Goldfields Gas Pipeline

2025-29 Access Arrangement

Capital Expenditure Overview

January 2024

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OVERVIEW

GGP's customers and operating context

Capital expenditure (capex) covers the investments required to ensure that the Goldfields Gas Pipeline (GGP) can continue to provide a safe, reliable, and secure supply of energy.

The GGP supplies significant remote mining operations and power stations in the Pilbara and Goldfields-Esperance regions, where the value of mineral production is around $130.0 billion and $22.8 billion per year respectively.[1] The GGP also supplies gas to the Kalgoorlie gas distribution system which has around 7,500 small end-use customers.

As the GGP is a critical source of fuel, supply interruptions risk disruption to our customers' operations and, potentially, the emergency shutdown of critical safety systems, such as underground ventilation. Given the safety, economic and financial consequences of a loss of supply to our customers, and to Western Australia / Australia's economy more broadly, the reliability of the GGP is paramount.

An increasing complex external environment and an ageing asset

While the role of the GGP is to continue to provide a safe and reliable supply of energy, investment requirements are growing due to the increasingly complex external environment. Over the last five years we have seen:

- Significant cost increases and supply shortages**,** particularly for specialised labour and services in remote areas. Just 25 days into the current AA4 period, the first Australia case of COVID-19 was announced. Since then, we have experienced a series of operational challenges, shocks to global supply chains, the highest inflation in three decades, and now ongoing skilled workforce pressures pushing up supplier costs and prices.
- Increasing focus on emission reductions to achieve state and national climate targets from:
  - Customers – who are increasingly committed to reducing emissions. Among the Minerals Council of Australia's members, 93% target net-zero by 2050 and 12% by 2040.[2] 89% of the ASX 100 companies are now reporting in line with climate targets.[3]
  - Governments – At the national level we have seen the introduction of national legislated emission reductions targets, reforms to the Safeguard Mechanism and a

[1] Department of Mines, Industry Regulation and Safety 2023, *2022-23 Spatial and Regional Resources Data File,* Available here.
[2] Minerals Council of Australia 2023, *Climate Action Plan Progress Report 2023,* p.2 Available here.
[3] KPMG 2023, *Status of Australian Sustainability Reporting Trends June 2023 Update,* p.4 Available here.

change to the National Gas Objective (soon to be adopted in WA) all within about two years. At the state level the Western Australian government is committed to achieving net zero by 2050 and is currently developing a series of sectoral emissions reduction strategies which will cover the resources sector.

- Heightened focus on cyber and physical security from both our customers and governments leading to the introduction of the Security of Critical Infrastructure (SOCI) Act 2018 and associated Rules (made in February 2023).
- The completion of the Northern Goldfields Interconnect (NGI) which provides a second supply of gas to the GGP, from the Dampier to Bunbury Natural Gas Pipeline.

The GGP is now entering a new phase as it approaches 30 years of age. Many of its mechanical, electrical, and control components are nearing the end of their useful life, posing increasing reliability risks. Additionally, it is time for the next critical Inline Inspection (ILI), where an intelligent 'pig' will evaluate the pipeline's integrity.

The development of an optimised investment program

We have considered customer requirements, external factors, and the life-stage of the GGP to develop a prudent and efficient investment program.

In several areas increased investment is required, particularly where work cannot be deferred without risking the ongoing safety, security, and reliability of the pipeline. This uplift in investment has already commenced (and in some cases completed) and will continue over the AA5 period. These investment drivers are not GGP specific and have led to higher levels of investment across all energy assets across Australia.

We have been able to mitigate the cost impact of these factors by drawing on APA's overall strength. For instance, through:

- APA-wide dedicated specialist teams – improving the efficiency of projects and processes and allowing costs to be spread across a large portfolio of assets. For instance, the national program to comply with the requirements of the SOCI Act and address cyber security risks. This enables GGP to reduce costs well below what would have been incurred by a standalone entity.
- Unparalleled depth of knowledge and expertise from Australia's largest pipeline owner and operator. Our processes, plans and strategies reflect good industry practice, our experience across other similar assets as well as our knowledge of the latest industry developments. For instance, our ILI program has been developed by integrity engineers and planning teams who continuously run these campaigns around Australia. As a result, efficiencies have been embedded into our program while reducing technology and delivery risks.

We have also found opportunities to optimise our operations and investment plans. For instance, we have developed a new operating philosophy to leverage the Northern Goldfields Interconnect (NGI) to maintain security of supply while reducing emissions and fuel gas use. This has resulted in a new compressor run order (reducing emissions, opex and system use gas requirements[4]) and enabled the deferral of compressor engine overhauls (in some cases beyond the AA5 period) all while limiting reliability risks.

Although it is not yet confirmed that these and other efficiencies can be realised, for instance as the NGI was only officially opened six months ago and we have limited real-world data, we have incorporated these opportunities into our forecast on the basis that they represent our best estimate of future requirements.

Despite external headwinds forecast capex consistent with the current period

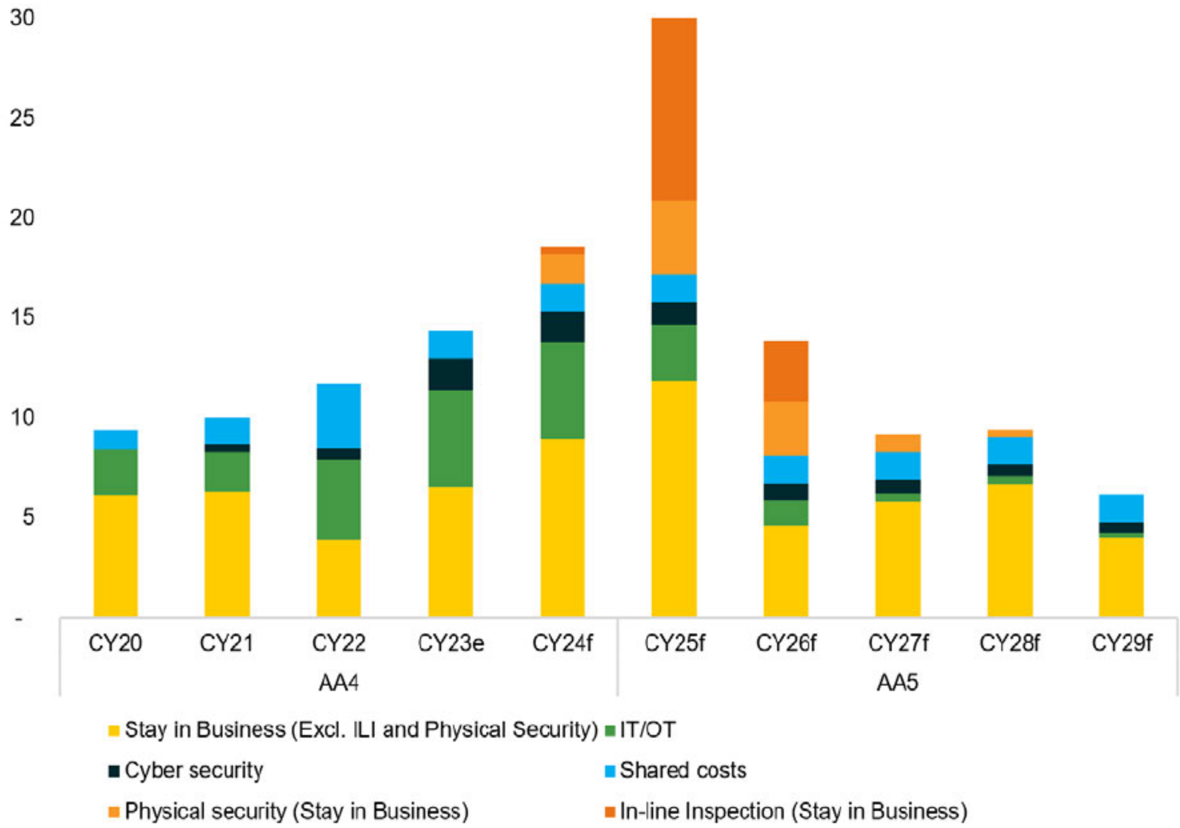
Forecast capex for AA5 is $69.3 million, 8% above the AA4 period. This increase in capex is primarily due to the ILI program, where costs are only incurred every 10 years. Removing the impact of the ILI results in AA5 capex 12% lower than in AA4.

