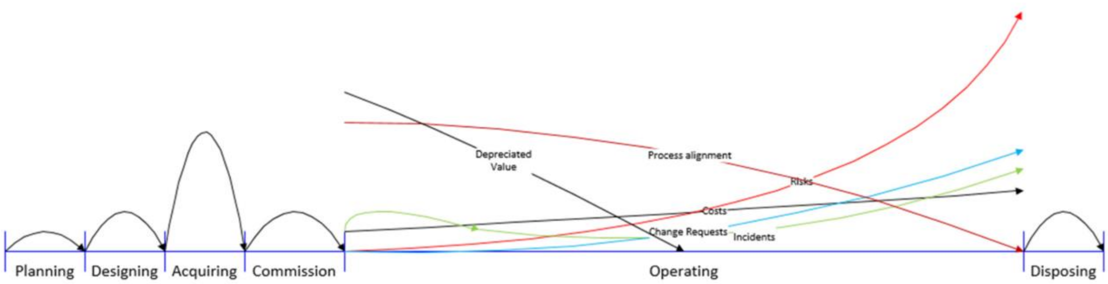
All IT applications have a lifecycle, from initially identifying the need for them right through to their retirement this lifecycle should be treated the same as for any organisational asset. Just like physical assets, IT applications need a certain level of ongoing maintenance to maximise their effective lifecycle.

Unlike traditional physical assets the rapid rate of change of technology, combined with the highly interconnected nature of technology assets, creates an environment where the user interfaces, network infrastructure and other IT applications can all move such that an aging IT Application may lose functionality because infrastructure it is dependent on no longer works with that application.

The reality of IT applications is that regardless of how good the planning, design, acquisition and commissioning stages are, not all business process needs can be met by systems from day 1 of their use. This is compounded by business needs that change over time and results in either manual process workarounds or changes to the IT applications over time.

All of these lifecycle factors are highlighted in Figure 0.2. This type of conceptual model is used to determine the overall lifespan of an application, the cost vs benefits of how long to operate an IT application and some of the key factors to consider when determining their replacement is due.

Figure 0.2: IT Application lifecycle concepts



We categorise our fleet of IT Application assets into two tiers, namely:

- **Tier 1 Core Systems:** Major core systems the whole business is critically dependent on, key business processes and regulatory obligations are dependent on them.
- **Tier 2 Enabling System**s: Important systems that may impact a part of the business but not the whole, business processes depend on them but workarounds are possible.

This is further detailed in the DBP Business Function Model section in Appendix B.

Our historical approach to IT application lifecycle maintenance has been ad-hoc. This is not consistent with industry standard practice, which is to schedule ongoing investment to maintain IT applications, usually at two to three year intervals for significant updates or refreshes, and annually for minor updates.

Industry standards suggest that if 'N' is the current version provided by the vendor then organisations should try to maintain a version level 'N-1' approach. Changes in the Cyber risk landscape have moved industry standards practice for security patching to a version level 'N' approach, based on a threat-based risk assessment approach.

The ad-hoc approach has an additional consequence in that metrics on the true business cost of not maintaining applications is difficult to measure and monitor. A key initiative early in this period is to implement an IT Asset Management system that can track IT assets and inform future lifecycle decisions.

Not maintaining IT applications to appropriate levels introduces 'technical debt' which accumulates over time and becomes more expensive to address the longer it is left to develop. Technical debt is a concept in software development that reflects the implied cost of additional rework caused by choosing an easy (limited) solution now instead of using a better approach that would take longer and cost more in the short term but less in the long term. Technical debt is often compared to monetary debt. If technical debt is not repaid, it accumulates 'interest', making it harder to implement changes later on.

1.4 AA5 forecast

The key aspects of the IT Sustaining Applications program are:

- CRS, Maximo, MS Dynamics AX modernisation.
- Optimise core capabilities leveraging new platforms and sourcing models.
- New technologies to advance the cyber security capabilities.
- Create a platform-independent environment by modernising relevant applications to enable a mobile workforce that can work across DBP e.g. responsive design, mobile, software as a service (SaaS) and virtualisation.

These aspects are supported by a number of individual initiatives, which are broadly outlined below.

Note: The CRS, Maximo & DMZ modernisation initiatives have been budgeted for under the respective business lines for the licensing and business unit internal labour costs but IT are capturing the IT support costs (e.g. [redacted] implementation costs and IT project management) needed to support the CRS, Maximo & DMZ projects.

The respective business unit owners of CRS and Maximo have developed their own business cases and will run the projects with IT providing support. IT have budgeted for the internal IT people costs associated with the proposed programs of work.

This business case is proposing to shift the IT application maintenance approach from ad-hoc to proactive to line up with accepted good industry practice, namely:

- **Tier 1 Core Systems:** For each core system a major functionality update every 2 years with a minor functionality update in the other years. Security updates on a per update risk based threat analysis.
- **Tier 2 Enabling Systems:** For all enabling systems a functionality release every year in line with vendors schedules. Security updates on a per update risk based threat analysis.

There are a few notable exceptions to these general rules, which are:

- For the CRS platform the application updates are based on the vendor's timelines as well as direction from the businesses as to required updates. It should be noted that CRS is covered in a separate Business Case (CRS DBP20);
- Due to a range of reasons MS Dynamics AX functionality upgrades are not possible until the system is replaced; and
- Database server upgrades are tied into application updates as required.

1.4.1 Core System Modernisation

Table 0.3: Core System Modernisation Initiatives

Initiative	Program of Work
Billing Revenue Management System (CRS)	Project to enhance CRS functionality for: • adding new customers • regulatory reporting Provision of software version upgrades and patches including development / testing and deployment.
Asset Management System (Maximo)	Project to enhance Asset Management functionality for: • Procurement • Works program management • Integration with DBPs proposed new Financial Management System • Reporting Ancillary application integrations used alongside Maximo – including Akwire for scheduling and Dataplace for inventory management.
Finance Management System (Dynamics AX)	Implementation of new Finance Management System with project coverage of people, process and technology. Maintenance of the existing system in parallel for a period of 3 months.
Customer Support / Service Desk	Upgrade to latest version of ServiceNow and review/update customer support processes. Implementation of an IT Asset Management capability.
Other Core Systems	Enhancements, software version upgrades and patches, Software license & Support costs for the following: • DBP Websites • GIS System / Tools • Document Management Systems

1.4.1.1 MS Dynamics replacement

During the implementation of the MS Dynamics AX platform in 2013, the core financial platform of the business, a range of significant customisations were developed and implemented in such a way that subsequent attempts to upgrade the underlying platform have failed so the application is not upgradable from a functionality perspective. Microsoft's support lifecycle for

MS Dynamics AX ends October 2021 which will mean the end of security patches outside of a bespoke and expensive support agreement with Microsoft.

The age of the MS Dynamics AX platform is also limiting integration with other IT applications, notably a contemporary Shippers portal. It is forecast to upgrade MS Dynamics AX in CY2020. With all major IT core system implementations lessons are learnt from the implementation and new functionality of the systems are never fully understood resulting in a range of post-implementation requirements. The intention is to implement a new solution that goes into production at the start of CY2021 with a parallel run and hyper-care for Q1.

This is a continuing program of work, with expenditure incurred in all years of AA5. There is an increase in spend from the forecast AA4 period due to the hyper-care and continuing changes to a system that addressed MS Dynamics AX issues. Additionally there is a small increase in maintaining IT applications to enable an industry standard approach that will also remediate relative underinvestment in the past and in support of our IT Enabling and IT Security programs of work.

1.4.2 Allocation of Program and Change Management

All of the initiatives proposed in this business case will require some form of program or change management. Within each initiative the costs for the people directly involved in the project have been allocated for, but there must be allocation for the business people not include in the projects for activities such as:

- project management;
- business process mapping & re-design;
- user training and awareness sessions; and
- User Acceptance Testing (UAT).

Each initiative will have differing levels of program and change management that will be determined through the project management startup phase.

1.4.3 AA4 comparison

Forecast actual expenditure in AA4 is $3.6 million above the allowance. $2.6 million of this increase is related to our finance system. $0.5 million was spent in 2016 and 2017 to undertake updates that were not allowed for in AA4, with a further $3 million forecast in CY2020 to upgrade the current version of MS Dynamics AX, which will be out of support, to an interim solution. This is being driven by the AGIG IT Strategy and Roadmap that has identified the organisational risk for DBP is too high to wait for the One ERP project to be implemented from CY2023.

The remaining $1.0 million variance was incurred for email system upgrades along with Office 365 and MOE upgrades, undertaking updates for Pay Global, INX, CAD and Windows and SPOT journey management, offset by a delay in our Maximo upgrade. This was caused due to the ad-hoc approach towards application lifecycle management which will be corrected for under the proactive approach recommended in AA5.

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

Figure 0.4: 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 framework for consequence assessment across a number of elements the framework for likelihood assessment is shown in Appendix A – Risk Assessment.

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'.

Due to the historical ad-hoc approach of managing applications the current versions of the core IT applications are not in line with the N-1 model. The underlying Dynamics AX platform of the finance systems has a Vendor Support Lifecycle end date of October 2021. Past that date Microsoft is no longer obliged to provide functionality or more importantly security updates. Whilst it is possible to obtain a special support extension this is costly and not guaranteed to be available.

The overall risk rating of IT Sustaining Applications is presented in Figure 0.5. Two 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 0.6: Risk rating – gas turbines and GEAs

	Trivial	Minor	Severe	Major	Catastrophic
Frequent			Outrage		
Occasional				DBP	
Unlikely			Loss of supply		
Remote				Asset Damage	
Hypothetical	People			Environment	

Negligible	**Low**	**Intermediate**	**High**	**Extreme**

1.5.1 Untreated risk

If the proposed upgrades are not implemented, the risk of catastrophic failure increases year-on-year, and if this extends beyond the AA5 period, the risk will increase from 'High' to 'Extreme'.

Refer to the full risk assessment result included as Appendix A to the Business Case.

Table 0.4: Risk Rating

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

Specifically, the risks are to:

- DBP – Our core IT applications are integrated and reliant on each other to allow transactions to flow from one application to another. Any IT application failure, or failure of the integration between them would have a significant impact on effective operations for an extended period of time while the remediation work was completed.

- Reputation – The current IT Applications present a risk to the ability of staff and Shippers to access information. By not maintaining the IT Applications the risk of cyber incidents and system incompatibilities will result in an increasing likelihood of extended outages impacting the ability of the organisation to function safely and effectively and causing widespread anger and concern.

- Asset Damage - Additionally, not implementing upgrades makes applications more vulnerable to cyber-attacks and increases the likelihood of security breaches. Security breaches compromise the confidentiality and integrity of corporate and customer data, and availability of operational and corporate systems giving rise to risks of Asset Damage in the order of $10-25 million.

1.6 Options Considered

A number of options have been considered to address the risks and benefits of how DBP maintains its suite of IT applications. These are:

- Option 1 – Do nothing differently – Continue with current IT applications and ad-hoc approach to maintaining them;

- Option 2 – Deliver proactive IT Sustaining Application initiatives;

- Option 3 – Deliver proactive IT Sustaining Application initiatives, but wait for the AGIG wide ERP solution

The following sections discuss these options in more detail.

1.6.1 Option 1 – "Do nothing differently" – Continue with current IT applications and ad-hoc approach to maintaining them

Option 1 would continue the current approach to maintaining IT applications.

Across AA4 we have been maintaining IT applications, however this has been on an ad-hoc basis as needs have arisen or to address identified issues. Whilst we have not had a material risk event due to an IT application failure it is likely that the 'do nothing differently' option will expose the organisation to a material impact due to a range of factors including, but not limited to:

- core applications will no longer be supported by IT vendors (e.g. MS Dynamics AX support ends October 2021);

- failure in older applications may occur, resulting in lengthy and unplanned outages;

- applications will become unstable and vulnerable to security breaches, which may allow staff and customer data to be compromised;

- the IT applications will eventually be unable to support DBP's strategic objectives;

- technology upgrades for core software will be required, so not continuing with the planned upgrades will mean the opportunity for the 'change out' of inefficient/obsolete technologies will be missed;

- the costs of maintenance and support agreements will increase as the systems are not upgraded and therefore placed out of the prescribed vendor maintenance cycles;

- lost opportunities for operating efficiencies due to better system integration reducing errors and manual workarounds; and
- lost opportunities to provide Shippers with better insights and accessibility to their information.

1.6.1.1 Achieving objectives

Table 0.5: Achieving Objectives below outlines how continuing an ad-hoc approach for IT Applications will support the achievement of our vision objectives in AA5.

Table 0.5: 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 of our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient as continuing with an ad-hoc approach for IT Applications has the potential to materially impact customer service, is not on line with accepted good industry practice and would lead to higher costs to resolve outages, seek specialised support arrangements with vendors and undertake manual workarounds in the medium to long term.

1.6.1.2 Cost assessment

The annual cost of sustaining IT applications, excluding the forecast $3m for Dynamics AX upgrade in CY20 is currently, $0.7 million. This has included MS Dynamics updates, Microsoft Office and Windows 10 updates, CAD annual licences, Land Asset Management System upgrades, INX upgrades, Citrix upgrades, AGIG common email & Intranet, SPOT Journey management and enhancements to Pay Global.

Table 0.6: Capex/Opex Split

	2018	2019	2020	2021	2022	Total
Capex	700	700	700	700	700	**3,500**
Opex	0	0	0	0	0	**0**
Total	**700**	**700**	**700**	**700**	**700**	**3,500**

1.6.1.3 Risk assessment

Table 1.7 below shows that continuing with a reactive approach to maintaining IT Applications in AA5 does not 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.7: Risk Rating – Option 1

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

The major risks associated with the continuation of the current ad-hoc approach to IT applications maintenance:

- DBP – the likelihood of a core IT application having a material security breach or integration failure will continue to increase with time until the inevitable happens. Remediation of that event is likely to be time-consuming, complex and key business processes may have to revert to manual processes until the systems are restored. This could cause major impacts for the business.

- Reputation – our reputation could be damaged significantly in the event of supply disruptions; delayed maintenance; compromised corporate staff and customer information and resultant litigation or regulatory intervention. Ability to access information and communicate in an emergency and/or dangerous situation would cause significant stress (anger and concern) for employees and customers.

- Asset Damage – Uncorrected deficiencies and poor integration between systems will result in more process inefficiencies, work order processing, an inability to make spatial and logical queries, an inability to carry out timely maintenance, longer outages and operational risks of errors in manual data processes compared to electronic communications ultimately resulting in poor decisions leading to asset damage.

1.6.2 Option 2 – Deliver proactive IT Sustaining Application initiatives

With this option, we would undertake a range of IT Sustaining Application initiatives to address current issues and support future needs, including:

- Modernise the IT applications to increase their integrity, security, ongoing supportability and ensure they are fit-for-purpose;

- Maintain core IT applications to versions in line with an industry standard approach;

- Integration of document collaboration services to drive efficiencies in the way staff and contractors enter and access information related to all aspects of operations.

The group-wide integration is considered prudent to enable effective collaboration and appropriate security of information both across the Group and with other appropriate 3rd parties.

The planned upgrades are required to, among other things; manage the transition of one version of the technology to a subsequent improved version. Upgrade versions are provided by vendors who recommend that their technology be upgraded to ensure continued provision of ongoing support and maintenance and that any known issues including security vulnerabilities are addressed.

These initiatives are considered mandatory to maintain the security and integrity of the IT applications DBP is reliant upon. They will enhance operational efficiencies, enable information collaboration, improved access to vital information, enhanced decision making, optimising assets, and positioning the organisation to be more agile and responsive to change. Not maintaining core systems and infrastructure to appropriate levels will introduce 'technical debt' which accumulates over time and becomes more expensive to address the longer it is left to develop.

1.6.2.1 Achieving objectives

Table 0.8: Achieving Objectives below outlines how proactive IT Sustaining Applications initiatives will support the achievement of our vision objectives in AA5.

Table 0.8: 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 of our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient as it proactively maintains a stable IT Applications environment to support business processes, in line with good industry practice at a sustainable cost over the medium to longer term.

1.6.2.2 Cost assessment

The capital cost of delivering the changes required to address existing issues and future needs is estimated to be $3.3 million.

Cost estimates are based on the latest market rate testing, considering the requirements of our application environment, using the best information available at the time of developing this business case. A formal procurement process will be undertaken for each of the initiatives to the works are delivered at an efficient cost.

Table 0.9: Capex/Opex Split

($'000)	2021	2020	2022	2023	2025	Total
Capex	1,565	821	415	350	165	3,316
Opex	0	0	0	0	0	0
Total	**1,565**	**821**	**415**	**350**	**165**	**3,316**

Table 0.10: Summary of IT Sustaining Applications capex

('000s)	2021	2022	2023	2024	2025	Total
I-01 CRS Billing Revenue Management System upgrade	94	0	0	0	0	**94**
I-02 Maximo Asset Management System Upgrade	170	0	0	0	0	**170**
I-03 Finance Management System	1,000	500	250	250	0	**2,000**
I-04 Customer Support/Service Desk	23	101	0	0	0	**124**
I-05 Other Core Systems	194	70	145	70	145	**624**
Program & Change Management	84	150	20	30	20	**304**
Total	**1,565**	**821**	**415**	**350**	**165**	**3,316**

1.6.2.3 Risk assessment

Table 0.11: Risk Rating – Option 2 below shows that implementing proactive IT Sustaining Applications initiatives in AA5 modifies the frequency or the consequence to reduce the risk rank to intermediate or lower in line with our Operational Risk Framework.

Table 0.11: Risk Rating – Option 2

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

This option appropriately addresses the major risks to DBP, Reputation and Asset Damage associated with IT Applications by providing for system renewal and ongoing maintenance in line with industry standards to ensure continued business performance, integrity, capability and supportability.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.6.3 Option 3 – Deliver proactive IT Sustaining Application initiatives, but wait for the AGIG wide ERP solution

With this option, we would address the upgrades and ongoing maintenance approach for all IT applications except rely on the proposed AGIG IT Strategy and Roadmap to deliver a group wide ERP solution project for CY2023. This would move $3 million from the AA4 CY2020 period into the AA5 CY2023 period, reduce some of the DBP only costs but shift a component of the system design and integration to a group wide cost and reduce the likelihood of having to do two finance system migrations in the space of five years.

However it would expose us to significant risk associated with no system or security updates over a further three year period for our core financial system at DBP.

1.6.3.1 Achieving objectives

Table 0.12: Achieving Objectives below outlines how delaying proactive IT Sustaining Application initiatives until the AGIG wide ERP solution has been implemented will support the achievement of our vision objectives in AA5.

This assumes that the AGIG wide ERP initiative does implement a solution in the AA5 period.

Table 0.12: Achieving Objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers - Reliability	Y
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	Y
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	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

This option does not deliver for customers in terms of customer service, does not align with being a good employer in terms of employee engagement and is not sustainably cost efficient in terms of working within industry benchmarks as it poses significant risk of core financial system failure due to no system or security updates for a further three year period – totaling seven years at a minimum.

1.6.3.2 Cost assessment

The cost of this option is estimated as $5.6 million.

Table 0.13: Summary of IT Sustaining Applications capex

('000s)	2021	2022	2023	2024	2025	Total
I-01 CRS Billing Revenue Management System upgrade	94	0	0	0	0	**94**
I-02 Maximo Asset Management System Upgrade	170	0	0	0	0	**170**
I-03 Finance Management System	0	1,000	3,000	250	0	**4,250**
I-04 Customer Support/Service Desk	23	101	0	0	0	**124**
I-05 Other Core Systems	194	70	145	70	145	**624**
Program & Change Management	30	20	20	84	150	**304**
Total	**511**	**1,191**	**3,165**	**404**	**295**	**5,566**

1.6.3.3 Risk assessment

Table 0.14: Risk Rating – Option 3 below shows that delivering proactive IT Sustaining Application initiatives, but waiting for the AGIG wide ERP solution in AA5 does not adequately modify the frequency or the consequence to reduce the risk rank to intermediate or lower in line with our Operational Risk Framework.

Table 0.14: Risk Rating – Option 3

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

Specifically, the risks to DBP and Reputation are not reduced to ALARP, with:

- DBP - the core nature of MS Dynamics AX means delaying this initiative to CY2023 poses an unacceptable risk to effective operations. Of far greater concern is the inability to patch Microsoft Dynamics AX which exposes our core financial system to an increasing risk of a material cyber incident or integration failure that holds the other core systems back from being upgraded and compounding the security, stability and availability of critical systems.

- Reputation – Delay in the finance system project exposes our core financial system to an increasing risk of a material cyber incident or integration failure that holds the other core systems back from being upgraded and compounding the security, stability and availability of critical systems which would cause significant stress (anger and concern) for employees, regulators and customers.

The AGIG IT Strategy and Roadmap identified this risk as outweighing the potential risk of a different platform for the DBP upgrade in 2020 compared to the AGIG decision in 2023, which would cause additional cost and disruption associated with a second financial system migration at DBP within a five year period. This risk has a low likelihood as the DBP implementation will assess against a similar set of criteria, and become a key input, for the AGIG implementation.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.7 Summary of Cost/Benefit Assessment

To assess the options, the costs, objectives and risk are considered for each option. A summary of the option assessment is shown in Table 0.15: Summary Of Cost/Benefit Analysis below.

Table 0.15: Summary Of Cost/Benefit Analysis

Option	Objectives	Costs	Risks
1. Do nothing differently – ad-hoc	This option does not achieve our objectives of delivering for customers, being a good employer or being sustainably cost efficient	$3.5m	This option does not adequately address the high and intermediate risks to DBP, Reputation and Asset Damage
2. Proactively maintain IT Apps	This option achieves our objectives of delivering for customers, being a good employer and being sustainably cost efficient	$3.3m	This option appropriately moderates all high and intermediate risks to DBP, Reputation and Asset Damage to ALARP
3. Proactively maintain IT Apps and defer Dynamics replacement	This option does not achieve all of our objectives in terms of delivering for customers being a good employer and being sustainably cost efficient	$5.6m Plus potential costs of cyber impacts,increased maintenance (including specialised support or rectification costs)	This option does not adequately address the high and intermediate risks to DBP, Reputation and Asset Damage as the core and integrated nature of the finance system means deferring the Dynamics replacement, even while proactively maintaining other applications cannot adequately mitigate these risks

1.8 Proposed Solution

1.8.1 What is the Proposed Solution?

Option 2 is the proposed solution because it achieves all the objectives at a reasonable cost and reduces the identified risk levels early in the AA5 period.

One key reason for recommending this option is the absence of data to either prove or disprove the metrics supporting both of the IT Sustaining Business Cases. Initiative I-04 Customer Support/Service Desk includes an activity to implement an IT Asset Management system. The current HelpDesk platform has not been configured to manage IT assets across their lifecycle. The only way to identify the age of IT assets, their current state, how many issues they have had and their Total Cost of Ownership (TCO) is through the manual combination of financial records, employee knowledge and spreadsheets at significant effort.

It would be negligent not to maintain our IT applications effectively across their lifecycle particularly where they are integral in management and long term decision making in our business.

Option 1 is not considered appropriate due to the increased risk and vulnerability exposure if we were to operate in an unsupported IT environment. The risk of applications not being able to support the effective operations of the business and provide the regulator and Shippers with accurate and timely information will continue to increase until a material risk event occurs. The method for costing the initiatives based on historical spend also skews the Total Capex reflecting that ad-hoc unplanned maintenance of any asset **always** costs more in the long term.

Option 3 was not considered appropriate because the approach to delay the MS Dynamics AX upgrade was considered too high risk based on the delayed timeframes combined with the ceasing of Microsoft support for Dynamics AX expiring in October 2021.

1.8.1.1 Implementation of the Initiatives

This business case spans a wide range of systems each with their own implementation context. Some are under maintenance agreements where the upgrade projects are only reflecting the Contractors/Consultants costs, some require product decisions that have to line up with the Group architectures and plans.

Each initiative in this business case will be managed using our project management methodology which requirements are guided by the characteristics of the project including the risk, complexity, cost and other unique factors.

Where the project involves system acquisition or outsourcing of a service, these activities will be undertaken in line with our Procurement Policy and Purchasing Procedure. Business requirements will be defined in more detail based on the needs and market capabilities at the time of delivery. This will help ensure optimal value and efficient outcomes at the time of purchase.

The project management processes will also define the organisational change process requirements and will reflect the final solution and approach.

As a general rule of thumb each initiative that introduces new capabilities will:

- Have an internal business case developed commensurate with the initiative’s, cost, risk and complexity;
- Management will review the business case based on the organisations over-arching priorities, risks and benefits of the initiative;
- IT Management will project manage the initiative and organisational change management according to the schedule and outcomes defined in the agreed business case;
- Involvement of business users will be managed to maximise their input whilst minimising the impact on their operational activities; and
- Organisational changes will be designed to manage the risk of change commensurate with the initiatives benefits and organisational priorities.

1.8.2 Why are we proposing this Solution?

1.8.2.1 Consistency with the National Gas Rules

Option 2, deliver proactive IT Sustaining Applications initiatives, is the recommended solution and will maintain IT Applications in line with accepted good industry practice.

Rule 79(2)(c)

The proposed expenditure on our IT Sustaining Applications project is required to maintain the integrity of services through current, supported and fit for purpose IT applications, managing technology risks and preventing material outages that impact the ability of the business to function (including tracking and reporting of business information to meet our regulatory obligations and requirements). Therefore this expenditure is consistent with NGR 79(2)(c)(ii) and (iii).

- **NGR 79(1) –** Maintaining a stable IT set of Information Technology (IT) applications that is current and fit for purpose is critical to our business (it informs business decisions and helps us to efficiently manage our business processes). The proposed proactive IT Sustaining Applications initiatives are consistent with accepted good industry practice, several alternative options and have been considered and unit rates and timing of refreshes have been tested to achieve the lowest sustainable cost of delivering pipeline services.

Rule 79(1)

The proposed expenditure on our IT Sustaining Applications is also consistent with Rule 79(1)(a), specifically we consider the capital expenditure is:

- *Prudent* – The expenditure is necessary in order to address the identified risks to DBP, Reputation and Asset Damage. The proposed initiatives also ensure that IT application assets are maintained and replaced before they arrive at the end of their useful economic life. 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 historic costs for similar work as well as estimates from relevant vendors of likely solutions. A formal procurement process will be undertaken once the project enters its delivery phase to ensure efficient prices are achieved through a competitive tender process. 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 initiatives will ensure that IT applications are maintained to industry standard version levels consistent with accepted and good industry practice.

- *Achieves the lowest sustainable cost of delivering pipeline services* – Several alternative options have been considered and unit rates and timing of refreshes have been tested to ensure critical systems and information are maintained to support our operational needs at the lowest sustainable cost.

1.8.3 Estimating the Efficient Costs

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

Where possible, the unit rate used to determine the cost of the program in AA5 is based on a three year average actual cost incurred by DBP in AA4.

Where this has not been possible, due to infrequent or new activities identified for AA5, these activities have been estimated based on

- the historical cost of the same or similar program of work;
- engaging IT strategy development experts to assist in development of the IT Plan CY2021-2025 that outlines a strategic plan and range of initiatives for IT over the AA5 period;
- where initiatives will need new products, at least two vendor quotes for a specification based on an informed 'best estimate'; and

- consultation with market specialists to determine the most likely implementation approaches and effort requirements to implement the initiatives and transform the business.

IT Initiatives will be implemented by three potential groups of resources. Internal staff generally undertake IT project management, the management and finance aspects of IT, and all of the business user involvement (e.g. business requirements, testing, and training). An internal rate card has been agreed that defines the unit costs associated with all of the internal resources.

IT support is currently outsourced with these resources generally involved in all IT initiatives to implement products into the environment and support processes (e.g. installing an application on a server). A rate card for these resources is defined as part of the ongoing management of that contract.

Product or service specific skills are often required in IT initiatives to implement products (e.g. Vendor contractors configuring their systems). These rates are negotiated during the procurement phase using DBP's Purchasing Policy.

For all of the systems identified for change in the AA5 period estimates have been developed based on historical costs of similar projects, quotes from vendors based on products identified by the AGIG IT Architects as being reasonable to base a budgeting process on. Vendors provided indicative pricing on their systems and maintenance costs and provided recommendations on ballpark implementation costs.

All of this information was collated and has been captured in the IT Initiative Breakdown Estimating Model v3, no vendor selection processes were undertaken as this will occur for initiatives requiring new products during development of the detailed business cases closer to the time of implementation.

All procurement processes for IT Apps will comply with our Procurement Policy and Purchasing Procedure and will follow transparent, competitive tendering processes to select the best value for money solution.

Overall there do not appear to be many factors affecting the sensitivity of these estimations, however a small amount is costed in USD and therefore susceptible to foreign exchange fluctuations.

