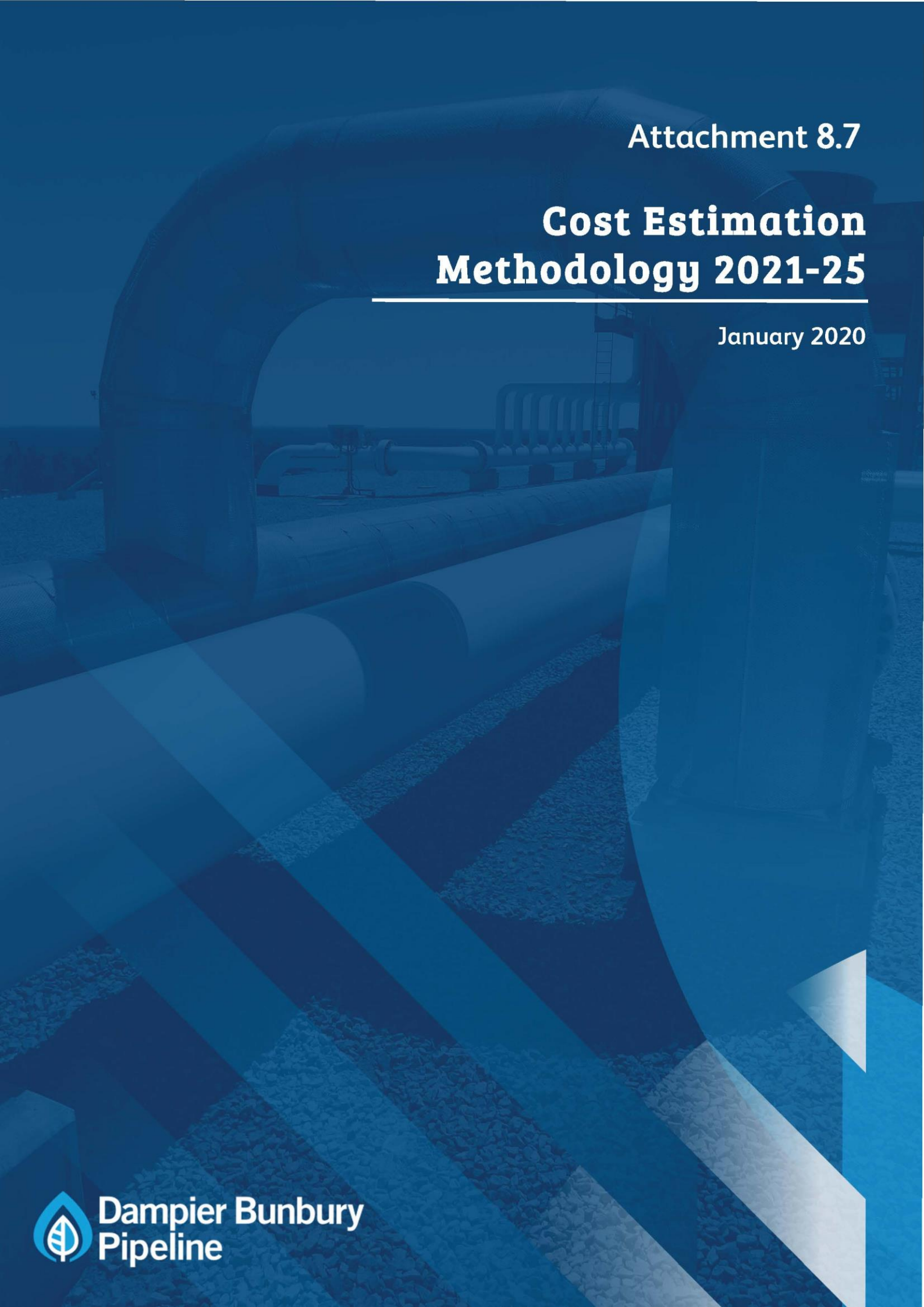


Attachment 8.7

Cost Estimation Methodology 2021-25

January 2020

Dampier Bunbury Pipeline

Contents

1. Overview

This report provides an overview of the approach and process for estimating the cost of the projects and programs of work required during AA5. The cost estimation process commences with the specification of the work required and then the cost of that work is estimated using an approach that differs depending on the type of work.

The cost estimation process is different for the three different types of work:

1. Ongoing activities are ongoing, volume driven activities where the costs are estimated by identifying the volume of work to be undertaken and applying an historical average unit rate (usually a three-year historical average) that reflects the cost of the volume driven program divided by the volume delivered. Where the program is delivered externally, the unit rates are also matched to similar locations. Examples of these programs include the GEA overhaul and turbine exchange programs;
2. Periodic programs of work are those that may not be required in every regulatory period, or have not been required previously but are expected in the future. These programs 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
3. 'One off' activities expected to be required in the AA5 period which have not been required in the past and are not expected to be required in to the future (for example, replacement of the Northern communications system). The cost of these activities would usually be determined through a competitive tender process. However, where this is yet to occur, they are estimated in two ways:
    a. 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;
    b. 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.

The unit rates may be based on a consolidation of different unit rates reflecting several different specialist areas and could comprise of resources available internally within DBP or external contractors or consultants. The cost of materials are identified and estimated separately.

There are a number of specialist engineering disciplines considered when estimating the cost of unique or one off work where no comparable unit rate, or project or program or actual cost is available. For each specialist discipline a different unit rate is applied based on the work activity.

Table 1.1 below presents the specialist engineering disciplines and work activities.

Table 1.1: Engineering disciplines and work activities used to apply unit rates

Specialist engineering disciplines	Work activities
• Telecommunications • Cathodic Protection (CP) • Electrical Control and Instrumentation (ECI) • Mechanical • Metering • Rotating Equipment (Rotating) • SCADA • Corporate • Business Systems • Finance System	• Asset installation • Asset removal/decommissioning • Asset repair/maintenance • Asset replacement/overhaul • Asset testing • Inspections

1.1. Efficient cost estimates

The costs applied in the AA5 expenditure forecast comprise of internal labour, external (contract/consultant) labour and materials. The weighting for each component reflects the actual average over time unless otherwise specified.

The forecast of labour costs reflects the weighted average cost incurred for the same program of work over the past three years except when there is a more recent commercial agreement with an external provider which identifies unit rates and costs that will continue to apply to future work. Copies of the most recent contracts for these external labour costs are included as Attachments to this document.

A three-year historical average is adopted because it is more likely to reflect variations over time as a result of changes in work practices, costs, productivity and efficiency as well as any changes in commercial arrangements such as indexation or refreshed tender processes.

For example, there may be variances in individual unit costs within a unitised program of work due to geographical location or other operational anomalies, however, unless there is better information about future events or changes that may affect the cost of undertaking the work, a historical average unit rate represent the best estimate available at the time.

All contracts are managed and monitored as per the AGIG Procurement Policy and Purchasing Procedure (previously the DBP Purchasing Policy), which focuses exclusively on the efficient, cost effective and ethical procurement of goods and/or services from suppliers in order to ensure DBP maximises savings whilst mitigating the risks associated with the provision of goods and services to achieve excellence in both operational and financial performance.

The procurement of materials and labour that are captured in historical costs are considered to be efficient because they are subject to procurement policy and purchasing procedure to ensure the best commercial outcome. The process requires either a competitive tender process for material value contracts or the consideration of written quotes where the items are lower value and the cost of tendering is disproportionate relative to the expected savings from the process as outlined in Table 1.2.

Table 1.2: Minimum purchasing requirements

Value of Transaction	Minimum Requirement	Required Documentation
<$20,000	1 written quotation	Prices and information received by email must be recorded within the purchasing system or in an appropriate file
>$20,000 - <$100,000	3 written quotations	Written request for quotations (RFQ's) detailing: • Goods or services required • Quantities required • Delivery date • AGIG's term & conditions • Special conditions, if any
>$100,000 - <$1,000,000	Tenders from a minimum of 3 vendors and up to as many suitable competitive sources available	Depending on AGIG's knowledge of market, Request for Tenders (RFT's) may be solicited from a group of specific known recommended vendors or by public advertising
>$1,000,000	Tenders from a minimum of 4 vendors and up to as many suitable competitive sources available	Depending on AGIG's knowledge of market, Request for Tenders (RFT's) may be solicited from a group of specific known recommended vendors or by public advertising

Further to this, approval of a sole source justification is required where the purchase is greater than $20,000 in value and there is recommendation to go to a single vendor, including where that is an original equipment manufacturer. The sole source justification must set out the grounds on which this is sought and may include the previous experience of the vendor, the location of the vendor or other factors that are expected to result in cost savings compared to other vendors, evidence that no other appropriate vendors are available or where it is an extension of other work underway where that vendor was selected as the result of a competitive tender process. Vendor safety performance (both occupational and process) are also important considerations in the assessment of vendors to undertake work on the DBNGP.

New contracts and arrangements are assessed against historical actual rates and costs to ensure that they are reasonable. Where there are variances between the AA4 actuals and AA5 estimates, these will be explained for each of the individual projects/programs within the relevant discipline and category.

Using comparable recent actual costs, or developing an estimate based on the specification of work broken down by specialist expertise or external estimates (where recent actual costs are not available) is a reasonable basis for estimating costs and represents the best forecast or estimate possible in the circumstances consistent with Rule 74 of the National Gas Rules (NGR).

Some unit rates can be affected by foreign currency fluctuations. Where this is the case, the most recent actual unit purchase price in AUD equivalent is considered the unit rate component for the AA5 period, rather than the average actual over AA4.

1.1.1. Basis of costs

All values in this report are expressed in thousands of dollars real unescalated as at June 2019 unless otherwise stated.

1.2. Investment governance

Our business planning doesn't stop with each AA period. We continually update our capex plans to respond to changing business needs.

In the annual planning process, proposed capex projects are risk ranked and then submitted to our Project and Procurement Review Committee (PPRC) where funding requirements, resource availability and optimised delivery of the plan are considered. Risk ranking is refreshed to ensure projects identified as required in the medium term are accelerated or deferred where prudent, and to allow us to respond to significant unplanned events.

The approved capex projects are provided with our annual budget plan each year for Board approval. Once approved, projects are managed and monitored in line with our Project Management Methodology (PMM).