Figure 1.1 presents capex over AA4 and AA5 showing:

- The 'lumpiness' of ILI costs, due to the nature of a 10-year inspection program.
- Increased investment to secure the GGP against rising physical security threats starting in 2024.
- Largely steady stay in business costs (after accounting for ILI and physical security) to maintain the reliability of the GGP. Forecast investment is focussed on replacing end of life equipment at facilities. We will also install dry gas seals at Wiluna to remove operational and reliability risks from the current wet seals and deliver emissions reductions.
- Continued investment to meet the requirements of the Security of Critical Infrastructure Act 2018 (the SoCI Act).
- A reduction in Information Technology and Operational Technology (IT/OT) costs following from major system replacements in AA4. We have recently completed a transformation program to modernise and replace legacy systems, such as Grid Solutions and the hydrocarbon accounting system.

[4] Reducing costs to our consumers who procure system use gas.

Figure 1.1 Capex over AA4 and AA5 ($2023, millions)



A summary of category-level expenditure across AA4 and AA5 is set out Table 1.1.

Table 1.1 Capital expenditure over AA4 and AA5 ($2023 millions)

Category	Subcategory	AA4	AA5
Stay in business	Integrity (including ILI)	0.5	12.9
	Rotating maintenance	1.7	3.1
	End of equipment life	9.2	17.4
	Net zero	-	4.0
	Physical security	1.5	7.6
	Hazardous area / compliance	1.0	0.8
	Reliability	13.6	4.3
	Other	4.4	1.2
	Buried pipework	1.9	2.1
Shared	IT/OT	18.0	5.2
	Cyber security	4.0	3.8
	Other	8.3	7.0
Total		**64.9**	**69.3**

We have also benchmarked our capex costs to other major pipelines and found our forecast capex is comparable to the other large gas pipelines around Australia, once pipeline age and level of compression is considered. Average forecast capex over the AA5 period is $13.9 million per year compared to the average capex of $19.8 million per year of all large pipelines. The other regulated Western Australian scheme pipeline, the Dampier to Bunbury Natural Gas Pipeline (which is older and has more compressor stations), incurs around $30 million per year.

Attachments and supporting information:

- Attachment 10.2 Capital expenditure model
- Attachment 10.3 Capital expenditure coverage allocation model
- Attachment 10.4 ITOT plan
- Attachment 10.5 ITOT architecture vision
- Attachment 10.6 Technology enablement program – Business showcase
- Attachment 10.7 SoCI cyber plan
- Attachment 10.8 Asset Performance and lifecycle plan
- Attachment 10.9 Asset Management presentation
- Attachment 10.10 SIB business case: In-line Inspection
- Attachment 10.11 SIB business case: Rotating equipment major maintenance
- Attachment 10.12 SIB business case: End of equipment life
- Attachment 10.13 SIB business case: Wiluna wet seals
- Attachment 10.14 SIB business case: Physical security
- Attachment 10.15 SIB business case: GEA replacement program
- Attachment 10.16 SIB business case: Buried services

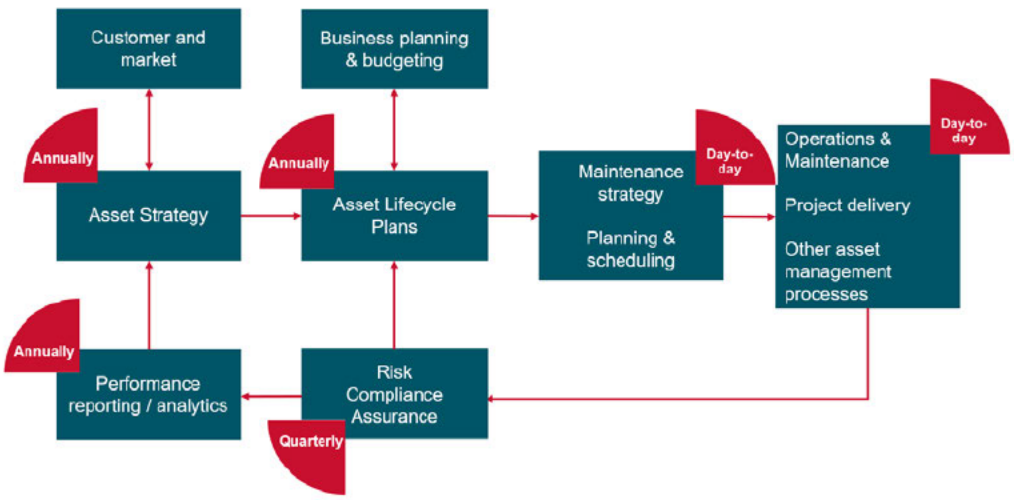
1. ASSET PERFORMANCE AND LIFECYCLE PLANNING

The full Lifecyle planning process for the GGP is managed through APA's Operational Excellence framework and supporting business processes. This includes the Asset Management System and Planning processes which translate strategy into actionable plans that balance cost, risk and performance.

Figure 1.1 APA's Operational excellence framework

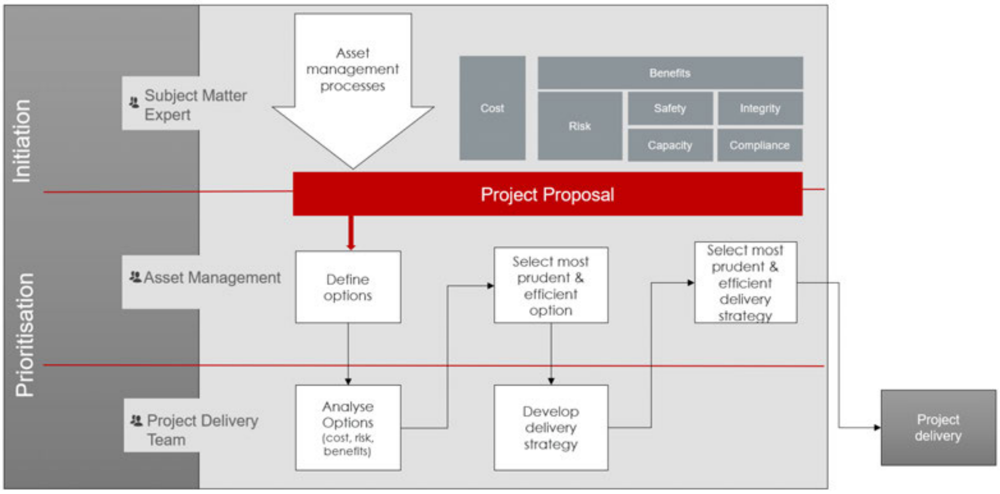
Consistent with ISO55000, the APA's asset management approach is centred around the circular Plan-Do-Check-Act cycle for continual improvement. This is achieved through a combination of process and rhythms as outlined in Figure 1.1.

Figure 1.2 Asset Management process and rhythms



These processes and rhythms are supported by a suite of modern IT systems, such as our Asset Lifecycle PowerApp or our Maximo maintenance management software. These systems streamline the project initiation, prioritisation, and review process (outlined in Figure 1.3) and means that our plans are not static linear documents but more of a database of information captured in a live system.

Figure 1.3 Capex initiation and prioritisation process



At the heart of all our process is the investment prioritisation based on cost, risk and performance. Our systems provide a live view of all proposed investments mapped by:

- **Risk** – with a ranking based on APA's Enterprise Risk Matrix.[5] This takes into account the likelihood and impact of events across several dimensions.[6]
- **Asset Management Plan Alignment –** Capturing other benefits which could relate to better customer outcomes, improved compliance or reliability, emissions reductions etc.

Importantly, consistent with the requirements set out in Pipeline Licence 24,[7] the GGP is designed, constructed, tested, operated, and maintained in accordance with AS 2885, the Australian Standard for high-pressure gas pipelines. This standard requires risks to be identified, managed and, where appropriate, eliminated or reduced to as low as reasonably practicable (ALARP). ALARP is only achieved when the cost of further risk reduction measures is grossly disproportionate to the reduced risk.

Investment prioritisation process is not a one-off process at APA, but embedded throughput each of the asset management rhythms and processes. APA's systems provide a live picture of all project proposals and our assessment on the cost, risk and performance, as shown in Figure 1.4.