Appendix A – Risk Assessment

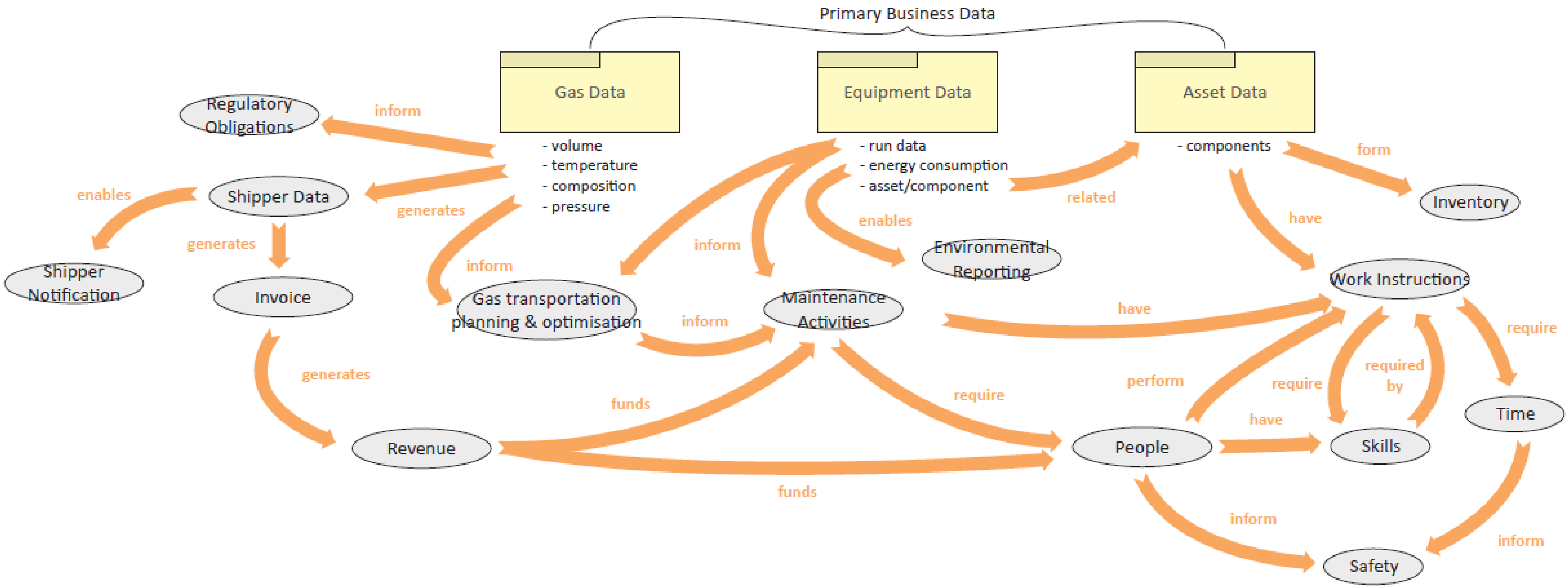
Figure 0.7: Summary of Risk Assessment for IT Sustaining Applications

	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	Trivial	Hypothetica	NEGLIGIBLE	1	Major	ypothetica	LOW	5	Severe	Frequent	HIGH	125	Major	Remote	NTERMEDIAT	25	Severe	Remote	LOW	5	286
Do nothing differently	Major	Occasional	HIGH	125	Trivial	Hypothetica	NEGLIGIBLE	1	Major	ypothetica	LOW	5	Severe	Frequent	HIGH	125	Major	Remote	NTERMEDIAT	25	Severe	Remote	LOW	5	286
Deliver proactive IT Sustaining Application initiatives	Severe	Unlikely	NTERMEDIAT	25	Trivial	Hypothetica	NEGLIGIBLE	1	Major	ypothetica	LOW	5	Minor	Unlikely	LOW	5	Severe	Remote	LOW	5	Severe	Remote	LOW	5	46
Update IT applications and the approach to maintaining them but wa t for the AGIG wide ERP solution	Major	Occasional	HIGH	125	Trivial	Hypothetica	NEGLIGIBLE	1	Major	ypothetica	LOW	5	Severe	Unlikely	NTERMEDIAT	25	Severe	Remote	LOW	5	Severe	Remote	LOW	5	166

Appendix B – DBP IT Application Context

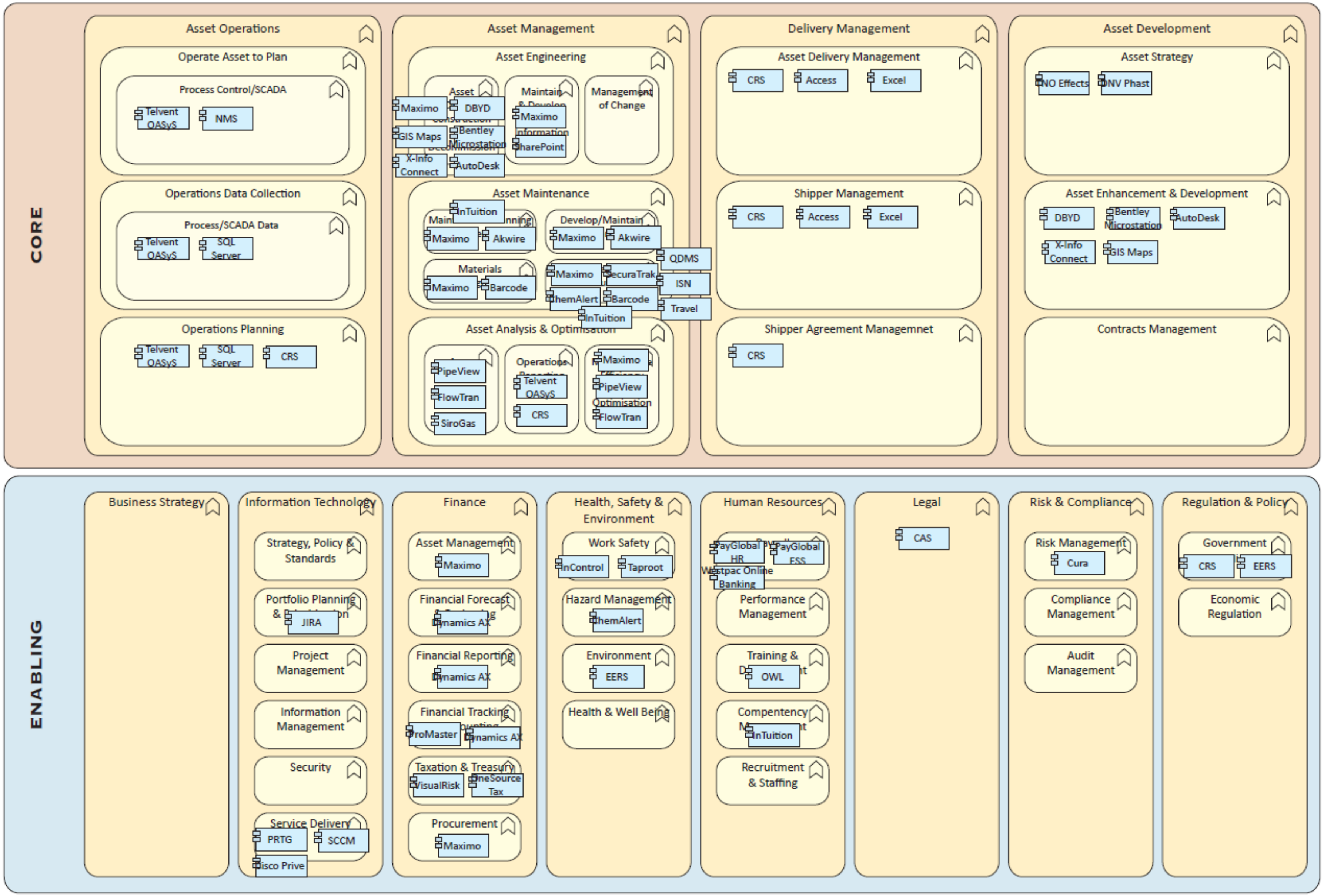
DBP Information Mud Map

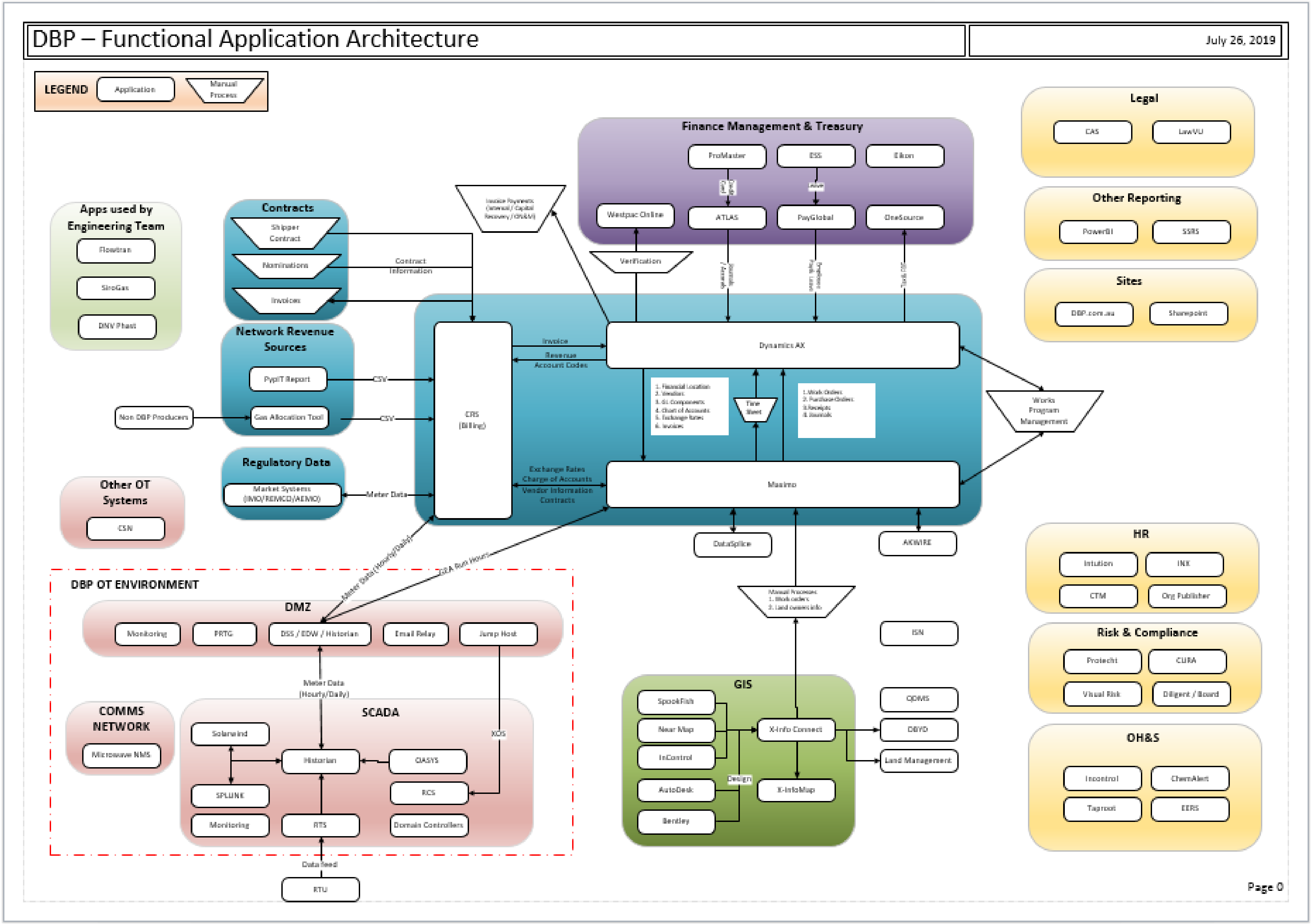
The following diagram represents the Primary Business Data and the flow of this information.



DBP Business Function Model

The following diagram represents how DBP’s Applications map back to the business functions.


CORE
Asset Operations
Operate Asset to Plan
Process Control/SCADA
Telvent OASyS
NMS
Operations Data Collection
Process/SCADA Data
Telvent OASyS
SQL Server
Operations Planning
Telvent OASyS
SQL Server
CRS
Asset Management
Asset Engineering
Maximo
DBYD
GIS Maps
Bentley Microstation
X-Info Connect
AutoDesk
Maximo
SharePoint
Management of Change
Asset Maintenance
InTuition
Maximo
Akwire
Develop/Maintain
Maximo
Akwire
QDMS
Materials
Maximo
Barcode
Maximo
SecuraTrak
ISN
ChemAlert
Barcode
Travel
InTuition
Asset Analysis & Optimisation
PipeView
FlowTran
SiroGas
Operations
Telvent OASyS
CRS
Maximo
PipeView
Optimisation
FlowTran
Delivery Management
Asset Delivery Management
CRS
Access
Excel
Shipper Management
CRS
Access
Excel
Shipper Agreement Managemnet
CRS
Asset Development
Asset Strategy
DNO Effects
DNV Phast
Asset Enhancement & Development
DBYD
Bentley Microstation
AutoDesk
X-Info Connect
GIS Maps
Contracts Management
ENABLING
Business Strategy
Information Technology
Strategy, Policy & Standards
Portfolio Planning
JIRA
Project Management
Information Management
Security
Service Delivery
PRTG
SCCM
Cisco Prive
Finance
Asset Management
Maximo
Financial Forecast
Dynamics AX
Financial Reporting
Dynamics AX
Financial Tracking
ProMaster
Dynamics AX
Taxation & Treasury
VisualRisk
OneSource Tax
Procurement
Maximo
Health, Safety & Environment
Work Safety
InControl
Taproot
Hazard Management
ChemAlert
Environment
EERS
Health & Well Being
Human Resources
PayGlobal HR
PayGlobal ESS
Westpac Online Banking
Performance Management
Training &
OWL
Competency
InTuition
Recruitment & Staffing
Legal
CAS
Risk & Compliance
Risk Management
Cura
Compliance Management
Audit Management
Regulation & Policy
Government
CRS
EERS
Economic Regulation


DBP – Functional Application Architecture
July 26, 2019
LEGEND
Application
Manual Process
Apps used by Engineering Team
Flowtran
SiroGas
DNV Phast
Contracts
Shipper Contract
Nominations
Invoices
Contract Information
Network Revenue Sources
PypIT Report
Gas Allocation Tool
Non DBP Producers
CSV
Regulatory Data
Market Systems (IMO/REMCO/AEMO)
Meter Data
Other OT Systems
CSN
Finance Management & Treasury
ProMaster
ESS
Eikon
Westpac Online
ATLAS
PayGlobal
OneSource
Verification
Legal
CAS
LawVU
Other Reporting
PowerBI
SSRS
Sites
DBP.com.au
Sharepoint
CIS (Billing)
Invoice
Revenue Account Codes
Dynamics AX
Time Sheet
Exchange Rates
Charge of Accounts
Vendor Information
Contracts
Maximo
Works Program Management
DataSplice
AKWIRE
Manual Processes
ISN
HR
Intution
INX
CTM
Org Publisher
Risk & Compliance
Protecht
CURA
Visual Risk
Diligent / Board
OH&S
Incontrol
ChemAlert
Taproot
EERS
GIS
SpookFish
Near Map
InControl
AutoDesk
Bentley
Design
X-Info Connect
X-InfoMap
QDMS
DBYD
Land Management
DBP OT ENVIRONMENT
DMZ
Monitoring
PRTG
DSS / EDW / Historian
Email Relay
Jump Host
Meter Data (Hourly/Daily)
COMMS NETWORK
Microwave NMS
SCADA
Solarwind
Historian
OASYS
SPLUNK
RCS
Monitoring
RTS
Domain Controllers
XOS
Data feed
RTU
Page 0

IT Enabling Business Case – Capex DBP22

1.1 Project Approvals

Table 0.1: IT Enabling DBP22 – Project approvals

Prepared By	Amber Smith, Manager IT, AGIG
Reviewed By	Kylie Stones, IT PMO Manager, AGIG; Praveen Desari, Solution Architect, AGIG
Approved By	Andrew Staniford, Chief Customer Officer, AGIG

1.2 Project Overview

Table 0.2: IT Enabling DBP22 – Project overview

Description of Issue/Project	Our existing reporting, information management and decision making systems are disparate, difficult to access, inefficient and limiting our ability to make informed and efficient decisions, drive further efficiencies, comply with regulatory obligations and make a range of other improvements to Shipper service delivery, the safety and integrity of services without significant manual effort. The IT Enabling project intends to accelerate productivity and asset performance through Business Intelligence (BI), data management and analytics, and pursuing a connected workforce through digital transformation. The key aspects of the IT Enabling program are: • Business Intelligence; • Data Analytics; • Digital Transformation; and • Program and Change Management.
Project Name	IT Enabling
Estimated Cost	Total forecast capex for AA5 is $5.1 million. The costs have been estimated based on historic costs delivering the same, or similar work, supplier pricing and work that is sufficiently comparable to other external projects.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Estimated benefits	The IT Enabling project will yield a number of tangible and intangible benefits, with the tangible benefits totaling $8.1 million over 10 years. These tangible benefits include workforce and Enterprise Asset Management (EAM) cost savings in terms of more efficient document collaboration (reduced time spent correcting errors and double handling of information in spreadsheets, whilst reducing the likelihood of errors) and avoided opex and capex costs as combining data trends from multiple systems will enable better business decisions, for example, inventory management and reduce the need for write-offs. The intangible benefits include improved safety, customer service, information management, data quality, asset integrity and reliability benefits. These benefits compare to a total cost of $6.6 million over the 10 years to the end of AA6 and result in a positive Net Present Value (NPV) of $0.5 million which results in overall customer benefits through lower future prices than there otherwise would have been without the investment. If the intangible benefits could be quantified, the NPV would likely be even greater.
Expenditure incurred in AA4	There was no approved allowance or related capital expenditure for IT Enabling projects in AA4.

Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – The proposed IT Enabling capex is consistent with accepted good industry practice, several alternative options have been considered and unit rates and timing of refreshes have been tested to ensure prudent investment to achieve the lowest sustainable cost of delivering pipeline services. **NGR 79(2)** - The proposed IT Enabling capex will implement systems and processes that enable decision making based on more accurate and timely information which will translate into cost efficiencies and therefore lower future prices than they otherwise would have been. It is also expected to deliver $0.5 million of tangible benefits, with further intangible benefits in terms of improved safety, customer service, information management, data quality, asset integrity and reliability. Therefore this capex is consistent with NGR 79(2)(a). **NGR 74** – the forecast costs are based on the latest market rate testing, and project options consider the requirements of our business (including focus areas where the most value can be derived). Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Stakeholder engagement	<u>Customers</u> 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 IT Enabling project will improve and uplift the delivery of DBP IT services to standard industry practice, enabling effective and efficient services to the customer and ensuring compliance with regulatory obligations. During our Shipper Roundtables we presented key areas of our planning, including our proposed capex and opex. We gave a high-level view of our IT capex to explain the step change in IT investment we are proposing in AA5. Shippers were broadly comfortable with our approach and high-level program in AA5 noting they would be supportive of IT investment to improve the customer experience where there is a business case demonstrating customer benefits. Our proposed capex was then outlined in our Draft Plan. There were no questions specifically raised in relation to the IT Enabling program. In response to Shippers' general interest in key areas and drivers of increased spend this business case clearly outlines reasons for changes in expenditure between AA4 and AA5. <u>Other</u> We engaged with various key stakeholders across the business to develop our IT Strategy, Roadmap and Investment Plan for AA5. This included owners and users of key information and systems. Internal stakeholders told us that they would value more reliable sources of knowledge on which to base their business decisions that impact the reliability and timeliness of our services. Being able to identify trends and outliers from a whole range of back office data and Operational Technology data would enable better business decisions and asset management capabilities. We have also engaged with key suppliers and technology partners in relation to some of the specific initiatives within the IT Enabling program of work.
Other relevant documents	This Business Case should be read in conjunction with: • DBP IT Investment Plan • Asset Management Plan (TEB-001-0024-07) • Other technology Business Cases: IT Security, IT Sustaining Apps, IT Sustaining Infrastructure, SCADA, Maximo and DMZ and CRS.

1.3 Background

We maintain a range of core IT systems that store information critical to informed business decision making. This information is spread across both back office systems (e.g. IT) and operational technology systems (e.g. OT) and in the future will incorporate information from a wide range of other connected technologies, namely Internet of Things (IoT) e.g. GPS tracking systems in vehicles generate logs that may need to be incorporated into OHS management systems.

Currently this information is spread across IT systems, file shares and email. Through a range of discussions it has been estimated that around half of the information on file shares and email is mainly unmanaged.

The unstructured nature of this approach means that where a system has reporting built in it is possible to get consolidated information out of that system. However, most systems have pre-defined reports and are not conducive to ad-hoc queries or identifying trends across data sets. This often tends to be where information is extracted from systems into uncontrolled spreadsheets where it is massaged to provide insights for management.

At this stage the reporting requirements used to forecast the likely scope and costs of the IT Enabling initiatives have been determined with regard to similar initiatives undertaken by Australian Gas Networks (AGN). These will be refined as the project develops with the assumptions made to date summarised in Appendix B.

Whilst documents on file shares have some controls these controls do not compare to more structured document management systems that enable version control, workflow management and approval cycles.

Further, to achieve the National Gas Objective "to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas", we must make informed decisions throughout our business based on timely, accurate and relevant information. This information must come from all aspects of the business, from IT, IoT and OT systems.

Advances in big data management, machine learning and data analysis can be leveraged to assist management in identifying trends and opportunities. For example metal stress monitors could materially change the physical asset maintenance regimes by moving them from preventative maintenance based on industry standards and norms, to just-in-time maintenance. This must be supported by fit-for-purpose collaboration tools to enable staff to work effectively on documents when and where they need to.

The Digital Transformation initiatives align to the proposed AGIG IT Strategy and Roadmap initiative T4T-04 Enhance the Collaboration and Communication Platform that intends to improve collaboration across the group using Office365 capabilities.

1.4 AA5 forecast

The key aspects of the IT Enabling program are:

- Business Intelligence;
- Data Analytics;
- Digital Transformation; and
- Program and Change Management.

Table 0.3 below shows the AA5 forecast cost by initiative. Note these initiatives are inclusive of specific Program & Change Management costs.

Table 0.3: Summary of AA5 forecast by initiative ($'000)

Initiative	2021	2022	2023	2024	2025	Total AA5
I-10 & 11 Business Intelligence	775	641	398	0	0	**1,814**
I-12 Data Management and Analytics	0	0	765	449	458	**1,672**
I-13 & 14 Digital Transformation	684	618	158	98	98	**1,656**
	1,459	**1,259**	**1,321**	**547**	**556**	**5,142**

Further detail on these initiatives is outlined below.

1.4.1.1 Business Intelligence

Table 0.4: Business Intelligence Initiatives

Initiative	Program of work
Consolidated Data (Historical)	Define a master data model, identify a stable, flexible and sustainable data platform to simplify the complex data landscape, improve data quality and integrity, enhance organisational agility and reduce manual work. Consolidate data required for reporting into a consistent and structured manner. Consolidate data from a variety of sources designed to support strategic and tactical decision making. Introduce a data governance framework to improve controls over change management and document control.
Implement Enterprise BI Models and Toolsets (Historical)	Identify and implement an enterprise BI platform with models, toolsets and dashboards for reporting on corporate historical data. Migrate as much of current reporting to the new platform where viable.

1.4.1.2 Data Analytics

Table 0.5: Data Management and Analytics initiatives

Initiative	Program of work
Data Management and Analytics Program (Predictive)	Develop a strong culture of data management to capture business knowledge consistently and accurately. Extend the BI platform and people skills to incorporate data analytics and machine learning to enable predictive analytics.

1.4.1.3 Digital Transformation

Table 0.6: Digital Transformation initiatives

Initiative	Program of work
File Management and Mobility	Implement document management solutions that are fit-for-purpose to enable both appropriate control over documents whilst empowering employees to have access where, how and when they need them.
Process Automation	Establish process automation capabilities to enable business users to automate repetitive manual processes between CRS, Maximo and Dynamics AX.

1.4.1.4 Allocation of Program and Change Management

All of the initiatives proposed in this business case will require some form of program or change management. Within each initiative the costs for the people directly involved in the project have been allocated for, but there must be allocation for the business people not include in the projects for activities such as:

- project management;
- business process mapping & re-design;
- user training and awareness sessions; and
- User Acceptance Testing (UAT).

Each initiative will have differing levels of program and change management that will be determined through the project management startup phase.

1.5 Risk Assessment

Our current data analytics, reporting and decision making require the consolidation of large amounts of information across a disparate range of applications, systems and a heavy reliance on Excel spreadsheets that are both difficult to govern, maintain version control and are error prone. Despite the integrated nature of our core applications, the underlying data in these applications is unconnected and siloed. The ability for management to observe and report on trends across information silos is limited to a reliance in individual's expertise. All of this gives rise to:

- manual and inefficient reporting processes, with a substantial amount of manual work required to collate, consolidate, check and disseminate information;
- business risks and inefficiencies because information is fragmented across business lines and systems and manual processes introduce the risk of inaccuracies and duplication of data and information; and
- regulatory compliance risks.

Apart from being inefficient, the operation of these systems in this manner is exposing DBP to a range of risks as highlighted in Table 0.7*: Risk Rating* below, which shows that the untreated risk associated with the current systems is Medium.

Table 0.7: Risk Rating

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

The key risks associated with the current approach to data analytics, reporting and collaborating on information are:

- DBP – Most of DBP's decisions are based on timely, reliable and accurate information. Currently this information is widely dispersed, often uncontrolled and outside core systems (e.g. spreadsheets). As such key business decisions around operational efficiencies, safety and service delivery are based on information that may not have a robust lineage.

- People – Decisions around people management practices and safety systems are dependent on relevant, timely and accurate information. Uncontrolled information could result in management not using the latest information exposing the organisation to industrial or legal action. Not being able to identify trends reduces management's ability to optimise the workforce or the way the workforce is working.

- Reputation – Our Shippers expect a reliable and cost effective service. DBP's reputation with Shippers would be adversely impacted if it was not identifying and exploiting efficiency opportunities that should reasonably be identified through the data it has.

- Asset Damage & Supply – The ongoing maintenance of DBP's assets and effectiveness of supply is based on management decisions based on information. If the information available to decision makers was not relevant, accurate or timely it is likely that poor decisions would be made that could cause catastrophic short term or long term impacts.

1.6 Options Considered

A number of options have been considered to address the gaps identified between the current and desired cyber maturity status. These are:

- Option 1 – Do nothing differently – Continue with current approach to reporting, document management and collaboration.

- Option 2 – Deliver customised IT Enable initiatives

- Option 3 – Deliver out-of-the-box IT Enable initiatives

The following sections discuss these options in more detail.

1.6.1 Option 1 – "Do nothing differently" – Continue with current approach to reporting, document management and collaboration

Option 1 would continue the reporting, document management and collaboration approach implemented in the current period where document management and collaboration is largely unstructured, unmanaged, manually intensive and reporting is based on core system capabilities.

Across AA4 we have not invested in any Business Intelligence processes or systems. Whilst we are not aware of a material risk event due to inaccurate information in decision making processes or regulatory reports it is likely that the 'do nothing differently' option will continue the inefficiencies of the current approach and ultimately expose the organisation to a material impact due to a range of factors including, but not limited to:

- increased demand by Shippers to have real time access to supply data;

- increased quantity of information being generated by systems and employees;

- increasing complexity of DBP's systems and the continuing demand for users to be able to access information anywhere, anytime on any device;

- increasing exposure to 3rd parties that need to collaborate and have access to information;

- contractual or regulatory litigation due to errors in documents, or not being able to find documents; and

- unexploited opportunities to find and exploit operational efficiencies based on 'knowing what you know'.

1.6.1.1 Achieving objectives

Table 0.8: Achieving Objectives below outlines how doing nothing differently will support the achievement of our vision objectives in AA5.

Table 0.8: Achieving Objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers - Reliability	-
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 of our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient. Continuing to not invest in business intelligence, data analytics and digital transformation will mean missed opportunities in terms of better (quicker) informed and efficient decisions, driving further efficiencies, complying with regulatory obligations and making a range of other improvements to Shipper service delivery, the safety and integrity of services with less significant manual effort.

1.6.1.2 Cost assessment

The annual cost of the current approach to File Management is currently a bundled service included in the current Microsoft Office 365 licenses and Microsoft Server license for the file servers. It is not possible to estimate this component cost as Microsoft does not provide costings for just these services. Otherwise there was no allocation in the AA4 period.

Based on the do nothing differently approach there would be no required capex or opex for the AA5 period.

Table 0.9: Capex/Opex Split Option 1

Forecast ($m)	2021	2022	2023	2024	2025	Total
Capex	0	0	0	0	0	**0**
Opex	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**

1.6.1.3 Risk assessment

Table 0.10: Risk Rating – Option 1 below shows that continuing with a reactive, unmanaged and manual approach to reporting, document management and collaboration in AA5 does not 'Modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.10: Risk Rating – Option 1

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

Specifically, the risks are:

- DBP – impact to effective operations through litigation or regulatory fines due to errors in reporting, people management, contracts or unacceptable cost consequences in terms of operational inefficiencies not being identified, operational efficiencies not being exploited.

- People – Decisions around people management practices and safety systems are dependent on relevant, timely and accurate information. Uncontrolled information could result in management not using the latest information exposing the organisation to industrial or legal action. Not being able to identify trends reduces management's ability to optimise the workforce or the way the workforce is working.

- Environment – Decisions around environment management practices are dependent on relevant, timely and accurate information. Uncontrolled information could result in management not using the latest information exposing the organisation to regulatory or legal action. Not being able to identify trends reduces management's ability to optimise the management of environmental issues.

- Reputation – Our Shippers expect a reliable and cost effective service. DBP's reputation with Shippers would be adversely impacted if it was not identifying and exploiting efficiency opportunities that should reasonably be identified through the data it has.

- Supply – The ongoing maintenance of DBP's assets and effectiveness of supply is based on management decisions based on information. If the information available to decision makers was not relevant, accurate or timely it is likely that poor decisions would be made that could cause catastrophic short term or long term impacts.

1.6.2 Option 2 – Deliver customised IT Enabling initiatives

With this option, we would undertake a range of IT Enabling initiatives to address current issues and support future needs around effective collaboration and informed decision making, including:

- Identifying all data sources and building an organisational data model that enables DBP's data to be copied into a centralised repository (e.g. Data Lake) in a structured way. That repository would be able to accept data from all DBP systems.
- Developing fit-for-purpose data governance and management processes to ensure that current and future systems can participate in the centralised repository and business intelligence systems.
- Establishing a centralised repository and the mechanisms to both initially and then on an ongoing basis bring the identified information into the repository such that it can be leveraged by BI tools.
- Implementing enterprise data, reporting and dashboard tools that support integration of operational data from (or about) assets with commercial data to improve decision-making intelligence, dashboards and reporting systems.
- Transforming current reporting and dashboards across to the new systems.
- Implement predictive data analytics capabilities including Artificial Intelligent systems to identify advanced insights.
- Implementing fit-for-purpose document management systems that utilise the specific products for specific business needs (e.g. Contracts in a system that supports review and signature workflows, Engineering documents and procedures in a system designed specifically for large asset drawings and the supporting business processes.)
- Configuring Office365 for optimal collaboration and accessibility to documents and document workflows.

These initiatives are considered important to ensure that employees are enabled to work and collaborate efficiently, management decisions are based on relevant, timely and accurate information and opportunities for efficiencies are identified from the data that we have or can collect.

1.6.2.1 Achieving objectives

Table 0.11: Achieving Objectives below outlines how delivering customised IT Enabling initiatives will support the achievement of our vision objectives in AA5.

Table 0.11: 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	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 leverages fit-for-purpose IT solutions to accelerate productivity and asset performance through Business Intelligence (BI), data management and analytics, and pursuing a connected workforce through digital transformation.

1.6.2.2 Cost assessment

The capital cost of delivering the changes required to address existing issues and future needs is forecast at $5.1 million in AA5.