We categorise our capex as either:

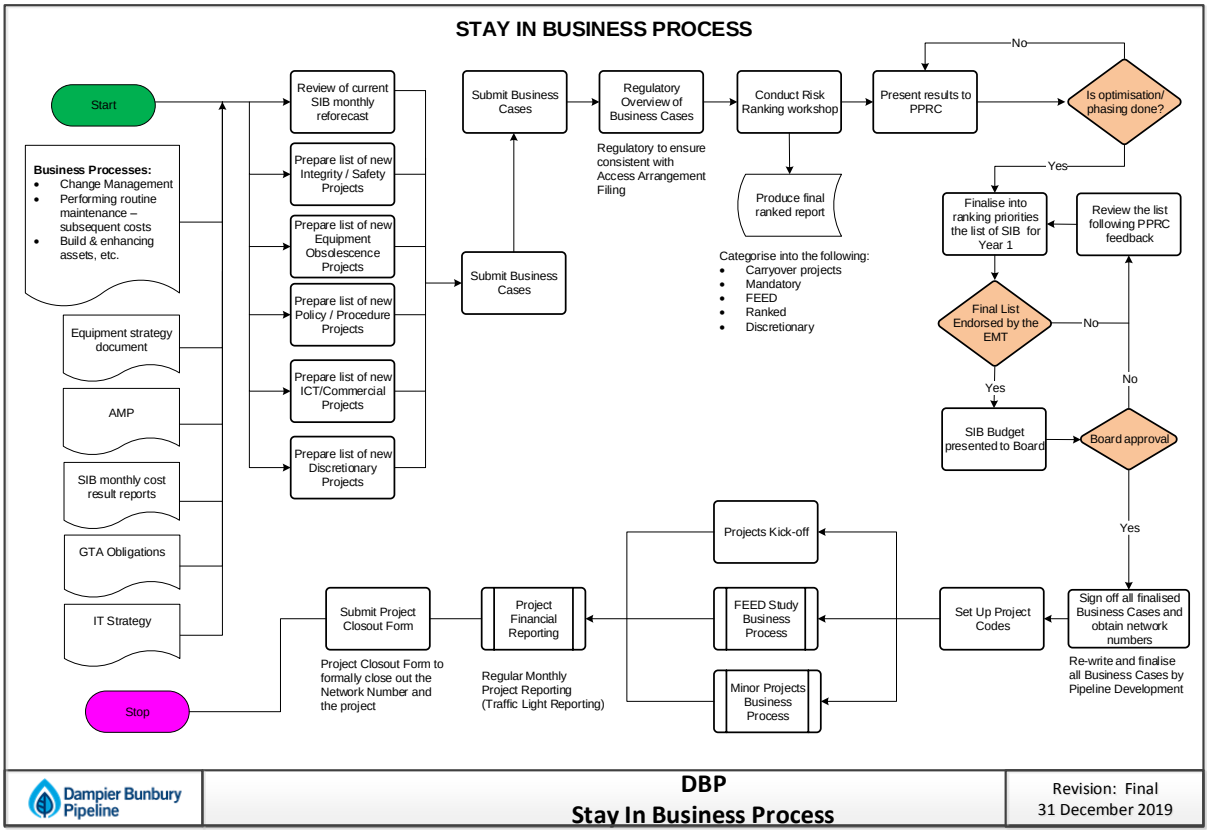
- stay-in-business (SIB) capex – where it maintains or improves our ability to deliver the current quantity of services our customers demand; or
- expansion capex – where it is required to increase the quantity of services we can deliver to our customers.

Our forecast capex in AA5 is solely SIB capex totalling $155.2 million. This report also includes $39.9 million in bottom-up build initiatives which are included in regulatory opex.

1.2.1. Stay-in-business capital process

Our SIB capex process is summarised in Figure 1.1 below.

Figure 1.1: Summary of our SIB process



Asset managers submit projects for screening and risk ranking based on business processes (such as Management of Change and routine maintenance), equipment strategies, our Asset Management Plan (AMP) and our obligations.

Subsequent to the screening and risk ranking process, the proposed SIB project list undergoes a Regulatory Overview of Business Cases to ensure consistency with AA filing documents. It is then presented to our Project and Procurement Review Committee (PPRC) (formerly PRC) for evaluation taking into consideration funding requirements and resource availability and any major deviation between the year's business revised risk priorities and the AA filed documents.

Based on the feedback from the PPRC, the SIB list for year is finalised together with an optimised list for the 8-year planning cycle to ensure funding and resource requirements are balanced (without significant fluctuations) for each year in comparison with other years within the planning cycle. This forms part of the budget pack for sign off from the Board.

Following Board approval of the budget, SIB projects are authorised for execution by the Executive Management Team or Chief Executive Officer, as per the Delegation of Financial Authority, prior to transitioning into appropriate business processes, which may include Front-End Engineering Design, business planning and project execution in line with our Project Management Methodology.

2. Ongoing activities

The forecast expenditure program includes a number of ongoing activities that are volume-driven, substantially repeatable and delivered in a consistent manner over time. For these programs, the estimate cost for the forecast program is based on identifying the volume of work required and applying an historical unit rate, typically a three-year average.

The unit rate or program work costs may be based on a consolidation of different unit rates reflecting several different specialist areas and could comprise of resources available internally within DBP or external contractors or consultants. Where the program is delivered externally, the unit rates reflect current contracting arrangements and are also matched to similar locations.

Historical unit rates are broken down into the specialist discipline and work activity (as summarised in Table 2) and may include materials and other costs. Where materials and other costs are not included in historical unit rates the estimate reflects historical average costs or the costs included in commercial agreements.

The volume of work represents the best estimate for AA5 based on AMP, risk-based condition assessment and delivery optimisation considerations. The work required and options considered are outlined in the relevant business case.

2.1. Forecast expenditure for ongoing activities estimated using unit rates

The forecast expenditure for ongoing activities is $74 million and represents 38% of the AA5 expenditure forecast (including bottom-up items treated as regulatory opex). The programs are delivered by a mix of internal and external resources. Table 2.1 below shows the programs of work for ongoing activities in AA5 where the costs are forecast based on unit rates. More detailed information on the volume and unit rate assumptions is provided in section 2.3.

Table 2.1: Ongoing activities estimated based on unit rates in AA5

Project/initiative name	Engineering discipline	Activity type	AA5 forecast expenditure
Turbine overhauls	Rotating	Asset replacement/overhaul	24,700
Refurbishment of below ground pipework	CP	Inspections	6,500
GEA engine overhaul	Rotating	Asset replacement/overhaul	5,000
Annual replacement of DBNGP fleet vehicles	Vehicles	Asset replacement/overhaul	4,050
Meter Station Valves and Control Valves overhauls	Metering	Asset replacement/overhaul	3,882
Painting of aboveground facilities	CP	Asset repair/maintenance	3,500
[redacted]	[redacted]	Asset replacement/overhaul	[redacted]

Project/initiative name	Engineering discipline	Activity type	AA5 forecast expenditure
Dry gas seal replacement.	Rotating	Asset replacement/overhaul	2,000
Microsoft Dynamics AX	Finance System	Asset repair/maintenance	2,000
EOP Integrity Management	EOP	Asset repair/maintenance	1,500
Annual allocation for MoC projects	EOP	Asset repair/maintenance	1,250
Hazardous area inspection and rectification	ECI	Asset repair/maintenance	1,200
Transmission Operations & Maintenance Tools	Tools	Asset replacement/overhaul	1,000
Recycle valve replacement/overhaul	Mechanical	Asset replacement/overhaul	1,000
Long range Ultrasonic or dig up of unpiggable pipes at facilities	CP	Inspections	900
SCADA hardware upgrade	SCADA	Asset replacement/overhaul	870
I-05 Other Core Systems	IT	Asset repair/maintenance	624
Replacement of civil equipment - truck, grader and tractor	Vehicles	Asset replacement/overhaul	600
Inspection of pressure vessels and pressure relief valves	Mechanical	Inspections	600
SCADA software upgrade	SCADA	Asset repair/maintenance	1,000
Electrical Protection Integrity Testing	ECI	Asset testing	550
Citrix Virtual Servers Upgrade	IT	Asset repair/maintenance	520
DMZ upgrade	Business Systems	Asset repair/maintenance	510
Upgrade of Nuovo Pignone HMI software to latest Windows version	ECI	Asset repair/maintenance	500
Safety Case Revision and remaining life review	Safety	Asset repair/maintenance	500
HSE Improvement Projects	Safety		450
Maximo annual patching	Business Systems	Asset repair/maintenance	420
Process safety initiatives and compliance upgrades.	Safety		250
Borescope Replacement	Rotating	Asset replacement/overhaul	200

Project/initiative name	Engineering discipline	Activity type	AA5 forecast expenditure
Annual digup program based on Runcom results	CP	Asset repair/maintenance	150
Inspection and Re-preservation of Compressor Bundles in Storage	Rotating	Inspections	70
Gas Measurement Monitoring Software upgrade	Metering	Asset repair/maintenance	50
AA5 Ongoing activities forecast			**74,343**

2.2. Current status of supporting contracts

We rely on external resources to deliver a number of ongoing activities which are supported by contracts. These contracts have been established based on a competitive tender process or reflect the preferred supplier subsequent to reviewing multiple quotes as required by the procurement policy.

The existing contracts for external labour and materials which are relevant to the historical actual unit rates and estimated unit rate forecasts for AA5 are summarised in Table 2.2 below, identifying the services provided as well as the process undertaken prior to entering in to the arrangement.

Table 2.2: Relevant contracts underpinning unit rate forecasts and current status

Supplier	Engaged for the provision of	Specialist engineering discipline	Process for engagement
[redacted]	Labour and materials	ECI	Purchase Orders as required, subject to purchasing procedure.
[redacted]	Labour	ECI / Rotating / Mechanical	Competitive Tender [redacted]
[redacted]	Labour	Rotating	Alternative Service Providers also under contract [redacted]
[redacted]	Labour and materials	Rotating	Sole Source - Original Equipment Manufacturer
[redacted]	Labour and materials	Rotating	Sole Source - Justification approved at DFA level
[redacted]	Labour and materials	Rotating	Sole Source - Original Equipment Manufacturer
[redacted]	Materials only	Rotating	Sole Source - Original Equipment Manufacturer

Supplier	Engaged for the provision of	Specialist engineering discipline	Process for engagement
[redacted]	Labour only	CP	Competitive Tender [redacted]
[redacted]	Labour only	ECI / Mechanical	Alternative Services Providers also under contract [redacted]
[redacted]	Labour and materials	Mechanical	Sole Source - Justification approved on Document Execution [redacted] are also contracted to provide similar services.
[redacted]	Labour and materials	Mechanical	All valving equipment purchases are competitively tendered between two or more vendors depending on value.
[redacted]	Labour only	ECI	Alternative Service Providers also under contract [redacted]
[redacted]	Labour only	ECI	Alternative Services Providers also under contract [redacted]
[redacted]	Labour only	ECI	Project work is competitively tendered between [redacted]
[redacted]	Labour and materials	ECI	Purchase Orders as required, subject to purchasing procedure.
[redacted]	Materials only	Rotating / ECI	Purchase Orders as required, subject to purchasing procedure.
[redacted]	Labour and materials	Metering	Sole Source - Justification approved at DFA level
[redacted]	Labour and materials	Metering	Purchase Orders as required, subject to purchasing procedure.
[redacted]	Materials only	Corporate	[redacted]
[redacted]	Labour only	Telecommunications	Purchase Orders as required, subject to purchasing procedure.
[redacted]	Labour only	Telecommunications	Purchase Orders as required, subject to purchasing procedure.