[5] Consistent with ISO 31000 (the universal standard practice for employing risk management processes) and aligned with AS2885

[6] Health and Safety, Environment, Heritage or Social Impact, Operational Capability, People, Compliance, Reputation and Customer, and Financial.

[7] Clause II(1)

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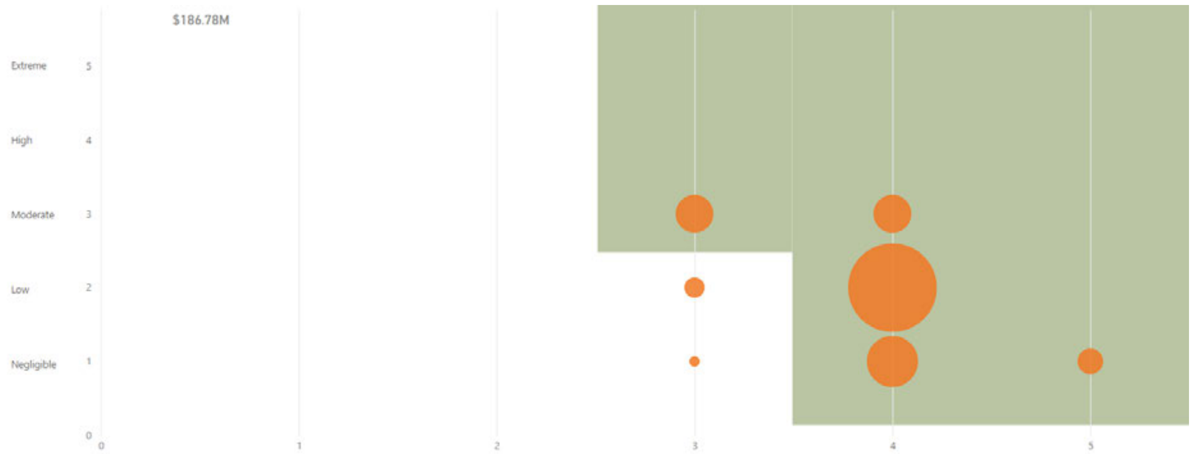
Figure 1.4 Capex Prioritisation



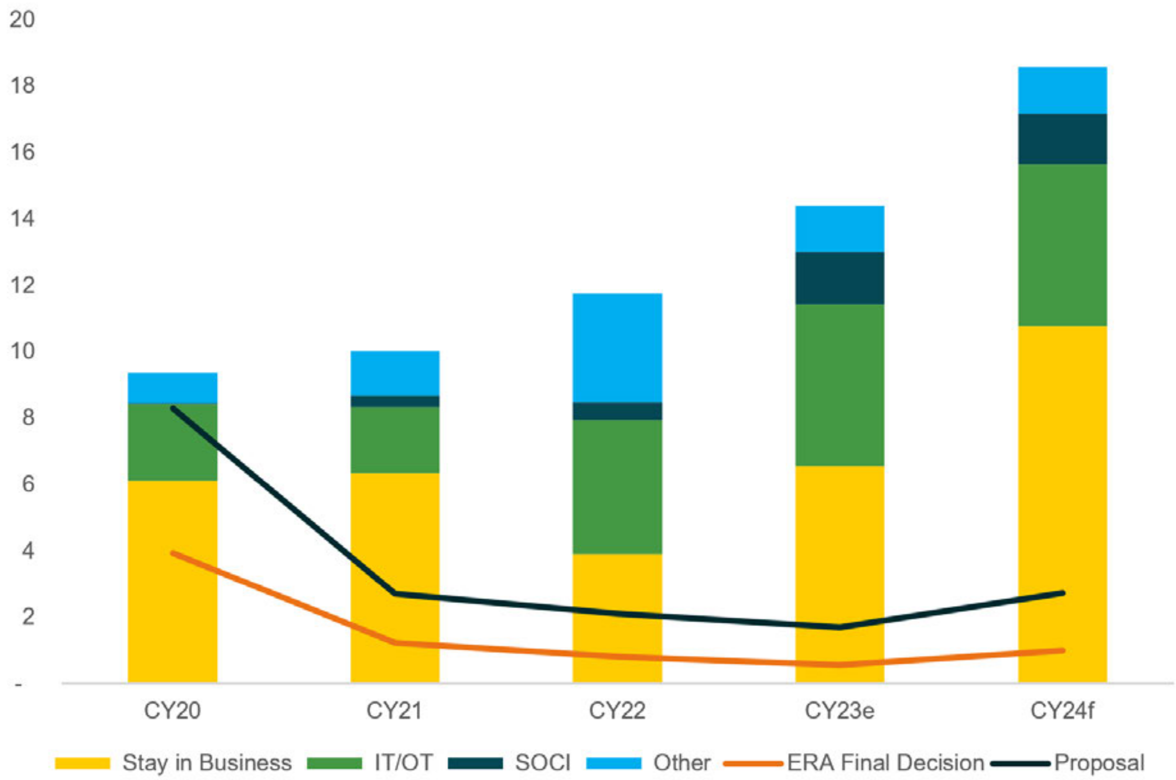
	1	2	3	4	5
Description	Low urgency but provides longer term benefits to the business	Provides medium term benefits to the business that are logical to progress	Immediate business benefit and alignment with accepted division wide initiatives to address known / systematic issues, improve operability/efficiency, safety	High priority initiatives linked to an endorsed improvement program or key strategic issue in an AMP or required for compliance (APA Policy, customer contract, legislation)	Board level endorsed, APA strategy/strategic imperative
Examples	Tools to trend long term equipment performance, Team one-off initiatives	Enterprise Analytics. Power BI dashboards	Aggregated equipment obsolescence programs, Vic Battery Chargers, control system upgrades, Maximo upgrades, Online Sim	GGP reliability improvements, Regulatory Compliance, 10 year Integrity plan, Hours based Overhauls, HA Rectification, EC functional improvements, O&M Tools & equipment	Unpiggables, MSP SCC, MWP CP Augmentation

Since the development of our AA4 forecast, APA's asset management approach has matured with the implementation of a nationally consistent framework and project delivery approach. As outlined in section 3, we have built on these processes and plans to develop our forecast for AA5.

2. CAPEX FORECASTING PERFORMANCE

As shown in Figure 2.1, actual and estimated capex for the AA4 is $64.1 million, higher than both our initial forecast ($17.6 million) and the ERA's draft decision ($7.5 million), which we accepted.

Figure 2.1 AA4 Capex: proposed, ERA Final Decision and Actual



This material difference follows on from AA2 and AA3, where we spent significantly less than the forecast. During the AA4 process, the ERA has raised concerns regarding the accuracy of our capex forecasts and forecasting process. The ERA was also concerned that documents were not produced which identified the steps taken to improve capex forecasting accuracy.[8]

We acknowledge and recognise that our capex forecasting approach needs to improve.

[8] ERA 2019, *Draft Decision on Proposed Revisions to the Goldfields Gas Pipeline Access Arrangement for 2020 to 2024,* p.54 and 89. Available here.

Accordingly, section 2.1 below explores the key factors driving the difference between forecast and actual capex in AA4. Section 2.2 discusses some of the inherent challenges we face in forecasting expenditure for a gas pipeline (relative to other infrastructure such as distribution networks) as well as the evolving operating environment.

These lessons learned flow into the following chapter 3 on governance, prioritisation and cost estimation, which outlines the steps we have taken to improve our capex forecasting approach.

2.1.Factors driving forecast inaccuracy

Exclusion of key expenditure categories

The increase in expenditure, relative to the forecast, was primarily because entire categories of spend were not anticipated and were not included in the forecast. This included all IT/OT costs, all cyber security expenditure, costs to maintain the physical security of the pipeline and shared corporate costs (such as office fit outs and APA wide programs of work). Over AA4 these cost $30.4 million or just about half of outturn capex.

Scope uncertainty

The second main reason for forecasting inaccuracy was due to uncertainty in the scope of key programs. While equipment failures (which put reliability at risk) were known when the AA4 forecast was prepared, investigations into the cause of these issues had not yet been completed.

For example, a provisional forecast of $4.86 million was included to replace the Gas Engine Alternators (GEA) at Yarraloola and Ilgarari. However, the works required at Yarraloola were more extensive than anticipated requiring a new fuel gas skid and the design and fabrication of a new enclosure and battery room. The covered allocation of reliability improvement works at Yarraloola alone will cost about $6.9 million.