A formal detailed design and business case will include a procurement process to ensure expenditure is based on the results of a competitive tender process to ensure the works are delivered at an efficient cost. IT strategy experts were engaged to assist in developing estimates based on utility industry standard approaches to these types of projects.

The Business Intelligence (BI) Program in particular has an multi-year spend not normally associated with IT projects. One of the key challenges with BI is that we (and other organisations undertaking this type of investment) cannot define all of our business requirements until we have begun to use BI systems and understand what they can and deliver. There needs to be several iterations to get the data ingestion, reporting, trend analysis and forecasting to be truly effective. Additionally over this period there is an allowance made for growth in the types and amount of SCADA data being integrated with IT data.

We have also undertaken a cost benefit analysis for our IT Enabling investment in AA5, which results in a total net benefit of $0.5 million as shown in Table 0.12 below.

Table 0.12: Cost benefit analysis of customised IT Enabling initiatives

($'000)	NPV (10 yr)	2021	2022	AA5 2023	2024	2025	2026	2027	AA6 2028	2029	2030
Total capex	**5,827**	**1,459**	**1,259**	**1,321**	**547**	**556**	**150**	**500**	**150**	**500**	**150**
Benefits - Cost savings											
Document Collaboration		n/a	n/a	149	149	149	149	149	149	149	149
EAM savings		n/a	n/a	155	155	155	155	155	155	155	155
Benefits - Cost avoidance											
BI impact on overall opex		n/a	n/a	n/a	176	527	703	703	703	703	703
BI impact on overall capex		n/a	n/a	n/a	58	175	233	233	233	233	233
Total benefits	**6,319**	**-**	**-**	**305**	**539**	**1,007**	**1,241**	**1,241**	**1,241**	**1,241**	**1,241**
Total net benefit	**492**	**(1,410)**	**(1,176)**	**(888)**	**62**	**538**	**1,119**	**848**	**1,127**	**874**	**1,135**

Assumptions:

- 0.5% pa cost savings across workforce and EAM based on industry reported average savings for Document Management (benefits lagged one year from implementation)
- 0.75% pa cost avoidance across total expenditure based on industry reported average savings for Business Intelligence related to efficiencies and improved decision making (benefits lagged one year from implementation and it take three years to reach total benefit)
- Discount rate of 3.48% (real pre-tax WACC October 2019)

1.6.2.3 Risk assessment

As identified in section 1.5 above, the major risks associated with the document management, collaboration and reporting are to DBP, reputation and Supply. Table 0.13: Risk Rating – Option 2 below shows that implementing customised IT Enabling initiatives does 'Modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.13: Risk Rating – Option 2

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

Specifically:

- DBP – This option provides a pathway to collect our information into a useful pool enabling effecting Business Intelligence tools to automate reporting, find untapped insights and enable employees to collaborate on documents, materially reducing the risks associated with the current approach which introduces risks to effective operations through the quantity of repetitive manual processing and making decisions based on complex, multi-version spreadsheets where the opportunity of missing key stakeholders input is dependent on the diligence of individuals.

- Reputation – Our Shippers expect a reliable and cost effective service and would like us to be more proactive in our customer service. Tools that assist us to identify and exploit such opportunities would positively impact our reputation.

- Supply – Ensures information available to decision makers is relevant, accurate and timely and therefore does not adversely impact our ability to deliver gas to our customers.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.6.3 Option 3 – Deliver out-of-the-box BI reporting only

With this option, we would implement an out-of-the-box BI reporting solution utilising the one 'best fit' product for our circumstances. The key differences between this option and delivering customised IT Enabling initiatives are:

- It would identify key data sources only and pull this data into a centralised repository (e.g. Data Lake) in a structured way. An out-of-the-box solution would not be capable of pulling all current and likely future information sources, and may not be able to combine sources from the separate IT and OT systems.

- It does not include developing predictive data analytics capabilities including Artificial Intelligent systems to identify advanced insights.

- It would configure the Office 365 document management system (SharePoint) to enable document workflow scenarios, but not for Engineering documents or documents requiring signatures.
- It would not automate repetitive finance documentation tasks.

This option would improve on current reporting, document management and collaboration processes, without impacting regulatory or contractual obligations, but is not expected to deliver a positive net benefit over the next 10 years.

1.6.3.1 Achieving objectives

Table 0.14: Achieving Objectives below outlines how this option will support achievement of our vision objectives in AA5.

Table 0.14: Achieving Objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers - Reliability	-
Delivering for Customers – Customer Service	N
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	N
Sustainably Cost Efficient – Delivering Profitable Growth	N
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

This option does not deliver for customers in terms of customer service (does not include the predictive data analytics that would provide better customer insights and more proactive service offerings), and is not sustainably cost efficient in terms of working within industry benchmarks (other utilities are investing a lot in data management, digital capabilities and business intelligence). Further, the tangible benefits are unlikely to outweigh the capex investment over the next 10 years.

1.6.3.2 Cost assessment

The capital cost of delivering the changes required to address just the business reporting needs is forecast at $1.6 million in AA5 as outlined in Table 0.15: Forecast capex for out-of-the-box BI initiatives in AA5.

Table 0.15: Forecast capex for out-of-the-box BI initiatives in AA5

('000s)	2021	2022	2023	2024	2025	Total
Business Intelligence Program	575	641	398	-	-	**1,614**
Data Analytics Program	-	-	-	-	-	-
Digital Transformation Program	-	-	-	-	-	-
Total	575	641	398	-	-	1,614

A formal detailed design and business case will include a procurement process to ensure expenditure is based on the results of a competitive tender process to ensure the works are delivered at an efficient cost. IT strategy experts where engaged to assist in developing estimates based on utility industry standard approaches to these types of projects.

We have also undertaken a cost benefit analysis for just undertaking BI in AA5, which results in a total net present cost of $0.3 million as shown in Table 0.16: Cost benefit analysis of BI IT Enabling initiatives only below.

Table 0.16: Cost benefit analysis of BI IT Enabling initiatives only

				AA5					AA6		
($'000)	**NPV (10 yr)**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total capex	**2,199**	**575**	**641**	**398**	**0**	**0**	**250**	**75**	**250**	**75**	**250**
Benefits - Cost savings											
Document Collaboration		n/a	n/a	75	75	75	75	75	75	75	75
EAM savings		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Benefits - Cost avoidance											
BI impact on overall opex		n/a	n/a	n/a	59	176	234	234	234	234	234
BI impact on overall capex		n/a	n/a	n/a	19	58	78	78	78	78	78
Total benefits	**1,933**	0	0	75	153	309	387	387	387	387	387
Total net benefit	**(266)**	**(556)**	**(599)**	**(292)**	**133**	**260**	**111**	**245**	**104**	**229**	**97**

Assumptions:

- 0.25% pa cost savings across workforce based on half of the industry reported average savings for Document Management given repetitive finance tasks are out of scope of this solution (benefits lagged one year from implementation)
- 0.25% pa cost avoidance across total expenditure based on one third of the industry reported average savings for Business Intelligence related to efficiencies and improved decision making given limited data analytics and not all data sources tapped into (benefits lagged one year from implementation and it take three years to reach total benefit)
- Discount rate of 3.48% (real pre-tax WACC October 2019)

1.6.3.3 Risk assessment

As identified in section 1.5 above, the major risks associated with the document management, collaboration and reporting are to DBP, Reputation and Supply. Table 0.17: Risk Rating – Option 3 below shows that implementing out-of-the-box BI reporting would reduce some risk areas.

Table 0.17: Risk Rating – Option 3

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

Specifically:

- DBP - Using an out-of-the-box, one product fits all, for document management and BI reporting will address several existing inefficiencies, however where it cannot be applied to all business processes some inefficiencies and risks of error from manual workarounds still exist (specifically for Engineering documents and any documents requiring a signature – e.g. customer contracts) and these will continue to have an impact on effective operations and expose us to unacceptable cost consequences particularly as others in our industry adopt these technologies.

- Reputation – Our customers would be concerned where we have invested $1.6 million in a BI reporting tool, but they do not see tangible benefits.

- Supply - Using an out-of-the-box solution for a Data Lake will exclude some critical data sources from the BI reporting tool which limits the potential improvements in terms of relevant, accurate and timely data available for decision makers and how this impacts our ability to deliver gas to our customers.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.7 Summary of Cost/Benefit Assessment

To assess the options, the costs, objectives and risk are considered for each option. A summary of the option assessment is shown in Table 0.18: Summary Of Cost/Benefit Analysis below.

Table 0.18: Summary Of Cost/Benefit Analysis

Option	Objectives	Costs	Risks
1 – Do nothing differently limited data integration and governance	Does not support our objectives of delivering for customers, being a good employer or being sustainably cost efficient	$0 Ongoing inefficiencies around document management and workflows (estimated at $0.3m pa) Lost opportunity for cost avoidance (up to $0.9m pa)	Does not address identified risks to DBP, Reputation and Supply.
2 - Deliver customised IT Enabling initiatives data analysis, BI and governance capabilities	Supports our vision objectives of delivering for customers (improved and proactive customer service through better insights), being a good employer and being sustainably cost efficient (delivers efficiencies in day to day operations and improves access to relevant, accurate and timely information for decision makers).	$5.1m Delivers a benefit of at least $0.5m in NPV terms over 10 years	Adequately addresses identified risks to DBP, Reputation and Supply. Offering more proactive solutions to our customers will also improve our reputation.
3 – Deliver out of the box BO reporting solution	Does not support our objectives of delivering for customers, being a good employer or being sustainably cost efficient as underinvestment in IT Enabling initiatives means continued inefficiencies for some document processes and lost opportunities for identifying predictive insights	$1.6m Ongoing inefficiencies around document management and workflows (estimated at $0.2m pa) Lost opportunity for cost avoidance (up to $0.6m pa)	Mitigates some identified risks to DBP, Reputation and Supply, but does not allow for more proactive customer service driven by intelligent insights and many known document management and collaboration inefficiencies remain.

1.7.1 Cost Benefit Analysis

The following provides some more information on the assumptions underpinning the cost benefit analysis undertaken for the IT Enabling project options.

- **Measurement period** – The benefits and costs of this project have been assessed over a 10-year period to reflects the ongoing and long-term nature of the project's benefits, balanced with the economic life of the investment. This is consistent with the measurement period used by other AGIG businesses for similar projects, see AGN *Victoria and Albury Final Plan Attachment 8.6 December 2016, Business Case – Capex V47 - Business Intelligence.*
- **Project benefits** – Cost savings: The document management and collaboration initiatives have made assumptions based on document management, automation and collaboration industry RoI models that indicate after a year of implementation the total workforce will see a 0.5% efficiency. We have also assumed similar benefits would be realised in Enterprise Asset Management. It is anticipated that this will reflect work productivity gains due to staff re-allocating time currently spent on repetitive non-value adding tasks ultimately leading to better outcomes for the organisation as a whole, rather than a direct reduction of FTE. Cost avoidance: The estimated project benefits are based on BI industry Return on Investment (RoI) models that indicate BI initiatives enable better and more timely management decisions that avoid costs due to unplanned events and improve the utilisation of capex. At a high level this is being reflected as a

potential saving of 0.75% of the organisations total capex with a graduated implementation over 3 years as management optimise the systems and their decisions.

- **Capex** – The capex in AA5 period reflects the cost of implementing the IT Enabling initiatives for each of the options. In the subsequent period, the capex includes the costs of ongoing renewals of the BI and document management solutions (forecast at $500k every second year for a major feature uplift and $150k every other year for ongoing patches).
- **Discount rate** – A discount rate of 3.48% has been applied in line with the real pre-tax Weighted Average Cost of Capital (WACC) calculated for October 2019.
- **Sensitivity analysis** – Cost and benefit realisation: We have undertaken a sensitivity analysis which tests the NPV under differing cost and benefit realisation (up to +/- 30%) compared to the assumptions we have just outlined. This analysis shows that a positive NPV is achieved for 60% of these scenarios and that any cost savings in project delivery materially improve the NPV, and at a higher rate than cost overruns reduce the NPV. We also note that this analysis only considers the tangible benefits which can be costed, but there are also likely to be intangible benefits through improved safety, customer service, information management, data quality, asset integrity and reliability which we have not attempted to quantify. Discount rate: Adjusting the discount rate down to 3.00% and up to 4.00% still yields a positive NPV between $0.6 and $0.4 million over the 10 years.

1.8 Proposed Solution

1.8.1 What is the Proposed Solution?

Option 2 to deliver customized IT Enabling initiatives is the proposed solution because it achieves all the objectives, addresses known document management and collaboration inefficiencies, and introduces systems that bring more accuracy, reliability and timeliness to the reporting that management use to make business decisions and provide information to regulators.

Consideration was given to constraining some of the initiatives to just out-of-the-box single solution options (Option 3), however it is believed that due to the unique needs of engineering, contract and legal documents and by excluding some data from the business intelligence solutions the loss of opportunities and efficiencies outweighs the capex cost savings.

Continuing to do nothing differently does not support achievement of our vision objectives in AA5, is not consistent with accepted good industry practice and results in inefficiencies and lost opportunities for cost avoidance in the order of $6.3 million in net present terms over the next 10 years.

1.8.1.1 Implementation of the Initiatives

This business case spans three key areas, collating the organisations data for use, exploiting the data with BI tools and document management and collaboration. Each initiative in this business case will be managed in line with our project management methodology. Where projects involve system acquisition or outsourcing of a service the project will define the business requirements in more detail based on the needs and market capabilities at the time and then utilise our procurement policy and purchasing procedure to ensure optimal value is achieved at the time of purchase.

The project management plan will outline the most appropriate organisational change processes based on the solution and implementation approach for each of the initiatives.

As a general rule of thumb each initiative that introduces new capabilities will:

- have an internal business case developed commensurate with the initiative's, cost, risk and complexity;
- management will review the business case based on overarching priorities, risks and benefits of the initiative;
- IT Management will project manage the initiative and organisational change management according to the schedule and outcomes defined in the agreed business case and project management plan;
- involvement of business users will be managed to maximise their input whilst minimising the impact on their operational activities; and
- organisational changes will be designed to manage the risk of change commensurate with the initiatives benefits and organisational priorities.

1.8.2 Why are we proposing this Solution?

1.8.2.1 Consistency with the National Gas Rules

Rule 79(2)

The proposed IT Enabling capex will implement systems and processes that enable decision making based on more accurate and timely information which will translate into cost efficiencies and therefore lower future prices than they otherwise would have been. It is also expected to deliver $0.5 million of tangible benefits, with further intangible benefits in terms of improved safety, customer service, information management, data quality, asset integrity and reliability. Therefore this capex is consistent with NGR 79(2)(a).

Rule 79(1)

The proposed IT Enabling capex consistent with the requirements of Rule 79(1) of the National Gas Rules, specifically the capital expenditure is:

- Prudent – Our decisions are based on timely, reliable and accurate information. Currently this information is widely dispersed, often uncontrolled and outside core systems (e.g. spreadsheets). The proposed customised IT Enabling initiatives are prudent as they will implement systems, processes and tools to enable decision making based on more accurate and timely information which will translate into cost efficiencies and therefore lower future prices than they otherwise would have been.

- Efficient – The forecast expenditure is based on estimates of similar projects, discussions with vendors and industry experts. A formal procurement process will be undertaken once the project is fully mapped, and will ensure efficient prices are offered based on a competitive tender process. The proposed expenditure can therefore be considered consistent with the expenditure that a prudent service provider acting efficiently would incur.

- Consistent with good and accepted industry practice – The proposed projects align to 'Big Data' and 'Business Intelligence (BI)' style industry standard projects that look to normalise the organisations data and then exploit it.

- Achieves the lowest sustainable cost of delivering pipeline services – The proposed initiatives will enable more informed decision making throughout the business, including being able to proactively offer new and more flexible services to our customers. It will reduce manual processing and costs and improve accuracy which results in tangible cost savings in document collaboration and EAM as well as cost avoidance in terms of better and more timely management decisions that avoid costs due to unplanned events and improve the utilisation of capex.

1.8.3 Estimating the Efficient Costs

As noted in the 'Final Plan Attachment 8.7_Cost_Estimation_Methodology 2021-2025', the unit rates used for all projects managed within this program of include the internal labour, external labour, materials, travel and other costs forecast.

Where possible, the unit rate used to determine the cost of the program in AA5 is based on a three year average actual cost incurred in AA4.

Where this has not been possible, due to infrequent or new activities identified for AA5, these activities have been estimated based on

- the historical cost of the same or similar program of work;
- engaging IT strategy development experts to assist in development of the IT Plan CY2021-2025 that outlines a strategic plan and range of initiatives for IT over the AA5 period;
- where initiatives will need new products, at least two vendor quotes for a specification based on an informed 'best estimate'; and
- consultation with market specialists to determine the most likely implementation approaches and effort requirements to implement the initiatives and transform the business.

IT Initiatives will be implemented by three potential groups of resources. Internal staff generally undertake IT project management, the management and finance aspects of IT, and all of the business user involvement (e.g. business requirements, testing, and training). An internal rate card has been agreed that defines the unit costs associated with all of the internal resources.

IT support, which is currently outsourced, are generally involved in all IT initiatives to implement products into the environment and support processes (e.g. installing an application on a server). A rate card for these resources is defined as part of the ongoing management of that contract.

Product or service specific skills are often required in IT initiatives to implement products (e.g. Vendor contractors configuring their systems). These rates are negotiated during the procurement phase in line with our Procurement Policy and Purchasing Procedure.

While we have not implemented projects of this type at DBP, we have utilised information developed for our AGN networks business to guide the scope and requirements of the BI initiative for DBP. Further, we have seen the increased uptake of BI systems and use of scalable cloud based computing has put downward pressure on the cost of implementation which we believe makes AA5 the optimum time for us to invest in these technologies.

The data lake estimates have been based on Microsoft Azure pricing costs as representing the most likely vendor based on leveraging the Power BI licenses included within the Office 365 E5 licenses we are already moving to. This pricing has been based on current storage capacities and an industry approach to estimate the anticipated computing and storage needs for a data lake.

The document management system licenses have been estimated based on vendor provided quotes based on products suggested by the our internal IT Architects as being reasonable potentials that would provide a good budget estimate. Assumptions around licensing variables have been based on known current usage patterns or demand.

Estimates for the consulting and internal effort have been based on vendors recommendations or industry averages for similar projects.

Appendix A – Risk Assessment

Figure 0.1: Summary risk assessment for IT Enabling

	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	Occasiona	HIGH	125	Severe	Remote	LOW	5	Severe	Remote	LOW	5	Minor	Frequent	NTERMEDIAT	25	Trivial	ypothetica	NEGLIGIBLE	1	Severe	Unlikely	NTERMEDIAT	25	186
Do nothing differently	Major	Occasiona	HIGH	125	Severe	Remote	LOW	5	Severe	Remote	LOW	5	Minor	Frequent	NTERMEDIAT	25	Trivial	ypothetica	NEGLIGIBLE	1	Severe	Unlikely	NTERMEDIAT	25	186
Deliver customised IT Enable initiatives	Severe	Unlikely	NTERMEDIAT	25	Minor	Hypothetica	NEGLIGIBLE	1	Minor	Hypothetica	NEGLIGIBLE	1	Minor	Unlikely	LOW	5	Trivial	ypothetica	NEGLIGIBLE	1	Severe	Remote	LOW	5	38
Deliver out-of-the-box IT Enable initiatives	Major	Occasiona	HIGH	125	Severe	Remote	LOW	5	Severe	Remote	LOW	5	Minor	Frequent	NTERMEDIAT	25	Trivial	ypothetica	NEGLIGIBLE	1	Severe	Unlikely	NTERMEDIAT	25	186

Appendix B – High Level Business Reporting Requirements

Based on analysis of reporting requirements at AGN the following reflects the estimated high-level reporting requirements of DBP that would be refined as part of any project implementing business intelligence systems.

Table 1.19 Reporting Requirements

Type	Reporting Requirements
Regulatory Reporting	DBP are required to provide multiple reports to various regulatory bodies, including the Australian Energy Market Operator (AEMO). These reports can be required on a daily, monthly, quarterly, annual or ad hoc basis, depending on the report requirements. Often the report content is replicated across different regulatory bodies and it is critical to provide consistent, accurate information to those bodies to comply with DBP's obligations.
KPI Reporting	Key Performance Indicator (KPI) reporting is required to provide Senior Management visibility on the performance of the business and achievement of key strategic goals. These KPIs cover all aspects of the business, including Employee Health and Safety, Network Safety and Reliability, Customer Service and Financial Performance. The absence of accurate and timely reporting on these KPIs affects the ability of DBP to respond to business issues that impact the prudent and efficient operation.
Management Reporting	Management reporting is critical to ensuring business managers have the appropriate proactive and historical information required to effectively respond to business issues. This reporting covers operational information required to manage work, financial information required to manage costs and customer information required to deal with customer issues. This management reporting is required to ensure managers have the relevant information to their areas of responsibility to drive their business to achieving the business KPIs, address operational issues and meet regulatory obligations.
Financial Reporting	DBP has significant financial information and reporting requirements, including to parent companies, auditors, taxation offices, regulatory bodies (for example Regulatory Information Notices) as well as to internal management. Without this financial information, DBP has an increased risk of financial non-compliance and managers cannot track to agreed budgets and address financial issues in a timely manner.
Asset Performance and Decision Making	DBP produces asset performance reports such as the Distribution System Performance Report, in accordance with AS4645 (Gas Distribution Network Management). These performance reports enable DBP to analyse historical performance and identify priority areas for maintaining the performance of the Network. Without this information, DBP cannot optimise the limited funds available to operate and maintain DBPs assets.
Business Submissions	Information from the various systems is also required to inform business submissions, such as Business Cases, changes to regulatory requirements and the addition of new customers such as large sub-divisions. Without the required business information, there is an increased risk that business submissions will be either reduced or rejected.
Customer Queries	Customer query reporting includes a variety of customer interactions, including emergencies, connections to gas, status of work and complaints. Reporting is critical in this case to ensuring DBP manages and improves the customer experience by providing managers transparency on where there are customer service issues.

IT Security Business Case – Capex DBP23

1.1 Project Approvals

Table 0.1: IT Security DBP23 - Project approvals

Prepared By	Amber Smith, Manager IT
Reviewed By	Kylie Stones, IT PMO Manager; Lee Davies, Security Architect
Approved By	Andrew Staniford, Chief Customer Officer

1.2 Project Overview

Table 0.2: IT Security DBP23 - Project overview

Description of Issue/Project	Improving cyber risk management by proactively undertaking initiatives to work towards a maturity level of MIL 3 under AESCSF which is commensurate with good industry practice and our cyber risk appetite. Every government agency and regulator involved with Critical Infrastructure have stated multiple times that Directors are accountable for ensuring cyber controls are commensurate with the organisation's cyber risk. The key aspects of the IT Security program are: • Cyber Resilience; • Technology Governance and Architecture; • Data Protection and Privacy; and • Program and Change Management.
Project Name	IT Security
Estimated Cost	Total capex for AA5 is $1.7 million. The costs have been estimated based on historic costs delivering the same or similar work and supplier pricing. We have sought specialist advice and quotes from our IT partners, consultants and other vendors in the market to inform these cost estimates.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 – Do nothing differently – Continue with current reactive approach to cyber risk ($1.4 million); • Option 2 – Deliver proactive IT Security program to achieve goal maturity level MIL 3 in AA5 ($1.7 million) (this is the recommended option); and • Option 3 - Deliver proactive IT Security program to achieve maturity level MIL 2 in AA5 and goal maturity level MIL 3 in AA6 ($1.4 million).
Expenditure incurred in AA4	There was no allowance for IT Security projects in AA4. In response to changing business needs over the period, we are forecasting to actually invest $1.4 million in IT Security initiatives, this includes: • $0.9 million developing and implementing our Cyber Security Framework; and • $0.5 million on standardising rights and role based access and implementing multifactor authentication.

Consistency with the National Gas Rules (NGR)	NGR 79(1) – Investing in IT Security projects will ensure our systems are resilient and robust with security measures commensurate with the cyber risks impacting our business. The proposed proactive IT Sustaining Applications initiatives are consistent with accepted good industry practice, several alternative options and have been considered and unit rates and timing of refreshes have been tested to achieve the lowest sustainable cost of delivering pipeline services. NGR 79(2) - All IT systems and technology infrastructure are exposed to cyber threats. The confidentiality, integrity and availability of information and information technology systems is critical to ensure the business is able to deliver its services effectively and in line with its various regulatory obligations and requirements, such as Critical Infrastructure Act, Privacy Act and FIRB reporting obligations. Our IT Security program will ensure our systems are secure and remain resilient to external threats and is therefore consistent with NGR 79(2)(c)(ii). NGR 74 – the forecast costs are based on the latest market rate testing, and project options consider the requirements of our application environment. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Stakeholder engagement	<u>Customers</u> 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 IT Security program will continue to build our cyber security maturity to ensure the IT services that support our operations are robust and resilient to threats. During our Shipper Roundtables we presented key areas of our planning, including our proposed capex and opex. We gave a high-level view of our IT capex to explain the step change in IT investment we are proposing in AA5. 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 IT Security program. In response to Shippers' general interest in key areas and drivers of increased spend this business case clearly outlines reasons for changes in expenditure between AA4 and AA5. <u>Other</u> We engaged with various key stakeholders across the business to develop our IT Strategy, Roadmap and Investment Plan for AA5. This included owners and users of key systems. We have also engaged with key suppliers and technology partners in relation to some of the specific initiatives within the IT Security program of work.
Other relevant documents	This Business Case should be read in conjunction with: • DBP IT Investment Plan • Asset Management Plan (TEB-001-0024-07) • Risk Management Policy and Operational Risk Model (together our Risk Management Framework) • Other technology Business Cases: IT Enabling, IT Sustaining Apps, IT Sustaining Infrastructure, Maximo and DMZ and CRS

1.3 Background

Our decisions are based on timely, reliable and accurate information. That information is stored in and flows across our technology assets. Any threat to the confidentiality, integrity or availability of that information, or the information assets could jeopardise our decisions both in the short, medium and long-term. Although we do not appear to be materially at risk from storing what most people think of as 'sensitive' information, staff records and some customer information does fall into this category.

Over the last few years there has been an increased focus by regulators and the public around how organisations manage their cyber risk. Whilst most people perceive this has been due to a growing cyber threat, this is not accurate, the threat has always been there and it has always been growing.

There are a range of compliance obligations we are subject to that are connected to the management of cyber risk including Privacy and Foreign Investment Review Board (FIRB) obligations. These are extended by a range of contractual obligations around the confidentiality of information.

The best guidance for Directors and Executives at the moment suggests that Cyber Risk is predominately a people problem. As such the best risk mitigation approach is one that is people led, supported by technology where appropriate. Even the best cyber defence systems money can buy are simple to penetrate if a helpful employee is conned effectively.

Our current Cyber risk management approach involves:

- Implementing perimeter defences (e.g. Firewalls, SPAM scanners);
- Cyber Security Framework and Policies;
- Induction materials on cyber risks; and
- Desktop anti-virus.

This approach is based on standard industry practice which has focused on prevention controls, sometimes at the cost of controls that enable an organisation to detect and respond to a cyber-risk event.

Over the last few years the cyber industry has been subtly shifting the approach from 'prevention heavy' to a more balanced approach where the intent is 'cyber resilience' so that an organisation can deal with cyber risk events effectively when they occur.

In October 2018 the Australian Energy Sector Cyber Security Framework (AESCSF) was published. This framework enables organisations to measure their level of Cyber Maturity against the AESCSF cyber framework published by the U.S. Department of Energy, see Appendix B that has been extended into the AESCSF.

We conducted a maturity assessment in 2017 against the AESCSF. The AGIG IT Strategy & Roadmap has determined we must be working towards a score of a MIL 3 against the framework over time to meet the obligations AEMO's committed the Market to in response to the Finkel review Report, "Independent Review into the Future Security of the National Electricity Markey – Blueprint for the Future 2017".

There was no specific allowance in AA4 for IT security with cyber initiatives typically incorporated into the more traditional IT budget areas.

Given the heightened awareness and focus on cyber security, the program of work proposed in AA5 continues the work implemented in AA4, with a targeted increase in the early years of AA5 to align the organisation's cyber risk management approach to a more contemporary approach, increasing the maturity against AESCSF.

1.4 AA5 forecast

The key aspects of the IT Security program are:

- Cyber Resilience;
- Technology Governance and Architecture;
- Data Protection and Privacy; and
- Program and Change Management.

These aspects are supported by a number of individual initiatives, which are broadly outlined below.

1.4.1 Cyber Resilience

Table 0.3 – Cyber Resilience Initiatives

Initiative	Program of work
Secure Development Lifecycle (SDLC)	Develop an approach that ensures all systems (off the shelf, configured or custom built) implemented for DBP are 'secure by design' to ensure they do not introduce any weaknesses to the DBP cyber controls. Implement this methodology across the acquisition, management and maintenance of all technology assets and processes.
Cyber training and awareness	Multi-audience approach to ensure that the right messages reach the right people at the right frequency. Ranging from operational staff right through management to the Directors with activities in all years of the AA5 period and during onboarding.
Third Party cyber risk management	Extend the supply chain's capability to make informed decisions about supplier's potential cyber impact on the organisation. Enable the cyber response team to work with relevant third parties during a cyber-crisis.
Business continuity testing for cyber incidents	Fine tune the organisation's business continuity approach to deal with a likely cyber event and test the changes.
Threat intelligence	Introduce a threat intelligence capability that empowers management to make more sophisticated threat assessments of current, proposed systems or events.
SIEM implementation	Implement a Security Incident & Event Management (SIEM) service to reflect the desired maturity level against AESCSF and ensure that DBP can detect if there has been an intrusion into the network and respond appropriately.

1.4.2 Technology Governance and Architecture

Table 0.4: Technology Governance and Architecture Initiatives

Initiative	Program of work
Technology Governance and Architecture	Define appropriate network architectures and processes to enable the effective management of IT, IoT and OT devices. Establish appropriate networks and management processes.

1.4.3 Data Protection and Privacy

Table 0.5: Data Protection and Privacy Initiatives

Initiative	Program of work
Information Classification	Identify all information pools, define a classification policy and process. Allocate responsibility to information owners and classify all information.
Data Leak Prevention	Design and implement a (DLP) solution that enables the organisation to enforce its information classification policy and support impacted users in the event of a Sensitive Information breach.