2.3. Forecast unit rates for ongoing activities by work program

The following sections provide further information on the estimated costs and volumes for ongoing activities in AA5 by work program. The unit rates reflect historical average or contracted rates. Where contracts are scheduled to expire, unit rates have been assumed to be maintained at the current rate unless there are specific drivers for a change, which are individually identified in the relevant section below.

Some unit rates can be affected by foreign currency fluctuations. Where this is the case, the most recent actual unit purchase price in AUD equivalent is considered the unit rate component for the AA5 period, rather than the average actual over AA4. Unit rates could also be affected by the location of the works as the DBNGP spans 1,500km from Dampier to Bunbury through remote areas of Western Australia.

All unit rate values are expressed in real unescalated dollars of June 2019 unless otherwise stated.

The forecast volume of work reflects the best estimate for AA5 based on asset management plans, risk-based assessment and delivery optimisation considerations. Further information on the work required and options assessed is captured in the relevant business case.

2.3.1. Rotating

Rotating equipment assets are a subset of pipeline mechanical equipment, made up of gas turbines driving compressors and power generation (Gas Engine Alternators- GEA's) and their associated sub systems. There are a number of ongoing activities in this program of work that are volume based; overhauling turbines, overhauling GEAs, replacing dry gas seals, replacing borescopes (which are used to inspect inner components of these assets) and inspecting and re-preserving compressor bundles in storage.

2.3.1.1. Turbine overhaul

Gas turbines drive centrifugal compressors which are used to maintain pipeline pressure to meet gas demand. There are two operational turbines within each of the ten compressor stations (20 total). The turbines are overhauled once the manufacturer's guideline for operational hours is exceeded, this being a key driver of compromised asset integrity and potential failure.

Overhaul of a gas turbine includes disassembly, inspection, repair or replacement of subcomponents with refurbished parts (at zero hours). The refurbished unit is reassembled and tested to confirm performance of the turbine before it is returned to full service.

During AA5, seven turbines are forecast to be overhauled compared to six turbines in AA4, with allowance for one premature failure/repair, compared to two in AA4.

Table 2.3: Unit rates forecasts ($'000) for turbine overhauls

Turbine overhauls	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs for the turbine overhauls and is based on a three-year historical average.

The unit rate for [redacted] is [redacted] compared to [redacted] for [redacted]. One of the overhauls in AA5 is for a [redacted] turbine which drivers a higher unit rate than that experienced in AA4, slightly offset by one less premature failure/repair.

Specialist engineering disciplines, procurement and construction management (EPCM) activities are provided utilising internal resources.

The work will be delivered with external labour provided by [redacted] or [redacted]. The solar turbine is provided by [redacted] and the [redacted] turbines have been provided by [redacted]

The [redacted] and [redacted] contracts are priced in USD and EUR respectively, therefore foreign exchange fluctuations can have a significant impact on the unit rates realised for this program. Actual unit rates in AA4 were higher than forecast due to foreign exchange fluctuations. The AA5 program cost estimates assume consistent foreign exchange rates at current levels over the five years.

2.3.1.2. GEA engine overhaul

The purpose of a GEA is to generate electricity. They are used at compressor stations as prime power generation and at mainline valves for backup power generation for battery charging.

GEAs need to be serviced at regular intervals and undergo overhauls at 12,000, 24,000, 48,000 and 52,000 hours. In AA5 we will overhaul 20 GEAs, compared to 16 in AA4.

Table 2.4: Unit rates forecasts ($'000) for GEA engine overhaul

GEA overhaul	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (3 year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on a three-year historical average.

EPCM activities are provided utilising internal resources. The delivery of the work will be undertaken by external resources provided by either [redacted] or [redacted] under a preferred supplier contract.

[redacted] and [redacted] supply the equipment for this program under a preferred supplier contract. The costs are specific to the GEA that is being overhauled. The estimated cost for the equipment in AA5 is based on historic averages and contracted rates.

2.3.1.3. Dry gas seal replacement

A dry gas seal and buffer seal work together to create a barrier or buffer between gas and oil on the driven compressor impeller bundle during operation of compressor units. All current operational units have dry gas and buffer seals installed. Dry gas seals are three times the cost of buffer seals to replace. Seals are replaced based on condition, with an allowance for the equivalent of four replacements every three-years included in AA5 compared to the equivalent of two so far in AA4.

The replacement cost of dry gas and buffer seals can also vary depending on location (with seals at remote locations costing more to replace than at metropolitan locations). One of the buffer seal replacements completed in AA4 was at CS9 which brings down the average cost per replacement.

Table 2.5: Unit rates forecasts ($'000) for dry gas seal replacement program

Dry gas and buffer seal replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs for the dry gas and buffer seal replacement program and is based on a three-year historical average.

Internal labour is utilised for delivery. Materials are supplied by the OEM; [redacted] and [redacted] or their authorised subcomponent manufacturers and managed in line with our OEM and preferred supplier contracts.

2.3.1.4. Borescope replacement

Borescopes are used to undertake inspections of rotating equipment. They can suffer damage with use over time and therefore require replacement. We are forecasting to replace two borescopes in AA5 compared to one in AA4 in line with their useful life.

Table 2.6: Unit rate forecasts ($'000) for the borescope replacement program

Borescope replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The forecast unit rate includes the supply of materials and a small amount of capitalised time of internal labour for EPCM. Materials and services are procured from a range of suppliers in line with our procurement policy.

2.3.1.5. Inspection and re-preservation of Compressor Bundles in storage

This program includes the inspection of compressor bundles in long term storage in Jandakot and, when required, refreshing the preservation to mitigate against corrosion. They are inspected periodically to confirm the condition of the desiccant is adequate as a secondary measure to prevent corrosion on the bundles.

An allowance has been included in AA5 for inspection and re-preservation of [redacted] (half every 2 years). This compares to [redacted] in AA4.

Table 2.7: Unit rates forecasts ($'000) for inspection and re-preservation of compressor bundles in storage

Inspection and re-preservation of compressor bundles in storage	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs for the inspection and re-preservation of compressor bundles program and is based on a three-year historical average.

Project management and delivery will be undertaken by internal and external resources depending on capacity and opportunities to bundle with other works and represents the majority of costs.

2.3.2. Cathodic Protection (CP)

The main function of the CP system is to prevent corrosion of the pipeline. The CP system prevents corrosion of the buried pipeline, which include the main pipeline, the pipeline loop sections, below ground pipework at facilities.

This program includes four ongoing programs; refurbishing below ground pipework, painting of aboveground facilities and managing the integrity of unpiggable pipes and digging up below ground pipework to verify the condition.

2.3.2.1. Refurbishment of below ground pipework

The program involves exposing the below ground pipework at compressor stations, assessment of coating condition, sandblasting, inspection, recoating and backfilling. An average of 160 meters of pipe is required to refurbished at compressor stations (based on the five completed to date). The program is expected to be completed in AA5 with one compressor station treated each year, so that all ten have been completed. Once completed, refurbishment of below ground pipework will be driven by ongoing in service inspection, monitoring and risk assessment.

Table 2.8: Unit rates forecasts ($'000) for refurbishment of below ground pipework program

Refurbishment of below ground pipework	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units (metres)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs for the refurbishment of below ground pipework and is based on a three-year historical average.

EPCM and integrity assessment is undertaken by internal resources.

The civil works, blasting and painting will be delivered by external labour provided by [redacted](in the north) and [redacted](in the south). Digging around the pipeline is one of the highest risk asset management activities we undertake. These contractors have a long history of delivering this work to high safety and quality standards and their contracts are regularly reviewed in line with the Procurement Policy and Purchasing Procedure to ensure competitive and efficient pricing is achieved.

The purchase of paint and coating materials and other consumables is consistent with the minimum purchasing requirements for low value purchases.

2.3.2.2. Painting of Aboveground Facility

This program involves the painting of meter stations, MLVs and compressor stations. In general the painting condition on the whole asset is 30+ years old and needs to be refurbished.

The estimated costs are based on the historical average cost for coating refurbishment as follows:

1. Compressor Station - [redacted]
2. Meter Station - [redacted]
3. Main Line Valves - [redacted]

CS9 was repainted 2019 at a lower cost than the average given its metropolitan location.

MLV7 completed in 2016/17 at a higher cost than average due to severe deterioration that required it to be blast back to bare metal before repainting.

Table 2.9: Unit cost forecasts ($'000) for Painting of Aboveground Facility

Painting of Aboveground Facility	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total CS units							
CS unit cost							
Total MS units							
MS unit cost							
Total MLV units							
MLV unit cost 0							

The unit cost includes the internal labour, external labour, materials, travel and other costs for the Painting of Aboveground Facility program.

EPCM activities will be provided by internal resources. The delivery of the work and supply of required materials will be undertaken by external providers. External resources are selected based on standard procurement processes as per the Procurement Policy.

Contractors that have been utilised include [redacted]

2.3.2.3. Long range Ultrasonic or digup of unpiggable pipes

Long range ultrasonic or dig up of unpiggable pipes is a core practice in monitoring the condition of and providing assurance around the effectiveness of corrosion protection measures such as pipeline coating and cathodic protection.

The AA5 program allows for five dig ups per year, with a smaller program in 2021 to focus resources on completing the post ILI dig-ups. This compares to 20 dig ups completed in AA4 in the unpiggable laterals in the metropolitan area and south west.

Table 2.10: Unit cost forecasts ($'000) for long range ultrasonic and dig up program

Long range ultrasonic or digup of unpiggable pipes	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure							
Total units							
Unit rate (three-year average)							

The unit rate includes the internal labour, external labour, materials, travel and other costs for the Long range ultrasonic or digup of unpiggable pipes is based on a three-year historical average.

EPCM and integrity assessment is provided by internal resources. civil works will be delivered by external labour provided by [redacted] (in the north) and [redacted] (in the south). Digging around the pipeline is one of the highest risk asset management activities we undertake. These contractors have a long history of delivering this work to high safety and quality standards and their contracts

are regularly reviewed in line with the Procurement Policy and Purchasing Procedure to ensure competitive and efficient pricing is achieved.

2.3.2.4. Annual dig-up program based on ILI

This program involves the excavation and physical inspection of the pipeline to verify in line inspection results which have identified pipe defects. Five excavations are forecast for 2021 following the expected completion of pigging in 2020. This compares to 40 in AA4, with the works in this program aligning to the timing of pigging. There will be a pickup in dig-up activity in AA6 coinciding with the next cycle of intelligent pigging. Allocation for AA5 relates to remaining inspection and validation of laterals that will be inspected in late 2020.

Table 2.11: Unit cost forecasts ($'000) for annual dig-up based on ILI

Annual dig-up based on ILI	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs for the dig-up program based on a three-year historical average.