Supplier cost pressures

The third reason for forecasting inaccuracy was the significant increase in post-COVID input prices. Global and local supply chain constraints have increased the cost of specialised equipment, support, and labour, particularly in the remote areas in which the GGP operates. As a result, there has been a step change in the cost to undertaken works across the GGP.

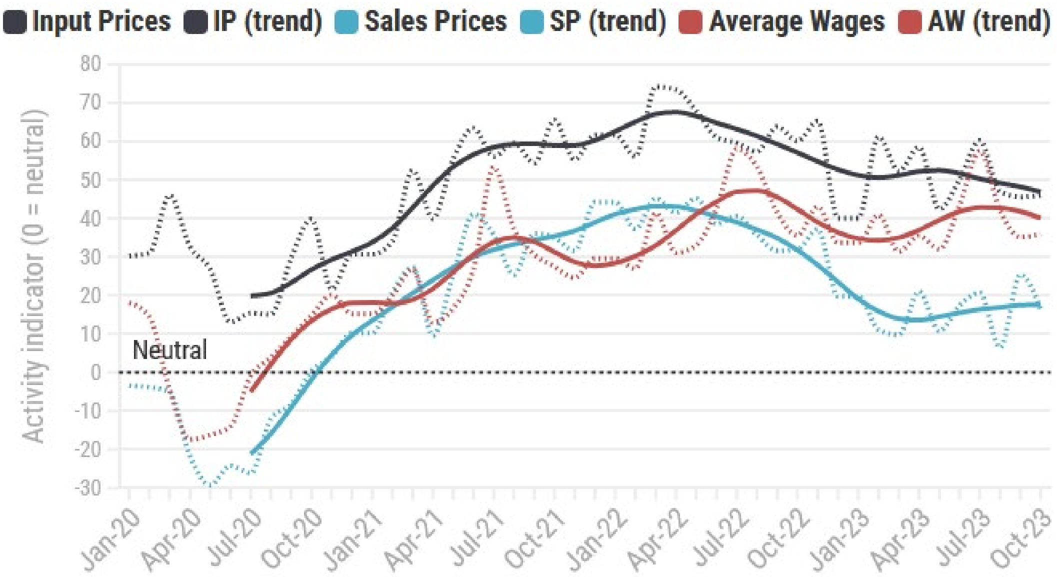
These cost pressures are not unique to the GGP:

- AEMO has found that cost to undertake transmission projects has increased by about 30% in real terms between the 2022 and 2024 Integrated System Plans.[9]

[9] AEMO 2023, *2023 Transmission Expansion Options Report,* p. 3. Available here.

- The WA Wage Price Index has risen to high levels and is currently the second highest in the nation at 4.6% (Q3 2023).[10]
- Ai Group's price and wages indicators[11] (Figure 2.2) shows that input prices and wages have been in 'expansion' territory since just after the start of AA4 (mid 2020) and remain substantially elevated.

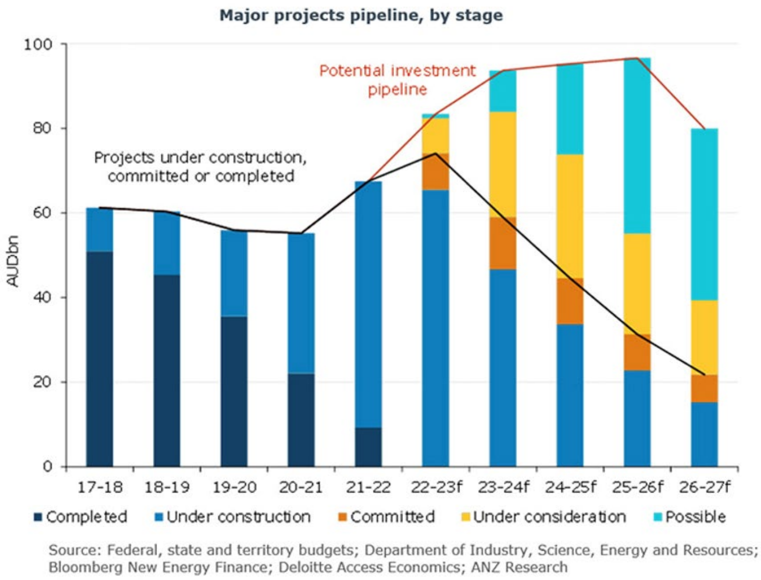
Figure 2.2 Ai Groups Price and Wage indicators



Cost pressures have been particularly high in the energy and infrastructure sectors. We have seen global increases in the level of energy investment to mitigate the impact of global energy supply chain shocks stemming from the war in Ukraine. We have also seen a significant increase in the Australian infrastructure pipeline. ANZ's major projects pipeline, shown in Figure 2.3, highlights the increase in projects from about 2021/22. Together these factors have put pressure on the skilled workforce and supporting global supply chains resulting in higher input-prices.

[10] ABS 2023, *Wage Price Index, Australia.* Available here.
[11] AI Group Australian Industry Index. Available here

Figure 2.3 ANZ's Major Projects Pipeline[12]



2.2.Forecasting accuracy for transmission pipelines

While we acknowledge the need to improve our forecasting accuracy, it's important to remember that perfect foresight is unattainable. Forecasting investment requirements, especially for transmission pipelines, is inherently challenging.

Characteristics of transmission investments

The forecasting horizon of expenditure in an Access Arrangement of between five and seven years increases the risk that forecasting assumptions and the consequent capex requirements are inaccurate. While all regulated businesses are subject to this uncertainty, forecasting is particularly challenging for transmission pipelines due to the 'lumpy' – significant and irregular – nature of the capex requirements.

In contrast, gas and electricity distribution networks have higher levels of recurrent work (e.g. connections, repex), which have a lower forecasting risk for two main reasons:

1. Higher levels of work reduce forecasting error through diversification. Even if project-level forecasting errors are consistent across distribution and transmission, the larger volume of work in distribution mitigates the overall risk, due to the law of large numbers.
2. Recurrent work provides more historical data for forecasting. For instance, the average cost of pole replacement programs can be accurately forecast using historic costs, with relatively low scope uncertainty. In contrast, transmission projects like

[12] ANZ 2023, *Australia's infrastructure opportunity still to peak*, August 22. Available here

facility re-life programs lack directly applicable historical costs and require cost forecasts based on works of similar complexity or projects on other pipelines.

The irregularity of transmission investments is why more uncertainty mechanisms are incorporated into the National Electricity Rules for transmission networks. For example, the contingent project mechanism[13] and the Network Capability Component of the Transmission Service Target Performance Incentive Scheme.

Forecasting accuracy in an evolving operating environment

As mentioned earlier, we are operating in a rapidly changing environment, particularly regarding the national regulatory frameworks (emissions, cyber security etc.) governing our sector. These changes make our operating assumptions increasingly volatile and in turn increase forecasting inaccuracy.

These forecasting risks have been recognised by overseas regulators. For instance, in response to the general uncertainty with the transition to net-zero, Ofgem included five categories of uncertainty mechanisms in its RIIO-2 framework.[14]

[13] While electricity distribution networks can propose a contingent project, in practice the cost and specificity thresholds have meant that it is largely been used by transmission networks.
[14] Ofgem 2020, *RIIO-2 Final Determinations – Core Document,* p.5 and p.56. Available here.

3. GOVERNANCE, PRIORITISATION AND COST ESTIMATION

The context and requirements for an Access Arrangement forecast differ from our usual business processes.

The key difference relates to the number of decision points and forecast horizons. An Access Arrangement capex decision is a one-off decision made in advance by an external body for a 5-year period. In contrast, our business processes consist of a range of annual, quarterly, monthly, and daily decisions which continuously incorporate the latest information and analysis as it becomes available.

Decisions are generally not made until all the strategy, analysis and preliminary engineering work has been completed. Information supporting these decisions is captured across a range of internal 'live' asset management and financial systems.

As a result, preparing for a regulatory period requires bringing forward our strategy and analysis and investment decision making processes. It also requires the preparation of extensive, robust 'static' documents to substantiate the prudency and efficiency of our forecast.

