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ATCO Gas Australia Proposed Access Arrangement for the Mid-West and South-West Gas Distribution Systems

Review of Technical Aspects of the Proposed Access Arrangement

CONFIDENTIAL

Report to

Economic Regulation Authority of Western Australia

from

Energy Market Consulting associates

March 2019

This report has been prepared to assist the Economic Regulation Authority (ERA) with its assessment of ATCO Gas Australia's Access Arrangement for the Mid-West and South-West Gas Distribution Systems, for the period from 1st January 2020 to 31st December 2024 (AA5), which it is required to conducted in accordance with the National Gas Law (NGL) and the National Gas Rules (NGR). This report covers a particular and limited scope as defined by the ERA and should not be read as a comprehensive assessment of proposed expenditure that has been conducted making use of all available assessment methods.

This report relies on information provided to EMCa by the ERA and by ATCO Gas Australia up until 24th October 2018. EMCa disclaims liability for any errors or omissions, for the validity of information provided to EMCa by other parties, for the use of any information in this report by any party other than the ERA and for the use of this report for any purpose other than the intended purpose.

In particular, this report is not intended to be used to support business cases or business investment decisions nor is this report intended to be read as an interpretation of the application of the NGR or other legal instruments. EMCa's opinions in this report include considerations of materiality to the requirements of the ERA and opinions stated or inferred in this report should be read in relation to this over-arching purpose.

Some numbers in this report may differ from those shown in ATCO's Access Arrangement Information (AAI) or other documents due to rounding.

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About EMCa

Energy Market Consulting associates (EMCa) is a niche firm, established in 2002 and specialising in the policy, strategy, implementation and operation of energy markets and related network management, access and regulatory arrangements. EMCa combines senior energy economic and regulatory management consulting experience with the experience of senior managers with engineering/technical backgrounds in the electricity and gas sectors.

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Purpose of this report

1. This report provides our assessment and findings from our review of ATCO's capex incurred (or to be incurred) in AA4, and its proposed capex and opex allowances for AA5.

2. We have undertaken our review primarily based on ATCO's AA5 Access Arrangement Information document (AAI) and the documents that ATCO provided in support of its proposal, and we have considered these documents to definitively provide its proposal and supporting rationale. To augment these sources, we sought and were provided with a range of additional documents[1], and we met with ATCO for an onsite meeting at which we provided ATCO with the opportunity to provide clarifications and additional information on its proposal.

Review approach

3. Our review approach is to assess ATCO's proposal based on the methods that it claims to have used in preparing it. We have sought to understand ATCO's expenditure governance and management processes, and the forecasting methods and relevant assumptions it has applied and, with this understanding, to then assess the projects and programs of work that form the basis of its submission.

4. Our review has placed emphasis on assessing those matters that are of greatest significance in driving the level of reference tariffs that the Economic Regulation Authority (ERA) is being asked to approve. Accordingly, we have deepened our assessment process on such components of proposed expenditure, so as to provide the ERA with the necessary supporting evidence and supporting logic on matters of most significance. Our review does not, nor is it intended to, represent an expenditure approval process and the specific projects, programs and activities that ATCO chooses to undertake are matters for ATCO's management judgment.

[1] We have sought to take account of all information provided, but we disclaim responsibility for full consideration or acknowledgment in this report, of information that was provided after 24th October 2018 as the information cut-off for completion of our assessment.

ATCO's proposal

5. ATCO reports that it has incurred, or will incur, a total of $496.0m capex and a total of $354.9m opex in the AA4 period (5.5 years):
   - for capex, ATCO is forecasting to spend more than the ERA's regulatory capex allowance in the AA4 period, by $7.3m or 1.4%. The cumulative capex in the first three years of AA4 is significantly less than the ERA allowance, however ATCO's forecast for the final two years would, if incurred, be materially greater than the allowance. The shift in timing of expenditure raises questions over the prudency of the delivered programs, and we review this as part of our AA4 assessment; and
   - for opex, ATCO is forecasting to spend $51.2m (or 13%) less than the ERA's AA4 opex allowance. Whereas the ERA's AA4 allowance represented a slight increase from ATCO's 2014 expenditure level, ATCO markedly reduced its opex in 2015 and has maintained this lower level of spending despite continuing growth in customer numbers and extensions to its network.