EPCM and integrity assessment is provided by internal resources. As with the above program, the civil works will be delivered by external labour provided by [redacted] (in the north) and [redacted] (in the south). Digging around the pipeline is one of the highest risk asset management activities we undertake. These contractors have a long history of delivering this work to high safety and quality standards and their contracts are regularly reviewed in line with the Procurement Policy and Purchasing Procedure to ensure competitive and efficient pricing is achieved.

2.3.3. Mechanical

2.3.3.1. Recycle valve replacement/overhaul

This program involves the major overhaul or strip inspection for the 55 recycle valves installed at compressor stations. The program runs on a 4 yearly basis, with 14 valves overhauled each year.

The program allows for 2 major overhauls and 12 'strip and inspect' each year, reflecting the current AA4 activity levels.

Table 2.12: Unit cost forecasts ($'000) for recycle valve replacement/overhaul

Recycle valve replacement/overhaul	AA4 Forecast*	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total overhaul units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total strip and inspect units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

*This is based on three years of costs captured under mainline subsequent costs and the unit rate is reflective of a mix of overhauls and 'strip and inspect' activities undertaken

The unit rate includes the internal labour, external labour, materials, travel and other costs for the recycle valve replacement/overhaul program and are based on a three-year historical average.

EPCM activities are provided by internal resources. Valve are supplied by the three OEMs [redacted]

2.3.3.2. Inspection of pressure vessels and pressure relief valves

This program involves the inspection of both pressure valves and water bath heaters for turbine fuel gas temperature control. The inspection program runs on a 4 yearly basis, as required by AS3788. Where the previous vessel inspection indicated no corrosion/deterioration of the vessel, the inspection method could be changed to non-intrusive inspection for the subsequent one, remaining compliant with the requirements of AS3788 but reducing the unit cost significantly relative to historical.

Table 2.13: Unit cost forecasts ($'000) for inspection of pressure vessels and pressure relief valves

Inspection **of pressure vessels and pressure relief valves**	Measure	AA4	2021	2022	2023	2024	2025	AA5
Pressure vessel – compressor stations	**Total**	[redacted]						
	Units							
	Unit cost							
Pressure vessel – meter stations	**Total**							
	Units							
	Unit cost							
Pressure vessel – mainline valves	**Total**							
	Units							
	Unit cost							
Pressure relief valve – compressor stations	**Total**							
	Units							
	Unit cost							
Pressure relief valve – meter stations	**Total**							
	Units							
	Unit cost							
Pressure relief valve – mainline valves	**Total**							
	Units							
	Unit cost							

The unit rate includes the internal labour, external labour, materials, travel and other costs for the inspection of pressure vessels and testing / certification of the pressure relief valves.

EPCM activities will be provided by internal resources. The delivery of the work and supply of required materials will be undertaken by external resources. External labour is delivered by [redacted].

2.3.4. ECI

The Electrical, Control and Instrumentation activities are used to operate and protect plant as well as to provide an interface for displaying the current and historical status of the plant. There are three volumetric programs in AA5 including the inspection and rectification of hazardous areas, testing electrical protection integrity and upgrading HMI software.

2.3.4.1. Hazardous area inspection and rectification

This is a mandatory 4 yearly inspection program of hazardous areas and the rectification of non-conformances, as required by AS60079. The work is split into two programs based on the location type; compressor stations (which are more complex sites), meter stations and mainline valves (which are less complex sites).

The total cost for each section will also depend on the repair and rectification work that is required. We have assumed the level of repairs and rectification addressed during AA4 are reflective of typical levels and have no reason to think these levels will change in AA5.

Is some of the meter stations and MLV scopes have been captured under the CS program in AA4 but overall the intent of this scope is to ensure all field equipment located in hazardous areas regardless of process are assured to be operating in compliance with this requirement.

Table 2.14: Unit cost forecasts ($'000) for Hazardous area inspection and rectification at Compressor Stations

Hazardous area inspection and rectification at CS	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 2.15: Unit cost forecasts ($'000) for Hazardous area inspection and rectification at Meter Stations and MLVs

Hazardous area inspection and rectification at MS and MLVs	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour and materials, travel and other costs for the electrical protection integrity testing program and is based on historical cost of inspection and rectification works across the pipeline.

EPCM is undertaken by internal resources. The delivery of the work will be by external resources. [redacted] and [redacted] are specialists in this field and are contracted to deliver the external labour, which includes the physical inspection on site, rectification or repair on site and all associated reports.

2.3.4.2. Electrical Protection Integrity Testing

This program involves the protection setting testing of the 415 volt AC to switch gear. One pilot site has been completed, with an AA5 program of 2 per year moving forward, so all 10 stations will be complete every 5 years.

Table 2.16: Unit cost forecasts ($'000) for Electrical Protection Integrity Testing program

Electrical Protection Integrity Testing program	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs for the electrical protection integrity testing program and is based on the pilot program conducted at CS1 under opex in AA4.

Project management is undertaken by internal resources. The delivery of the work and supply of materials is by external resources. NHP is contracted to provide the external labour.

2.3.4.3. Upgrade of [redacted] HMI software to latest Windows version

This program involves the upgrade of the turbine control system software and hardware to the latest version of Windows. The actual Simplicity, Toobox HMI software must run on a Windows 10 operating system to comply with cyber security requirements. The hardware also needs to be replaced to be compatible with the new windows operating system. There are two [redacted] units (CS6 and CS9) with the HMI software upgraded every six years.

Table 2.17: Unit cost forecasts ($'000) for NP HMI Windows update

NP HMI Windows update	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs for the NP HMI software and hardware update and is based on three-year average actual costs in AA4.

Project management is undertaken by internal resources. The delivery of the work and supply of materials is purchased under the OEM contract with [redacted].

2.3.5. Safety

2.3.5.1. Safety Case review

The Safety Case will be revised and updated in AA5 to reflect changes in assets, operational requirements and review the appropriate remaining lives. The Safety Case is required to be revised

and signed off by the Department of Mining, Industry Regulation and Safety every five years, with the last review completed in 2016.

Table 2.18: Unit rate forecasts ($'000) for Safety Case review

Safety Case review	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes all costs for the Safety Case revision and is anticipated to be undertaken internally.

The Safety Case review for 2016 was a larger review than is anticipated for 2021. It was undertaken across 2015 and 2016 (note only 2016 costs are captured above) at a total cost of [redacted].

2.3.5.2. HSE and process safety initiatives

In line with our Zero Harm principles, we undertake HSE and process safety initiatives to keep up with technology and industry advancements, to improve safety reporting and monitoring, to implement new risk mitigation strategies and to ensure strategies are put in place to deal with new risks that emerge. These programs provide funding for system changes to that support or HSE and process safety (i.e. INX, Process Safety dashboard), as well as small capital works that result from incident investigations. Process Safety is a relatively new ongoing focus area with investment beginning in AA4 and expected to continue each year over AA5.

Table 2.19: Unit rate forecasts ($'000) for HSE and process safety initiatives

HSE and process safety initiatives	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
HSE Total forecast expenditure	175	90	90	90	90	90	450
HSE Total units	2	1	1	1	1	1	1
HSE Unit rate (three-year average)	**88**	**90**	**90**	**90**	**90**	**90**	**450**
Process safety Total forecast expenditure	38	50	50	50	50	50	250
Process safety Total units	1	1	1	1	1	1	**5**
Process safety Unit rate (three-year average)	**38**	**50**	**50**	**50**	**50**	**50**	**50**

The unit rate includes all costs for the HSE and Process Safety initiatives and is based on average historical spend and an expectation of ongoing requirements each year over AA5.

2.3.6. Metering

The volumetric metering program includes the replacement and overhaul of meter station pressure control valves and shutdown / isolation valves as well as updates to gas measurement monitoring hardware and software.

2.3.6.1. Meter station valves and control valves overhaul

There was significant additional expenditure in this program in AA4 driven by design changes for over pressure protection agreed with DMIRS following an over pressure incident. The AA5 program includes complete of control valve cabinet replacements started in AA4, and then annual valve overhauls returning to historic levels.

Table 2.20: Unit rate forecasts ($'000) for Meter Station Valves and Control valves overhauls program

Meter Station Valves and Control valves overhauls	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Control valve forecast expenditure	[redacted]						
Control valve units							
Control valve unit rate							
10 inch valve forecast expenditure							
10 inch valve units							
10 inch valve unit rate							
4 inch valve forecast expenditure							
4 inch valve units							
4 inch valve unit rate							
Valve control cabinets forecast expenditure							
Valve control cabinets units							
Valve control cabinets unit rate							
Total program	**8,353**						**3,882**

The unit rate includes the internal labour, external labour, materials, travel and other costs for the meter station valves and control valves overhauls replacement program and is based on average historical costs.

EPCM activities is undertaken by internal resources. The delivery of the work and supply of materials will be by external resources. [redacted] are engaged to deliver the materials under OEM contracts.

2.3.6.2. Gas Measurement Monitoring Software upgrade

This program will upgrade the gas measurement monitoring software on a five-yearly frequency to ensure compatibility with the latest alarm philosophy (so equipment can meet alarming KPI's), implement enhancement and bug removal, up to date security patches and flow computing logic improvements. The Gas Measurement Monitoring Software was packaged with the Flow Computer upgrade project in AA4.

Table 2.21: Unit rate forecasts ($'000) for Gas Measurement Monitoring Software upgrade

Gas Measurement Monitoring Software upgrade	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units	[redacted]						
Unit rate	[redacted]						

The unit rate includes the internal labour, materials, travel and other costs for the Gas Measurement Monitoring Software upgrade and is based on previous costs incurred for upgrades.

Internal labour delivers EPCM activities. The delivery of the work and supply of required materials will be undertaken by external resources. External resources are provided by [redacted] and the OEM's in line with our procurement policy.

2.3.7. EOP

The engineering and operational projects discipline includes a number of support activities to manage the integrity of assets and address defects or unsafe situations.

2.3.7.1. EOP Integrity Management [1]

Each year there is miscellaneous capital expenditure required to sustain the operation and the management of asset integrity and may include updated drawings, engineering software, process design software, security software, Document Management system upgrade, updates to our GIS and server room integrity.

The AA5 forecast is based on the annual average expenditure incurred over AA3 and AA4.

Table 2.22: Unit rate forecasts ($'000) for EOP Integrity Management

EOP Integrity Management	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	1,389	300	300	300	300	300	1,500
Total units	5	1	1	1	1	1	5
Unit rate (three-year average)	**278**	**300**	**300**	**300**	**300**	**300**	**300**

The unit rate includes the internal labour, external contractors, capitalised licenses and materials & services costs.

EPCM activities are provided by internal resources. The supply and servicing of required materials will be undertaken by external providers. External resources are typically supplied by [redacted].

[1] Note that this was previously referred to as 'Subsequent Costs'

2.3.7.2. Annual allocation for MoC Projects

This program includes the cost of addressing defects or unsafe situations that occur during normal operations that need to be addressed to ensure a safe and reliable asset. Engineering changes can also be submitted for approval which prompt the need for some additional changes to ensure reliability and operability of the asset.