Recognising these distinct needs, we've largely extended and adapted our existing business-as-usual process in respect of governance, prioritisation, and quality assurance. However, we have also made changes to reflect recent lessons learned (discussed in section 2), and expectations set out by the ERA and other regulators, such as the Australian Energy Regulator (AER), to ensure that our forecast is robust. We provide further details on our comprehensive approach below.

3.1. Incorporating lessons learned from AA4

In recognition of the need to improve our capex forecasting accuracy, we have reviewed our performance over AA4 and refined our approach. In implementing these adjustments, we were mindful not to over-correct and introduce new uncertainties.

Our capex forecast:

- Includes forecasts for categories of expenditure absent from our AA4 forecast (IT/OT, cyber security, physical security, and corporate costs). In doing so we also reviewed the program from an overall view to incorporate interrelationships and ensure no duplication across programs.
- Ensures our cost estimates reflect current market conditions but with no adjustment for ongoing labour or contractor real price escalation.

- Includes anticipatory adjustments to reflect our changing external environment including incorporating potential operational efficiencies reducing forecast costs.
- Applies an appropriate cost estimation methodology to account for cost uncertainty (as outlined in section 3.3). However, the risk of scope uncertainty cannot be materially mitigated until site assessments and engineering design and assessments are complete.

3.2. Considering expectations set out in the AER's Better Resets Handbook

The AER's Better Resets Handbook[15] was developed in recognition of the rapidly changing energy system with the aim of making the regulatory process more efficient.

We used the expectations set out by the AER to guide the development of our forecast and to provide another cross check to ensure that our forecast and our forecasting approach was sound. The summary of how we have applied each of the AER's expectations in respect of capex is outlined in Table 3.1.

The AER's handbook emphasises the use of revealed costs as a reference point and clear justification for any increases in cost. Our forecast is consistent with these expectations as our forecast for AA5 is similar (lower if the ILI project is accounted for) than spend over AA4.

Table 3.1 Australian Energy Regulator Better Resets Handbook capex expectations

AER expectations	GGP Approach
Top-down testing of the total capex forecast and at the category level • Demonstrate that forecast capex is not materially above current period spend. • Explain where there is a material underspend and forecast step up from the revealed level. • Provide well-justified reasons if material benefits are claimed and for these to be explained to customer groups. • Top-down testing of forecast recurrent expenditure against historic actuals at the category level. • Explain why new categories of spend are required	✓ Expectation met: • Proposed AA5 capex is 12% lower than AA4 capex once the 10-year nature of the ILI campaign is taken into account. • Proposed AA5 capex is consistent with the level of capex incurred by larger pipelines of a similar age and level of compression. • We are not forecasting a step up in capex following a material underspend. • Largely recurrent categories of spend (IT/OT, Cyber Security, shared costs) are all lower in AA5 than in AA4. • A new category of spend (emissions reduction) has been included with the need and benefits clearly articulated.

[15] Available here.

AER expectations	GGP Approach
Evidence of prudent and efficiency decision making on key projects and programs • Identify and provide evidence of the need for each project. • Use quantitative cost benefit analysis assessing all feasible options showing that the preferred option maximises net benefits. • Account for trade-offs between capex and opex.	✓ Expectation met: • All major components of expenditure include a business case outlining the need, feasible options and a quantitative cost benefit assessment (considered together with other factors such as risk). • Trade-offs have been incorporated, for instance the impact of emission reduction projects (capex) reducing safeguard compliance costs (opex).
Evidence of alignment with asset and risk management standards • Alignment with industry standards on good asset and risk management to demonstrate prudent and efficient decision making.	✓ Expectation met: • Forecast capex is aligned with good industry practice, AS 2885 and the insights, knowledge and expertise from APA's large portfolio of infrastructure assets.
Genuine consumer engagement on capital expenditure proposals • Engage consumers on the expenditure required and outline to consumers what options are available. • Explain why proposed programs are required and the cost compared to other viable options. • Undertaken efforts to understand customer preferences on capex.	– Expectation partially met • We have interviewed 13 of our customers and sought to understand their preferences and integrated their feedback into our proposal. • We have published a First Look Positions Paper. • We have not engaged customers on project level options analysis as the option assessment has primarily been driven by risk, cost, and compliance with regulatory obligations (rather than customer preferences or values).

3.3. Cost estimation approach

Forecasting costs over AA5 is challenging due to:

- High levels of recent and ongoing inflation.
- Obsolesce – Where new products are required it is unknown what the replacement product will be or the extent of engineering works required for install.
- Unknown scope – In many cases the exact scope of works will be determined until precursor, site visits, engineering and development work occurs.

As a result, we have applied a series of cost estimation approaches for each expenditure item:

- Where we have recent quotes or market prices, and the scope is largely known (for instance with our ILI program) we have produced a build-up of costs. We then cross checked this build up against top-down benchmarks (of ILI costs per section) of similar projects delivered by APA.

- Where we have similar recent costs (such as for turbine overhauls) we use those costs as the basis of our forecast.
- For works where the scope is unknown, we have used high-level estimates based on previous works of a similar location (given mobilisation is a large component of costs on the GGP), complexity and length.
- Where we haven't undertaken similar works in the past (such as with physical security) we produce a bottom-up build.

Applying a range of approaches ensures that each cost estimate is fit-for-purpose and the best possible estimate that can be produced in the circumstances.[16]

3.4.Benchmarked GGP capex against other similar large pipelines

While our capex forecast is consistent with current period actuals, expenditure across AA4 and AA5 is higher than the ERA's final decision for AA4 and prior periods.

We recognise that the long-term historic level of investment is an important data point for regulators in determining whether the overall level of expenditure is efficient. Accordingly, as part of our review process, we have benchmarked the GGP's average level of capex against the largest 14 pipelines in Australia (based on capacity and length).[17] The pipelines have a range of owners, operate in a range of different environments and are subject to different forms of regulation.

While only indicative,[18] the benchmarking data, set out in Table 3.2, suggests that the GGP's actual AA4 capex and forecast AA5 capex is relatively low. Only younger pipelines with less compression incur less capex than the GGP.

Notably, the ERA's allowance for AA4 averages out to $1.5 million per year. No pipeline of the GGP's size or age operates with this level of capex. The SEA Gas Pipeline and the Tasmanian Gas Pipeline incur capex of about $1.8 million and $0.1 million respectively. However, both are younger and about half the length of the GGP. The SEA Gas Pipeline only has two compressor stations while the Tasmanian Gas Pipeline has none.

The results of this analysis indicate that the level of capex that we had forecast for AA4 (and in turn the ERA's final decision) was too low to be realistic or sustainable level of capex for a pipeline of the GGP scale or criticality. It indicates that a step up in expenditure is

[16] Consistent with the requirements of Rule 74(2).
[17] Based on capacity and length. The only large pipeline missing is Jemena's Northern Gas Pipeline which is exempt from Part 23 disclosures and no public data is available.
[18] High-level benchmarking data does not consider the pipeline components (younger pipelines with more modern materials required less ongoing spend), compressor utilisation (high in the GGP given the pipeline's relatively small diameter), pipeline operating environment, capitalisation policies, and expansions etc. which all affect capex.

unsurprising and is at a level consistent with what a prudent service providing in accordance with good industry practice would incur.[19]

Table 3.2 Average capex incurred by Australia's largest transmission gas pipelines[20] ($million Dec 2023)

Pipeline	Capacity (TJ/day)	Length (km)	Compressor stations	Commissioned	Historic capex	Forecast capex
Victorian Transmission System	2,012	1,992	7	1969	53.4	49.6
Moomba to Adelaide Pipeline System	241	1,184	8	1969	15.2	N/A
Roma to Brisbane Pipeline	336	438	3	1969	19.1	8.9
Moomba to Sydney Pipeline	489	2,001	3	1976	81.3	N/A
Dampier to Bunbury Natural Gas Pipeline	845	1,539	10	1984	28.7	31.8
Amadeus Gas Pipeline	145	1,658	1	1986	7.5	3.6
Queensland Gas Pipeline	145	807	2	1989	5.7	N/A
Covered Goldfields Gas Pipeline	109	1,378	4	1996	12.6	13.9
South West Queensland Pipeline	453	937	3	1996	38.0	N/A
Carpentaria Gas Pipeline	119	840	2	1998	4.3	N/A
Eastern Gas Pipeline	350	822	4	2000	12.7	N/A
Tasmanian Gas Pipeline	129	740	0	2002	0.1	N/A
SEA Gas Pipeline	314	700	2	2004	1.6	N/A
Wallumbilla Gladstone Pipeline	1,588	543	0	2014	0.7	N/A

3.5. The strength and experience of APA

Lastly, we have drawn on APA's scale, expertise, and established processes. This includes APA's asset management approach which has matured over the 5-years since the GGP's previous access arrangement period, incorporating changes from our operational excellence program as well as the development of business process definitions and consistent performance metrics.