1.4.4 Allocation of Program and Change Management

All of the initiatives proposed in this business case will require some form of program or change management. Within each initiative the costs for the people directly involved in the project have been allocated for, but there must be allocation for the business people not include in the projects for activities such as:

- project management;
- business process mapping & re-design;
- user training and awareness sessions; and
- User Acceptance Testing (UAT).

Each initiative will have differing levels of program and change management that will be determined through the project management startup phase.

1.4.5 AA4 comparison

There was no allowance for IT Security projects in AA4. In response to changing business needs over the period, we are forecasting to actually invest $1.4 million in IT Security initiatives, this includes:

- $0.9 million developing and implementing our Cyber Security Framework; and

- $0.5 million on standardising rights and role based access and implementing multifactor authentication.

Table 0.6 below provides a comparison of AA5 forecast spend compared to AA4 actual spend by initiative. Note Program and Change Management costs are incorporated within each of the three initiatives below.

Table 0.6: Summary of AA5 forecast and AA4 actual spend by initiative

Initiative	2021	2022	2023	2024	2025	Total AA5	Total AA4	Variance
I-15 Cyber Resilience	170	313	322	221	221	**1,247**	**935**	**312**
I-16 Technology Governance and Automation	32	64	33	-	-	**129**	-	**129**
I-17 Data Protection and Privacy	182	182	-	-	-	**364**	**462**	**(98)**
Total	384	559	355	221	221	1,740	1,397	343

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 0.1: Risk management principles, with a commitment to balance outcomes sought with delivery and cost implications considered and assessed.

Figure 0.1: 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 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 IT Security is presented in Figure 0.2. Three elements of risk are rated as high, one intermediate and one low. This results in a high risk ranking for these assets in an untreated scenario.

Figure 0.2: Risk rating – IT Sustaining Applications

	Trivial	Minor	Severe	Major	Catastrophic
Frequent					
Occasional				DBP/Outrage	
Unlikely			People	Asset Damage	
Remote			Loss of supply		
Hypothetical				Environment	

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

Table 0.7: Risk Rating

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

The key risks associated with IT Security are:

- DBP – Most of DBP's decisions are based on timely, reliable and accurate information. That information is all stored in and flows over DBP's technology assets. Any threat to the confidentiality, integrity or availability of that information, or the information assets could jeopardise DBP's decisions both in the short, medium and long-term, posing a major risk to DBP's operations.

- People – The linkage between mental health and digital wellbeing are just beginning to surface as formal risks to organisational workforce wellbeing. Employees suffering from screen addiction, fatigue (from binge watching Netflix), personal phishing, digital bullying and harassment of themselves or their family members are now recognised impacts to overall wellbeing and have the potential to impact employees as they work.

- Reputation/Outrage – Over the last few years there has been an increased awareness of regulators and the public around how organisations manage their cyber risk. With complex infrastructure assets under DBP's management, we are also exposed to the threat of hackers taking control of physical infrastructure that Western Australia depends on for safe and reliable energy supply. The more likely risk is that of the public's perception that hackers have control even due to a minor unrelated back-office systems hack. If DBP were to not adequately invest in IT Security, it would expect widespread concern and anger from its Shippers, regulators and the public.

- Asset Damage & Supply – The remote control and operations of the DBNGP relies on IT systems, exposing DBP to the threat of hackers taking control of physical assets. While this is unlikely, the assets under control are of high value and there is the potential for improper control to cause major asset damage. DBP has many fail safes in place to ensure the continued safety and reliability of its operations, even under extreme conditions, therefore the risk to people and supply from hackers taking physical control of assets is negligible to low.

1.6 Options Considered

A number of options have been considered to address the gaps identified between the current and desired cyber maturity status. These are:

- Option 1 – Do nothing differently – Continue with current reactive approach to cyber risk

- Option 2 – Deliver proactive IT Security program to achieve goal maturity level MIL 3 in AA5

- Option 3 - Deliver proactive IT Security program to achieve maturity level MIL 2 in AA5 and goal maturity level MIL 3 in AA6

The following sections discuss these options in more detail.

1.6.1 Option 1 – "Do nothing differently" – Continue with current reactive approach to cyber risk

Option 1 would continue the IT Security approach implemented in the current period where we reactively respond to cyber risk.

Across AA4 DBP has been investing in Cyber controls, however this has been more on an ad-hoc basis as needs have arisen or to address identified issues. Whilst DBP has not had a material risk event due to a cyber incident, it is highly likely that the 'do nothing differently' option will expose the organisation to a material impact due to a range of factors including, but not limited to:

- increased automation and AI being used by hackers is increasing the speed and likelihood of them finding and exploiting weaknesses;

- increasing quantity and sophistication of phishing and whaling (big fish) attacks has seen a marked increase in businesses being impacted;

- increasing complexity of DBP's systems and the continuing demand for users to be able to access information anywhere, anytime on any device is increasing the attack surface exposed to hackers;

- increased adverse impact on staff wellbeing and mental health;

- unknown and un-quantified but increasing exposure to 3rd party cyber risk;
- not knowing where all of the 'crown jewels' of information are, especially not being able to determine if a data leak occurs what regulatory reporting obligations are relevant; and
- not knowing how crisis management and business continuity plans will actually work in the event of a material cyber incident.

1.6.1.1 Achieving objectives

Table 0.8: Achieving Objectives below outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.8: 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

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 failing to appropriately address cyber risks has the potential to materially impact public safety, reliability and customer service, is not on line with accepted good industry practice and would lead to high costs to resolve any material risk events such as penetration of our systems, data leaks or system corruption.

1.6.1.2 Cost assessment

The average annual capex of the current approach to Cyber security in AA4 is $0.3 million spent on Cyber Security Framework, Cyber Resilience, Standardised Rights & Role Based Access and Multifactor Authentication Project (MFA) initiatives.

Table 0.9: Summary of AA4 actual IT Security spend

	2016	2017	2018	2019	2020	Total
Capex	0	53	137	793	411	**1,394**
Opex	0	0	0	0	0	**0**
Total	**0**	**53**	**137**	**793**	**411**	**1,394**

Based on the ad-hoc activities undertaken in AA4, the following costs are estimated in AA5 under a continuation of a reactive approach to cyber risk.

Table 0.10: Capex/Opex Split Option 1

	2021	2022	2023	2024	2025	Total
Capex	280	280	280	280	280	**1,400**
Opex	0	0	0	0	0	**0**
Total	**280**	**280**	**280**	**280**	**280**	**1,400**

1.6.1.3 Risk assessment

Table 0.11: Risk Rating – Option 1 below shows that continuing with a reactive approach to cyber risk in AA5 does not 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.11: Risk Rating – Option 1

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

The major risks associated with the continuation of the current reactive approach to cyber risk are:

- DBP – the likelihood of a sophisticated phishing or whaling causing financial impact has increased, current reporting from AusCERT and the ACORN network indicates this is a $100m+ impact on business in Australia. Typical impacts are in the range of $250-500k and have rarely been covered by insurance.
- People – The linkage between mental health and digital wellbeing are just beginning to surface as formal risks to organisational workforce wellbeing. Employees suffering from screen addiction, personal phishing, digital bullying and harassment of themselves or their family members are now recognised impacts to overall wellbeing.
- Reputation/Outrage – DBP's reputation could be damaged significantly in the event of a loss of control of its assets due to a cyber-incident, supply disruptions, delayed maintenance, compromised corporate staff and customer information and resultant litigation.

Supply – DBP operates its assets remotely from its operations control centre in Perth. Continued degradation of systems poses an unacceptable risk of loss of control. Furthermore, security breaches may cause outages in systems resulting in insufficient information being available, increasing the likelihood of an incident.

1.6.2 Option 2 – Deliver proactive IT Security initiatives in AA5

With this option, we would undertake a range of IT Security initiatives to address current issues, support future needs and address the identified maturity gap against the EM-C2M2 standard, including:

- develop the capability to ensure all new systems and changes have cyber security built in;
- ensure that all our employees have the appropriate levels of Cyber awareness so they can make sophisticated cyber decisions;
- being able to make informed decisions about Third Party cyber risk;
- testing the organisations capabilities to manage and recover from cyber incidents;
- ensuring the organisation has the capabilities and capacity to detect a cyber-incident;

- manage all technology assets within DBP using the same governance and architectural principles for service delivery, asset management, system designs, and security by using the same consistent policies, standards processes and tools. Specifically considering the differences between Information Technology (IT), Internet of Things (IoT) and Operational technology (OT);
- ensuring we know what the organisations information is, especially its 'crown jewels' and Sensitive Information that would trigger regulatory obligations if lost. Knowing where it is, how it is controlled when it is both 'at rest' and 'on the move'; and
- having the processes and systems to notify and support anyone potentially impacted by a breach of sensitive information the processes.

These initiatives are considered mandatory to maintain the confidentiality, integrity and availability of the organisations information and information systems of the IT environment. They will also work towards ensuring a number of the organisation's regulatory and contractual obligations are also met.

This approach is aligned to the AGIG IT Strategy & Roadmap which has laid out initiatives across the group to achieve an MIL 3 maturity level by the end of 2024.

1.6.2.1 Achieving objectives

Table 0.8: Achieving Objectives below outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.12: 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 ensures a secure and resilient IT environment to support business processes, commensurate with the cyber risk we face, in line with good industry practice at a sustainable cost over the medium to longer term.

1.6.2.2 Cost assessment

The capital cost of delivering the changes required to address existing issues and future needs is estimated to be $1.7 million.

Cost estimates are based on the latest market rate testing, considering the requirements of our application environment, using the best information available at the time of developing this business case. A formal procurement process will be undertaken for each of the initiatives to the works are delivered at an efficient cost.

Table 0.13: Capex/Opex Split

	2021	2022	2023	2024	2025	Total
Capex	384	559	355	221	221	**1740**
Opex	-	-	-	-	-	-
Total	**384**	**559**	**355**	**221**	**221**	**1740**

This expenditure is broken down further by the key initiatives that align to the IT Investment Plan CY2021-CY2025 as follows:

Table 0.14: Cost Estimate

($'000)	2021	2022	2023	2024	2025	Total
I-15 Cyber Resilience	170	313	322	221	221	**1,247**
I-16 Technology Governance and Automation	32	64	33	0	0	**129**
I-17 Data Protection and Privacy	182	182	0	0	0	**364**
Total	**384**	**559**	**355**	**221**	**221**	**1,740**

1.6.2.3 Risk assessment

As identified in 1.5 above, the major risks associated with IT Security are to DBP, Reputation/Outrage and Asset Damage. Table 0.15: Risk Rating – Option 2 below shows that implementing proactive IT Security initiatives to achieve goal maturity level MIL 3 in AA5 reduces the frequency of risks down to remote in line with our Operational Risk Framework.

Table 0.15: Risk Rating – Option 2

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

The current cyber risk exposure is High and as Critical Infrastructure we are required to provide assurance that we have implemented cyber controls commensurate with the risk. This option is recommended as the best balance between an ad-hoc approach and a proactive program of work in alignment with the overarching AGIG IT Strategy & Roadmap.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.6.3 Option 3 – Deliver proactive IT Security program working towards maturity level MIL 2 in AA5 and maturity level MIL 3 in AA6

With this option, we would undertake fewer IT Security initiatives in AA5 to address just critical issues and only aim for a maturity level of MIL 2 in AA5 with a continued spend in AA6 to achieve maturity level MIL 3 against the EM-C2M2 standard over a ten year period.

The intention would be to move the following initiatives from Option 2 out to the AA6 period:

- being able to make informed decisions about Third Party cyber risk;
- testing the organisations capabilities to manage and recover from cyber incidents;
- extending the cyber event detection services to utilise Threat Intelligence capabilities;
- implementing data protection controls to prevent exfiltration and/or privacy breaches (e.g. data loss prevention); and
- having the processes and systems to support anyone potentially impacted by a breach of sensitive information the processes.

1.6.3.1 Achieving objectives

Table 0.16: Achieving Objectives below outlines how working toward MIL 3 over a longer period (by end of AA6) will support the achievement of our vision objectives in AA5.

Table 0.16: 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	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

This option aligns with our vision objectives of delivering for customers and being a good employer in AA5, but is unlikely to be sustainably cost efficient as pushes out the investment required to reach MIL 3 over 10 years, in which time accepted industry practice in terms of IT Security will have moved, requiring additional capex in future to catch up. This option will also adversely impact the AGIG IT Strategy and Roadmap which has set a goal around achieving a maturity level of MIL 3 in the AA5 period.

1.6.3.2 Cost assessment

This approach would shift $0.3m, or 17%, of the total Option 2 spend, from the AA5 period out to the AA6 period.

Table 0.17: Capex/Opex Split Option 3

	2021	2022	2023	2024	2025	Total
Capex	384	345	325	191	191	**1,436**
Opex	0	0	0	0	0	**0**
Total	**384**	**345**	**325**	**191**	**191**	**1,436**

With the rapid changes in technology and accepted industry practice in IT Security, it is expected there will be additional capex required beyond AA5 to catch up to the industry standard in terms of IT Security controls.

1.6.3.3 Risk assessment

As identified in 1.5 above, the major risks associated with IT Security are to DBP, Reputation/Outrage and Asset Damage. Table 0.18: Risk Rating – Option 3 below shows that implementing proactive IT Security program to achieve maturity level MIL 2 in AA5 and goal maturity level MIL 3 in AA6 reduces the frequency of risk to people and asset damage sufficiently, but not for DBP and Reputation/Outrage, and is therefore inconsistent with the requirements of our Operational Risk Framework.

Changes to the Data Protection and Privacy initiative in this option have been designed to keep the organisation within the strict obligations of the Privacy Act but not within what the general public and Shippers would be expecting.

By delaying the 3rd Party Cyber risk controls we will not have the ability to make decisions about whether suppliers could impact our cyber risk.

Table 0.18: Risk Rating – Option 3

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

Specifically, the remaining risks under this option are:

- DBP – there is a potential impact to effective operations where our maturity level is behind other businesses within the AGIG group and we do not have controls in place to address third party cyber risk; and
- reputation/Outrage – While this option does include the minimum investment in data protection and privacy as required by the Privacy Act, it is unlikely to meet the expectations of our customers and the general public (or the level of investment by our peers) which would cause major concern and anger, particularly were a data leak to occur.

1.7 Summary of Cost/Benefit Assessment

To assess the options, the costs, objectives and risk are considered for each option. A summary of the option assessment is shown in Table 0.19: Summary Of Cost/Benefit Analysis below.

Table 0.19: Summary Of Cost/Benefit Analysis

Option	Objectives	Costs	Risks
Option 1	This option does not achieve our objectives of delivering for customers, being a good employer or being sustainably cost efficient	$1.4m	Poses high risk to DBP, Reputation/Outrage and Asset Damage, Intermediate risk to People and Supply.
Option 2	This option achieves our objectives of delivering for customers, being a good employer and being sustainably cost efficient	$1.7m	Implements controls to bring identified risks to DBP, People Reputation/Outrage, Asset Damage and Supply to ALARP level.
Option 3	This option does not achieve all of our objectives in terms of delivering for customers being a good employer and being sustainably cost efficient	$1.4m	Does not adequately address all risks to DBP, People Reputation/Outrage, Asset Damage and Supply.

1.8 Proposed Solution

1.8.1 What is the Proposed Solution?

Option 2 is the proposed solution because it achieves all the objectives and given the regulatory and public awareness around the management of cyber risk is the most prudent option. The suite of initiatives have been designed to deliver the desired cyber maturity improvements against the AESCSF needed for the DBP IT systems and in line with the timetable defined in the AGIG IT Strategy and Roadmap.

Consideration was given to only undertaking some of the initiatives, however this is out of alignment with the AGIG IT Strategy and Roadmap and will cause one of their key objectives to fail, will leave 3rd Party cyber risk unaddressed and will reduce the organisation's ability to meet regulators and Shippers expectations around dealing with a Sensitive Information breach. This option would still leave DBP in compliance with regulatory and legal obligations but not AGIG, Shipper and public perception.

The option of continuing with the current approach is also not recommended as everyone from regulators to Shippers are concerned about cyber risk and to continue to under-invest may generate a material cyber and reputational impact. It also will cause the AGIG to miss objectives outlined in the AGIG IT Strategy and Roadmap.

1.8.1.1 Implementation of the Initiatives

This business case spans a wide range of IT security initiatives each with their own unique context. The IT security market is one of the most rapidly changing IT markets with vendors bringing completely new solutions to market in unheard of development timeframes. For example Virtual Private Network (VPN) solutions organisations have traditionally implemented have been revolutionised in 2019 and whilst costs remain similar the implementation has radically changed requiring a much larger network re-architecting phase instead of a user education phase as the security onus has been moved from the user to the network.

Each initiative in this business case will be managed using our project management methodology which requirements are guided by the characteristics of the project including the risk, complexity, cost and other unique factors.

Where the project involves system acquisition or outsourcing of a service, these activities will be undertaken in line with our Procurement Policy and Purchasing Procedure. Business requirements will be defined in more detail based on the needs and market capabilities at the time of delivery. This will help ensure optimal value and efficient outcomes at the time of purchase.

The project management processes will also define the organisational change process requirements and will reflect the final solution and approach.

As a general rule of thumb each initiative that introduces new capabilities will:

- have an internal business case developed commensurate with the initiative's, cost, risk and complexity;
- management will review the business case based on the organisations over-arching priorities, risks and benefits of the initiative;
- IT Management will project manage the initiative and organisational change management according to the schedule and outcomes defined in the agreed business case;
- involvement of business users will be managed to maximise their input whilst minimising the impact on their operational activities; and
- organisational changes will be designed to manage the risk of change commensurate with the initiatives benefits and organisational priorities.

1.8.2 Why are we proposing this Solution?

1.8.2.1 Consistency with the National Gas Rules

Option 2, deliver proactive IT Security program to achieve goal maturity level MIL 3 in AA5, is the recommended option as it will ensure our IT environment is robust and resilient to threats, adequately addresses the risks identified and aligns with the AGIG IT Strategy and Roadmap.

Rule 79(2)

The proposed expenditure on IT Security is required to maintain the integrity of services through IT Security controls commensurate with the cyber risk we face and is therefore consistent with NGR 79(2)(c)(ii).

All IT systems and technology infrastructure are exposed to cyber threats. The confidentiality, integrity and availability of information and information technology systems is critical to ensure the business is able to deliver its services effectively and in line with its various regulatory obligations and requirements, such as Critical Infrastructure Act, Privacy Act and FIRB reporting obligations. This requires investment to ensure our systems are secure and remain resilient to external threats.

Rule 79(1)

The proposed expenditure on IT Security is consistent with the requirements of NGR 79(1) as the capital expenditure is:

- *Prudent* – the expenditure is necessary in order to address the risks of IT Security identified. The project is also based on taking a planned and proactive approach to cyber risk controls which is commensurate with the cyber risk exposure. 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 historic costs for similar work as well as estimates from relevant vendors of likely solutions. A formal procurement process will be undertaken once the project enters its delivery phase to ensure efficient prices are achieved through a competitive tender process. 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 initiatives will improve our cyber maturity as measured against the relevant industry cyber framework (e.g. AESCSF)

- *Achieves the lowest sustainable cost of delivering services* – aligning the IT Security initiatives to address the gaps required to achieve a maturity level of MIL 2, then MIL 3 ensures that we are investing in the right initiatives. Aligning the proposed additional services to existing architectures will ensure cost effectiveness. This will be balanced with ensuring our needs are met by utilising services and products that are recognised as being "lead-quadrant" by industry commentators.

1.8.3 Estimating the Efficient Costs

As noted in the 'Final Plan Attachment 8.12_Cost Estimation Methodology, the unit rates used for all projects managed within this program of include the internal labour, external labour and materials/other costs forecast.

Where possible, the unit rate used to determine the cost of the program in AA5 is based on a three year average actual cost incurred by DBP in AA4.

Where this has not been possible, due to infrequent or new activities identified for AA5, these activities have been estimated based on:

- the historical cost of the same or similar program of work;
- engaging IT strategy development experts to assist in development of the IT Plan CY2021-2025 that outlines a strategic plan and range of initiatives for IT over the AA5 period;
- where initiatives will need new products, at least two vendor quotes for a specification based on an informed 'best estimate'; and
- consultation with market specialists to determine the most likely implementation approaches and effort requirements to implement the initiatives and transform the business.

IT Initiatives will be implemented by three potential groups of resources. Internal staff generally undertake IT project management, the management and finance aspects of IT, and all of the business user involvement (e.g. business requirements, testing, and training). An internal rate card has been agreed that defines the unit costs associated with all of the internal resources.

IT support and is currently outsourced generally are involved in all IT initiatives to implement products into the environment and support processes (e.g. installing an application on a server). A rate card for these resources is defined as part of the ongoing management of that contract.

Product or service specific skills are often required in IT initiatives to implement products (e.g. Vendor contractors configuring their systems). These rates are negotiated during the procurement phase in line with our Procurement Policy and Purchasing Procedure.

The IT Plan CY2021-2025 identified the range of initiatives and subsequent work by IT Strategy consultants has developed estimates for those initiatives based on IT industry forecasting methods, multiple vendor quotes and the rate cards for internal and outsourced resources. These estimates incorporate internal and outsourced IT contractor costs, product specific contractor costs, products, organisational change and travel costs where applicable.

This is the model that has been successfully deployed and implemented on the DBNGP under the existing AA4 and previous arrangements.

As part of developing the DBP IT Investment Plan CY2021-2025 an analysis was conducted between our current IT Security spending vs Utilities Industry averages based on *Gartner IT Key Metrics Data 2019: Key IT Security Measures: by Industry (G00375661)*.

The proposed $1.7m capex over the 5 years of AA5 represents 4.3% of the Total IT investment for the same period. Gartner's data indicated that the Utilities Average is between 5% and 6%. This reflects

Appendix A – Risk Assessment

Figure 0.3: Summary of risk assessment

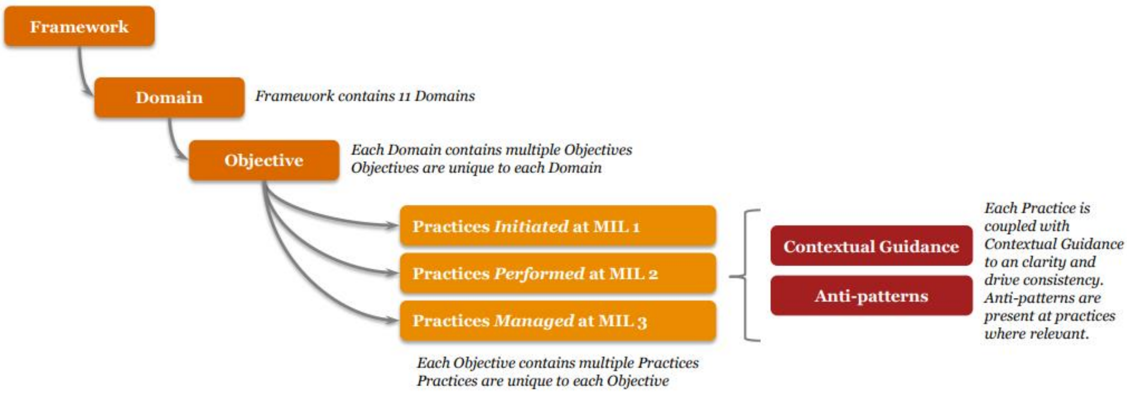
	DBP				**People**				**Environmental**				**Outrage**				**Asset Damage**				**Loss of Supply**				
	Consequence	Frequency	Risk	**Score**	Consequence	Frequency	Risk	**Score**	Consequence	Frequency	Risk	**Score**	Consequence	Frequency	Risk	**Score**	Consequence	Frequency	Risk	**Score**	Consequence	Frequency	Risk	**Score**	**Total Risk Score**
Untreated	Major	Occasional	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	Major	Hypothetical	LOW	5	Major	Occasional	HIGH	125	Major	Unlikely	HIGH	125	Severe	Remote	LOW	5	410
Implement reactive approach to IT Security in AA5	Major	Occasional	HIGH	125	Severe	Unlikely	INTERMEDIATE	25	Major	Hypothetical	LOW	5	Major	Occasional	HIGH	125	Major	Unlikely	HIGH	125	Severe	Remote	LOW	5	410
Deliver proactive IT Security initiatives in AA5	Severe	Unlikely	INTERMEDIATE	25	Severe	Remote	LOW	5	Major	Hypothetical	LOW	5	Severe	Unlikely	INTERMEDIATE	25	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	90
Deliver proactive IT Security program working towards maturity level MIL 2 in AA5 and maturity level	Major	Unlikely	HIGH	125	Severe	Remote	LOW	5	Major	Hypothetical	LOW	5	Major	Unlikely	HIGH	125	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	290

Appendix B – Australian Energy Sector Cyber Security Framework

The Australian Energy Sector Cyber Security Framework (AESCSF) is based on well-established and globally adopted frameworks – namely AESCSF and the NIST CSF. The AESCSF augments areas where AESCSF has limited coverage (such as privacy), and supplements it with additional information including, but not limited to, Australian-specific requirements, contextual guidance, and anti-patterns developed in conjunction with the Cyber Security Industry Working Group. This provides the depth and breadth of coverage necessary for Australian market participants.

Framework Structure

The practices within a domain are grouped by objective – target achievements that support the domain. Within each objective, the practices are ordered by MIL – Maturity Indicator Level.

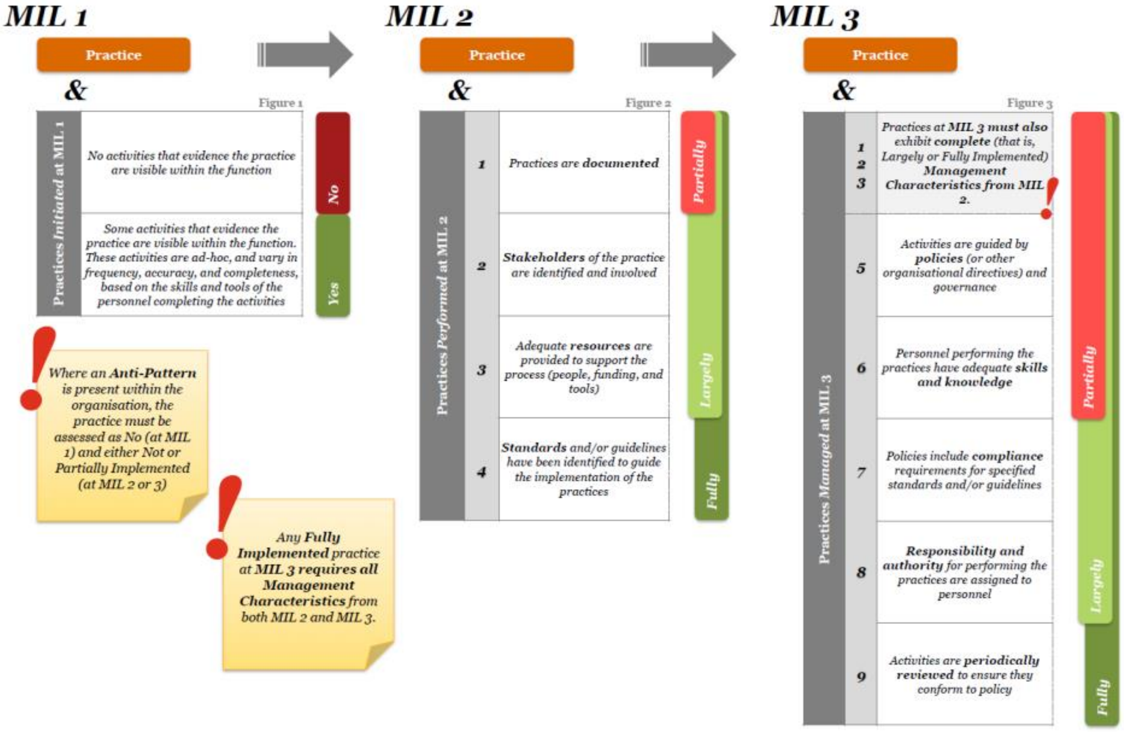


AESCSF Domains

The AESCSF is divided into 11 domains - 10 C2M2 domains and the Australia Privacy Management domain. The domains are logical groupings of cyber security practices. Each domain has an acronym that cross references across the AESCSF Toolkit and Guidance Artefacts.

Scoring model

The Framework is supported by a Maturity scoring model that enables organizations to assess their current and desired future states with any gaps between the two being a key input into the organization cyber strategy roadmap. AEMO have a working group that is determining high level guidance on what maturity organizations should be aiming for. However their regulatory position is that organizations should determine this based on their operating context and cyber risk appetite.



Office relocation – Capex DBP27

1.1 Project Approvals

Table 0.1: Office relocation DBP27 – Project approvals

Project Manager	Jeromie Gasper, Project Manager
Project Sponsor	Jon Cleary, General Manager Commercial
Project Approver	Tawake Rakai, GM Transmission Asset Management

1.2 Project Overview

Table 0.2: Office relocation DBP27 – Project overview

Description of Issue/Project	Our existing CBD office lease for Levels 6 and 7 at 12-14 The Esplanade is due to expire on 31 July 2020. The current office houses our control room, the Operational Technology server room, the Communications server room and over 140 office staff. In anticipation of the expiry of this lease, we undertook a review of options available to identify the preferred solution to meet ongoing operational and accommodation requirements. As a first step we engaged CBRE Advisory & Transaction Services to provide a Strategic Accommodation Report which set out recommendations in relation to exploring an early lease renewal over the current premises, versus a potential relocation in mid-2020. After further investigations conducted throughout 2019, we have negotiated a lease for Levels 22 and 23 at 140 St Georges Terrace. The new leased premises within the CBD meet our logistical, technical and financial requirements, and offer better overall value for money compared to The Esplanade. This Business Case covers the capex to be undertaken in AA4 to: • fit out the new location to meet our requirements; • vacate The Esplanade at the end of the current lease and meet the 'make good' requirements of the lease; and • relocate the control room, server rooms and office resources by mid-2020.
Project Name	CBD Offices
Estimated Cost	Total forecast capex for the current Access Arrangement (AA4) is $4.1 million.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Variation	There was no allowance for this expenditure in AA4. No additional capex is forecast for AA5.
Consistency with the National Gas Rules (NGR)	NGR 79(1) – The new fit out and relocation is the result of a strategic accommodation review conducted prior to the end of the current lease to compare the value of exploring an early lease renewal over the current premises, versus a potential relocation in mid-2020. The lease, fit out of new premises and make good of current premises have been competitively sought and negotiated. The new fit out has been designed to meet our requirements with regard to industry standards for office accommodation and control rooms. The option to relocate provides better value than the renewal of the existing lease. Therefore, the capex is prudent, efficient, in line with accepted and good industry practice and represents the lowest sustainable costs of delivering pipeline services as required by NGR 79(1)(a).