The costs are estimated based on the average annual historical cost for this type of work.

Table 2.23: Unit rate forecasts ($'000) for Annual allocation for MoC Projects

Annual allocation for MoC	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	1,174	250	250	250	250	250	1,250
Total units	5	1	1	1	1	1	5
Unit cost (three-year average)	**235**	**250**	**250**	**250**	**250**	**250**	**250**

The unit rate includes the internal labour, external contractors/consultants, materials and other costs for MoC Projects based on the average historical MoC costs.

EPCM activities and labour are provided by internal resources. The supply of required materials will be undertaken by external providers. External resources are supplied by various contracted resources as required by the issue to be addressed.

2.3.8. SCADA

The periodic SCADA program includes the replacement of hardware (servers, switches, firewalls) and upgrading SCADA software.

2.3.8.1. SCADA Hardware replacement

This program includes the replacement of SCADA servers, switches and firewalls in line with their useful life. Four servers will be replaced each year during AA5, totaling 20 for the period compared to 18 in AA4. 15 field switches are due to be replaced in AA5, compared to 4 office switches in AA4. Replacement of field switches is more expensive than for office switches. Firewalls were replaced in AA4 and don't fall due again until AA6.

Table 2.24: Unit rate forecasts ($'000) for SCADA Hardware

SCADA Hardware	AA4	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Server expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Server units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Server unit rate	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Switches expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Switches units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Switches unit rate	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, materials, travel and other costs for the SCADA Hardware replacement. The unit rate is based on historic cost of hardware replacement.

Project management and installation will be undertaken by internal resources. The other activities and supply of required materials will be undertaken by external providers. Where external resources are required they are supplied by [redacted].

2.3.9. Vehicles

We have a fleet of vehicles which is used for operation, including to inspect the pipeline. These vehicles are replaced regularly based on age, condition and ongoing maintenance costs to ensure the safety and reliability of the fleet, minimise potential risk to employees and minimise whole of life costs.

We replace our fleet at a rate of roughly nine per year. Vehicles are prioritized for replacement based on total kilometres, age, condition and the historic use of vehicle. Vehicles primarily used in metropolitan areas and on sealed roads do not wear and tear as quickly as vehicles with considerable remote driving and on unsealed roads. In AA5, 45 vehicles are due to be replaced compared to 52 AA4.

2.3.9.1. Annual replacement of fleet vehicles

Table 2.25: Unit rate forecasts ($'000) for DBNGP fleet vehicle replacements

Fleet vehicle replacements	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate reflects the total cost incurred in the acquisition of a fleet vehicle, including post-factory modifications. It is based on average historical costs with the vehicle types replaced each year being relatively consistent.

All fleet vehicles are supplied by [redacted] Pricing between the different [redacted] dealerships in and around Perth is regularly reviewed to ensure competitive and efficient pricing is achieved.

2.3.9.2. Replacement of civil equipment

We have a number of heavy vehicles and civil equipment used in operating and maintaining the pipeline. This equipment is serviced or replaced on an age and/or condition basis to ensure ongoing safety, reliability and availability of the equipment. The AA5 forecast includes replacement of four heavy vehicles and civil equipment, and major servicing of manitous. This is consistent with spend and activities in AA4.

Table 2.26: Unit rate forecasts ($'000) for civil equipment

Replacement of civil equipment	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	615	200	-	200	-	200	600
Total units	3	1	-	1	-	1	3
Unit rate (three-year average)	**205**	**200**	**-**	**200**	**-**	**200**	**200**

The unit rate includes the internal labour, external contractors, materials and other costs for the replacement of civil equipment and is based on historical costs.

EPCM will utilise internal resources. Other activities and supply of materials will be undertaken by a range of specialist external providers in line with our procurement policy.

2.3.10. Tools

The Transmission Operations and Maintenance and Transmission Asset Management teams require tools to carry out activities in the operation, maintenance and management of the pipeline. These include light warehouse equipment, workshop equipment, portable pumps and oil filtration, hand tools, various calibration, electronic testing, noise and vibration measurement equipment, GPS trackers, portable CP TRU and data loggers and process simulation software. These items are regularly serviced and replaced to ensure they are available, reliable, safe and fit for purpose.

Table 2.27: Unit rate forecasts ($'000) for TOM tools

Replacement of TOM tools	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	963	200	200	200	200	200	1,000
Total units	5	1	1	1	1	1	5
Unit rate (three-year average)	**193**	**200**	**200**	**200**	**200**	**200**	**200**

Table 2.28: Unit rate forecasts ($'000) for TAM tools

Replacement of TAM tools	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	373	75	75	75	75	75	375
Total units	5	1	1	1	1	1	5
Unit rate (three-year average)	**75**	**75**	**75**	**75**	**75**	**75**	**75**

The forecast unit rate includes the supply of materials and a small amount of capitalized time of internal labour for EPCM. Materials and services are procured from a range of suppliers in line with our procurement policy and minimum purchasing requirements.

2.3.11. Corporate, Business and Finance Systems

We have a number of IT systems and hardware which support our corporate, business (operational) and finance functions. These systems and hardware must be updated, upgraded and replaced regularly to ensure they remain robust, secure, fit-for-purpose and supported by the vendor.

The ongoing programs for corporate, business and finance systems in AA5 includes Annual IT Asset Renewal, Other core systems, Citrix upgrades, DMZ upgrades and Maximo annual patching.

Table 2.29: Forecasts ($'000) for Corporate, Business and Finance Systems

	AA4 forecast	AA5						Supplier/ vendor
		2021	2022	2023	2024	2025	TOTAL	
Annual IT Asset Renewal	1,300	733	762	452	427	1,063	3,437	[redacted]
I-05 Other Core Systems	1,089	194	70	145	70	145	624	[redacted]
Citrix Virtual Servers Upgrade	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Maximo annual patching	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
DMZ	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Microsoft Dynamics AX	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Corporate, Business and Finance System – Ongoing	**6,461**	**2,097**	**1,747**	**1,002**	**1,302**	**1,363**	**7,511**	

The forecasts for each program includes internal labour, external resources, materials and other costs. These programs are delivered externally, with internal labour providing EPCM.

Materials and external resources are supplied by each of the listed suppliers and vendors under supplier and vendor agreements. These agreements are reviewed and tendered periodically to ensure they continue to deliver efficient outcomes. Single source suppliers are managed in line

with our Procurement Policy and Purchasing Procedure. End user and network equipment is procured from various suppliers as per the minimum purchasing requirements.

3. Periodic work programs

The forecast expenditure program includes a number of programs of work that may not be required in every regulatory period or have not been required previously but are expected in the future. For these programs, the estimate cost for the forecast program is based on identifying the volume of work required and applying an historical unit cost. In general, the cost estimate is based on the most recent actual cost incurred to deliver comparable work.

The unit costs may be based on a consolidation of different unit costs reflecting several different specialist areas and could comprise of internally or externally delivered work. Where the program is delivered externally, the unit costs are also matched to similar locations.

Historical unit costs are broken down into the specialist discipline and work activity (as summarised in Table 1.1) and may include material and other costs. Where materials and other costs are not included in historical unit costs the estimate reflects historical average costs or the costs included in commercial agreements.

The specification of work reflects the requirements of the AMP and previous periods where available.

For some infrequent or new periodic programs of work, a bottom up approach has been used to forecast costs by outlining each component required and applying the most comparable rates from recent activities and supplier quotes.

3.1. Forecast expenditure for periodic programs estimated using unit costs

The forecast expenditure for periodic programs is $60 million and represents 31% of the AA5 expenditure forecast. This program is delivered by utilising a mix of internal and external resources. Table 3.1 below shows the periodic programs of work which are forecast based on unit costs for AA5. More detailed information on the unit cost assumptions is provided in section 3.4.

Table 3.1: Programs of work which are estimated based on unit cost forecasts in AA5

Project/Program	Discipline	Category of expenditure	Frequency	AA5 expenditure ($'000s)
Compressor unit control system replacement (Stage 4 Units)	ECI	Asset replacement/overhaul	18 year replacement cycle	18,400
Refurbishment of compressor station accommodation	Mechanical	Asset repair/maintenance	Approx 10 yearly	5,000
GEA control system replacement (Allen Bradley for Waukesha)	ECI	Asset replacement/overhaul	15 year replacement cycle	2,700
GEA control system replacement (ESM for GEA)	ECI	Asset replacement/overhaul	15 year replacement cycle	2,700

Project/Program	Discipline	Category of expenditure	Frequency	AA5 expenditure ($'000s)
CS unit F&G control system replacement (Stage 4)	ECI	Asset replacement/overhaul	15 year replacement cycle	2,400
CS unit F&G monitoring system replacement (ACS)	ECI	Asset replacement/overhaul	15 year replacement cycle	1,800
GEA control system replacement (Intellisys for DEA)	ECI	Asset replacement/overhaul	15 year replacement cycle	1,800
Replacement of original DBNGP signage	Mechanical	Asset replacement/overhaul	End of Life equivalent	1,723
Unit isolation valve replacement	Mechanical	Asset replacement/overhaul	30+ year replacement cycle	1,500
Station isolation valve replacement	Mechanical	Asset replacement/overhaul	30+ year replacement cycle	1,500
Pig barrel isolation valve replacement	Mechanical	Asset replacement/overhaul	30+ year replacement cycle	1,500
Station PLC replacement	ECI	Asset replacement/overhaul	End of life	1,500
Water bath heater replacement	Metering	Asset replacement/overhaul	End of life	1,200
Fuel gas heater	Mechanical	Asset replacement/overhaul	End of life	1,165
Replacement of Air Conditioning at Compressor Stations	Mechanical	Asset replacement/overhaul	End of life	1,155
RTU replacement	ECI	Asset replacement/overhaul	10-15 years	1,040
SCADA software	SCADA	Asset repair/maintenance	Approx 5-7 yearly	1,000
Turbine combustion air inlet filter system replacement	Rotating	Asset replacement/overhaul	30 year replacement cycle on condition	900
GEA control system replacement (GE for Waukesha)	ECI	Asset replacement/overhaul	15 year replacement cycle	900

Project/Program	Discipline	Category of expenditure	Frequency	AA5 expenditure ($'000s)
Load bank Control Panel Redesign and Replacement	ECI	Asset replacement/overhaul	Design flaw causes cracks – safety concern	750
Inspection of piping above/below ground interface	Mechanical	Asset repair/maintenance	10 to 20 year cycle between below and above ground	725
Lister GEA control system replacement	ECI	Asset replacement/overhaul	15 year replacement cycle	652
Replace batteries at MLV and Meter Stations	ECI	Asset replacement/overhaul	8 year replacement for battery and 15 year replacement for charger	601
Solar Turbines Software Upgrade	ECI	Asset repair/maintenance	5 yearly	560
Impressed current groundbeds replacement	CP	Asset replacement/overhaul	35 year replacement cycle	500
Earthing Replacement and AC mitigation of facilities	CP	Asset replacement/overhaul	On condition	500
Replacement of solar panels	Telecommunications	Asset replacement/overhaul	10-15 yearly	500
UPS system 24v	ECI	Asset replacement/overhaul	8 year replacement for battery and 15 year replacement for charger	458
UPS system 110v	ECI	Asset replacement/overhaul	8 year replacement for battery and 15 year replacement for charger	450
Meter station piping repair due to corrosion	Mechanical	Asset repair/maintenance	On condition (+35 years)	400