[19] Consistent with Rule 79(1)(a)
[20] Data obtained Part 23 disclosures, the AER's Gas Transmission operational performance data, and regulatory decisions etc. Historic capex based on the average of the most recent 5-years of data available or the most recent regulatory period. Forecast capex from regulatory decisions for the next regulatory period.

The starting point for our forecast was our existing long-term view included in our live Asset Performance and Lifecycle Plan. This program was then tested and refined based on the input of numerous specialists, addressing key areas including customer perspectives, feasibility, deliverability, process optimisation, reliability, emissions, and asset management.

This process anticipated the impact of external factors and the likely strategic and operational changes which could be delivered. This led to:

- The development of a new operating philosophy following the increasing importance of emission reduction and the ability to reduce compression on the GGP due to the NGI. This in turn has fed into a reduction in the proposed opex (through a reduced emission and Safeguard Mechanism cost forecast).
- The review of the GEA replacement and compressor maintenance strategy to reflect the operating philosophy and expected reduction in compressor utilisation.
- The re-profiling of end-of equipment life works to manage reliability and deliverability risks.
- Identifying which emissions reductions projects to include in our forecast.
- Identifying and removing overlap across forecasts.
- Improved deliverability capability.

4. ALLOCATION OF COSTS TO THE NOTIONAL COVERED AND UNCOVERED PIPELINES

4.1. Cost allocation approach

The GGP comprises two notional pipelines: a covered pipeline and a non-scheme pipeline. Forecast GGP capex has allocated to between the notional pipelines as follows:

- Expenditure on a specific compressor unit:
  - Covered if that specific compressor unit forms part of the covered pipeline.
  - Uncovered if that specific unit forms part of the uncovered pipeline.
- Expenditure at compressor station assets where capital expenditure could not be attributed to a specific compressor unit is allocated to the covered pipeline based on the proportion of covered compressor units at that station.
- Expenditure on distance related assets (such as ILI projects) is allocated based on the covered percentage of TJ/km of contracted capacity.
- Expenditure on all other assets is allocated based on the covered percentage of TJ/d of contracted capacity.

Although the GGP is split between two notional pipelines for economic regulation purposes, operations and investments are optimised at the whole of GGP level.[21] As a result, the submitted Asset Performance and Lifecycle Plan and all other justification document generally provide a whole of GGP view of costs of each project or program.

Whole of GGP costs are then transparently allocated on a site-by-site basis in the Forecast Capex Coverage Allocation Model.

4.2. Updated allocators

The Cost Allocation Method (CAM) for AA5 differs from AA4 (where previously expenditure on all other assets were allocated on TJ/Km). This change results in a smaller proportion of capex being allocated to the covered pipeline.

[21] This ensures that, consistent with Rule 79(1)(a), capex is such as would be incurred by a prudent service provider acting efficiency in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services.

We are also anticipating an increase in the provision of covered pipeline services, enabled as a result of the NGI. This results in an increase on reference service usage and lowers reference tariffs.

While the net impact is lower tariffs, increasing the size of the notional covered pipeline also results in a higher allocation of costs. This is because the allocators are based on contracted capacity. The difference in allocators is set out in Table 3. Applying these new allocators increase capex by $2.5 million in AA5 relative to the allocators used in AA4.

Table 3 Comparison of capex allocators

Allocators	AA4	AA5
Covered capacity allocator (TJ/day)	52%	61%
Covered capacity-distance allocator (TJ x KM /day)	66%	70%

Using these updated allocators reflects our best estimate[22] of covered capacity and in turn forecast covered pipeline capex.[23]

[22] Consistent with Rule 74(2) which states that a forecast of estimate must be arrived at on a reasonable basis and must represent the best forecast or estimate possible in the circumstances.
[23] Consistent with Rule 79(1)(c) which relates to the allocation of capital expenditure.

5. STAY IN BUSINESS

Stay in business capex relates to the ongoing investment required to ensure that the GGP can continue to operate safely, reliably, and efficiently.

Stay in business capex over AA4 and AA5 is summarised in Table 5.1. The table shows that the increase in capex in AA5 is largely driven by our ILI program (recurrent on a 10-year timeframe so not included in AA4) and our one-off program to maintain physical security.

Table 5.1 AA5 Stay in business ($millions Dec 2023)

Category	AA4	AA5
Integrity	0.5	12.9
Rotating major maintenance	1.7	3.1
End of equipment life	9.2	17.4
Net Zero	-	4.0
Physical security	1.5	7.6
Hazardous area / compliance	1.0	0.8
Reliability	13.6	4.3
Other	4.4	1.2
Buried pipework	1.9	2.1
Total	**33.7**	**53.4**

The remainder of the program is largely steady with an increase in the costs of end-of-life equipment across our facilities offset by a reduction in spend on maintaining the reliability of our compressor stations.

The increasing importance of achieving net-zero through reducing emissions has been considered. For example, the installation of dry gas seals at Wiluna, while justified primarily on the basis of safety and integrity benefits, will also reduce emissions. For transparency, given the material emissions reductions benefit it brings it has been categorised under a 'net zero' category – although it could also fall under reliability.

A summary of each category is provided below.

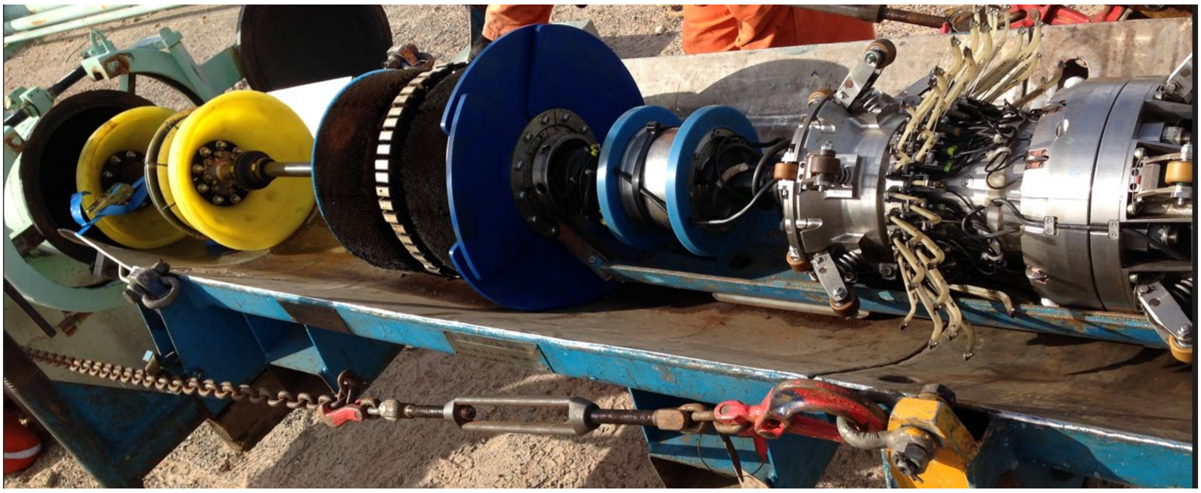
5.1. In-line inspection

Pipelines are vulnerable to various forms of degradation such as corrosion, cracking, fatigue, stress-related failures, vibration, wear, and external damage. These vulnerabilities can lead to catastrophic failures ranging from pin-hole leaks to the complete 'unzipping'[24] of the pipeline. If ignition occurs, this can result in injuries, fatalities, damage to nearby infrastructure, and a disruption to downstream gas supply.[25]

To mitigate these risks, good industry practice is to conduct periodic inspections using In-Line Inspection (ILI) tools, commonly known as pigs. These tools are inserted into the pipeline and are propelled through the pipeline by the gas stream. The tools undertake a thorough assessment of the pipeline's condition by detecting and monitoring potential issues like corrosion, cracks, and deformations.