	NGR 79(2) – The accommodation for the control room, server rooms and office functions is necessary to support and equip our business to effectively manage and operate the DBNGP 24 hours a day, 7 days a week. The forecast capex for the CBD Office and Control Room relocation is required to maintain and improve the safety of services and maintain the integrity of services as per NGR 79(2)(c)(i) and (ii). NGR 74 - the forecast costs are based on the latest market testing, and project options consider the individual requirements of the locations. High level cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
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 new CBD Offices and Control Room ensure we have appropriate office accommodation and facilities, at an efficient cost, to continue to deliver strong safety, reliability and customer service.
Other relevant documents	This Business Case should be read in conjunction with: • AMP General

1.3 Background

This project will relocate the CBD office and control room to new premises located across levels 22 and 23 of 140 St Georges Terrace in 2020 at a forecast cost of $4.1 million. The project includes:

- the fit out of the new premises (which is under negotiation, following a competitive tender);
- make good of the current premises; and
- replacement of core networking switches/routers and some network access switches are at their effective end of life (as noted in DBP30 IT Sustaining Infrastructure Business Case).

The lease of the Esplanade premises is due to expire 31 July 2020. The current lease situation is summarised in Appendix B. Renewal of the current lease without renegotiation would see an increase in gross rent due to the cessation of the current rental abatement incentive and a likely continuation of 3.75% annual increases. This outcome is expected to result in rental rates above the current market average.

The upcoming expiry of the lease sparked a strategic review of our accommodation for CBD Office and Control Room leasing arrangements. A number of options were considered at the various stages of the review, with the two options progressing to a full options analysis being:

1. renegotiating an extension of the Esplanade lease and undertaking refurbishment; and
2. relocate and fit out another leased CBD location.

A summary of the steps of the Strategic Accommodation Review is set out in Appendix C.

A further driver of this project is to provide a CBD office and control room with:

- quality, reliable and secure network access;
- upgraded control and server rooms working in tandem with its back up at the DBP owned Jandakot facilities;
- a contemporary work environment for staff which includes open, fluid office space, a modern, consolidated kitchen with space for eating and modern bathrooms; and

- a variety of meeting facilities to suit different types of meeting environments including quiet spaces and break out areas for more formal meetings.

We have been located at the Esplanade in Perth's CBD for over 15 years. The total leased area is 2,115 square metres across two levels and provides space for the control room, the IT, OT and communications server rooms, a workshop, office space for up to 142 staff and contractors, a boardroom, three 10-12 person capacity meeting rooms (two of these adjoining and specially equipped for emergency response), three 6-8 person capacity meeting rooms, three 2-3 person capacity meeting rooms, one staff breakout area/kitchen on the upper level, four additional kitchenettes without seating, 21 car bays and a storeroom.

The fit out has been adjusted ad hoc over the 15 years to support the growing operations of the business. The upper level is primarily open plan and includes the staff breakout area and full sized kitchen. The lower level is fit out in smaller pockets with long corridors, small kitchenettes and no staff breakout areas. There is no open access between floors. Amenities are located within fire exits and require security access cards in and out.

The Esplanade premises also presents some operational and technical challenges relating to the management of the technology infrastructure in the building to support the control room, OT and IT server rooms and the Uninterruptable Power System (UPS).

Specifically the building was initially developed as a single tenant location, with all IT and other communications infrastructure wired in that way. This means our connections are shared with other floors which limits capacity and has caused interruptions leading to employee impacts of slow network speeds and WIFI instability.

1.3.1 AA4 submission

Table 0.3 and Table 0.4 below outline the forecast expenditure for relocation from the current to new leased premises in AA4. This project was not forecast in our original AA4 submission. It is expected this project will be completed in AA4 and no further capex is forecast for AA5.

Table 0.3: Corporate capex by activity in AA4 ($'000)

Activity	AA4 forecast
Minor works at Esplanade through to 2019	144
Make good of Esplanade	400
Fit out and relocation to 140 St George's Terrace	3,600
Total	**4,144**

Table 0.4: Corporate capital expenditure – AA4 Approved vs Actual

($'000)	2016	2017	2018	2019	2020	Total AA4
Actual	-	15	105	524	3,500	4,144
Approved	-	-	-	-	-	-
Variance	**-**	**15**	**105**	**524**	**3,500**	**4,144**

1.4 Risk Assessment

Our risk management framework 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 importance of managing the day to day operations of the control room in an environment which does not compromise the safe and reliable delivery of essential services the control room is responsible for is a high priority for DBP.

Similarly, the ability to offer functional, affordable and appealing office accommodation to staff and contractors is another priority for DBP, as the competitive nature of employment in skilled engineering and other key roles demands it.

The overall risk rating of the office relocation is shown in the below:

Table 0.5: Risk Rating

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

Specifically, the risks are:

- DBP – allowing continuation of the current lease with no renovations for a further five years presents a major risk to effective operations now and in the future. The fit out is segmented, outdated and does not support our values of One Team and Perform (which require an open, fluid office space conducive to collaboration). There are issues with the technology infrastructure and inadequate meeting facilities. The outdated staff amenities do not provide for optimal staff comfort and hence do not position us as an employer of choice in the oil, gas and utilities industry. It also exposes us to higher leasing costs, likely to be above the market average, in the next five years compared to what is achievable under a new lease.

1.5 Options considered

After an extensive review of potential office and control room accommodation locations, a decision was taken between the following three options:

- Option 1 – Remain on Levels 6 and 7, The Esplanade;
- Option 2 – Relocate to Levels 22 and 23, 140 St Georges Terrace; and
- Option 3 – Relocate to Level 10, 20 Walters Drive, Osborne Park.

Other options considered throughout the review include relocating some or all CBD staff to new offices built at our Jandakot depot, alternative CBD and non-CBD locations and consolidating our CBD offices, control room and depot to new fit-for-purpose city fringe premises. These options were discounted as they did not meet our infrastructure requirements, involved property market risks that come with buying and selling (including the lead time required), caused an unacceptable level of disruption to our operations and employees or were comparatively more costly based on a high level estimate of likely costs and time to complete required building works.

A summary of the Strategic Accommodation Review timeline, options and findings is provided in Appendix C.

1.5.1 Option 1 – Remain at Esplanade with renegotiated lease

Under this option we would renegotiate the lease for Levels 6 and 7 at 12-14 The Esplanade, where we have been based for the past 15 years. We would also carry out refit works at this location to ensure it can meet our ongoing business requirements.

1.5.1.1 Achieving objectives

Table 0.6: Achieving Objectives below outlines how this option aligns with achieving our vision objectives in AA5.

Table 0.6: Achieving Objectives

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	Y
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	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

Specifically this option aligns with our vision of delivering for customers in terms of public safety and customer service, but has the potential to impact operations, and reliability, in the short-term. In the short-term it also does not align with our vision of being a good employer, causing the most disruption to staff health and safety and engagement. It is also not the most sustainably cost efficient as it requires the highest capital investment of the three options. Further, it has the lowest Nabers rating of the options explored.

In addition, even the refurbished fit out will not provide a truly contiguous office space which is important in supporting our value of One Team.

1.5.1.2 Cost assessment

This option results in a total opex cost of $6.2 million in AA5, including 21 onsite parking bays. This would represent a saving of $1.6 million when compared to the current lease agreement.

Dealing with the technology infrastructure challenges at the Esplanade has required significant ongoing spend to manage the existing IT, OT (i.e. SCADA) and Uninterruptable Power System infrastructure in the building, with $0.5 million invested in AA5. Correcting this to provide standalone connections for Levels 6 and 7 would be very costly. The renegotiation and new fit out at the Esplanade would not address these concerns.

Of the three options, the Esplanade will require the most significant fit out given the age of the existing fit out and the difficulty in managing a fit out while also maintaining a working office and control room. For these reasons, the Esplanade is likely to have a higher impact on operations (with the master control room required to move to the back-up control room at Jandakot while it is refurbished).

The fit out is expected to cost $4.75 million. Temporary accommodation and relocation costs would be incurred to alternatively place staff during refit works at an estimated cost of $0.5 million.

Table 0.7: Capex cost by activity – AA4 ($'000)

Activity	AA4 forecast
Minor works at Esplanade through to 2019	144
Fit out at Esplanade -	**4,750**
• Server Room/Comms/UPS	1,050
• Control Room	500
• Refit	3,200
Relocation and other	500
TOTAL	**5,394**

The table below provides a summary of costs incurred over AA4 and AA5 under the Esplanade option.

Table 0.8: Summary of Esplanade lease renewal and refit costs

Cost category	2020	2021	2022	2023	2024	2025	NPC
Capex -							
OT/IT/AV Maintenance	625	52	-	15	-	625	1,211
Fit out	2,500	2,250	-	-	-	-	4,517
Relocation and other	250	250	-	-	-	-	475
Total Capex	**3,375**	**2,552**	**-**	**15**	**-**	**625**	**6,167**
Opex -							
Lease and outgoings	1,181	973	973	973	973	973	5,389
Parking	222	214	214	214	214	214	1,149
Total Opex	**1,403**	**1,187**	**1,187**	**1,187**	**1,187**	**1,187**	**6,538**
Total Cost	**4,778**	**3,739**	**1,187**	**1,202**	**1,187**	**1,812**	**12,705**

1.5.1.3 Risk assessment

Our risk management framework 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'.

By remaining in the current location, we would/would not mitigate all identified risks over the medium to long term. Undertaking the required refit of the current location while continuing to use this as DBP's main office introduces new short-term risks as identified and described below.

Table 0.9: Risk Assessment – Option 1

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

Specifically, in the short term, renegotiating the lease at the Esplanade and completing a refit of the control room and offices would:

- DBP – Significant control room disruption during renovations. The master control room will move to the back up control room at Jandakot for a period, noting the Jandakot backup control room is not appropriately sized for ongoing use.
- People – Temporary relocation of staff and having part of the tenancy operating as a worksite, while part of it still functions as offices, introduces health and safety risks to employees, contractors and visitors. Also moving the control room to Jandakot for a period of time increases the risk to control room staff driving late at night, where public transport is not as frequently available as in the city. Further this option does not provide more modern, accessible and comfortable staff amenities.
- Reputation/outrage – the disruption from renovations at the Esplanade is likely to cause major concern and anger from staff.
- Asset Damage – There is a risk construction works at the Esplanade could cause damage to existing assets
- Supply – During renovations, the master control room will have to move to the back up control room at Jandakot which, while suitable for short term use as an emergency backup, is not appropriately sized for ongoing use.

1.5.2 Option 2 – Relocate to 140 St Georges Terrace

This option involves expiry of the current CBD lease and execution of a new lease for Levels 22 and 23 at 140 St Georges Terrace. Refit of new premises would be completed and relocation undertaken before August 2020.

We engaged CBRE Occupier to complete a market review and obtain indicative lease costs for potential new premises that could meet our requirements. We then proceeded with further investigations and negotiations in relation to the lease and refit of a shortlist of locations. This option considers the preferred CBD location of 140 St Georges Terrace which was selected from the shortlist as best meeting our requirements, at the lowest cost. It is a total of 2,201 square meters over two levels which has provision to join the two floors by internal stairs.

We have been granted 9 months access to the premises to undertake refit works prior to the lease commencing. The targeted floors have recently been refurbished with new lighting, ceilings and floor coverings. The floors are ready for fit out walls and desks.

1.5.2.1 Achieving objectives

Table 0.10 below outlines how this option aligns with achieving our vision objectives over AA5.

Table 0.10: Achieving objectives - Option 2

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	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

Specifically this option aligns with our vision of delivering for customers in terms of public safety, reliability and customer service (maintains current ability for face to face meetings with our customers also located in the CBD), being a good employer, in terms of health and safety and engagement. It is also the most sustainably cost efficient requiring lower capital investment than the other options, and also having a higher Nabers rating than the current location.

In addition, the refurbished fit out will provide a truly contiguous office space which is connected by internal stairs. This is important in supporting our value of One Team.

1.5.2.2 Cost assessment

This option would result in a total operating cost of $6.1 million, including 21 car parking bays (16 onsite, and 5 located at a nearby public parking facility) for AA5.

In terms of capital costs, this option includes make good costs at Esplanade, fit out costs at the new premises, and relocation and other costs totaling $4.0 million (Table 0.4). It should be noted these cost estimates are still being finalised with the successful tenderer as final selections are made and work commences.

Table 1.11: Cost by activity – AA4 ($000)

Activity	AA4 forecast
Minor works at Esplanade through to 2019	144
Make good of Esplanade	400
Fit out and relocation to 140 St George's Terrace -	**3,380**
• Server Room/Comms/UPS	50
• Control Room	800
• Refit	2,530
Relocation and other	220
TOTAL	**4,144**

The table over provides a summary of costs incurred over AA4 and AA5 under the option to move to a new leased CBD location.

Table 0.112: Summary of Esplanade lease renewal and refit costs

Cost category	2020	2021	2022	2023	2024	2025	NPC
Capex -							
Make good	400	-	-	-	-	-	387
Fit out	3,380	-	-	-	-	-	3,266
IT/OT Infrastructure	-	52	-	15	-	625	628
Relocation and other	220	-	-	-	-	-	213
Total Capex	4,000	52	-	15	-	625	4,436
Opex -							
Lease and outgoings	1,112	1,042	1,042	1,042	1,042	1,042	5,624
Parking	199	176	176	176	176	176	961
Relocation	100	-	-	-	-	-	97
Total Opex	1,411	1,218	1,218	1,218	1,218	1,218	6,681
Total cost	**5,411**	**1,270**	**1,218**	**1,233**	**1,218**	**1,843**	**11,117**

1.5.2.3 Risk assessment

Table 0.123 shows that relocating to Levels 22 and 23 at 140 St Georges Terrace does 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.133: Achieving objectives

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

Specifically, it addresses the risk to effective operations now and in the future by providing an open, fluid office space conducive to collaboration, removing the technology infrastructure risks of the current location (noting fibre to the building will be available mid-2020), providing adequate meeting facilities, new staff amenities and positioning us as an employer of choice in the oil, gas and utilities industry. It also reduces leasing costs, and other opex in the next five years compared to what is achievable under other options.

1.5.3 Option 3 – Relocate to 20 Walters Drive, Osborne Park

This option involves expiry of the current CBD lease and execution of a new lease for Level 10 at 20 Walters Drive, Osborne Park. Refit of new premises would be completed and relocation undertaken before August 2020.

We engaged [redacted] to complete a market review and obtain indicative lease costs for potential new premises that could meet our requirements. We then proceeded with further investigations and negotiations in relation to the lease and refit of a shortlist of locations. This option considers the preferred non-CBD location of 20 Walters Drive, Osborne Park which was selected from this shortlist as best meeting our requirements at the lowest cost. It is a total of 2,327 square metres over a single level.

1.5.3.1 Achieving objectives

Table 0.14 below outlines how this option aligns with achieving our vision objectives over AA5.

Table 0.14: Achieving objectives - Option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	N
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

Specifically this option aligns with our vision of delivering for customers in terms of public safety and reliability, but not customer service (it does not maintain the current ability for face to face meetings with our customers also located in the CBD). It aligns with being a good employer in terms of health and safety, but not employee engagement.

Of each of the options, it has the greatest long-term impact on our employees. It would require a large portion of our employees to take two or more forms of public transport in their journey, making cycling to work longer, more difficult and more hazardous, and turning more employees to car travel.

Further, it also impacts our future potential to attract and retain the best employees. In terms of being sustainably cost efficient, it requires higher upfront capital investment than the other options, with lower ongoing rent, but other impacts that will increase ongoing opex. It also has the highest Nabers rating of the final three locations and provides a truly contiguous office space with all staff located on a single floor (this being important in supporting our value of One Team).

1.5.3.2 Cost assessment

This option would result in a total operating cost of $3.8 million, including 21 onsite car parking bays for AA5, for rent and outgoings.

However, we consider a non-CBD location would require additional parking bays to be made available for employees and therefore we would take up the option for all 80 on site car parking bays we would be allocated at a total additional cost of $0.4 million over the period.

There would be additional travel costs for travelling to the city for meetings with customers and for the executive travelling to and from the airport, compared to the CBD location, which we estimate to be at least $11,000 pa.

We also expect the non-CBD location to have a detrimental impact on our ability to attract and retain high quality employees in the oil and gas sector in WA. Overtime this would likely require a once-off increase in salaries and other conditions, estimated at a cost of $600,000 p.a. ongoing.

In terms of capital costs, this option includes make good costs at Esplanade, and relocation and fit out costs at the new premises which have been estimated as $4.1 million would additionally be incurred.

Table 0.15: Cost by activity – AA4 ($000)

Activity	AA4 forecast
Minor works at Esplanade through to 2019	144
Make good of Esplanade	400
Fit out and relocation to 20 Walters Drive, Osborne Park -	**3,730**
• Server Room/Comms/UPS	250
• Control Room	800
• Refit	2,680
Relocation and other	250
TOTAL	**4,524**

The table over provides a summary of costs incurred over AA4 and AA5 under the option to move to a new leased non-CBD location.

Table 0.16: Summary of non-CBD lease, relocation and refit costs

Cost category	2020	2021	2022	2023	2024	2025	NPC
Capex -							
Make good	400	-	-	-	-	-	387
IT/OT Infrastructure	-	52	-	15	-	625	628
Fit out	3,730	-	-	-	-	-	3,605
Relocation and other	250	-	-	-	-	-	242
Total Capex	4,380	52	-	15	-	625	4,803
Opex -							
Lease and outgoings	1,036	682	682	682	682	682	3,979
Parking	170	110	110	110	110	110	645
Additional wages	75	300	450	600	600	600	2,276
Additional travel	7	11	11	11	11	11	55
Total Opex	1,288	1,103	1,253	1,403	1,403	1,403	6,954
Total cost	**5,668**	**1,155**	**1,253**	**1,418**	**1,403**	**2,028**	**11,758**

1.5.3.3 Risk assessment

Table 0.17 shows that relocating to Level 10, 20 Walters Drive, Osborne Park to a non CBD location, DBP would mitigate the identified risks of the current CBD office and control room, but would introduce new risks to reputation.

Table 0.17: Achieving objectives

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

Specifically, the risks are:

- DBP – the risk to effective operations now and in the future by providing an open, fluid office space conducive to collaboration, removing the technology infrastructure risks of the current location (however, noting only fibre to the node is available), providing adequate meeting facilities and new staff amenities. While it reduces leasing costs, it increases other opex in the next five years compared to what is achievable under other options.
- Reputation/outrage – there is a significant risk of disengagement with staff by moving out of the CBD (with an analysis of staff addresses indicating a significant proportion would need to take multiple modes of public transport or would have their cycling journey impact). Further, it is anticipated that Shippers will express dissatisfaction with a decrease in accessibility for face to face meetings. A non-CBD location could adversely impact DBP’s ability to attract and retain high calibre employees without other measures, such as salary packages and inclusions being lifted.

1.6 Summary of options

Table 0.18: summary of cost/benefit analysis

Option	Objectives	NPC	Risks
Remain at Esplanade and refit	This option achieves our objectives of delivering for customers and being a good employer, however in the short-term causes the most disruption to the control room (and potentially reliability) and employees in the short-term. It also is not sustainably cost efficient.	$12.7m ($6.2m capex, $6.5m opex)	This option does not adequately address the risk to DBP, and also introduces additional risks in the short-term to People, Reputation, Asset Damage and Supply
Relocate to 140 St Georges Terrace	This option achieves our objectives of delivering for customers, being a good employer and being sustainably cost efficient	$11.1m ($4.4m capex, $6.7m opex)	This option appropriately moderates the risk to DBP to ALARP
Relocate to 20 Walters Drive, Osborne Park	This option achieves our objectives of delivering for customers in terms of public safety and reliability, but not customer service, being a good employer in terms of health and safety, but not engagement, and is not the most sustainably cost efficient.	$11.8m ($4.8m capex, $7.0m opex)	This option appropriately moderates the risk to DBP but introduces a new risk to Reputation

1.7 Project Delivery

1.7.1 What was delivered?

In anticipation of the expiration of the lease agreement for the Esplanade in July 2020 we undertook the following activities in the AA4 period:

- review of current and anticipated need in terms of functionality and space for control room and office, people and assets;
- identified business requirements and priorities and assessed options available within the CBD and beyond;
- selected the most suitable option;
- continue to progress its project management and change plan to effectively transition staff and operations to a new CBD location;
- will undertake 'make good' investment at the Esplanade;
- continue to finalise the contract for the office fit out for St George's Terrace to meet operational requirements; and
- plans for physical relocation activities to move all equipment and property to the new office accommodation, and dispose of end-of-life equipment that will not come over.

1.7.2 Why was it delivered?

1.7.2.1 Operational requirements

We considered logistical, operational and financial requirements in assessing how best to meet our accommodation needs, including:

- access to the most reliable and quality network connection for our control room;
- access to our Shippers (and them to us) to enable continued effective working relationships;
- ability to create a more open and connected space to support collaboration and working to our One Team and Perform values; and
- access for our employees and contractors to suitable transport infrastructure, including for those teams working shifts across our 24 hour operations, and on premise facilities and amenities to maintain competitiveness as an employer of choice in the oil, gas and utilities industry.

The control room is critical for all operational requirements of the DBNGP. Its core function is to ensure the effective monitoring and control of the pipeline including mainline valves, meter stations, compressor stations and associated equipment. More information in relation to SCADA and Communications and how they support pipeline control can be found in the SCADA, Northern Communications Replacement and Jandakot Redevelopment Business Cases.

In order to ensure continuity of safe operations, including the ability to have uninterrupted visibility of pipeline operations and condition, the control room requires high quality and reliable broadband connection. The preferred CBD location will offer fibre to the building (FTTB) from mid-2020, which is not available at the non-CBD location.

Our Commercial Team meet regularly with Shippers and need to be readily available to discuss commercial and contractual obligations consistent with a 98% reliability standard. The team is often required to meet multiple times each week, especially when negotiating contracts. Having ready access to meet in person and discuss these issues is highly valued by our Shippers, hence increasing the importance of having a CBD presence.

As noted earlier, our office accommodation is home for 142 staff and contractors. In a tightening employment market, where we are competing with other participants in the oil, gas and utilities industry, we must maintain our status as an employer of choice in order to have high quality talent available to operate and maintain the DBNGP.

Maintaining a CBD presence is favoured by employees and contractors because of public transport accessibility, cycling routes, amenity and overall location at the centre of the metropolitan area.

1.7.2.2 Consistency with the National Gas Rules

Rule 79(2)

The relocation to 140 St Georges Terrace is required to maintain the integrity of services. It will provide an open, fluid office space conducive to collaboration, remove the technology infrastructure risks of the current location (noting fibre to the building will be available mid-2020), provide adequate meeting facilities, upgrade our control room, IT and OT server rooms, provide modern staff amenities and position us as an employer of choice in the oil, gas and utilities industry.

Rule 79(1)

The relocation to 140 St Georges Terrace is also consistent with Rule 79(1)(a), specifically we consider the capital expenditure is:

- Prudent – The expenditure is necessary in order to address the identified operational requirements which has been confirmed through engagement with key stakeholders including the Pipeline Control Centre, SCADA, IT and Communications. The relocation considers costs and benefits associated with various options over a 6-year period to identify the most value for money option. The proposed expenditure can therefore be seen to be of a nature that would be incurred by a prudent service provider.

- Efficient – The expenditure incurred to date, and forecast to be incurred in 2020, is based on actual costs and/or those provided by landlords and subject matter experts in line with our Procurement Policy. The options assessed and findings were presented to our Executive Management Team at a number of stages, and included negotiating further reductions in rent with prospective landlords, before a final decision was made. 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 relocation takes into consideration requirements of office accommodation in professional workplaces, as well as operational requirements of a control room that operates WA's major gas transmission pipeline. It follows good industry practice by ensuring that office accommodation is maintained within its useful life and to current technological standards, therefore the proposed capital 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 maintaining reliability of supply, whilst achieving the lowest sustainable costs over time. The relocation to 140 St Georges Terrace reduces leasing costs and other opex in the next five years compared to what is achievable under other options. It is also the lowest capex requirement of the options.

1.7.3 Efficient Costs

In AA4, the actual program costs are forecast to be $4.1 million. This includes minor works at the Esplanade office ($0.1m), make good costs for the existing office premise when vacating ($0.4m) as well as prudent fit out costs for the new accommodation ($3.6m). It should be noted these cost estimates are still being finalised with the successful tenderer as final selections are made and work commences.

A further discount to ongoing leasing costs was negotiated with the owners at 140 St Georges Terrace, with an increased incentive (from 50% to 54%) secured for the duration of the new lease (5 plus 5). This is regarded as being favourable over the current rates now in the marketplace.

Appendix A – Summary Risk Assessment

Figure 0.1: Summary of 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	Occasional	HIGH	125	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	130
Option 1 - renew Esplanade, refit	Major	Remote	INTERMEDIATE	25	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	30
Option 2 - Relocate to 140 St Georges Tce	Major	Occasional	HIGH	125	Severe	Occasional	INTERMEDIATE	25	Trivial	Remote	NEGLIGIBLE	1	Minor	Frequent	INTERMEDIATE	25	Minor	Occasional	LOW	5	Severe	Occasional	INTERMEDIATE	25	206
Option 3 - Relocate to Walters Drive, Osborne Park	Major	Remote	INTERMEDIATE	25	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	Severe	Occasional	INTERMEDIATE	25	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIGIBLE	1	54

Appendix B – Current Lease Situation

Table 0.19: Summary of current lease

PREMISES:	Levels 6 & 7, 12-14 The Esplanade, Perth
AREA:	2,115.10 square metres (Excludes Storage Area)
EXPIRATION DATE:	31 July 2020
OPTIONS TO FURTHER EXTEND:	Five (5) years, subject to providing 6 to 9 months' prior written notice. Last Date to Exercise Option: 31 January 2020
[redacted]	
MAKE GOOD REQUIREMENTS:	Full make-good obligations apply, with the requirement being to reinstate Premises to open plan base building condition. This includes removing all fit out, re-instating all services to an open plan configuration, repainting, repairing and making good all surfaces.

Appendix C – Summary of Strategic Accommodation Review

Stages of the review

Table 0.20: Stages of the accommodation review and office relocation project

Timeline	Activities	Options explored and findings
May 2018	Kick off Perth Office Review with the objective to review the options to reduce the operating costs of the AGIG Perth Offices.	Options under consideration included: 1. renegotiating an extension of the Esplanade lease; 2. renegotiating an extension of the Esplanade lease and undertaking refurbishment; 3. consolidating on one refurbished level at the Esplanade and relocating some staff to new office buildings at Jandakot; 4. relocate and fit out another leased CBD location; 5. relocate and fit out to a leased non-CBD location; 6. relocate to a redeveloped and expanded Jandakot; and 7. purchase a new fit for purpose facility that can incorporate our office, control room and depot accommodation requirements.
November 2018	[redacted] engaged to provide a Strategic Accommodation Report and recommended strategy in relation to exploring an early lease renewal over the current premises, versus a potential relocation in mid-2020.	An analysis of market conditions determined our current lease situation would likely result in above market costs if we were to renew without pursuing renegotiation at the end of July 2020. Further, it was advised it would be advantageous for us to pursue alternative leasing options in conjunction with renegotiation discussions with the current landlord.
Mid-2019	[redacted] commenced preliminary negotiations on our behalf, and presented our Commercial team with a Market Review of potential suitable premises.	[redacted] Market Review and preliminary negotiations with prospective landlords presented 32 potential alternative locations, as well as an indicative price for renewal at the Esplanade. From this review, four locations, including the current Esplanade location were shortlisted for further consideration.
Q3 2019	We progressed discussions with the shortlisted locations, undertook preliminary analysis of likely fit out costs and an assessment of business impact of the various locations.	Proposed rent and outgoings (including incentives) received for the shortlisted locations were presented. Key operations, IT and OT stakeholders were consulted to determine key fit out requirements and preliminary fit out costings were developed. An assessment of business impact, including impact to employees, placed CBD locations as the preferred.

Timeline	Activities	Options explored and findings
April 2019	Further discussions were had with the shortlisted CBD locations to seek improved rent and incentives. The outcome of this, along with preliminary fit out costs were presented to the EMT for consideration.	The EMT instructed the Commercial team to come back with a cost analysis of the top two non-CBD locations, alongside the preferred CBD locations for their consideration.
June 2019	The two preferred CBD locations, the current location and two non-CBD locations were presented to the EMT for consideration.	Members of the EMT undertook to conduct site visits of four alternative locations (two CBD and two non-CBD). It then resolved to pause negotiations for the preferred non-CBD locations in favour of further discussions for the preferred CBD alternative.
July 2019	The final three options were presented to the EMT and approval was given to execute a head of agreement with the preferred CBD alternative location at 140 SGT.	
November 2019	Contract negotiations and final selections continue for the construction of the fit out in 2020.	