Project/Program	Discipline	Category of expenditure	Frequency	AA5 expenditure ($'000s)
Refurbishment of underground oil sump tanks.	Mechanical	Asset repair/maintenance	End of Life (+30 years)	400
Upgrade of Station & Unit F&G monitoring system at CSs (Inc SESD & MLESD)	ECI	Asset replacement/overhaul	15 year replacement cycle	350
TRU replacement	CP	Asset installation	20 years	320
CS unit F&G control system replacement (Stage 2)	ECI	Asset replacement/overhaul	15 year replacement cycle	300
Turbine meter replacement	Metering	Asset replacement/overhaul	End of Life (+30 years)	225
Coriolis meter replacement	Metering	Asset replacement/overhaul	End of Life	160
CSN Cisco Firewall and Server Replacement	Business Systems	Asset replacement/overhaul	End of life	160
Flow computer replacement	Metering	Asset replacement/overhaul	Approx 5 years	150
Upgrade of Gas Chromatographs	Metering	Asset replacement/overhaul	End of life	123
Instrument air system replacement.	Mechanical	Asset replacement/overhaul	Approx 23 years	90
Emergency response equipment replacement	Mechanical	Asset replacement/overhaul	End of Life	70
Maximo Business process redesign	Operational Tech	Asset repair/maintenance	5-10 yearly as required by changing business needs	893
AA5 programs – unit cost forecast				**59,639**

3.2. Current status of contracts

We have a number of contracts in place for the provision of external labour and materials which form the basis for unit costs adopted to estimate the cost of periodic programs in AA5. These are summarised in Table 3.2 below. The nature of our SIB capex means that a supplier may provide services for a range of programs, or over a number of years.

Contracts for services are entered into in line with the requirements of procurement policy and purchasing procedure. Generally contracts are set for three years with two 12 month extension options available. Each contract has a custodian who is typically the largest user of the services under that contract. The value and quality of work delivered under these contracts is regularly evaluated.

Table 3.2: Summary of contracts for periodic work programs

Supplier	Provision of	Specialist engineering discipline	Process for engagement
[redacted]	Labour and materials	Corporate	Sole Source - [redacted].
[redacted]	Labour and materials	SCADA	Contract for SCADA Back-up Solution was competitively tendered [redacted]
[redacted]	Labour and materials	Metering	Sole Source Justification approved at DFA level.
[redacted]	Labour and materials	Corporate	Sole Source Justification - [redacted]
[redacted]	Labour and materials	ECI	Sole Source - Original Equipment Manufacturer
[redacted]	Labour and materials	EOP	Sole Source - [redacted]
[redacted]	Labour and materials	SCADA	Sole Source - [redacted]
[redacted]	Labour and materials	Land Management	Sole Source - [redacted].
[redacted]	Labour only	Metering	Alternative Service Providers also under contract [redacted]
[redacted]	Labour and materials	SCADA	Specialist Equipment - [redacted] (RFA in accordance with purchasing procedure).
[redacted]	Labour and materials	EOP	Alternative Services Providers also under contract [redacted]

Supplier	Provision of	Specialist engineering discipline	Process for engagement
[redacted]	Labour and materials	Corporate	Competitive Tender [redacted]

3.3. Forecast unit costs

In AA5, where contracts are scheduled to expire, unit rates have been assumed to be maintained at the current rate unless there are specific drivers for a change.

Specific drivers for change include external events such as the impact of foreign currency fluctuations. Where this has materially influenced unit rates in AA4, the most recent actual unit purchase price in AUD equivalent is considered the unit rate component for the AA5 period, rather than the average actual over AA4.

The forecast also reflects the best estimate of the work volume that will be undertaken over AA5, based on asset management plans. More information on the work required and options considered is contained in the relevant business cases.

3.3.1. ECI

3.3.1.1. Compressor unit control system replacement

The compressor unit control systems are proactively replaced on an 18 year cycle. The compressor unit controls for the [redacted] Stage 4 units are due to be replaced in AA5. The forecast unit cost for this replacement is based on the most recent supplier quotes and actual costs incurred to replace the unit controls for Stage 1 units in 2015/16, 2017 and 2019.

Table 3.3: Unit cost forecasts ($'000) for compressor unit control system replacement

Compressor unit control system replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The forecast unit cost includes internal labour, external labour, materials, travel and other costs. EPCM is undertaken by internal labour. External labour and materials are provided under the sole supplier contract with [redacted] for the Stage 4 [redacted] turbine units.

3.3.1.2. GEA control system replacement

The GEA control systems are replaced on a 15-year cycle, with 18 due to be replaced in AA5. The forecast unit cost for this replacement is based on most recent supplier quotes and actual costs incurred to replace similar controls in 2017.

Table 3.4: Unit cost forecasts ($'000) for compressor unit control system replacement

GEA unit control system replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The forecast unit cost includes internal labour, external labour, materials, travel and other costs. EPCM is undertaken by internal labour. External labour is provided by [redacted]. Materials are supplied by [redacted] or the engine OEM.

3.3.1.3. Compressor unit fire & gas control and monitoring system replacement

The compressor unit fire & gas control and monitoring system replacement involves the replacement of fire & gas controls on the eight Stage 4 units, two Stage 2 units and replacement of monitoring systems on the six ACS compressor units, with three replacements completed in AA4. The AA4 replacement also included SESD/MLESD standardisation hence are slightly more expensive than the replacements forecast in AA5.

Table 3.5: Unit cost forecasts ($'000) for compressor unit fire & gas control and monitoring system replacement

Compressor unit fire & gas control and monitoring system replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
F&G controls - Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
F&G controls - Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
F&G controls - Unit cost (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
F&G monitoring - Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
F&G monitoring - Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
F&G monitoring - Unit cost (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit costs include internal labour, external contractors, materials, services and other costs.

EPCM activities will be provided by internal resources. The delivery of the work and supply of required materials will be undertaken by external providers. External labour is delivered by [redacted] and [redacted] Materials are supplied by [redacted] in line with our procurement policy.

3.3.1.4. Station PLC replacement

The station Programmable Logic Controllers (PLC) integrate a number if control systems at compressor stations and are programmed to execute station or emergency shutdown where certain signals are received from the various control systems at the station. The station PLCs are replaced proactively at end of life (approximately every 10 years). Five station PLCs will be replaced in AA5, following on from two replacements completed in AA4.

Table 3.6: Unit cost forecasts ($'000) for Station PLC replacement

Station PLC replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units							
Unit cost (three-year average)							

The unit cost includes internal labour, external contractors, materials, services and other costs.

EPCM activities will be provided by internal resources. The delivery of the work and supply of required materials will be undertaken by external providers. External labour is delivered by [redacted] and materials are supplied by various suppliers in line with our procurement policy.

3.3.1.5. RTU replacement

There are 52 Main Line Valves (MLVs) with RTUs as well as standalone meters with RTUs. The average service life of the RTU is between 10 and 15 years.

The previous RTU replacement was completed in 2010 and the RTUs will reach end of life by the end of AA5. This periodic replacement program will see all RTUs replaced evenly over the three years 2023-25. The cost estimate for replacement is based on the historical average over the prior period, which included pre-engineering and coding.

Table 3.7: Unit cost forecasts ($'000) for replacement of RTU replacement

RTU replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units							
Unit cost (three-year average)							

The unit cost includes the internal labour, external labour, materials, travel and other costs for the RTU replacement program.

EPCM activities will be provided by internal resources. The delivery of the work and supply of required materials will be undertaken by external providers. External labour is delivered by various engineering contractors and materials supply is undertaken in line with our procurement policy.

3.3.1.6. Lister GEA control system replacement

10kW lister GEAs are used as a standby back up source of power at MLVs. They are controlled remotely and the control systems are replaced proactively after 15 years of service in line with the AMP. The last replacement was completed between 2006 and 2007, with all 41 controls to be replaced 2023-2025.

Table 3.8: Unit cost forecasts ($'000) for Lister GEA control system replacement

Lister GEA control system replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit cost includes the internal labour, external labour, materials, travel and other costs for the lister GEA control system replacement. EPCM is undertaken by internal labour. External labour is provided by various engineering providers. Materials are generally supplied by the OEM.

3.3.1.7. Battery replacement

Batteries provide primary and secondary power that supports electrical instrumentation and communications across compressor stations, meter stations and mainline valves. Batteries are replaced every eight years, chargers/rectifiers are replaced every 15 years. These replacements are prioritised by condition. Chargers are around four times the cost of a battery.

In AA5, we will replace:

- batteries at 34 sites (28 repeaters and 6 spur sites) to complete our replacement program across all 51 sites which began in 2020;
- 110v batteries at six compressor stations (compared with batteries and chargers at four compressor stations in AA4); and
- 24v batteries at one compressor station and chargers at three compressor stations (compared with 24v batteries at six compressor stations and chargers at three compressor stations in AA4) – note these systems vary in size and hence replacement costs vary across locations.

Table 3.9: Unit cost forecasts ($'000) for battery replacement

Battery replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
MLV & MS - Total forecast expenditure	[redacted]						
MLV & MS - Total units							
MLV & MS - Unit cost (three-year average)							
110v - Total forecast expenditure							
110v - Total units (battery equiv)							
110v - Unit cost (three-year average)							
24v - Total forecast expenditure							
24v - Total units							
24v - Unit cost (three-year average)							

The unit cost for batteries, chargers and rectifiers includes internal labour, external contracts, materials and other costs.

The work is delivered using a combination of internal labour and external contractors, including [redacted]. Materials are supplied by the battery OEM and [redacted] in line with our procurement policy.

3.3.1.8. [redacted] Turbines Software Upgrade

We are currently utilising an XP version [redacted] software package, for which we no longer have any spare hardware. The [redacted] software upgrade will upgrade 16 turbine packages to the Windows 10 version, which will allow installation on existing HMI spare hardware. Two upgrades were completed in AA4, with the remaining 14 to be completed in 2021. The upgrades in AA4 also included hardware, hence were more expensive than those forecast in 2021.

Table 3.10: Unit cost forecasts ($'000) for Solar turbine software upgrades

Solar turbine software upgrades	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units							
Unit cost (three-year average)							

The unit cost includes internal labour and materials. The software package is purchased from the OEM, under existing contracts.