Regular inspections allow for the early identification of issues, which are then either rectified or closely monitored, depending on their severity and growth rate. In turn these inspections prevent catastrophic failures, reduce supply risks, and maintain safety of the pipeline.

Figure 5.1 ILI tool



Good industry practice (across Australia and internationally) is to undertake inspections at a maximum frequency of at least 10-years, unless specific risk factors require more regular intervals.[26] As the GGP was inspected using ILI tools in 2015, the next scheduled ILI is due in 2025.

Further details on this program are outlined in the IL Business Case.

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[24] Rapid, self-propagating failure of the pipeline where a crack of defect expands along the length of the pipe, leading to a significant rupture.

[25] Recent examples of a catastrophic failure of a pipeline due to a leak include the San Bruno Pipeline explosion, the 2004 Ghislenghien pipeline explosion and the 2019 Enbridge gas pipeline explosion.

[26] This is a consistent view across ATCO Gas (page 46), AGIG (page 68), Jemena (page 28) and Evoenegry (page 1).

5.2.Rotating equipment major maintenance program

GGP rotating plant consists of:

- Reciprocating and Turbine Compressors which compress and move gas through the pipeline. Reciprocating compressors use pistons driven by a crankshaft in a cylinder. In contrast, turbine compressors employ rotating blades. These engines require specialised maintenance due to their high-speed and precision components.
- Gas Engine Alternators (GEAs) These GEAs supply electrical power at the pipeline's remote compressor stations. Powered by gas-fuelled, large piston engines, GEAs drive alternator packages and automatically synchronise to meet varying power demands. Each station has two or three GEAs to ensure redundancy and a reliable power supply for essential systems like controls, instrumentation, and auxiliary equipment.

This rotating plant is critical to the safe and reliable supply of gas. This equipment requires regular maintenance to counteract the wear and tear associated with continuous or intermittent operation. Components such as pistons, bearings, blades, seals, and O-rings are all subject to stress and degradation over time, posing risks of equipment failure.

To mitigate these risks and ensure operating efficiency and safety, the rotating plant undergoes regular servicing and periodic overhauls. Overhauls are capex.

Further details on this program are outlined in the Rotating Major Maintenance Business Case.

5.3.End of equipment life

Commissioned in 1996, the GGP is approaching mid-life and will be 33 years old by 2029. While the pipeline itself has a long-life (with a regulatory asset life of 70 years), components such as cathodic protection units, valve actuators, solar power and battery systems and control units have much shorter assets lifespans ranging from about 10 to 30 years old.

Over time factors such as wear and tear, performance degradation and obsolescence lead to increasing safety, reliability and integrity risks and the development of a replacement program.

Over AA5 we will undertake a targeted program of works to 're-life' these facilities by addressing obsolescence risks associated with electrical control and instrumentation equipment. The program targets Remote Terminal Units (RTUs), Cathodic Protection Units, solar power systems, gas chromatographs and remotely controlled actuators.

In developing this program, we have considered the feasibility and deliverability of the program. We have identified that site-by-site deployment approach (rather than a component based replacement program) delivers the greatest efficiencies.

We have also identified that it is possible to spread the program out over two access arrangement periods by focussing on the assets at the most risk and sites with the highest criticality. Importantly, the program will make spares available for the remaining obsolete components still in service, thereby enabling the re-life of our offtake stations and main line valves to be largely deferred to AA6.

Development work on the program has commenced while site works will commence in 2023. The program will cost $17.4 million over the AA5 period.

Further details on this program are outlined in End of Equipment Life Business Case.

5.4.Net zero

GGP's role in reducing emissions

The GGP is responsible for emitting about 120,000 tonnes of carbon dioxide (tCO2e) each year.

Around 80% of emissions relate to fuel gas usage for compression and electricity generation. Most of the remaining 20% relate to methane emissions across the pipeline. Methane emissions arise due to unintentional leaks (generally at flanges, valves, and seals etc.) as well as from intentional releases like venting and blowdowns. Blowdowns occur when a compressor unit moves into standby and undertakes a controlled release of gas to relive pressure within the unit.

Although there are less methane emissions than carbon dioxide emissions, the methane emissions factor is relatively high per unit of gas lost as methane is a more potent greenhouse gas than the byproducts of combustion (carbon dioxide and water vapour).

Benefits of reducing emissions

Reducing emissions is increasingly important to:

- Support the achievement of net-zero targets in Australia and Western Australia, consistent with the soon to be amended National Gas Objective.
- Minimize the financial impact of the Safeguard Mechanism where the GGP must procure and surrender Australian Carbon Credit Units (ACCU) or Safeguard Mechanism Credits for emissions that exceed their baseline amount.

AA5 capex program

Emission reduction benefits have been factored into the development of the GGP's forecast capex.

For instance, we expect to realise a material reduction in emissions from our project to install dry gas seals at Wiluna. The emissions reduction benefit has been taken into account and quantified, even though the project is primarily driven by the reduction in risk of oil-in pipeline events from the existing wet seals.

These works will cost $4 million in AA5 and are expected to reduce emissions by about 2,475 t $CO_{2\text{-}e}$ per year. Further details on this program are outlined in the Wiluna Wet Seals Business Case.

We also note that we expect to also undertake works at our Wyloo West and Turee Creek compressor stations (likely to include installing blow down recovery systems). The capex for these projects is on the uncovered pipeline so has not been included in this proposal. However, the expected reduction in emissions (along with the reduction in emissions from the works at Wiluna) have been included in our emission reduction (and safeguard cost) forecast.

5.5. Physical security

The GGP is facing increasing threats from activism, violent extremism and foreign interference and espionage. This changing threat environment, coupled with incidents demonstrating the vulnerability of APA sites, changes the risks faced by the GGP and therefore the potential consequences for GGP's operational capability, personnel and customers as well as public safety, should those risks be realised.

A physical security threat and risk assessment of the GGP has been undertaken to identify, analyse, and evaluate security risks associated with the existing site security controls.

Based on the results of this assessment a program of works, due to commenced in 2024, has been developed to address several site-specific security risks. [redacted]

Additional information is provided in confidential Physical Security Business Case.

5.6. Hazardous area / compliance

A hazardous area is where electrical equipment is installed is required to comply with all appropriate and applicable Australian standards, acts, and regulations, including AS/NZS 60079 Explosive atmospheres and AS/NZS 3000:2018 Electrical Installations (Wiring rules).

It is a requirement of these standards that Electrical Equipment Hazardous Area (EEHA) inspections are performed on a periodic basis and a plan put in place to address any remedial works required.

In late 2022, APA engaged a contractor to perform an EEHA inspection of Paraburdoo Compressor Station and Ilgarari Compressor Station on the GGP. These inspections have identified a series of defects which need to be rectified to be compliant with AS/NZS 60079 and AS/NZS 3000, and to reduce risk to health, safety, and operations.

Figure 4.7.3 Example of defect at Paraburdoo Compressor Station. 24 cables without labels.

Development and planning work commenced for both compressor stations during 2023. We anticipate on site rectification works commencing at Paraburdoo in July 2024 with completion of works at both sites during the first quarter of 2026.

The cost of these works is $0.8 million over AA5. This is slightly below our spend in AA5 ($1.0) which included the commencement of these works as well as works to improve the fire suppression systems at Yarraloola and Wyloo.

5.7.Reliability

Ongoing investment is required to maintain reliability of supply. It is essential that the Gas Engine Alternators (GEA's), which power our compressor stations, continue to function. GEA failure can lead to the shutdown of a compressor station and in turn a potential interruption to supply.

The current model of GEAs deployed across the GGP is obsolete and units across the GGP are reaching the end of their useful lives. Our experience at Yarraloola indicates that GEA reliability reduces over time. While components can be repaired and replaced, a reactive approach will require ongoing rectification works to address issues as they arise. This approach will incur operational reliability risks and will result higher costs, given the repeated unplanned mobilisation costs that will be incurred.

We intend to progressively replace our GEA's over time. This program has been developed based onsite criticality, condition, and the new compressor operating philosophy.

Over the AA5 period, we intend on replacing the GEA at Wiluna largely as it is one of the oldest stations in our fleet and has the highest criticality. Reliability works at Paraburdoo and Ilgarari have been deferred to next period to align with the compressor overhaul and to reflect the reduced usage in our new operating philosophy.