Shortlisted locations

Levels 6 and 7, 12-14 The Esplanade

✓ 2,115 sqm at [redacted]

× Issues with technology infrastructure in building and no planned date for FTTB to be connected

× Not contiguous

✓ Provides for separately located SCADA Master and Back-up

✓ 21 car parking bays at [redacted]

× Lowest Nabers rating of the options (3.0)

✓ Easily accessible by public transport (direct journey)

✓ Well-equipped EOTF

✓ Proximity to cafes, shops and other

× Temporary accommodation required during fitout

Esplanade/Jandakot (keep one floor at Esplanade and relocate remaining to new offices at Jandakot)

× required floor space of ~1,000 sqm to be built at Jandakot, ~1,000 sqm at greater than [redacted] at Esplanade (unlikely to get same rental value as keeping both floors), plus additional rent at Esplanade while constructing at Jandakot

× FTTN available

× Not contiguous

✓ Provides for separately located SCADA Master and Back-up

× not easily accessible by public transport (direct journey)

× impact to retention and attraction of high caliber staff

× Proximity to cafes, shops and other

× requires development approval

Levels 22 and 23, St Georges Terrace

✓ 2,201 sqm at [redacted]
✓ FTTB available mid-2020
✓ Provision for internal stairs to make contiguous
✓ Provides for separately located SCADA Master and Back-up
✓ 21 car parking bays at [redacted] 16 in building, 5 public carpark next door
✓ Improved Nabers rating compared to current (3.5)
✓ Easily accessible by public transport (direct journey)
✓ Well-equipped EOTF
✓ Proximity to cafes, shops and other
✓ No temporary accommodation required during fitout
✓ Amenities are new or near new
✓ Flooring, painting, lighting is new or near new

Two or three of Levels 16, 17 and 18, 108 St Georges Terrace

× 1,644 sqm at [redacted]
✓ FTTB available mid-2020
× Not contiguous
✓ Provides for separately located SCADA Master and Back-up
✓ 21 car parking bays at [redacted] – 5 in building, 16 public carpark
× Lowest Nabers rating of the options (3.0)
✓ Easily accessible by public transport (direct journey)
✓ Well-equipped EOTF
✓ Proximity to cafes, shops and other

Levels 11 and 12, 905 Hay St

✓ 2,151 sqm at [redacted]
✓ FTTB available mid-2020
✓ Provides for separately located SCADA Master and Back-up
✓ 21 car parking bays at [redacted] – 7 in building, 14 public carpark
✓ Improved Nabers rating compared to current (4.5)
✓ Easily accessible by public transport (direct journey)
✓ Well-equipped EOTF
✓ Proximity to cafes, shops and other
✓ Available early 2020, likely to require short extension at current location to allow for fit out

Jandakot

× Required floor space of ~2,000 sqm to be built at Jandakot

× Once building and additional parking (~80 additional parks) are provided, Jandakot will have limited capacity to grow – any large projects (i.e. Shipper funded) likely to need to seek additional warehousing elsewhere

× Requires additional rent at Esplanade while constructing at Jandakot

× FTTN available

× Does not provide for separately located SCADA Master and Back-up, Back-up control room rent estimated at ~$500k pa

× Not easily accessible by public transport (direct journey)

× Impact to retention and attraction of high calibre staff

× Proximity to cafes, shops and other

× Requires development approval

1 Walters Drive, Osborne Park

✓ 2,468 sqm at [redacted]
✓ contiguous
× FTTN available
✓ Provides for separately located SCADA Master and Back-up
✓ 80 car parking bays at [redacted]
✓ Improved Nabers rating compared to current (5.0)
× not easily accessible by public transport (direct journey)
× impact to retention and attraction of high calibre staff
✓ Well-equipped EOTF
✓ Proximity to cafes, shops and other
× Additional travel and employee costs

20 Walters Drive, Osborne Park

✓ 2,327 sqm at [redacted]
✓ Contiguous
× FTTN available
✓ Provides for separately located SCADA Master and Back-up
✓ 80 car parking bays at [redacted]
✓ Improved Nabers rating compared to current (4.5)
× not easily accessible by public transport (direct journey)
× impact to retention and attraction of high calibre staff
✓ Well-equipped EOTF
✓ Proximity to cafes, shops and other
× Additional travel and employee costs

Southern Communications Upgrade – Capex DBP28

1.1 Project approvals

Table 0.1: Southern communications upgrade DBP28 – Project approvals

Prepared by	Mike Leahy, Senior Communications Engineer
Reviewed by	Hugo Kuhn, Manager Engineering and Operational Projects
Approved by	Tawake Rakai, GM Transmission Asset Management

1.2 Project overview

Table 0.2: Southern Communications Upgrade DBP28 – Project overview

Description of issue/project	This document discusses the variation in expenditure that was required during the AA4 period to complete the Southern Communications Upgrade project. Telecommunications infrastructure across the DBNGP communications network was installed as part of the original DBNGP when commissioned in 1984. In 2011 (during the AA3 period), we commenced the Southern Communications Upgrade project, which was required to replace end of life communications equipment along the southern part of the pipeline (Perth to Bunbury). The recommended option for the Southern Communications Upgrade project involved replacing DBP communications equipment on Western Power-owned shared infrastructure assets (including towers, poles and land). We considered several alternatives, including establishing a standalone communications system south of Perth (similar to our northern communications network), as well as a move to fibre optic cable, satellite and Telstra's platform. As part of the AA4 regulatory determination process, the Economic Regulation Authority (ERA) and its technical experts (EMCa) reviewed the proposed ~$11 million project. The ERA subsequently endorsed the recommended option, determining that the project meets the requirements of NGR 74, 79(1) and NGR 79(2)(c)(i) to (iii). The ERA approved: • $6.8 million (real 2016) of capital expenditure spent during AA3 on replacement communications equipment be added to the regulated asset base; and • $1.88 million (real 2016) of forecast capital expenditure to install replacement communications equipment on Western Power's shared infrastructure assets. During the AA4 period, the circumstances surrounding the project changed significantly. [redacted] As a result, we revisited the Southern Communications Upgrade project and revised the recommended option. [redacted]

[redacted]

The redesigned solution cost $4.8 million more than the original AA4 forecast, and includes:

- installing the previously purchased communications equipment on the seven new, DBP-owned communications towers to be totally independent of Western Power's southern microwave towers;
- connecting DBP's southern communications system to the northern communications system via a leased optic fibre cable between The Esplanade and Kwinana Junction (bypassing Western Power's East Perth facility);
- replacing the Kwinana Industrial Estate pilot cable network with a polled access valve (PAV) radio network with Kwinana Junction as the hub; and
- re-contracting the leased circuits connecting compressor station 10 and Kwinana Junction.

These works are being undertaken during 2019 and 2020.

This change in project scope represents necessary action to ensure we can continue to operate and manage our communications system efficiently. We submit that the additional $4.8 million, which will be incurred during the AA4 period, represents expenditure such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

This document describes and justifies the $4.8 million AA4 variation, explaining the options considered and why the additional capex should be considered conforming under the NGR.

Project name	Southern Communications Upgrade
Estimated cost and variation from forecast	The Southern Communications Upgrade project was forecast to cost $2.0 million over the AA4 period. This was to complete the recommended option which leveraged third party communications infrastructure. DBP ultimately progressed with an alternative option, which was to establish a standalone southern communications network. This was because DBP considered the costs and risks associated with the use of Western Power's infrastructure assets for its communications equipment to be unacceptable. The redesigned solution is estimated to cost $6.8 million over AA4 which is $4.8 million more than forecast due to the change in project scope. The costs and timing are:

$'000	2016	2017	2018	2019	2020	Total
Forecast	1,505	513				**2,018**
Actual	1,127	823	376	1,500	3,000	**6,826**
Variance	(378)	310	376	1,500	3,000	**4,808**

Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 – Continue to leverage the current shared third-party owned infrastructure [redacted] and • Option 2 – Install standalone infrastructure [redacted] (this is the option progressed).
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the redesigned communications upgrade project is consistent with accepted good industry practice, and the legislated communications requirements. Several practicable options were considered, and market/unit rates have been tested and verified by an independent expert to achieve the lowest sustainable cost of providing pipeline services. **NGR 79(2)** – the move to a DBP-owned and operated, standalone southern communications network is necessary to maintain the long-term performance and reliability of the communications network and consequently the continued

	operation of the pipeline, and the safety and integrity of services. The communications network provides visibility of the network to our operations and field staff, as well as access to data related to the pressure, temperature, flows, alarms across the DBNGP, and customer information. The restricted access and stringent requirements related to shared infrastructure does not provide sufficient capacity to readily maintain and replace assets as required to maintain a reliable communications network. Therefore, the proposed expenditure is conforming capex based on the grounds of NGR 79(2)(c)(ii).
Stakeholder engagement	The Southern Communications Upgrade project was considered by the ERA and its consultants as part of the AA4 regulatory review process. The ERA deemed the replacement of the communications equipment in the southern communications system meets the requirements of NGR 79(1), 79(2)(c)(i) to (iii) and NGR 74. Our shippers highly value reliability. They also expect us to maintain a strong focus on operational issues as it is important for reliability and emergency management. Our Southern Communications Upgrade project replaces outdated, unsupported and failing equipment in the communications network to ensure it provides a reliable source of data on the network including customer information. As part of the study conducted by Gibson Quai, potential suppliers and service providers were consulted, and where required provided cost estimates. [redacted] We also negotiated with the Department of Planning, Lands and Heritage, and various local governments in relation to the approval of the new communications infrastructure assets as part of the revised solution. This document outlines: • reasons for changes in expenditure between forecast and estimated actual expenditure over AA4; and • what alternatives were considered and ultimately progressed in the AA4 program of work.
Other relevant documents	This document should be read in conjunction with: • Asset Management Plan in 2016 (TEB-001-0024-07) • Telecommunications Asset Management Plan (TEB-001-0024-07) • Dampier Bunbury Pipeline Southern Communications Upgrade Strategy

1.3 Background

All physical Dampier to Bunbury Natural Gas Pipeline (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 DBNGP communications network provides Supervisory, Control and Data Acquisition (SCADA) for all compressor stations, main line valves, meter stations and other associated facilities between Dampier and Bunbury. It also provides all telephony, mobile voice radio, corporate ethernet and maintenance LAN (CSN) connections between these facilities including the head stations located at The Esplanade and Jandakot.

The system can be best described in two parts: the northern communications network and the southern communications network. The northern network runs from Dampier to Perth while the southern network is from Perth to Bunbury.

The existing southern communications system commences at the Esplanade Perth and connects via optic fibre to the Western Power facility located in Joel Terrace East Perth. It consists of bandwidth on a backbone microwave radio network, which traverses the Western Power repeater sites down to Bunbury, and spur links[32] that convey data from the polled access valve (PAV), metering and compressor sites to an aggregation site[33] via narrow bandwidth radio link using spur UHF radios.[34] Compressor station 10 is not on the Western Power backhaul path and is instead connected via a Telstra data service.

Access to Western Power's existing communications infrastructure assets is based on the original system being installed by Western Power (formerly State Government-owned SECWA, which also included the DBNGP). Western Power also has plans to upgrade this system and since Western Power is not a carrier it does not have a licence to provide communications capacity to us on a commercial basis.

Telecommunications infrastructure across the southern communications network was installed 10-30 years ago and is now at the end of its technical design life.

In 2011 (during the AA3 period), we commenced the Southern Communications Upgrade project, which was required to replace end of life DBP-owned communications equipment along the southern part of the pipeline (Perth to Bunbury).

The recommended option for the Southern Communications Upgrade project involved replacing our communications equipment on Western Power-owned shared infrastructure assets (including towers and land). We considered several alternatives, including establishing a standalone communications system south of Perth (similar to our northern communications network), moving our communications to fibre optic cable, satellite and Telstra's platform.

1.3.1 AA4 submission

As part of the AA4 regulatory determination process, the ERA and its technical experts (EMCa) reviewed the proposed ~$11 million project. The ERA subsequently endorsed the recommended option, determining that the project meets the requirements of NGR 74, 79(1) and NGR 79(2)(c)(i) to (iii).

The ERA approved:

- $6.8 million (real 2016) of capital expenditure spent during AA3 on replacement communications equipment be added to the regulated asset base; and

[32] It should be highlighted the reliability performance and data capacity of these links is lower than the backbone system.

[33] These are typically a backbone microwave repeater (owned by others).

[34] A specialised copper cable link is used for Kwinana.

- $1.88 million (real 2016) of forecast capital expenditure to install replacement communications equipment on Western Power's shared infrastructure assets.

1.3.2 Variations between AA4 forecast and actual expenditure

In AA4, total capital expenditure of $6.8 million was required to finalise the Southern Communications Upgrade project.

The increase in capital expenditure required to complete the project was due to the need for us to redesign the solution to account for third-party requirements, and also to have maintenance and asset replacement control over these high criticality assets.

[redacted]

[redacted]

[redacted] we decided it would be prudent to install the new communications equipment on new DBP-owned assets (towers, poles and land). We also took steps to redesign the system configuration so that our southern communication system no longer connected to East Perth, and to install an alternative to Western Power's pilot cable network at the Kwinana Industrial Area. This would remove our reliance on Western Power altogether, and allow us full control over asset upgrade, maintenance and replacement of communications equipment in the future.

The redesigned solution is estimated to cost $6.8 million over AA4, which is $4.8 million more than the AA4 forecast due to the change in project scope. The costs and project timing are shown in Table 0.15.

Table 0.3: Southern communications upgrade forecast costs

$'000	2016	2017	2018	2019	2020	Total
Forecast	1,505	513				**2,018**
Actual	1,127	823	376	1,500	3,000	**6,826**
Variance	**(378)**	**310**	**376**	**1,500**	**3,000**	**4,808**

1.4 Risk assessment

Risk management is a constant cycle of analysis, treatment, monitoring, reporting and then identifying once again, as shown below in Figure 0.1, with a commitment to balance outcomes sought with delivery and cost implications considered and assessed.

Figure 0.1: 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 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'.*

Six areas are considered for each type of risk:

1. DBP – corporate/financial risk
2. People – safety risk to the public and employees
3. Environmental – risk of adverse impact on environment/local ecosystems
4. Reputation/Outrage – risk of customer anger and reputational damage
5. Asset Damage – dollar impact on assets
6. Supply – risk of supply interruption to customers

The untreated risk rating associated with the Southern Communications Upgrade project is presented in Figure 0.2.

Figure 0.2: Untreated risk rating – Southern communications upgrade project

	Trivial	Minor	Severe	Major	Catastrophic
Frequent	Asset Damage		DBP Outrage		
Occasional					
Unlikely					
Remote					
Hypothetical	People Environmental Supply				

Negligible	**Low**	**Intermediate**	**High**	**Extreme**

Table 0.5. shows the untreated risk for each risk area.

Table 0.4: Southern Communications Upgrade Project risk rating

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

The upgrade of the southern communications network is high risk and high priority. The risk is high for two of the six key risk areas:

- **DBP** – the communications network is critical to public safety and customer service/delivery as it provides data related to the pressure, temperature, flows, alarms about the pipeline to our operational and field staff. Failure of the communications network removes the essential connection to the SCADA system. The continued operation of the pipeline without sufficient communications risks safe and reliable operations within business as usual parameters. Reduced operation of the pipeline could potentially cost millions of dollars in penalties and foregone revenue for both us and our customers. The consequence of a communications network failure issue is ranked severe as it can threaten the effective operation of the

DBNGP. The current likelihood is frequent. Undertaking the proposed capex program will reduce the likelihood of such an event to remote.

- **Reputation/Outrage** – the communications network is critical to customer service/delivery. Inconsistent or unreliable performance due to underinvestment can lead to unplanned outages of the communications network, and subsequent reduced operation of the pipeline. Any reduced supply may lead to reputational damage and outrage.

1.5 Options considered

Different options were considered to address the issues presented by the failure to negotiate reasonable infrastructure access terms with third-party service providers. The options were:

- Option 1 – Continue to leverage the current shared third-party owned infrastructure; and
- Option 2 – Install standalone infrastructure.

These options are discussed in the following sections.

1.5.1 Option 1 – Continue to leverage the current shared third-party owned infrastructure

This option reflects the original recommended solution.

This option assumes that the current access arrangement with Western Power will continue, whereby we rely on access to shared infrastructure in the southern communications system that is more than 30 years old.

It involves the replacement of communications equipment in our southern communications system with modern, fit for purpose equipment including on Western Power-owned infrastructure assets (land and towers). This was the recommended solution at the time of preparing the AA4 submission, as it would meet the required objectives and risk reduction, and was cheaper than establishing new DBP-owned infrastructure.

[redacted]

- [redacted]
- [redacted]

The original option therefore involved upgrades to Western Power's communication towers at Douglas Road, Serpentine, Mornington and Lake Clifton and a new Tower at Jandakot to replace Western Power's decision to decommission the KPS chimney stack that was used to cover the Kwinana Industrial together with new fibre leasing arrangements to Kwinana Junction and CS10 for cost-prohibitive assets such as dark fibre (to replace the pilot cables).

[redacted]

Continued failure to address the risks associated with the southern communications network is not tolerable for us or our customers.

[redacted]

This solution is therefore not consistent with good asset management practice, and therefore not consistent with NGR 79(1)(a).

1.5.1.1 Achievement of objectives

This option would not allow the proactive replacement of end of life communications equipment, or the subsequent ongoing maintenance of these assets in a timely manner.

The deterioration in performance of our communications equipment will likely lead to a significant number of assets failing within the next five years, which will in turn drive a high volume and high cost reactive replacement program.

We consider this approach is not sustainable, as outages will occur more frequently if the current asset risk is not addressed proactively.

The table below outlines how this option will support the achievement of our vision objectives.

Table 0.5: Alignment with vision – Option 1

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

1.5.1.2 Cost assessment

The completion of the project by installing our new communications equipment on shared infrastructure assets would have cost $2.7 million over the AA4 period. A breakdown of this estimate is provided in Table 0.6.

Table 0.6: Cost breakdown – Option 1, $million

Activity	Cost estimate
Labour	1.0
Jandakot Tower	0.4
Keysbrook Tower	0.4
Douglas Road	0.2
Lake Clifton	0.2
Mornington	0.2
Electrical works	0.4
Total	**2.7**

1.5.1.3 Risk assessment

This option will result in the ultimate exhaustion of all remaining spares holdings, as the equipment has reached its end of life and the manufacturer no longer supports the equipment. As of 2014 all spares holdings of the UHF (PAV) radios have been exhausted. We now rely on an internal resource to repair these units at component level utilising other faulty radios for parts.

This option is therefore not efficient, and increases risk significantly, particularly given the age and obsolescence risk of the current communications systems.

Communications outages can impact pipeline operations and subsequently throughput and contracted supply obligations.

Unplanned availability of the southern communications system may also require changes to the pipeline operation that do not represent an optimised case for the level of supply and demand. This may result in extra fuel gas consumption and costs that would not have been incurred had the pipeline had been able to operate under normal conditions.

In any event, costs associated with further delays to the replacement program would not *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 providing services*.[35]

1.5.2 Option 2 – Install standalone infrastructure

This option delivers the various activities outlined in the original recommended option, with the incremental addition of new DBP-owned infrastructure assets. The installation of DBP-owned infrastructure asset is critical to facilitate the installation of the new equipment, as well as the ongoing maintenance of those assets as it removes the risks, costs and challenges of shared infrastructure going forward, as well as including the incremental benefit of having independent control and access in the future.

The primary additional infrastructure required to establish a new, DBP-owned standalone southern communications network are:

- **A new, standalone microwave backbone** – this option requires the installation of fibre optic cable between Kwinana Junction and CS10, five poles[36] in the Kwinana Industrial Area and equipment to facilitate the leasing of the fibre ring connecting Jandakot, Kwinana Junction and The Esplanade and will allow us to replace Western Power's microwave backbone and pilot cable network.

- **Upgraded DC and rectifiers** – this option requires the installation of new DC and rectifiers at all southern sites from Main Line Valve 117 to Clifton Road to support the new communications equipment and associated UHV comms from the backbone to multiple meter stations serviced by the southern communications located south of the Esplanade Control Centre

[35] NGR 79(1)(a)

[36] The new poles are at Rockingham Meter Station, Mason Road Meter Station, Alcoa Kwinana Meter Station, Kwinana Power Station and Compressor Site 10

- **Installation of a new communications towers** – this option required new towers to be installed at Forestdale, Kwinana Junction, Keysbrook, Pinjarra, Wagerup West, Wellesley and Clifton Road (a total of 7 low heights towers). These new assets are required as we no longer will use Western Power's assets. The largest cost is the new Forrestdale tower. This was required as we no longer had access to Western Power's Douglas Road and Serpentine towers, and the existing tower at Jandakot was not tall enough to connect to Whiteman Park and Keysbrook. We considered increasing the height of the Jandakot tower but were unable to because of flight path restrictions.

  The proposed new radio path will be Whiteman Park – Kwinana Junction – Keysbrook (MLV142) – Pinjarra (MLV143) – Wagerup West (MLV144/153) – Wellesley (MLV154-155) – Clifton Road, which will thereby connect the northern communications network to the southern communications network a single integrated communications network mimicking the DBNGP for the very first time in its operating life .

1.5.2.1 Achievement of objectives

The establishment of a new, DBP-owned standalone communications network south of Perth delivers for customers in terms of reliability and public safety by providing increased access to and reliability of our high criticality communications assets.

It provides data related to the pressure, temperature, flows, alarms about the pipeline to our operational and field staff and is therefore critical to the operation of the pipeline and provision of pipeline services.

Table 0.7 outlines how this option will support the achievement of our vision objectives.

Table 0.7: Alignment with objectives – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	-
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	-
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Working within Industry Benchmarks	-

1.5.2.2 Cost assessment

The estimated cost of this option is $4.8 million.

Table 0.8: Cost assessment – Option 2

	2016	2017	2018	2019	2020	Total
AA4 Forecast	1,505	513				**2,018**
AA4 Actual	1,127	823	376	1,500	3,000	**6,826**
Variance	**(378)**	**310**	**376**	**1,500**	**3,000**	**4,808**

1.5.2.3 Risk assessment

This option represents the lowest treated risk as it is targeting the individual assets in line with the AMP. It is therefore consistent with our Risk Management Framework and the only option that can achieve a 98% reliability contractual obligation at the lowest sustainable cost.

This option reduces the frequency of risk events, and is therefore consistent with our Risk Management Framework, which requires to *[m]odify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower.*

Establishing a standalone southern communications system is the lowest sustainable cost of upgrading the end of life communications equipment and providing ongoing access for future maintenance and replacements and would therefore *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 providing services.*[37]

Refer to section 1.4 for more detail.

1.6 Summary of options

Table 0.9 presents a summary of how each option compares in terms of achieving our objectives, the estimated cost, and the residual risk rating.

Table 0.10: Summary of cost/benefit analysis

Option	Achievement of our objectives	Estimated cost	Risk
Option 1 – Continue to leverage the current shared third-party owned infrastructure	This option does not support the achievement of our objectives of delivering for customers, being a good employer and being sustainably cost efficient.	$2.7 million[38]	Does not adequately address the high risks to DBP, Reputation or supply
Option 2 – Install standalone infrastructure	This option aligns with our objectives of delivering for customers, being a good employer and being sustainably cost efficient.	$6.83 million	Adequately reduces risks to DBP and Reputation, to intermediate and low and is considered ALARP

1.6.1 Why is the progressed solution prudent?

Option 2 was progressed due to its alignment with our Risk Management Framework, asset management principles and the primary manufacturer's specification. It supports our vision and values and delivers for its customers on reliability of performance and customer service.

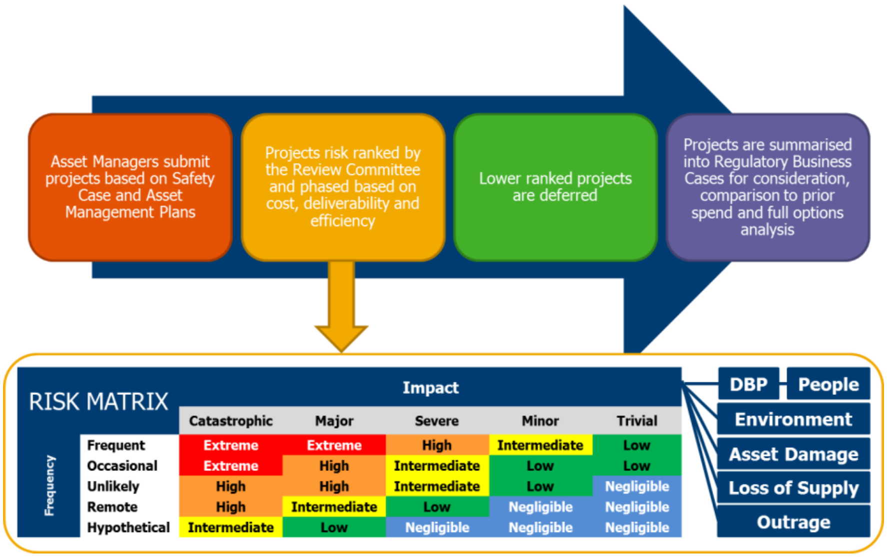
Figure 0.3 summarises how we develop our capital expenditure plans, and highlights that risks identified as intermediate or higher are prioritised, with lower risks removed or deferred from the capital program. Option 2 is consistent with this approach as it focuses on treating all intermediate or higher risks as soon as is reasonably practicable (by the end of the AA4 period). Option 1 would not address the identified risks within the AA4 period and would increase the

[37] NGR 79(1)(a)

[38] note this is $0.7 million above AA4 forecast

overall risk associated with the DBNGP as projects get pushed into AA5, leading to an even larger capital works program in the future.

Figure 0.4: Our capex plan development process



Failure to proactively plan and control our assets for future upgrade, replacement and ongoing maintenance of the southern communications network assets could result in limited visibility of pipeline assets, which would result in loss of throughput, excessive operating expenditure and impact on reliability and the ability to meet contractual obligations.

1.6.1.1 Consistency with the National Gas Rules

Option 2 is the progressed solution, recommending that we establish a new standalone southern communications network to ensure the timely replacement and prudent maintenance of our communications equipment in line with the relevant AMP guidelines.

NGR 79(1)

Option 2 is consistent with Rule 79(1)(a), which requires that *capital 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 providing services.*

We consider that the capital expenditure is:

- **Prudent** – the project will allow timely replacement and maintenance of existing assets that are arriving at the end of their useful lives. Assets are scheduled to be replaced ahead of failure, minimising disruption to customers, mitigating pipeline operations risks, and allowing for efficient resource scheduling. The proposed expenditure is there consistent with such that would be incurred by a prudent service provider.

- **Efficient** – forecast expenditure is based on the actual unit cost incurred in the delivery of similar work undertaken in AA3. The design and operational delivery of the program is forecast for completion by internal staff and external resources. External resources are engaged as a result of formal contracts in place following the tender process, as per our Procurement Policy. These services are reviewed annually by our Contracts and Procurement functions, and new rates negotiated accordingly.

- **Consistent with accepted and good industry practice** – the project follows good industry practice of allowing replacement and maintenance activities to be undertaken in a timely manner, and aligned with commitments embedded within the AMP and manufacturer's recommendations. Therefore the proposed capital 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 proposed option achieves the lowest sustainable cost delivery of services by undertaking works that reduce risks to as low as reasonably practicable while maintaining reliability of supply. This mitigates the costs of reactive works and penalties resulting from asset failure.

NGR 79(2)(c)(ii)

The progressed solution is necessary to maintain integrity of pipeline services. Replacing, repairing and/or managing these assets satisfies the grounds under Section 79(2)(c) of the National Gas Rules (NGR), which states capex is justifiable if:

(c) the capital expenditure is necessary:

(i) to maintain and improve the safety of services; or

(ii) to maintain the integrity of services; or

(iii) to comply with a regulatory obligation or requirement; …

There is a clear need to maintain the integrity of services, which would otherwise be compromised should these assets not be replaced, repaired or managed in line with the AMP and/or at the end of their useful life.

1.6.2 Efficient costs

The unit rates used to determine the cost of the AA4 program were based on average actual costs incurred in AA3. This includes the internal labour, external labour and materials/other costs.

Key assumptions that were made in the cost estimation for the AA4 southern communications upgrade project include:

- cost based on historical expenditure;
- estimates derived from contractual rates of vendors to be utilised;
- resource cost based on other similar projects ongoing at present or in previous AA periods; and
- OEM contractual rates for spares and labour that are part of our telecommunications services agreements.

CS1 compressor re-wheeling – Capex DBP29

1.1 Project approvals

Table 0.1: CS1 compressor re-wheeling DBP29 – Project approvals

Prepared by	Nghia Truong, Head of Pipeline Development
Reviewed by	Hugo Kuhn, Manager Engineering and Operational Projects
Approved by	Tawake Rakai, GM Transmission Asset Management

1.2 Project overview

Table 0.2: CS1 compressor re-wheeling DBP29 – Project overview

Description of issue/project	This business case discusses the lower-than-forecast expenditure incurred during the AA4 period to re-wheel the compressor at Compressor Station 1 (CS1) for efficient operation under lower flow. CS1 was designed to be the highest gas flowing station on the DBNGP due to its location near the state's northern gas fields and associated forecast flows at the time of installation. Between 2010 and 2015, changing pipeline hydraulics has resulted in CS1's gas flow being below its design capacity. Further reductions have been experienced with the Varanus Island inlet gas bypassing CS1. The flow of gas has reduced over time to approximately half of the design flow. Operating the compressor under low flow is unsafe with the unit operating at, or near, the surge control line of the compressor. To mitigate this risk, we were recycling gas to increase the flow to a safe level away from the surge line. Recycling gas at low flow results in inefficient operation. The recommended option was to "re-wheel" the two compressor units at CS1. This solution involves replacing the existing wheel (impellers) within the compressor with a different low flow wheel. It allows the compressor station to operate in a safe and efficient manner under low flow, while not compromising the site's ability to accommodate future growth in a cost-effective manner. In 2016, we undertook a front-end engineering design (FEED) study with the compressor manufacturer [redacted]. Through this process, we identified that only one of the two compressors needed re-wheeling due to the low utilisation of CS1 at that time. The CS1 enhancement project was completed in 2017.
Project name	CS1 Compressor Re-wheeling
Actual cost and variation from forecast	The CS1 compressor re-wheeling project was forecast to cost $3.6 million over the AA4 period. This was to re-wheel the two compressors at CS1. We ultimately only re-wheeled one of the two compressors, deferring the works on the second unit until utilisation of CS1 increased. Total capex required for this project was therefore only $1.2 million, $2.4 million less than forecast.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 – Continue to operate compressors below design flows (no capital expenditure required); • Option 2 – Re-wheel compressors ($1.2 million) (this is the option progressed); and • Option 3 – Replace compressors with smaller compressor packages ($3.4 million).

Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – it was prudent to take action to ensure CS1 could continue to operate safely and efficiently at lower flows. Re-wheeling the units allowed CS1 to continue to be operated in line with good industry practice when experiencing low flows. Deciding to only re-wheel one of the two units in 2017 achieves the lowest sustainable cost of delivering pipeline services. The project considered several practicable options and good procurement practices achieved the lowest sustainable cost of providing pipeline services. **NGR 79(2)** – the project ensured the safe and efficient operation of the compressors at CS1 at the lower levels of flow and therefore was required to maintain and improve the safety of services and maintain the integrity of services under NGR 79(2)(c)(i) and (ii).
Stakeholder engagement	The CS1 compressor re-wheeling project was considered by the ERA and its consultants (EMCa) as part of the AA4 regulatory review process. The ERA deemed the project meets the requirements of NGR 79(1), 79(2)(c)(i) and (ii) and NGR 74. Our shippers highly value reliability. They also expect us to maintain a strong focus on operational issues as it is important for reliability and emergency management. During the planning and design stages, we engaged with the compressor manufacturer – Solar – to ensure the options considered would effectively address the issue and reflected the most sustainable, cost effective solution over the long-term. This document outlines: • reasons for changes in expenditure between forecast and estimated actual expenditure over AA4; and • what alternatives were considered and ultimately progressed in the AA4 program of work.
Other relevant documents	This document should be read in conjunction with: • Asset Management Plan in 2016 (TEB-001-0024-07) • Rotating Equipment Asset Management Plan (TEB-001-0024-03)

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.