3.3.1.9. Loadbank Control Panel Redesign and Replacement

The loadbank control panel, which power or de-power elements in the loadbank as the power demands go up and down, dissipating excess power. The redesign and replacement of loadbank control panels in AA5 will replace and rewire loadbank panels at five compressor stations which have been susceptible to failure caused by overheating. This compares to two completed in AA4.

Table 3.11: Unit cost forecasts ($'000) for Loadbank Control Panel Redesign and Replacement

Loadbank Control Panel Redesign and Replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit cost includes internal labour, external contractors, material, services and other costs.

Internal labour provides EPCM. External labour will be provided by [redacted] Materials and services are supplied by the OEM.

3.3.2. Telecommunications

3.3.2.1. Replacement and overhaul of solar panels

Solar power systems are utilised as a primary power source across a number of smaller sites. This program replaces solar panels approximately every 10-15 years, depending on condition, consistent with the AMP. This ensures optimal power supply is maintained. 11 panels will be replaced in AA5, with the last replacement/initial installation of these panels completed in 2013.

Table 3.12: Unit cost forecasts ($'000) for replacement of solar panels

Replacement of solar panels	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit cost includes the internal labour, external labour, materials, travel and other costs.

EPCM activities are to be provided by internal resources. The work will be delivered and materials supplied by external providers engaged in line with our procurement policy.

3.3.3. Rotating

3.3.3.1. Turbine combustion air inlet filter system replacement

The turbine air inlet replacement will replace the last of the original Stage 3A air inlet filter systems which has been in operation since 2000. The other two were replaced in AA3. Note that

the actual air inlet chambers were purchased as part of AA3 but has been stored at CS9 and will be installed in AA5 with its installation costs.

Table 3.13: Unit cost forecasts ($'000) for turbine air inlet replacement

Turbine air inlet replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units							
Unit cost (three-year average)							

The unit cost includes the internal labour, external labour, materials, travel and other costs.

EPCM activities are to be provided by internal resources. The work will be delivered and materials supplied by external providers engaged in line with our procurement policy.

3.3.4. Cathodic Protection

There are three cathodic protection periodic programs; replacing Transformer Rectifier Units (TRU) earthing replacement and impressed current groundbeds.

3.3.4.1. TRU Replacement

There are a total of 49 TRUs on the pipeline. TRUs have a useful life of around 20 years. This program will replace 32 end of life TRUs, with 6 units replaced each year, except for 2022, where 8 units will be replaced.

Table 3.14: Unit cost forecasts ($'000) for TRU replacement program

TRU replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units							
Unit cost (three-year average)							

The unit cost includes internal labour, external labour, materials, travel and other costs and is based on similar replacements completed in AA4 which was required due to lightning strike, causing complete failure of the units.

EPCM is provided by internal resources. The work is to be delivered and materials supplied by external providers. External labour is provided by [redacted] and materials by various suppliers in line with our procurement policy.

3.3.4.2. Earthing Replacement and AC mitigation of facilities

Cathodic protection surveys have identified performance deterioration of several sacrificial anodes. Sacrificial anodes have a useful life of around 20 years. The AA5 program will complete the Worsley lateral in 2021, the Swan river and Kwinana area in 2022 and the southern loop and end of line in 2023.

Table 3.15: Unit cost forecasts ($'000) for Earthing Replacement and AC mitigation of facilities

Earthing Replacement and AC mitigation of facilities	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit cost includes the internal labour, external labour, materials, travel and other costs. The unit cost is based on similar work completed where some earthling systems were replaced at MLVs.

EPCM activities will be provided by internal labour. The delivery of the work and supply of required materials will be undertaken by external providers. [redacted] is engaged for earthing installation and other external resources required will be engaged based on our procurement policy.

3.3.4.3. Impressed current groundbeds

This program will replace groundbeds with a loop resistance greater than 10 ohms after around 35 years in operation. The AA5 program will replace one groundbed per year, following one replacement undertaken in AA4.

Table 3.16: Unit cost forecasts ($'000) for Earthing Replacement and AC mitigation of facilities

Earthing Replacement and AC mitigation of facilities	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit cost includes the internal labour, external labour, materials, travel and other costs. The unit cost is based on similar work completed where some earthling systems were replaced at MLVs.

EPCM activities will be provided by internal labour. The delivery of the work and supply of required materials will be undertaken by external providers. [redacted] is engaged for earthing installation and other external resources required will be engaged based on our procurement policy.

3.3.5. Mechanical

3.3.5.1. Meter station piping repair

This program will repair piping at meter stations which have experienced normal above ground corrosion. There are 61 meter stations (54 are in operation and 7 are not), with 2 sites forecast for repair each year from 2021 based on condition.

Prior periods have included costs of repairing some meter station piping (for example, clamp repair at Alcoa, pipe repair at Alcoa heaters, Clifton Rd small bore pipe repair, Thomas Rd pipe repair).

Table 3.17: Unit cost forecasts ($'000) for Meter Station Piping repair due to corrosion

Meter Station Piping repair due to corrosion	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	-	[redacted]					
Total units	-	[redacted]					
Unit cost	-	[redacted]					

The unit cost includes the internal labour, external labour, materials, travel and other costs. The unit cost is based on similar historical projects completed via our painting programs.

EPCM activities will be provided by internal resources. The delivery of the work and supply of required materials will be undertaken by external providers. External labour is delivered by [redacted] and materials supply is completed in line with our procurement policy.

3.3.5.2. Replacement of air conditioning at compressor stations

This program involves the replacement of air conditioning at compressor stations which has reached end of life, prioritising those which have faults. 24 replacements have occurred during AA4. The full replacement program is scheduled for completion in 2023.

Cost estimates include forecast for the removal of old units, reconfiguration or relocation of ventilation control systems, patching and remedial works.

Table 3.18: Unit cost forecasts ($'000) for replacement of air conditioning at compressor stations

Replacement of air conditioning at compressor stations	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units	[redacted]						
Unit rate (three-year average)	[redacted]						

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on a three-year historical average.

EPCM activities are provided by internal resources. The delivery of the work and supply of air conditioning systems will be subject to commercial tender as per the procurement policy.

3.3.5.3. Inspection of piping above and below ground interface

The inspection of piping above and below ground interface program in AA5 considers the inspection of above and below ground interfaces at sites north of Gingin, with their southern counterparts inspected in AA4.

In total, there are 150 sites that need inspection. The highest risk ones with evidence of the worst corrosion are already complete. AA5 assumes an inspection of 19 MLVs, 12 meter stations and 2 compressor stations each year.

Table 3.19: Unit cost forecasts ($'000) for inspection of piping above and below ground interface

Inspection of piping above and below ground interface	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units	[redacted]						
Unit rate (three-year average)	[redacted]						

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on actual historical costs. The mix of site types drives a slightly lower average cost in AA5 than in AA4.

EPCM activities are provided by internal resources. External labour providers will be engaged in line with our procurement policy.

3.3.5.4. Station isolation valve replacement

There are 20 station isolation valves on the pipeline which are 30+ years old. These valves are integral to the emergency shutdown philosophy. We will replace these valves on condition at an average rate of one every two years from 2021. None of these valves have been replaced to date.

Table 3.20: Unit cost forecasts ($'000) for Station isolation valve replacement

Station isolation valve replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units	[redacted]						
Unit rate	[redacted]						

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on historical costs for similar works along with material cost estimates from suppliers.

EPCM and labour is typically provided by internal resources. Materials will be purchased in line with our procurement policy.

3.3.5.5. Unit isolation valve replacement

The unit isolation valves are 30+ years old. These valves are integral to the safe isolation of compressor units. We will replace these valves on condition at an average rate of one per year. The unit check valves for Stage 4 packages and one at CS10 were replaced in AA4.

Table 3.21: Unit cost forecasts ($'000) for inspection of piping above and below ground interface

Inspection of piping above and below ground interface	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit rate (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on actual historical costs for similar replacements in AA4.

EPCM and labour is typically provided by internal resources. Materials will be purchased in line with our procurement policy.

3.3.5.6. Pig barrel isolation valve replacement

The pig barrel provide positive isolation to launch and receive during the ILI program. Pipe sections have to be vented from the nearest MLV to accommodate pig launch and retrieval. We will replace five valves in AA5 in preparation for the next ILI runs in AA6.

Table 3.22: Unit cost forecasts ($'000) for inspection of pig barrel isolation valve replacement program

Pig barrel isolation valve replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on historical costs for similar works along with material cost estimates from suppliers.

EPCM will be provided by internal resources. The delivery of the work and supply of required materials will be undertaken by external resources. External labour is resourced by a number of suppliers - [redacted].

3.3.5.7. Refurbishment of compressor station accommodation and buildings

There is onsite accommodation at our compressor stations. We have been refurbishing and modernising these facilities in AA4 in lieu of the installation of new accommodation facilities. In AA5 we will complete our refurbishment and modernisation of internals and undertake reinforcement works for those located in cyclone prone areas. In addition, sealing of foundations will be reinforced to ensure wildlife are not attracted to these facilities particularly venomous snakes that can seek accommodation below the foundations of the building. It is a key safety issue for field staff. External works are expected to be more costly than the refurbishment and modernization of internals undertaken in AA4 to date, contributing to an increased unit cost.

Table 3.23: Unit cost forecasts ($'000) for Refurbishment of compressor station accommodation and buildings

Refurbishment of compressor station accommodation and buildings	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	2,445	1,000	1,000	1,000	1,000	1,000	5,000
Total units	-	-	-	-	-	-	-
Unit cost	**-**	**-**	**-**	**-**	**-**	**-**	**-**

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on historical costs for similar works along with bottom up cost estimates for new works.

EPCM is provided by internal resources. External labour and materials will be subject to a competitive tender in line with our procurement policy.

3.3.5.8. Replacement of DBNGP signage

The original DBNGP signs were installed in between 1985 - 1986. Looping signs were installed between 2000 - 2008. The number of signs with an average of 30+ years is 8,050 and with 15+ years is 5,890. Original DBNGP signage plates (Mainline in particular) require replacement due to fading of stickers, more prevalent in the northwest. Just over a fifth of replacements were completed in 2019, with the remaining to be completed in AA5 at a cost of [redacted] per sign.

Table 3.24: Unit cost forecasts ($'000) for Replacement of DBNGP signage

Replacement of DBNGP signage	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost ($) (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on historical costs for similar works along with bottom up cost estimates for new works.

EPCM is provided by internal resources. External labour and materials will be subject to a competitive tender in line with our procurement policy

3.3.5.9. Instrument air systems and components

There are two instrument air systems per compressor station, each with two air compressors, two dryers and two vessels. The useful life of the systems is around 23 years, with replacement of components undertaken on condition. The current components range from 12-30 years. In AA4 we replaced air compressors at two stations (at CS6 & CS9). We expect another two replacements in 2021, and four in AA6.

Table 3.25: Unit cost forecasts ($'000) for Instrument air system

Instrument air system	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units							
Unit cost							

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on actual historical costs for similar replacements in AA4.