The replacement GEA's at Wiluna together with some minor reliability improvements at Ilgarari make up the forecast of $4.3 million in AA5.

Further details on the GEA replacement program Business Case.

5.8. Other

Other stay-in business costs relates to miscellaneous capital, vehicles, site accommodation upgrades and the installation of new metering stations.

For AA5 we are forecasting $1.2 million in capex, limited to vehicles and miscellaneous capital. Our forecast is less than capex in AA4 ($4.4 million) primarily as we are not forecasting specific site accommodation upgrades or new metering stations.

Table 5.2 AA5 Stay in business: Other ($million Dec 2023)

Category	CY25	CY26	CY27	CY28	CY29	Total
Miscellaneous capital	0.14	0.14	0.14	0.14	0.14	0.70
Vehicles	0.15	0.15	0.01	0.01	0.16	0.48
Total	**0.29**	**0.29**	**0.15**	**0.15**	**0.30**	**1.18**

Miscellaneous capital expenditure

Miscellaneous capex covers the expenditure to undertake minor capital works and purchase instrumentation, tools etc. Generally, the need for this expenditure is identified and undertaken in short timeframes, as a result of equipment failure or opportunities to enhance existing systems. Expenditure varies year-to-year depending on what works are required.

Expenditure (and forecasts) of this nature is common across pipeline and other infrastructure businesses. A historical average is generally applied to forecast expenditure or is used as a cross-check.[27]

The starting point for our forecast was the placeholder included in our Asset Lifecycle and Performance Plan of $0.14 million per year. We then compared this forecast against historical amounts incurred, as shown in Table 5.3.

Table 5.3 Actual miscellaneous capex ($million, $2023)

Category	CY20	CY21	CY22	CY23*	Average
Total	**0.09**	**0.06**	**0.09**	**0.50**	**0.18**

Notes: CY23 only includes the actual values from the first 6 months of CY23 (with no adjustment of scaling). The estimate for the remaining 6 months was not included in this analysis.

We also considered the minor works expected to be required at our maintenance's bases, such as the installation of satellite Wi-Fi (separate from our SCADA systems), installing a water bore at Paraburdoo, shade parking and kitchen upgrade at Newman etc. Rather than prepare a cost forecast for these items we considered that we can fund these works out of the miscellaneous capex forecast.

[27] For instance JGN (see here, page 25) and AGN SA (see here, pages 213) also incur and forecast similar programs.

We have made not adjustment to our miscellaneous capex placeholder included in our Aset Lifecycle and Performance Plan as: we expect a continued need for miscellaneous capex, we have not forecast any separate costs to maintain our maintenance bases and that our placeholder is slightly below the historic average.

Vehicles

Most vehicles on the GGP are leased, however specialist vehicles (forklifts, trailers and heavy-duty commercial trucks) are owned.

The forklifts and trailers were purchased and delivered during the construction of the GGP in the mid-1990s and are still in use. At around 27 years of age these vehicles are well beyond industry benchmark of around 10 to 15 years.[28]

Our strategy, as outlined in our Asset Performance and Lifecycle Plan is to gradually replace these vehicles over time, to smooth the replacement program and move towards replacing the vehicles are more regular intervals. We plan to replace 4 of our 19 trailers and 1 of our 3 forklifts in AA5.

We intend to shift away from forklifts to using telehandlers which provides several operational and safety benefits compared to a transition forklift due to better visibility, versatility and manoeuvrability. Moving to newer vehicles also brings safety benefits in terms of seatbelt alarms/compulsory restraint systems and active stability control that were not available in the mid-1990s.

Our heavy commercial trucks have been replaced more recently (in 2016 and 2019). We follow the APA Group Motor Vehicle Procedure which sets out 10-year replacement criteria for heavy commercial vehicles. This is consistent with good industry practice.[29] This results in two vehicles scheduled to be replaced in FY26 and one to be replaced in FY29.

Moving to newer vehicles ensures that personal are protected by updated safety features including crash avoidance technologies such as electronic stability controls, adaptive cruise control and lane departure warning systems. These technologies are particularly beneficial given the long distances travelled and remote location of the GGP.

5.9.Buried pipework

APA have recently reported three separate environmental incidents to the state regulator, the Department of Mines, Industry Regulation and Safety (DMIRS), that have occurred at compressor sites on the GGP.

Investigations into these incidents has found the root cause to relate to the design, operability and maintenance of chemical and chemical waste storage and transfer systems.

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[28] See the industry benchmarking prepared by Endeavour Energy in their Fleet Asset Strategy here, page 16.
[29] Ibid.

For instance, there is currently a risk of an uncontrolled and unidentified leak from stainless steel lube oil lines contaminating soil.

To reduce the risk of unidentified integrity issues remains as low as reasonably practicable, in accordance with APA' Pressure piping Integrity Management Plan and Pressure Pipework Guidelines, a program of works has commenced to relocate pipework to above ground at all compressor sites. This option is consistent with AS/NZS 3788 (the standard for pressure equipment), accepted good industry practice and is required to comply with environment regulations.

Based on site criticality and the condition assessments, a program of work commenced in 2023 starting with Yarraloola and ends in 2027 at Neds creek. This program will cost $4 million in AA4 and $4.7 million in AA5.

For further information see the Buried Services Relocation Business Case.

6. SHARED CAPITAL EXPENDITURE

APA-wide programs and functions provide the GGP with access to specialised resources and economies of scale not available to a stand-alone operator.

Broadly, we are forecasting a reduction in costs across our Cyber Security, IT/OT and other categories.

Table 6.1 Shared capex over AA4 and AA5 ($2023 millions)

Category	AA4	AA5
IT/OT	18.0	5.2
Cyber security	4.0	3.8
Other	8.3	7.0
Total	**30.4**	**15.9**

6.1. Security of Critical Infrastructure

APA's enterprise-wide Protected Security program is driven by amendments to the *Security of Critical Infrastructure Act 2018* (the SoCI Act). APA engaged a third-party expert (EY) to conduct a gap analysis of APA's ability to meet the revised SoCI Act obligations, identify uplift needs and assist in the design of an appropriate suite of security controls.

To comply with the SoCI Act APA is:

- Working to achieve a defined maturity level as set out in the Australian Energy Sector Cyber Security Framework (AESCSF). (The AESCSF is the standard to be applied across the electricity and gas sectors to manage cyber security hazards.)
- Amending personnel and supply chain standards and procedures from a security perspective, including the introduction of an AusCheck screening process for new and ongoing critical workers, employees or contractors, and supplier security risk assessments.
- Identifying and remediating material risks.

The SoCI program commenced in 2022 and will continue over the AA5 period. Forecast capex over the AA5 period ($3.8 million) is less than what is expected to be incurred over the 2020-25 period ($4.0 million).

6.2. IT/OT

APA's enterprise-wide Information Technology (IT) portfolio enables core business information, communication, and operational technology to respond in an effective way to the energy sector shift to decarbonisation, decentralisation, and digitisation and to protect APA against cyber security threats (separate to the SoCI program).

Information, communications, and operational technology is necessary to support everyday business functions and technical operations of assets. The shift to digitisation is playing a greater role in more aspects of the day-to-day operations in energy.

Forecast IT/OT ($5.2 million) is lower than IT/OT incurred over the AA4 period ($18.0 million). Investment over the AA4 period was higher primarily due to the additional investment required to replace key systems in APA's Informational Communications and Operational Technology environment.

Additional information is provided in the ITOT Plan.

6.3. Other shared costs

Other shared costs incurred at the APA-Group level included costs related to corporate offices and national programs. Examples include our risk-based inspection program for pressure equipment (run nationally across all APA assets rather than on an asset basis) and costs related to supporting our Health Safety and the Environment and Emission Reduction functions.

We forecast these costs based on historical costs incurred in 2020, 2021 and 2022. This involved a two-step process. First, we removed the material one-off cost incurred due to the fit-out of our Brisbane office in 2022. We then took an average over adjusted actuals. This resulted in an annual forecast of $1.4 million a year.

Table 6.2 Actual Other Shared capex ($million Dec 2023)

Category	CY20	CY21	CY22	Average
Actual other costs	0.9	1.3	3.3	1.8
Actual other costs adjusted to remove Brisbane fit-out	0.9	1.3	2.1	1.4