Compressor stations are critical assets that support the transportation of gas to all customers. They are integral to the safe and reliable delivery of around 600TJ of gas a day. They run based on the gas requirements of customers and operations must be ramped up or down quickly to meet these needs.

Compressor Station 1 (CS1) was the first compressor station installed on the DBNGP. It is the furthest north, and critical to transport gas from the state's northern gas fields on the Burrup Peninsula, to the commercial, industrial and domestic markets in the south west of Western Australia. CS1 has two compressors, both manufactured by Solar.

CS1 was designed to be the highest gas flowing station on the DBNGP due to its location near the state's northern gas fields and associated forecast flows at the time of installation. It was designed and configured to support a forecast demand volume of 850 to 950 terra joules (TJ) per day as dictated by the Shipper's indicative nomination to DBNGP to have all of their supplies imported into the DBNBGP at Inlet Point I1-01 from the North West Shelf. This assures that Shippers are flexible to nominate downstream on a live DBNGP without impacting on their flexibilities to co-mingle their gas supplies as new Producers are developed post expansion. The wheel or impellers were sized to ensure the compressor operating point was at maximum efficiency at this design flow.

Between 2010 and 2015, changing pipeline hydraulics has resulted in CS1's gas flow being below its design capacity. Further reductions have been experienced with the Varanus Island inlet gas bypassing CS1 – a request by the Producer to inject into the downstream side of CS1. The flow of gas has reduced over time to approximately half of the design flow.

The original impellers were too large to operate safely and efficiently under the new, low flow operating regime. The compressors were often operating at or below the manufacturer's recommended speed. Operating the compressor under low flow is unsafe with the unit operating at, or near, the surge control line of the compressor. To mitigate this risk, we were recycling gas to increase the flow to a safe level away from the surge line. Recycling gas at low flow results in inefficient operation.

In 2015, we identified the need to address the safety risk and inefficiency of CS1 operating with impellers that were too large for the new, low flow operating conditions. The recommended approach was to re-wheel both CS1 compressors in as soon as practicable.

We then commenced works to:

- undertake a front-end engineering design (FEED) study with the equipment manufacturer – [redacted] – to confirm the proposed approach of re-wheeling the compressors at CS1;[39]
- ordering long-lead time items (assuming results were as expected); and
- ultimately re-wheel both CS1 compressors in 2017 to improve operational flexibility.

1.3.1 AA4 submission

As part of the AA4 regulatory determination process, the Economic Regulation Authority (ERA) and its technical experts (EMCa) reviewed the proposed project.[40]

The ERA approved \$3.6 million[41] of forecast capital expenditure for CS1 enhancements, determining that the recommended option met the requirements of NGR 74, 79(1) and NGR 79(2)(c)(i) and (ii).

1.3.2 Variations between AA4 forecast and actual expenditure

In AA4, total capital expenditure of \$1.2 million was required to address the operational issues at CS1. This was \$2.4 million lower than forecast because we only re-wheeled one compressor, rather than the two forecast to be required.

[39] The options considered were to (i) investigate the feasibility of operating the gas turbines at lower speed; (ii) carry out analysis for re-staging or re-wheeling the compressor units; and (iii) consider the feasibility of replacement both units with more suitable turbo compressor packages, e.g., smaller Taurus units. The study confirmed re-wheeling the compressors was the most cost-effective option.

[40] The issue had not been identified at the time of the initial access arrangement submission, but was added in our response to the ERA's draft decision.

[41] Note we have escalated this cost to real dollars June 2019.

The forecast assessed by the ERA and its technical consultants (EMCa) and ultimately approved by the ERA was estimated using the best information available at the time of developing the forecast. The estimate at the time was arrived at on a reasonable basis and was the best estimate possible in the circumstances.

As part of the FEED study, we identified that only one of the two compressors needed re-wheeling due to the low utilisation of CS1 at that time. We determined that under current circumstances, re-wheeling the second compressor at CS1 could be deferred without significant risk.[42]

The re-wheeling of one turbine at CS1 was largely completed in 2017 at a cost of $1.2 million, 66% lower than forecast due to the change in project scope. The costs and timing are shown in Table 0.3 and Table 0.4.

Table 0.3: CS1 compressor re-wheeling forecast and actual costs

($'000)	2016	2017	2018	2019	2020	Total
AA4 actual	5	1,310	(88)	-	-	**1,288**
AA4 approved	345	2,923	333	-	-	**3,601**
Variance	**(340)**	**(1,612)**	**(420)**			(2,373)

Table 0.4: CS1 compressor re-wheeling actual costs by category

($'000)	2016	2017	2018	2019	2020	AA4
Internal labour	5	145	-			148
Contractors / consultants	-	30	-			30
Materials & services	-	1,115	(87)			1,013
Travel & others	0	20	-0			20
Total	**5**	**1,310**	**(88)**	**-**	**-**	**1,288**

1.4 Risk assessment

Risk management is a constant cycle of analysis, treatment, monitoring, reporting and then identifying once again, as shown below in Figure 0.1, with a commitment to balance outcomes sought with delivery and cost implications considered and assessed.

[42] Re-wheeling the second compressor should be given consideration in the future should flows change significantly.

Figure 0.1: 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 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'.*

Six areas are considered for each type of risk:

1. DBP – corporate/financial risk
2. People – safety risk to the public and employees
3. Environmental – risk of adverse impact on environment/local ecosystems
4. Reputation/Outrage – risk of customer anger and reputational damage
5. Asset Damage – dollar impact on assets
6. Supply – risk of supply interruption to customers

Investment in the management and maintenance of compressor stations is a requirement of the AMP in order to appropriately manage the inherent risk associated with the core functions of these assets.

The sources of gas into the DBNGP had changed with more gas flowing into the DBNGP south of CS1. CS1 operation, as new producers were commissioned, makes the stations designed flow capability too large for current flow rates. Note that we have retained the original wheels to revert to original design intent as dictated by Shipper's nominations

The untreated risk rating associated with operational issues at CS1 is presented in Figure 0.2.

Figure 0.2: Untreated risk rating – CS1 compressor re-wheeling

	Trivial	Minor	Severe	Major	Catastrophic
Frequent					
Occasional			DBP Asset Damage	Outrage Supply	
Unlikely					
Remote	People Environmental				
Hypothetical					

Negligible	Low	Intermediate	High	Extreme

The overall risk rating of CS1 continuing to operate well below its design flows (untreated) versus taking corrective action to allow safe and efficient operation at the current flow levels through CS1 (treated) is presented in Table 0.5.

Table 0.5: CS1 compressor re-wheeling - risk rating

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

Specifically, the risks of continuing to operate CS1 below its design flows are to:

- **DBP** – exposes us to unacceptable cost consequences through inefficient operation meaning that fuel efficiency and optimal operation would not be possible with the compressors operating under recycling conditions.
- **Reputation/Outrage** – poor asset management and compressor unavailability leading to breach of contractual obligations would cause major alarm and anger, specifically from gas producers.

- **Asset Damage** – operating compressors close to surge conditions can shift operations to unsafe condition causing trips and potential safety impact and/or severe damage to compressor station equipment in the order of $2.5 million to $10 million.
- **Loss of Supply** – sub-optimal operation at CS1 would impact on shipper's nominations and ability to maintain balance and could lead to a major disruption[43] to supply.

1.5 Options considered

Different options were considered to address the operational issues at CS1 enhancement. The options were:

- Option 1 - Continue to operate compressors below design flows;
- Option 2 - Re-wheel compressors; and
- Option 3 - Replace compressors with smaller compressor packages.

These options are discussed in the following sections.

1.5.1 Option 1 – Continue to operate compressors below design flows

This option reflects maintaining the existing operating conditions at CS1. The CS1 compressors would continue to operate well below design flows, remain exposed to the potential of a surge, and this would compromise the safety and integrity of CS1 and the reliability of supply of gas.

This option also requires the recycling of gas to increase the flow to a safe level away from the surge line.

1.5.1.1 Achievement of objectives

This option does not deliver for customers in terms of reliability and public safety due to the risk of surges resulting in equipment damage and lengthy unplanned shutdowns of the compressor units.

It is not sustainably cost efficient in terms of working within industry benchmarks, and our own asset management objectives identified in the AMP to deliver profitable growth in that it does not appropriately respond to the requirements of gas suppliers or users. Nor would this solution align us in being environmentally and socially responsible due to the additional fuel gas required to support the recycling process.

As such, this option would not reflect the costs *such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.*[44]

Table 0.6 outlines how this option will support the achievement of our vision objectives.

[43] An interruption of supply for ≥1 day, but <1 week; or curtailment >30% capacity for ≥3days but <2 weeks.

[44] NGR 79(1)(a)

Table 0.6: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
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

1.5.1.2 Cost assessment

With this option, no capital costs would have been incurred in AA4. However, additional operating costs would have been incurred, the following of which are quantifiable should surge failure occur and damage the asset, repairs to equipment would cost between $2.5 million and $10 million.

There are also likely cost impacts that are not quantifiable related to:

- additional fuel gas required for recycling to increase flow but the real issue is that extended recycling would increase the gas temperatures by recycling warm gas to the point that the compressors would safely shut down … before it can be restarted. The services become unreliable and the stop/start nature would propagate back to NWSG and impact on their ability to export into the DBNGP due to variable pipeline pressures with CS1 on and off operation

- costs associated with penalties and foregone revenue for us and our customers [redacted]

- additional travel costs (planned activities allow us to share travel costs across different activities at the same location);

- additional costs for expediated freight; and

- additional costs for removing crews from other planned work to address a corrective maintenance requirement and then remobilising to complete the previous planned work.

1.5.1.3 Risk assessment

Table 0.7 below shows Option 1 does not reduce the frequency of risk events, with the total risk rating remaining high. It is therefore is inconsistent with our Risk Management Framework which requires us to *[m]odify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower.*

Table 0.7: Risk rating – Option 1

Risk Area	Untreated	Treated (Option 1)
DBP	Intermediate	Intermediate
People	Negligible	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	High	High
Asset Damage	Intermediate	Intermediate
Supply	High	High
Overall Rating	**High**	**High**

In any event, knowingly allowing the compressor units to operate in this manner and taking a reactive asset management investment approach would not *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 providing services.*[45]

1.5.2 Option 2 – Re-wheel compressors

This option involves replacing the wheel or impellers the CS1 compressors with new equipment that can operate safely and efficiently under the new, low flow operating regime.

Re-wheeling is more cost effective than replacing the entire compressor, and can be reverted should operating conditions at CS1 change significantly to warrant it. The old wheels have been retained as spare should conditions change permanently to warrant two units with high flow wheels.

It should be highlighted that we initially expected both compressors to need re-wheeling. However, as part of the FEED study undertaken in the planning phase of this project, we prudently concluded that only one was required due to the low utilisation of CS1 at that time. We subsequently decided to indefinitely defer the re-wheeling of the second compressor. This scope variation is discussed further in section 1.3.2.

1.5.2.1 Achievement of objectives

Re-wheeling the compressors at CS1 to allow it to operate effectively under the current operational conditions delivers for customers in terms of reliability and public safety by eliminating the risk of surge due to low flow and subsequent unplanned shutdown of the compressor.

It is sustainably cost efficient in terms of working within industry benchmarks, and aligning with our own asset management objectives identified in the AMP, delivering profitable growth in that it appropriately responds to the current requirements of gas suppliers and users, can be adjusted to adapt to further changes to those requirements in the future.

The solution is also environmentally and socially responsible as it ensures optimal fuel gas efficiency.

Table 0.8 outlines how this option supports the achievement of our vision objectives.

[45] NGR 79(1)(a)

Table 0.8: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	Y
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	Y
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

1.5.2.2 Cost assessment

The estimated cost of this option is $1.2 million. Refer to section 1.3 for the detailed cost breakdown.

1.5.2.3 Risk assessment

This option represents the lowest treated risk, as it is targeting the individual assets in line with the AMP. It is therefore consistent with our Risk Management Framework and the only option that can achieve a 98% reliability contractual obligation at the lowest sustainable cost.

Table 0.9 below shows this option reduces the frequency of risk events, and is therefore consistent with our Risk Management Framework which requires us to *[m]odify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower.*

Table 0.9: Risk rating – Option 2

Risk Area	Untreated	Treated (Option 2)
DBP	Intermediate	Intermediate
People	Negligible	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	High	Intermediate
Asset Damage	Intermediate	Low
Supply	High	Intermediate
Overall Rating	**High**	**Intermediate**

Re-wheeling the compressors presents the lowest sustainable cost of addressing operational issues at CS1 and would therefore *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 providing services.*[46]

Refer to section 1.4 for more detail.

[46] NGR 79(1)(a)

1.5.3 Option 3 – Replace compressors with smaller compressor packages

This option removes the current compressors at CS1 and replaces them with smaller compressor packages, more suitably sized and designed to operate under the new low flow conditions.

1.5.3.1 Achievement of objectives

Replacing both units at CS1 with more suitably sized units to match current levels of flow delivers for customers in terms of reliability and public safety as it eliminates the risk of surge due to low flow resulting in the unplanned shutdown of the unit

However, this option is not sustainably cost efficient in terms of working within industry benchmarks, and aligning with our own asset management objectives identified in the AMP in delivering profitable growth as it would overinvest in assets to meet the current requirements of gas suppliers and users. Also, in consideration of future requirements, this solution cannot be as easily, and cost effectively, returned to larger capacity requirements should they be required in the future.

This solution would be considered environmentally and socially responsible in achieving optimal fuel gas efficiency.

Table 0.10 outlines how this option will support the achievement of our vision objectives.

Table 0.10: Alignment with vision – Option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	Y
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	N
Sustainably Cost Efficient – Delivering Profitable Growth	N
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

1.5.3.2 Cost assessment

The estimated cost of this option is $3.6 million. The estimate was developed for consideration and included in the FEED study.

It includes internal labour costs for installation and equipment costs sourced directly from the manufacturer – Solar – who participated in the FEED study.

More detailed information is provided in the FEED study.

1.5.3.3 Risk assessment

Table 0.11 shows this solution would remove the risks associated with the operation of compressor impellers that are too large for the current low flow operations. However, it would introduce a new risk in terms of the additional cost and potential reputation damage if CS1 flows increased in the future and larger compressor packages have to be reinstalled.

Table 0.11: Risk rating – Option 3

Risk Area	Untreated	Treated (Option 3)
DBP	Intermediate	Intermediate
People	Negligible	Negligible
Environmental	Negligible	Negligible
Reputation/Outrage	High	High
Asset Damage	Intermediate	Intermediate
Supply	High	Intermediate
Overall Rating	**High**	**High**

Replacing the compressors at CS1 with more suitably sized (smaller) compressor packages reduces the risk rating in the following ways:

- **DBP** – the station will return to efficient operation meaning that fuel efficiency and optimal operation is again possible and compressors would not move to recycle. However, this option does require more capital expenditure than we consider is necessary. There may also be additional costs if the compressor package size has to be increased in the future.

- **Reputation/Outrage** – it would avoid any major concern or anger from producers, but may cause shippers concern given the unnecessary expenditure level of investment required to make this change. our reputation may also be damaged if flow rates increase in the near future and the smaller compressor packages need to be upgraded.

- **Asset Damage** – it would shift operation away from surge conditions and hence unlikely to cause trips and potential safety impact and/or severe damage to compressor station equipment.

- **Loss of Supply** – it would improve ability of shippers to balance nominations against use, meaning the frequency of a major disruption to supply is reduced to remote.

1.6 Summary of options

To assess the options, the costs, objectives and risk are considered for each option. A summary of the options assessment is shown in Table 0.12.

Table 0.13: Summary of cost/benefit analysis

Option	Objectives	Cost	Risk
Option 1 - Continue to operate compressors below design flows	Does not align with our vision objectives of delivering for customers and being sustainably cost efficient. Also does not align with our asset management objectives outlined in the AMP.	No capital expenditure required except reactively Potential for $2.5 - $10 million for asset repairs There are also likely cost impacts that are not quantifiable discussed in section 1.5.1.2.	Does not adequately reduce risks to DBP, Outrage/Reputation, Asset Damage and Loss of Supply
Option 2 - Re-wheel one of the two compressors	Aligns with our vision objectives of delivering for customers and being sustainably cost efficient. Also aligns with our asset management objectives outlined in the AMP.	$1.2 million	ALARP
Option 3 - Replace compressors with smaller compressor packages	Align with our vision objectives of delivering for customers but is not sustainably cost efficient. Also does not align with our asset management objectives outlined in the AMP.	$3.6 million	ALARP, however it introduces a new risk if flow rates increase in the near future

1.7 Progressed solution

1.7.1 Why is the progressed solution prudent?

Option 2 was recommended and subsequently progressed to ensure we continue to deliver safe and reliable pipeline services. It is consistent with good industry practice and lowers the risks associated with the operational low flow of gas through CS1 in line with the AMP guidelines, the Risk Management Framework and good industry practice.

Failure to address the issue could result in the failure of an asset which would result in loss of through-put, excessive operating expenditure and impact on reliability and the ability to meet contractual obligations

1.7.1.1 Consistency with the National Gas Rules

Rule 79(1)

Option 2 is consistent with Rule 79(1)(a), which requires that *capital 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 providing services.*

We consider that the capital expenditure is:

- Prudent – The project is based on the replacement of an existing asset which no longer meets the needs of the business and its stakeholders (gas producers and shippers). Because the replaced wheel had not reached the end of its useful life, it has been put in to storage and is available as either a spare or in the event demand returns to previous levels, can be reinstated in CS1. The proposed expenditure can therefore be seen to be of a nature that would be incurred by a prudent service provider.

- Efficient – The expenditure incurred was efficient as the changes in volume forecasts confirm that re-wheeling one unit was sufficient at this time. The work at CS1 was undertaken externally and competitively procured in line with our Procurement Policy. Therefore, the expenditure is consistent with the expenditure that a prudent service provider acting efficiently would incur.

- Consistent with accepted and good industry practice – The project follows good industry practice by ensuring the compressor station operates at or below the manufacturer's recommended speed to efficiently service the gas flow requirements at that station. The 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 replacement program in a proactive, planned and scheduled manner with the most appropriate volume of activity based on useful life, business needs (optimised over the short and long term) and in line with manufacturer's guidance and associated support.

Rule 79(2)(c)

The capital works program was necessary to maintain integrity of pipeline services. Re-wheeling a single compressor satisfies the grounds under Section 79(2)(c) of the National Gas Rules (NGR), which states capex is justifiable if:

(c) the capital expenditure is necessary:

> *(i) to maintain and improve the safety of services; or*
>
> *(ii) to maintain the integrity of services; or*
>
> *(iii) to comply with a regulatory obligation or requirement; …*

The re-wheeling of one unit at CS1 was required to maintain the integrity of services, which would otherwise be compromised should CS1 continue to operate well below its design flow levels which could lead to surge and shutdown with units remaining offline and unavailable for use for an extended period of time. Therefore, this expenditure is consistent with NGR 79(2)(c)(ii).

1.7.2 Efficient costs

The cost for the re-wheeling of CS1 includes the internal labour, external labour and materials/other costs forecast. The project was delivered slightly ahead of schedule and at lower cost compared to forecast, driven largely by the need to only address one compressor station rather than two.

Equipment was supplied by [redacted] under contract, which is managed in accordance with our Procurement Policy and Purchasing Procedure, and represented some 85% of the total cost of the project.

Detailed information on the actual cost and reasons for variations between the forecast and actual cost is provided in section 1.3.2.

Appendix A – Summary of risk assessment

Figure 1.3: Summary of 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	Severe	Occasional	INTERMEDIATE	25	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIG BLE	1	Major	Occasional	HIGH	125	Severe	Occasional	INTERMEDIATE	25	Major	Occasional	HIGH	125	302
Option 1 - Do Nothing	Severe	Occasional	INTERMEDIATE	25	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIG BLE	1	Major	Occasional	HIGH	125	Severe	Occasional	INTERMEDIATE	25	Major	Occasional	HIGH	125	302
Option 2 - Rewheel one of the two gas turbines	Severe	Unlikely	INTERMEDIATE	25	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIG BLE	1	Major	Remote	INTERMEDIATE	25	Severe	Remote	LOW	5	Major	Remote	NTERMEDIATE	25	82
Option 3 - Replace with smaller gas turbine units (i e. Solar Taurus)	Severe	Occasional	INTERMEDIATE	25	Trivial	Remote	NEGLIGIBLE	1	Trivial	Remote	NEGLIG BLE	1	Major	Occasional	HIGH	125	Severe	Occasional	INTERMEDIATE	25	Major	Remote	NTERMEDIATE	25	202

IT Sustaining Infrastructure Business Case – Capex DBP30

1.1 Project Approvals

Table 0.1: IT Sustaining Infrastructure DBP30 – Project approvals

Prepared By	Amber Smith, Manager IT
Reviewed By	Kylie Stones, IT PMO Manager; Praveen Desari, Solution Architect
Approved By	Andrew Staniford, Chief Customer Officer

1.2 Project Overview

Table 0.2: IT Sustaining Infrastructure DBP30 – Project overview

Description of Issue/Project	Maintain a stable Information Technology (IT) infrastructure that is current and fit for purpose to ensure that all IT stakeholders can access IT Applications when they need to. Deliver ongoing IT infrastructure renewal to maintain the integrity of the environment and manage technology risks. Refresh key infrastructure including desktops and telephony in line with our lifecycle management plan. This is a continuing program of work with an increase in activities compared to previous periods to catch up underinvestment in the past and support initiatives we will deliver under our IT Enabling, IT Security and IT Sustaining Applications projects.
Project Name	IT Sustaining Infrastructure
Estimated Cost	Total capex for AA5 is $4.2 million. The costs have been estimated based on historic costs delivering the same, or similar work, supplier pricing and an asset management schedule.
Basis of costs	All costs in this business case are expressed in real unescalated dollars June 2019 unless otherwise stated.
Options considered	• Option 1 – Break-Fix approach – Ad-hoc approach that budgets for replacing assets as they break or move out of vendor support with multiple big-bang replacement projects ($1.5 million); • Option 2 – Deliver proactive IT Sustaining Infrastructure initiatives on a 3/5 year asset replacement schedule ($4.0 million) (this is the recommended option); and • Option 3 – Deliver proactive IT Sustaining Infrastructure initiatives on a 5/7 year asset replacement schedule ($2.6 million).
Expenditure incurred in AA4	Approved expenditure for similar works in AA4 was $1.1 million. We are forecasting to actually spend $1.8 million on our IT Sustaining program in AA4. The drivers of the $0.7 million increase compared to forecast are: • L6 Office Refit & AV upgrade of $0.2 million to equip all medium sized meeting rooms with AV facilities; • Citrix Upgrade of $0.3 million to address physical sever issues which saw the transition to virtual servers brought forward to mitigate risk of unmanageable outages; and • Additional hardware renewal of $0.3 million reflecting the adoption of a more proactive end-of-life approach for end user equipment implemented part way through AA4.

Consistency with the National Gas Rules (NGR)	NGR 79(1) – Maintaining stable Information Technology (IT) infrastructure that is current and fit for purpose is critical to ensure that all IT stakeholders can access IT Applications when they need to. It is prudent to renew IT Infrastructure in line with our lifecycle management plan to maintain the integrity of our IT environment and manage technology risks. The proposed proactive IT Sustaining Infrastructure initiatives are consistent with accepted good industry practice in terms of the timing of asset renewals, several alternative options have been considered and unit rates and timing of refreshes have been tested to achieve the lowest sustainable cost of delivering pipeline services. NGR 79(2) - The proposed expenditure on our IT Sustaining Infrastructure project is required to maintain the integrity of services through current, supported and fit for purpose IT infrastructure, managing technology risks and preventing material outages or deteriorating performance which can come from ageing infrastructure. Our IT sustaining infrastructure program must ensure continual access to IT Applications which support critical business processes, including those related to compliance with the various regulatory obligations and requirements we are subject to, such as the Critical Infrastructure Act, Privacy Act and gas market reporting that need timely access to information for regulatory reporting. NGR 74 – the forecast costs are based on the latest market rate testing, and project options consider the requirements of our IT infrastructure environment. Cost assessments have been conducted for each option based on the best information available at the time of developing this business case. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Stakeholder engagement	<u>Customers</u> 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 IT Sustaining Infrastructure program will ensure the ongoing stability of the IT Infrastructure that our IT applications are dependent on that in turn our business operations are dependent on. This IT infrastructure will also enable the opportunity for new ways for Shippers to interact with our information. During our Shipper Roundtables we presented key areas of our planning, including our proposed capex and opex. We gave a high-level view of our IT capex to explain the step change in IT investment we are proposing in AA5. 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 IT Sustaining Infrastructure program. In response to Shippers' general interest in key areas and drivers of increased spend this business case clearly outlines reasons for changes in expenditure between AA4 and AA5. <u>Other</u> We engaged with various key stakeholders across the business to develop our IT Strategy, Roadmap and Investment Plan for AA5. This included owners and users of key systems. As part of the proposed AGIG IT Strategy and Roadmap there is an initiative (T4T-03) to Optimise the End User Environment that aligns with the IT Sustaining Infrastructure program.
Other relevant documents	This Business Case should be read in conjunction with: • DBP IT Investment Plan • Asset Management Plan (TEB-001-0024-07) • Other technology Business Cases: IT Enabling, IT Sustaining Applications, IT Security, Maximo and DMZ and CRS

1.3 Background

Our business processes and customer outcomes are based on reliable access to information. That information is all stored in, and accessed through our IT applications. Those IT applications run on and are accessed by IT infrastructure. For this business case IT infrastructure is defined as any IT technology used to store, host, or access our IT Applications. This includes, but is not limited to:

- Networking infrastructure (e.g. switches, routers, Wi-Fi)
- Communications links (e.g. network links between data centres)
- Servers that IT Applications are hosted on (e.g. virtual servers)
- End user computing devices (e.g. PC's, laptops, tablets, mobile phones)
- End user client software (e.g. Windows, Office 365)
- Input/output devices (e.g. printers, multifunction devices)
- Telephony devices (e.g. desktop phones, satellite phones, mobile phones)
- Meeting room equipment (e.g. tele/video conferencing, projectors)

All IT infrastructure assets have a lifecycle, from initially identifying the need for them right through to their retirement. This lifecycle should be treated the same as for any organisational asset. Just like all assets, IT infrastructure assets need a certain level of ongoing maintenance to maximize their effective lifecycle.

Not maintaining IT infrastructure to appropriate levels introduces 'technical debt' which accumulates over time and becomes more expensive to address the longer it is left to develop. Technical debt is a concept in software development, that applies to IT infrastructure as well, that reflects the implied cost of additional rework caused by choosing an easy (limited) solution now, instead of using a better approach that would take longer and cost more in the short term but less in the long term. Technical debt is often compared to monetary debt. If technical debt is not repaid, it accumulates 'interest', making it harder to implement changes later on.

With IT Infrastructure this technical debt translates to end users as instability of systems, more frequent random outages of the network and computers, all of which lead to frustration, manual workarounds, inefficiencies and missed targets. Continued random outages usually leads to 'shadow IT' where business people turn to their own IT to get the job done, introducing security and information loss risks.

The reality of IT infrastructure is that regardless of how good the planning, design, acquisition and commissioning stages are, not all business process needs can be met by systems from day 1 of their use and also business needs change over time. This results in either manual process workarounds or changes to the IT infrastructure over time.

All of these lifecycle factors are highlighted in Figure 0.1: IT Infrastructure asset lifecycle concepts. This type of conceptual model is used to determine the overall lifespan of IT infrastructure assets, the cost vs benefits of how long to operate an IT infrastructure asset and some of the key factors to consider when determining their replacement is due.

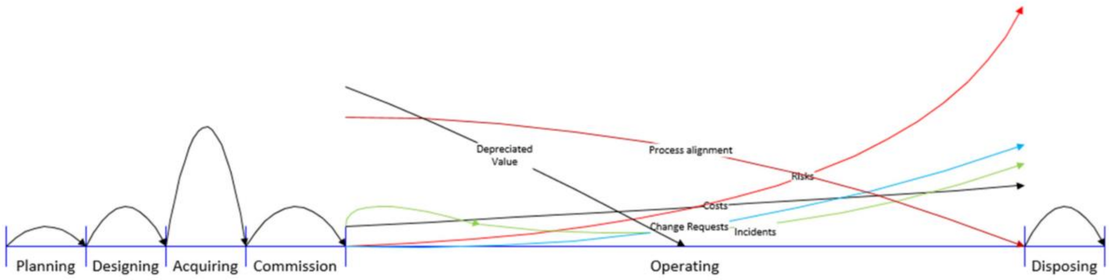


Figure 0.1: IT Infrastructure asset lifecycle concepts

The rapid rate of change of technology combined with the highly co-dependent nature of IT infrastructure assets with IT applications creates an environment where IT infrastructure assets can have varying lifecycles. For example laptops that are constantly being used as intended (e.g. mobile) usually have a shorter lifecycle than printers or desk phones whose functionality and use are such that they last longer.

Our historical approach to IT infrastructure lifecycle maintenance has been ad-hoc and has not followed an industry standard approach of proactive replacement before end-of-life. Good industry practice suggests “high impact” end user computing devices (e.g. laptops) tend to be on a 3 year replacement cycle whereas low use end user devices (e.g. desktop PCs), servers, telephony, printing and networking equipment are on a 5 year replacement cycle. These replacement cycles are in line with those suggested by equipment manufacturers through their warranty and support arrangements.

The current IT infrastructure and our asset lifecycle approach (which was implemented part way through AA4) is defined in Table 0.3. It was developed to reflect industry norms, but also considers the impact of the historical ad-hoc approach and the experiences of our IT team and IT support service provider.