EPCM is provided by internal resources. External labour and materials will be engaged/purchased in line with our procurement policy.

3.3.5.10. Fuel gas heaters

The six fuel gas heaters on ACS packages are electric water bath heaters which we will replace with electric immersion heaters (as used on other packages) in AA5 due to their age and increasing maintenance costs.

Table 3.26: Unit cost forecasts ($'000) for fuel gas heaters

Fuel gas heaters	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units							
Unit cost							

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on actual historical costs for similar replacements and quotes for materials from suppliers.

EPCM is provided by internal resources. External labour and materials will be engaged/purchased in line with our procurement policy.

3.3.5.11. Refurbishment of underground oil sump tanks

There are approximately five underground tanks at each compressor station ranging from 12-30 years. Soil monitoring indicates that some of these tanks are failing. We will undertake a program of work beginning in AA5 to refurbish or replace these tanks based on condition at a rate of one per year. This follows an assessment of below ground tank leaks undertaken in AA4.

Table 3.27: Unit cost forecasts ($'000) for Refurbishment of underground oil sump tanks

Refurbishment of underground oil sump tanks	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units							
Unit cost							

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on actual historical costs for similar replacements and quotes for materials from suppliers.

EPCM is provided by internal resources. External labour and materials will be engaged/purchased in line with our procurement policy.

3.3.5.12. Emergency response equipment

We keep a separate container/trailer packed with certain tools and equipment to enable a quick response to emergencies. This includes welding equipment, split sleeve fittings, hot tap and other equipment. We will replace the equipment in 2025 in line with its useful life.

Table 3.28: Unit cost forecasts ($'000) for Emergency response equipment

Emergency response equipment	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure							
Total units							
Unit cost							

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on actual historical costs for similar replacements and quotes for materials from suppliers.

EPCM is provided by internal resources. Materials will be purchased in line with our procurement policy.

3.3.6. Metering

The periodic metering programs include the replacement of meters, flow computers and heater fuel gas trains as well as the upgrade of gas measurement monitoring software.

3.3.6.1. Flow computer replacement

This program will replace flow computers at Compressor Stations one per year from 2025. This follows on from a larger program of work which upgraded flow computers across compressor stations and meter stations in AA4.

Table 3.29: Unit cost forecasts ($'000) for flow computer replacement

Flow computer replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	-	-	-	-	-	[redacted]	[redacted]
Unit cost (three-year average)	**-**	**-**	**-**	-	-	[redacted]	[redacted]

The unit cost includes the internal labour, materials, travel and other costs. The unit cost is based on the flow computer replacement costs incurred as part of larger upgrades in AA4.

EPCM activities will be provided by internal resources. The delivery of the work and supply of required materials will be undertaken by external resources. External resources are provided by [redacted] and [redacted]

3.3.6.2. Water bath heater replacement

There are approximately 20 water bath heaters located on the pipeline which are 12-30 years. This program is for the scheduled replacement of three heaters per year on condition due to increased maintenance costs.

Table 3.30: Unit cost forecasts ($'000) for Water bath heater replacement

Water bath heater replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	-	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	-	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost	-	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit cost includes the internal labour, materials, travel and other costs and is based on actual historical costs for similar replacements and quotes for materials from suppliers.

EPCM is provided by internal resources. External labour and materials will be engaged/purchased in line with our procurement policy.

3.3.6.3. Turbine meter replacement

This program will replace end-of-life turbine meters which have been in service for over 30 years and can no longer be refurbished or relifed. Turbine meters come in various sizes from 2 inches up to 12 inches with larger meters costing more than smaller meters.

Table 3.31: Unit cost forecasts ($'000) for Turbine meters replacement

Turbine meters	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	-	-	-	-	-	[redacted]	[redacted]
Total units	-	-	-	-	-	[redacted]	[redacted]
Unit cost	-	-	-	-	-	[redacted]	[redacted]

The unit cost includes the internal labour, materials, travel and other costs and is based on actual historical costs for similar replacements and quotes for materials from suppliers.

EPCM is provided by internal resources. External labour and materials will be engaged/purchased in line with our procurement policy.

3.3.6.4. Coriolis meter replacement

This will complete the coriolis meter replacements started in AA4.

Table 3.32: Unit cost forecasts ($'000) for coriolis meter replacement

Coriolis meters	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	-	-	-	-	-	-	-
Unit cost (three-year average)	-	-	-	-	-	**-**	**-**

The unit cost includes the internal labour, materials, travel and other costs and is based on actual historical costs in AA4.

EPCM is provided by internal resources. External labour and materials will be engaged/purchased in line with our procurement policy.

3.3.6.5. Upgrade of gas chromatographs

This will complete the gas chromatograph replacements started in AA4, with one more site to be done following two in AA4.

Table 3.33: Unit cost forecasts ($'000) for gas chromatographs replacement

Gas chromatographs	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost (three-year average)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit cost includes the internal labour, materials, travel and other costs and is based on actual historical costs in AA4.

EPCM is provided by internal resources. External labour and materials will be engaged/purchased in line with our procurement policy.

3.3.7. SCADA

3.3.7.1. SCADA Software upgrade

SCADA software is upgraded around every seven years with a major upgrade due in 2024. The cost of the upgrade has been estimated by considering the historical cost of previous upgrades and estimates received from our SCADA partner (Aveva).

In AA4 the SCADA application was modified to operate on a 64-bit operating system. Discussions with our SCADA partner indicate the 2024 upgrade will be much larger including significant enhancements to the SCADA application and user interface. We note this is still a much lower cost than the upgrade in 2011 of $4 million.

Table 3.34: Unit rate forecasts ($'000) for SCADA Software upgrade

SCADA Software upgrade	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The unit rate includes the internal labour, external labour, materials, travel and other costs and is based on advice from our SCADA software partner, [redacted].

EPCM will utilise internal resources. Other activities and supply of materials will be undertaken by external providers, with external resources supplied by [redacted].

3.3.8. Corporate, Business and Finance Systems

3.3.8.1. Maximo Business Process Redesign

This project will complete the process redesign of Maximo to align with the AMP that has started in AA4 consistent with audit findings and agreed actions.

Table 3.35: Unit cost forecasts ($'000) for Maximo Business Process Redesign

Maximo Business Process Redesign	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total units	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unit cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The forecast unit cost includes internal labour, external resources, materials and other costs. These programs are delivered externally, with internal labour providing EPCM.

Materials and external resources are supplied by Certus under a vendor agreement.

3.3.8.2. CSN Cisco Firewall and Servers Replacement

This project will replace the firewall and server for our CSN network used by our field operations and maintenance team to communicate across the pipeline. One server was replaced in AA4. The higher cost in AA5 includes firewall and server replacement.

Table 3.36: Unit cost forecasts ($'000) for CSN Cisco Firewall and Server Replacement

CSN Cisco Firewall and Server Replacement	AA4 Forecast	AA5 Forecast					
		2021	2022	2023	2024	2025	TOTAL
Total forecast expenditure	[redacted]						
Total units							
Unit cost							

The forecasts unit cost includes internal labour, external resources, materials and other costs. These programs are delivered externally, with internal labour providing EPCM.

Materials and hardware are supplied by various suppliers in line with our procurement policy.

4. Once off and new initiatives

The cost of once off and new initiatives are estimated based on the type of initiative. Large value, unique or relatively unique projects usually have detailed estimates developed at an early stage based on a comprehensive resource, cost and schedule. Whereas, lower value activities, which have some degree of repeatability or volume driven activities are estimated using a bottom up approach outlining each component required and applying the most comparable rates from recent activities and quotes for similar items from preferred suppliers.

4.1. Once off and new – individual estimates generated

The forecast expenditure for once off and new projects and programs is $61 million and represents 31% of the AA5 expenditure forecast.

Table 4.1 below shows the projects and initiatives for which individual estimates have been put together.

Table 4.1: Projects which have individual estimates for AA5

Project/Program	Discipline	Driver for investment	AA5 estimate
Replacement of Northern communications system	Comms	Obsolescence of existing system and equipment failure	29,992
Jandakot upgrade	Operations	Safety and changing business needs	8,083
IT Enabling	Corporate	Introduction of Business Intelligence and predictive analytics	5,142
Turbine Exhaust replacement	Mechanical	End of life	4,835
CRS upgrade	Business Systems	Modernisation (i.e. mobile use) and enhanced support requirements	2,787
Installation of Fire Suppression System on Stage 2 and 3A Units	ECI	Fire detection system installed but no fire suppression - insurer requirement to retrofit	1,950
Cyber resilience	Corporate	Ensuring our systems are robust and resilient to cyber threats	1,247
Piping Interface Wrap Removal	Mechanical	New solution to existing operational problem – interface coating instead of wrap	879
Compressor Sites Cladding Removal	Mechanical	More efficient than replacement	800

Project/Program	Discipline	Driver for investment	AA5 estimate
MLV Redesign for Closing Operation	ECI	New – started in 2018	520
Decommissioning & Mothballing of Non-operational assets/facilities	Asset Strategy	New – move from ad hoc to systematic approach to asset decommissioning and mothballing	500
Compressor Units Online Dynamic Data Vibration Monitoring System	Rotating	Asset installation – increased penetration of online dynamic vibration monitoring of compressor units, system install	450
Piping Inspection Under Insulation and Within Buried Pits	Mechanical	Condition	416
Compressor Station CP visibility	CP	Retrofit for non-visible components	400
Data Protection and Privacy	Corporate	Obligations	364
IT Program & Change Management Apps Component	Corporate	Support implementation of IT initiatives/changes	304
Meter station piping repair due to corrosion	Mechanical	Condition	400
Solar Compressor Package Dynamic Vibration Data Visibility Annual upgrade	Rotating	Asset installation – system license for additional dynamic vibration data packages	300
Relocate Unit Piping to above ground at CS3	Mechanical	Operational issues	297
Cockburn Power Station & PEPL Flow Meters	Metering	Condition	284
Upgrade of Fuel Gas pressure control loop for CS01/U1, CS03/U1, CS05/U1 & U2, CS08/U2	ECI	Condition	280
IACS office/workshop/test lab	Safety	Operational needs	234
Maximo upgrade (IT component)	Corporate	IT changes to support Maximo redesign	170
Replacement of Corroded Exhaust Flange at CS10U3	Mechanical	Condition	130
Technology Governance and Automation		IT Security	129
Customer Support/Service Desk	Corporate	Operational needs	124
As-build of CP Equipment at Compressor Stations	CP	Operational needs	124

Project/Program	Discipline	Driver for investment	AA5 estimate
CP visibility non visible sites	CP	Operational needs	115
CRS Billing Revenue Management System upgrade	Corporate	IT changes to support CRS upgrades	94
DC Power Upgrade MLV6	ECI	Operational needs	65
AA5 programs – individual estimates			**61,110**

The individual estimates include the internal labour, materials, travel and other costs for all initiatives. More information on the build up of these costs can be found in the relevant Business Cases.