Table 0.3: IT Infrastructure Asset fleet size estimates

IT Asset	Fleet size estimates	Current asset lifecycle
Networking infrastructure (e.g. switches, routers, Wi-Fi)	60 switches 2 core switch/routers 4 security devices	5 years 5 years 5 years
Communications links (e.g. fibre between sites, microwave links)	4 fiber links 4 redundancy links	~15 years
Servers that IT Applications are hosted on (e.g. virtual servers)	65 Infrastructure as a Service servers 65 virtual server OS	n/a 3 years
End user computing devices (e.g. PC's, laptops, tablets, mobile phones)	225 laptops, 225 docking stations 450 monitors 150 desktop PCs	3 years 5 years 5 years
End user client software (e.g. Windows, Office 365, Office 365 Security)	300 desktop OS 300 Office application suites	1 year 1 year
Input/output devices (e.g. printers, multifunction devices)	15 multifunction devices	5 years
Telephony devices (e.g. desktop phones, satellite phones, mobile phones)	175 desktop phones 120 satellite phones	5 years 3 years
Meeting room equipment (e.g. tele/video conferencing, projectors)	12 meeting room systems	5 years

1.4 AA5 forecast

As far as possible we have spread the investment in infrastructure renewal out over the asset lifecycle (e.g. for 3 year assets, around one third of the fleet is replaced each year).

The total forecast capex in AA5 is shown in Table 0.4.

Table 0.4: Forecast AA5 capex

($'000)	2021	2022	2023	2024	2025	Total
IT Asset Renewal (Lifecycle Management)	52	0	25	0	635	712
IT Asset Renewal (End-User Compute)	427	427	427	427	427	2,137
IT Asset Renewal (Virtual Servers)	0	260	0	260	0	520
Group Services Introduction Program	254	335	0	0	0	589
Total	**733**	**1,022**	**452**	**687**	**1,063**	**3,958**

In CY2020, our CBD office and control room will relocate (see DBP27 Office Relocation Business Case). The relocation project includes installation of new core networking switches/routers and some network access switches, as those in use at the current location are at end of life. The current telephony and conference room infrastructure will be moved. This will see investment in both capacity and lifecycle for our CBD office such that the updated equipment will not need changing in the AA5 cycle.

1.4.1 Key aspects of the program

The key aspects of the IT Sustaining Infrastructure program are:

- Refresh key infrastructure including desktops and telephony in line with our lifecycle management plan, incorporating the office relocation where necessary;
- Maintain a stable technology environment that is current (up to date and supported by vendors) and fit for purpose;
- Align DBP to good industry practices around data driven IT asset lifecycle management.

These aspects are supported by a number of individual initiatives, which are broadly outlined below.

1.4.1.1 Asset Renewal

Table 0.5: Requirements of IT Infrastructure Asset Renewal

Initiative	Program of Work
IT Asset Renewal (Life Cycle Management)	Ongoing replacement of IT infrastructure assets as per the asset management schedule (e.g. switches, routers, ISP connections, Wi-Fi network, telephony and meeting room technologies).
IT Asset Renewal (End-User Compute)	Continuing refresh of end-user computing devices that are reaching end-of-life and update/upgrade associated operating system and end user client software (e.g. laptops, tablets, desktops).
IT Asset Renewal (Virtual Servers)	Continuing refresh the virtual IT infrastructure and associated operating software (e.g. servers).
Whole of Group Services Integration	Positions DBP to realise greater integration of AGIG group-wide services potentially enabling whole-of-group services to be introduced realising economies of scale.

1.4.2 AA4 comparison

Table 0.6: Comparison of actual and approved capex in AA4

($'000)	2021	2022	2023	2024	2025	Total
Actual	205	389	621	424	150	1,790
Approved	283	198	195	191	187	1,054
Variance	**(78)**	**191**	**426**	**233**	**(37)**	**736**

The forecast actual expenditure in AA4 is $0.7 million above the approved amount of $1.1 million. The drivers of this increase were:

- L6 Office Refit & AV upgrade of $0.2 million to equip all medium sized meeting rooms with AV facilities;
- Citrix Upgrade of $0.3 million to address physical sever issues which saw the transition to virtual servers brought forward to mitigate risk of unmanageable outages; and
- Additional hardware renewal of $0.3 million reflecting end-of-life of end user equipment.

This is a continuing program of work, with expenditure incurred in all years of AA5. As shown in Table 0.7 below, there is a proposed uplift of $2.2 million compared to AA4 to remediate historic underinvestment, formalise the current asset lifecycle approach, introduce group services and support our IT Enabling, IT Security and IT Sustaining Applications programs of work.

Table 0.7: Forecast AA5 capex

<table>
<tr><th>($'000)</th><th>2021</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th><th>Total AA5</th><th>Total AA4</th><th>Variance</th></tr>
<tr><td>IT Asset Renewal (Lifecycle Management)</td><td>52</td><td>0</td><td>25</td><td>0</td><td>635</td><td>712</td><td rowspan="2">1,516</td><td rowspan="2">1,333</td></tr>
<tr><td>IT Asset Renewal (End-User Compute)</td><td>427</td><td>427</td><td>427</td><td>427</td><td>427</td><td>2,137</td></tr>
<tr><td>IT Asset Renewal (Virtual Servers)</td><td>0</td><td>260</td><td>0</td><td>260</td><td>0</td><td>520</td><td>274</td><td>246</td></tr>
<tr><td>Group Services Introduction Program</td><td>254</td><td>335</td><td>0</td><td>0</td><td>0</td><td>589</td><td>-</td><td>589</td></tr>
<tr><td>Total</td><td>733</td><td>1,022</td><td>452</td><td>687</td><td>1,063</td><td>3,958</td><td>1,790</td><td>2,168</td></tr>
</table>

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

Figure 0.2: 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 framework for consequence assessment across a number of elements and the framework for likelihood assessment is shown in Appendix A – Risk Assessment.

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'.

Our IT Infrastructure supports our IT applications, our CBD office and control room, and all safety and security systems. Asset decisions, day to day operations, regulatory reporting and staff efficiency are dependent on IT applications utilising our IT infrastructure assets to store, host, or access critical business information.

The overall risk rating of IT Sustaining Infrastructure is presented in Figure 0.3: Risk rating – IT Sustaining Infrastructure. Three elements of risk are rated as high, one intermediate and one low. This results in a high risk ranking for these assets in an untreated scenario.

Figure 0.3: Risk rating – IT Sustaining Infrastructure

	Trivial	Minor	Severe	Major	Catastrophic
Frequent			Reputation/ Outrage		
Occasional				DBP	
Unlikely				Loss of supply	
Remote				Asset Damage	
Hypothetical	People			Environment	

Negligible	Low	Intermediate	High	Extreme

1.5.1 Untreated risk

If the proposed upgrades are not implemented, the risk of catastrophic failure increases year-on-year, and if this extends beyond the AA5 period, the risk will increase from 'High' to 'Extreme'.

Refer to the full risk assessment result included as Appendix A to the Business Case.

Table 0.8: Risk rating

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

Specifically, the risks are to:

- DBP – Not proactively maintaining IT infrastructure assets is not considered prudent due to issues associated with accessibility to vital information, unmet business needs and inability to meet stakeholder expectations including clients, management and regulators.

- Reputation – New IT applications will increase the demand from Shippers to have reliable access to them, investing in the applications but not the infrastructure would create a disconnect for the Shippers which would cause major concern and anger.

- Asset damage – Unidentified monitoring alerts and lack of response could put assets at risk, the pipeline control centre, asset manage and operations and maintenance rely on IT infrastructure assets.

- Supply – We operate our assets remotely from our pipeline control centre in Perth. Continued degradation of IT infrastructure assets poses unacceptable risk of loss of control.

1.6 Options Considered

A number of options have been considered to address the risks and benefits of how we maintains our IT infrastructure assets over AA5. These are:

- Option 1 – Break-fix approach – Ad-hoc approach that budgets for replacing assets as they break or move out of vendor support with multiple big-bang replacement projects;
- Option 2 – Deliver proactive IT Sustaining Infrastructure initiatives on a 3/5 year asset replacement schedule; and
- Option 3 – Deliver proactive IT Sustaining Infrastructure initiatives on a 5/7 year asset replacement schedule.

The following sections discuss these options in more detail.

1.6.1 Option 1 – Ad-hoc approach that budgets for replacing assets as they break or move out of vendor support

Option 1 would revert to the historical approach of maintaining IT infrastructure assets by estimating the number of devices that are likely to fail and only budget to replace them, or if an asset can no longer be supported by its vendor and then planning for a 'big bang' asset replacement that replaces all of one type of asset in one go (e.g. replace a large portion of the fleet of laptops in one project where the vendor has withdrawn support for the deployed assets due to their age and obsolescence).

Across the early part of AA4, we implemented this approach. However, we shifted to a proactive approach of defining asset lifecycles and progressively updating the assets to spread the financial and operational risk impacts which was guided by accepted good industry practice as well as the experience of our IT team and IT support vendor.

Whilst we have not had a material risk event due to an IT infrastructure failure it is likely that this break-fix option will expose us to a material impact due to a range of factors including, but not limited to:

- failure in older assets may occur, resulting in unplanned outages for individuals (e.g. laptop) or everyone (e.g. core network device);
- assets become gradually more unstable and vulnerable to security breaches, which may allow staff and customer data to be compromised;
- the IT infrastructure assets will eventually be unable to support DBP's strategic objectives;
- the costs of maintenance and support agreements will increase as the assets are not upgraded and therefore placed out of the prescribed vendor maintenance cycles;
- lost opportunities for operating efficiencies due to better end user computing, telephony and meeting room devices; and
- instability for Shippers to new IT applications proposed for update in the AA5 period.

1.6.1.1 Achieving objectives

Table 0.9 below outlines how an ad-hoc approach will support the achievement of our vision objectives in AA5.

Table 0.9: 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 of our vision objectives of delivering for customers, being a good employer and being sustainably cost efficient as continuing with an ad-hoc approach for IT Infrastructure has the potential to materially impact customer service, is not on line with accepted good industry practice and would lead to higher costs to resolve outages, seek specialised support arrangements with vendors and undertake manual workarounds in the medium to long term.

1.6.1.2 Cost assessment

There is no accurate historical data to estimate the IT infrastructure asset expenditure. One of the proposed projects in AA5 is to implement an IT System Asset Management capability to be able to track this information. Based on the historical spend, management are aware of an estimation of $0.3 million forecast for CY2021 with linear increase as the cost of parts and repairs exceeds the cost of replacement over time.

Table 0.10: Capex estimate based on historical break-fix approach

	2021	2023	2023	2024	2025	Total
Capex	258	271	290	325	390	1,533
Total	**258**	**271**	**290**	**325**	**390**	**1,533**

1.6.1.3 Risk assessment

Table 1.11 below shows that an ad-hoc approach to IT Sustaining Infrastructure initiatives in AA5 does not 'modify the threat, the frequency or the consequence to reduce the risk rank to intermediate or lower'.

Table 0.11: Risk Rating - Option 1

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

The major risks associated with an ad-hoc approach to IT Sustaining Infrastructure are:

- DBP – Not proactively maintaining IT infrastructure assets is not considered prudent due to issues associated with accessibility to vital information, unmet business needs and inability to meet stakeholder expectations including clients, management and regulators.
- Reputation – New IT applications will increase the demand from Shippers to have reliable access to them, investing in the applications but not the infrastructure would create a disconnect for the Shippers.
- Asset damage – Unidentified monitoring alerts and lack of response could put assets at risk, the operations management centre systems rely on IT infrastructure assets.
- Supply – DBP operates its assets remotely from its operations control centre in Perth. Continued degradation of IT infrastructure assets poses unacceptable risk of loss of control.

1.6.2 Option 2 – Deliver proactive IT Sustaining Infrastructure initiatives on a 3/5 year asset replacement schedule

With this option, DBP would undertake IT Sustaining Infrastructure initiatives to address current issues and support future needs, including:

- Refresh key infrastructure including end user computing devices, servers and telephony in line with our lifecycle management plan. See Table 0.3 for the proposed lifecycles.
- Maintain a stable technology environment that is current (up to date and supported by vendors) and fit for purpose.

The planned upgrades are required to, among other things; manage the transition of one version of the technology to a subsequent improved version. Upgrade versions are provided by vendors who recommend that their technology be upgraded to ensure continued provision of ongoing support and maintenance and that any known issues including security vulnerabilities are addressed. The upgrades also bring additional functionality to the end use computing, network and telephony environments that the business can consider exploiting through change of business processes.

These initiatives are considered mandatory to maintain the security and integrity of the IT infrastructure that DBP is reliant upon. They will enhance operational efficiencies, enable information collaboration, reliable access to vital information, and positioning the organisation to be more agile and responsive to change. Not maintaining IT infrastructure systems and infrastructure to appropriate levels will introduce 'technical debt' which accumulates over time and becomes more expensive to address the longer it is left to develop.

1.6.2.1 Achieving objectives

Table 0.12 below outlines how this option will support achievement of our vision objectives in AA5.

Table 0.12: 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 proactively maintains stable IT Infrastructure to support business processes, in line with good industry practice at a sustainable cost over the medium to longer term.

1.6.2.2 Cost assessment

The capital cost of delivering the changes required to address existing issues and future needs is estimated to be $4.0 million.

Cost estimates are based on the latest market rate testing, considering the requirements of our application environment and using the best information available at the time of developing this business case. A formal procurement process will be undertaken for each of the initiatives to ensure the works are delivered at an efficient cost.

Table 0.13: Capex/Opex split – Option 2

($'000)	2021	2020	2022	2023	2025	Total
Capex	733	1,022	452	687	1,063	3,958
Opex	-	-	-	-	-	-
Total	**733**	**1,022**	**452**	**687**	**1,063**	**3,958**

Table 0.14: Forecast AA5 capex – Option 2

($'000)	2021	2022	2023	2024	2025	Total
IT Asset Renewal (Lifecycle Management)	52	0	25	0	635	712
IT Asset Renewal (End-User Compute)	427	427	427	427	427	2,137
IT Asset Renewal (Virtual Servers)	0	260	0	260	0	520
Group Services Introduction Program	254	335	0	0	0	589
Total	733	1,022	452	687	1,063	3,958

1.6.2.3 Risk assessment

Table 1.10 below shows that implementing proactive IT Sustaining Infrastructure initiatives in AA5 modifies the frequency or the consequence to reduce the risk rank to intermediate or lower in line with our Operational Risk Framework.

Table 0.15: Risk Rating - Option 2

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

This option appropriately addresses the major risks to DBP, Reputation, Asset Damage and Supply associated with IT Infrastructure by providing for proactive asset renewal in line with industry standards to ensure continued business performance, integrity, capability and stability.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.6.3 Option 3 – Deliver proactive IT Sustaining Infrastructure initiatives on a 5/7 year asset replacement schedule

With this option, we would undertake IT Sustaining Infrastructure initiatives proactively as per Option 2, but using longer asset lifecycles which would spread the costs over a longer period and effectively reducing the shorter lifecycle asset costs by 13% per year and 6% per year for the longer lifecycle assets.

The proposed asset lifecycles under this option are shown in Table 0.16 below.

Table 0.16: Longer IT Infrastructure Asset lifecycles

IT Asset	Fleet size estimates	Longer asset lifecycle
Networking infrastructure (e.g. switches, routers, Wi-Fi)	60 switches 2 core switch/routers 4 security devices	7 years 7 years 7 years
Communications links (e.g. fibre between sites, microwave links)	4 fiber links 4 redundancy links	~15 years
Servers that IT Applications are hosted on (e.g. virtual servers)	65 Infrastructure as a Service servers 65 virtual server OS	n/a 5 years
End user computing devices (e.g. PC's, laptops, tablets, mobile phones)	225 laptops, 225 docking stations 450 monitors 150 desktop PCs	5 years 7 years 7 years
End user client software (e.g. Windows, Office 365, Office 365 Security)	300 desktop OS 300 Office application suites	2 years 2 years
Input/output devices (e.g. printers, multifunction devices)	15 multifunction devices	7 years
Telephony devices (e.g. desktop phones, satellite phones, mobile phones)	175 desktop phones 120 satellite phones	7 years 5 years
Meeting room equipment (e.g. tele/video conferencing, projectors)	12 meeting room systems	7 years

1.6.3.1 Achieving objectives

Table 0.17 below outlines how this option will support the achievement of our vision objectives in AA5.

Table 0.17: 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	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 delivers for customers (as the change in timeframes for renewals will take time to affect the overall fleet), does not align with being a good employer in terms of employee engagement (driven primarily by those employees with the oldest and worst performing end user compute assets) and is not sustainably cost efficient in terms of working within industry benchmarks, particularly over the medium to longer term where it poses significant risk of increased reactive replacement costs, lost efficiency and potentially lost information through poor IT infrastructure asset performance and/or failure.

1.6.3.2 Cost assessment

The capital cost of delivering the changes required to address existing issues and future needs in line with the longer 5-7 year asset lifecycle for IT Infrastructure is estimated to be $2.6 million. This does not include any potential impacts of asset failure during AA5.

Table 0.18: AA5 Capex - Option 3

($'000)	2021	2022	2023	2024	2025	Total
IT Asset Renewal (Lifecycle Management)	52	0	25	0	0	77
IT Asset Renewal (End-User Compute)	282	282	282	282	282	1,412
IT Asset Renewal (Virtual Servers)	0	260	0	260	0	520
Group Services Introduction Program	254	335	0	0	0	589
Total	**588**	**877**	**307**	**542**	**282**	**2,598**

This option materially reduces the AA5 Capex compared to Option 2, in two key ways:

1. This approach moves the $0.6m network infrastructure end-of-life uplift for the CBD Office and Control Room from CY2025 to CY2027 in the AA6 period. This does not avoid the cost but does move the capex impact to AA6 period.
2. The end user computing device approach is to uplift a percentage of the fleet across its lifecycle. By extending the lifecycle from 3 years to 5 years this would reduce the capex budget from $0.4m to $0.3m or 25%.

However, the projected savings come at a cost. As the IT assets enter their last two years of life their reliability become less predictable and the costs associated with repairing modern technology are typically more than the cost of replacement. Both of these options trade deferred planned spending for unplanned spending.

Computer Economics research based on the updated ISO 19770-1:2017 – IT Asset Management recommends that organisations should monitor their IT Asset lifecycles but also indicate the industry trends show a lifecycle of 3 years for mobile and security devices and 5-6 years for most others. We expect that adopting a longer asset lifecycle for these devices introduces increased reactive costs to address failures, as well as inefficiencies from deteriorating performance and outages as the assets age and become less stable that would outweigh the capex savings made over the medium to longer term.

1.6.3.3 Risk assessment

Table 0.19 below shows that implementing proactive IT Sustaining Infrastructure initiatives, but with an increased lifecycle across assets in AA5 will reduce the frequency of risks to DBP, Reputation, Asset Damage and Supply, but it is unlikely this reduction will be sustainable toward the latter end of the period as the assets age.

Table 0.19: Risk Rating - Option 3

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

The approach of extending IT asset lifecycles by 2 years is a better approach than Option 1, however it is believed that it will still expose us to a growing risk of unplanned outages or higher maintenance costs as the assets are in their last few years of life.

Specifically:

- DBP – Extending the life of IT infrastructure assets beyond accepted industry practice is likely to impact operations and lead to unacceptable cost consequences through failure, additional maintenance, unplanned outages and inefficiencies which can all result from poorer asset performance or instability of IT infrastructure assets as they age.

- Reputation – New IT applications will increase the demand from Shippers to have reliable access to them and the information they store, investing in the applications to improve customer service in this way, but not the infrastructure to continue to support these applications would create a disconnect for the Shippers. It would also cause frustration for employees where applications run slower or cannot perform tasks they are capable of due to infrastructure limitations to host and store the information required.

- Asset damage – Unidentified monitoring alerts and lack of response could put assets at risk, the pipeline control centre systems rely on IT infrastructure assets that are renewed in line with changing application requirements and the volume of information being stored.

- Supply – DBP operates its assets remotely from its pipeline control centre in Perth. Continued degradation of IT infrastructure assets poses unacceptable risk of loss of control.

Refer to the full risk assessment result included as Appendix A to the Business Case.

1.7 Summary of Cost/Benefit Assessment

To assess the options, the costs, objectives and risk are considered for each option. A summary of the option assessment is shown in

Table 0.20 below.

Table 0.20: Summary of Cost/Benefit analysis

Option	Objectives	Costs	Risks
Option 1	This option does not achieve our objectives of delivering for customers, being a good employer or being sustainably cost efficient	$1.5m Uncertain additional costs based on average modelling issues.	This option does not adequately address the high and intermediate risks to DBP, Reputation, Asset Damage and Supply
Option 2	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 and intermediate risks to DBP, Reputation, Asset Damage and Supply to ALARP
Option 3	This option does not achieve all of our objectives in terms of delivering for customers, being a good employer and being sustainably cost efficient	$2.6m Likely increasing of unplanned replacement costs at the end of AA5 period, plus costs of failure and inefficiencies as asset performance deteriorates in the later years	This option does not adequately address the high and intermediate risks to DBP, Reputation, Asset Damage and Supply as lengthening the replacement schedule of IT Infrastructure increases the risk of unplanned outages or failure, inefficiencies through deteriorated asset performance and risks that the infrastructure renewal does not keep pace with the requirements of our IT Applications

1.8 Proposed Solution

1.8.1 What is the Proposed Solution?

Option 2 is the proposed solution because it finds a fit-for-purpose balance between a break-fix approach with big lumpy capex impacts due to big bang replacement projects and 'sweating the assets' approach that will increase the likelihood of network and end user computing devices outages as devices are in their final years. For example, users that are mobile and are required to maintain the same laptops for 5 years will find that in the last 2 years of that devices life there will be an increasing number of issues that impact their ability to work.

This option sees the capex impact spread evenly over every year resulting in a 'no surprises' approach. It enables the IT team to maintain a repeatable and reliable process to upgrade devices and also allows flexibility to deal with edge cases. For example, organisations that replace their entire fleet every 5 years often find that when business requirements change, or new technology arrives (e.g. high capacity batteries enabling a full working day on one charge) that that the business would benefit from, there is no room to incorporate that where needed. With a constantly cycling fleet of machines, newer technologies can be gradually included, where appropriate, on a new flexible cycle.

This approach also reduces the risks associated with change management. The impact of a whole fleet changeover requires a dedicated team and significant project management, replacing one third of the fleet is less disruptive and as the team are performing these tasks continually they develop the capability to do it more efficiently.

Option 1 has a significant risk associated with it. For the CBD Office and Control Room networking equipment, if a component nearing the end of its lifecycle ceased functioning, it is likely that a large number of users, or even customers, would be impacted. As opposed to an end user computing asset that would only impact one person where the risk could be managed by having a few spares. For large core infrastructure that is beyond vendor recommended lifecycles, spare parts may not be readily accessible. This could leave the whole of the CBD Office and Control Room without a functioning network for weeks.

Option 3 has a different risk, the end user computing devices are how all users 'experience' IT, over the 2 year extended period with more frequent disruptions there is the risk that the internal perception of IT will diminish and there will be overall productivity losses as a result.

1.8.1.1 Implementation of the Initiatives

This business case spans a wide range of IT infrastructure each with their own implementation context. Some are under maintenance agreements where the upgrade projects are only reflecting the Contractors/Consultants costs, some require product decisions that have to line up with other business units plans.

Where the project involves system acquisition or outsourcing of a service, these activities will be undertaken in line with our Procurement Policy and Purchasing Procedure. Business requirements will be defined in more detail based on the needs and market capabilities at the time of delivery. This will help ensure optimal value and efficient outcomes at the time of purchase.

The project management processes will determine the most approach organisational change processes depending on the solution and approach determined by the project.

As a general rule of thumb each initiative that introduces new capabilities will:

- Have an internal business case developed commensurate with the initiative's, cost, risk and complexity;
- Management will review the business case based on the organisations over-arching priorities, risks and benefits of the initiative;
- IT Management will project manage the initiative and organisational change management according to the schedule and outcomes defined in the agreed business case;
- Involvement of business users will be managed to maximise their input whilst minimising the impact on their operational activities; and
- Organisational changes will be designed to manage the risk of change commensurate with the initiatives benefits and organisational priorities.

1.8.2 Why are we proposing this solution?

1.8.2.1 Consistency with the National Gas Rules

Option 2, deliver proactive IT Sustaining Infrastructure initiatives, is the recommended solution and will maintain IT Infrastructure in line with accepted good industry practice.

Rule 79(2)(c)

The proposed expenditure on our IT Sustaining Infrastructure project is required to maintain the integrity of services through current, supported and fit for purpose IT infrastructure, managing technology risks and preventing material outages that impact the ability of the business to function (including tracking and reporting of business information to meet our regulatory obligations and requirements). Therefore this expenditure is consistent with NGR 79(2)(c)(ii) and (iii).

Rule 79(1)

The proposed expenditure on our IT Sustaining Infrastructure is also consistent with Rule 79(1)(a), specifically we consider the capital expenditure is:

- *Prudent* – The expenditure is necessary in order to address the identified risks to DBP, Reputation, Asset Damage and Supply. The project is based on the proactive replacement of IT infrastructure assets which have arrived at the end of their useful economic life, avoiding operational inefficiencies due to outages or deteriorated performance. 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 historic costs for similar replacements. Pricing for these assets is sought through a competitive tender process, and is subject to regular market testing to ensure efficient prices are achieved. The proposed expenditure can therefore be considered consistent with the expenditure that a prudent service provider acting efficiently would incur.

- *Consistent with accepted good industry practice* – The proposed asset lifecycle for our IT infrastructure assets is consistent with that employed across industries.

- *Achieves the lowest sustainable cost of delivering pipeline services* – The proposed proactive replacement of IT infrastructure is more cost effective than a reactive, or lower frequency replacement program. Repair costs, and lost productivity, for IT infrastructure assets which fail, are typically more costly than replacement over the medium to longer term.

1.8.3 Estimating the Efficient Costs

As noted in the 'Final Plan Attachment 8.7 Cost Estimation Methodology', the unit rates used for all projects managed within this program include the internal labour, external labour and materials/other costs forecast.

Where possible, the unit rates used to determine the cost of the program in AA5 is based on a three year average actual cost incurred by DBP in AA4.

Where this has not been possible, due to infrequent or new activities identified for AA5, these activities have been estimated based on:

- the historical cost of the same or similar program of work;

- engaging IT strategy development experts to assist in development of the IT Plan CY2021-2025 that outlines a strategic plan and range of initiatives for IT over the AA5 period;

- where initiatives will need new products, at least two vendor quotes for a specification based on an informed 'best estimate'; and
- consultation with market specialists to determine the most likely implementation approaches and effort requirements to implement the initiatives and transform the business.

IT Initiatives will be implemented by three potential groups of resources. Internal staff generally undertake IT project management, the management and finance aspects of IT, and all of the business user involvement (e.g. business requirements, testing, and training). An internal rate card has been agreed that defines the unit costs associated with all of the internal resources.

IT support is currently outsourced and generally are involved in all IT initiatives to implement products into the environment and support processes (e.g. installing an application on a server). A rate card for these resources is defined as part of the ongoing management of that contract.

Product or service specific skills are often required in IT initiatives to implement products (e.g. vendor contractors configuring their systems). These rates are negotiated during the procurement phase using DBP's Purchasing Policy.

To estimate the costs the IT asset fleet was categorised into groups, the fleet size estimated and the current lifecycle approach documented in Table 0.3 above. There has been an ongoing fleet replacement program and historical quotes for assets and their implementation were collated. An analysis was conducted for the various options above based on the proposed lifecycles. These estimates incorporate internal and outsourced IT contractor costs, product specific contractor costs, products, organisational change and travel costs where applicable.

There was no analysis done on utilising different vendors or products as the current 'types' of IT assets are not materially expected to change over the AA5 period. E.g. the current HP laptops currently cost around $2,000 for an enterprise specification standard laptop. It is not expected that in the AA5 period the organisation will want to change the specification to something materially different e.g. Chromebooks at $500 or Apple Air Books at $3,000. Discussions with end users did identify that the current IT Asset specifications is appropriate for business requirements.

There is some sensitivity to the security network infrastructure as this is a volatile market, however whilst the functionality is volatile the year on year costs tend to be similar.

This is the model that has been successfully deployed and implemented on the DBNGP under the existing AA4 and previous arrangements.

Table 0.21 below shows total unescalated costs for the IT Sustaining Infrastructure program by cost type. Table 0.15 below shows the escalation applied to costs to real dollars of December 2020, including real labour cost escalation of 0.69% per annum.

Table 0.21: IT Sustaining Infrastructure capex, by cost type

	2021	2022	2023	2024	2025	Total AA5
Internal Labour	23	40	11	32	21	127
Contractors / Consultants	86	222	53	181	90	632
Materials & Services	624	760	378	474	942	3,178
Travel & Others	-	-	10	-	10	20
Total	**733**	**1,022**	**452**	**687**	**1,063**	**3,957**

Table 0.22: IT Sustaining Infrastructure total escalated cost real dollars December 2020

($'000)	2021	2022	2023	2024	2025	Total
Total unescalated ($ Jun 19)	733	1,022	452	687	1,063	3,957
Escalation	40	23	13	12	6	94
Total escalated ($ Dec 20)	**1,605**	**844**	**428**	**362**	**171**	**3,410**

Appendix A – Risk Assessment

Figure 0.4: Summary risk assessment - IT Sustaining Infrastructure

	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	Trivial	ypothetica	NEGLIGIBLE	1	Major	ypothetica	LOW	5	Severe	Frequent	HIGH	125	Major	Remote	NTERMEDIAT	25	Major	Unlikely	HIGH	125	406
Break-Fix approach	Major	Occasional	HIGH	125	Trivial	ypothetica	NEGLIGIBLE	1	Major	ypothetica	LOW	5	Severe	Frequent	HIGH	125	Major	Remote	NTERMEDIAT	25	Major	Unlikely	HIGH	125	406
Deliver proactive IT Sustaining Infrastructure initiatives on a 3/5 year asset replacement schedule	Severe	Unlikely	NTERMEDIAT	25	Trivial	ypothetica	NEGLIGIBLE	1	Major	ypothetica	LOW	5	Minor	Unlikely	LOW	5	Severe	Remote	LOW	5	Severe	Remote	LOW	5	46
Deliver proactive IT Sustaining Infrastructure initiatives on a 5/7 year asset replacement schedule	Severe	Occasiona	NTERMEDIAT	25	Trivial	ypothetica	NEGLIGIBLE	1	Major	ypothetica	LOW	5	Minor	Frequent	NTERMEDIAT	25	Severe	Remote	LOW	5	Severe	Unlikely	NTERMEDIAT	25	86