6. ATCO has forecast total capex of $509.3m and total opex of $357.3m for the AA5 period (5 years). This represents increases of 12.7% and 10.7% respectively from the actual/estimated opex for the last 5 years of the AA4 period.

7. ATCO describes the main driver of its proposed increase in capex during AA5 as being a further increase in capex associated with its PVC mains replacement program.

Our assessment of ATCO's governance and management framework

8. Whilst it would appear that ATCO has an adequate investment governance hierarchy, we have material concerns regarding the detail underpinning key elements of its investment decision-making framework and the quality of ATCO's application of that framework. Our principal concerns are that:
   - ATCO's approach to risk management is flawed:
     - it applies an overly conservative approach to defining its 'frequency of occurrence' thresholds, leading in several cases to an overestimate of the risk of the event occurring;
     - it has not applied the ALARP test in accordance with the normative requirements of AS4645.1:2018, leading to an overestimate of conforming risk reduction expenditure;
   - ATCO's key asset management documents, including the Asset Management Plan, Asset Lifecycle Strategies, and 'business cases' do not provide clear links between planned and actual historical expenditure and forecast expenditure;
   - ATCO expects to deliver the AA4 capex portfolio with a small variance in aggregate to the ERA's AA4 allowance, however, it was not able to provide adequate information to support significant expenditure on projects in the AA4 period that it advanced from the AA5 period (or beyond), or newly introduced projects;
   - ATCO's business case process includes, among other things, a requirement to assess the benefits from proposed expenditure. We have found that with a few exceptions, ATCO does not provide sufficient evidence to support the claimed tangible benefits from its significant investment in AA4 or of the even higher investment it proposes in AA5;

- the business cases and supporting information provided to support AA4 expenditure are of variable quality, with the lack of rigour applied to cost-benefit analyses falling well short of good industry practice. As examples, we observe the following:
  - critical NPV spreadsheets contain largely unsubstantiated inputs (including hard-coded capex and opex and benefits) and did not consider the sensitivity of results to benefit assumptions; and
  - in some cases, we have found that ATCO's supporting analysis, when properly considered, does not support the justifications that ATCO has claimed;
- in general, ATCO has not provided evidence of the performance improvements likely to result from its capex programme at a project or program level, or at the portfolio level. Similarly, ATCO does not adequately explain the potential performance impact if it does not undertake the proposed level of capex; and
- presentation and application of its newly derived Asset Health KPI is inadequate, and as presented is not a reasonable indicator of the condition of its network, and inherent risk.

Our assessment of ATCO's forecasting methods, assumptions and regulatory accounting matters

9. We assessed ATCO's demand forecast from its supporting documentation, and primarily from the viewpoint of its impact on its proposed expenditure. We consider that these provide a reasonable forecast of the demand for new connections and of associated gas volumes, noting that during AA4 ATCO's mass market (B3 tariff) volumes per customer have fallen and it forecasts further decline in AA5. However, we have major concerns with the economics of such new connections from the data that ATCO has provided. Contrary to ATCO's claim, we conclude that its proposed growth capex (mostly comprising new greenfields and brownfields connections) does not meet the 'incremental revenue' test. This would seem to either affect ATCO's willingness to connect customers or, if ATCO was to seek to recover any shortfall by way of a customer contribution, this would likely reduce the demand for new connections. This would significantly reduce the AA5 capex that ATCO has proposed. We discuss this further in Section 6.

10. ATCO's volume-based capex forecasting approach lacks adequate review and challenge of assumptions pertaining to the volumetric inputs or economic analysis. ATCO's governance framework requires annual reviews of program-based activities, however we did not see evidence of these reviews, or how the results of these reviews have consistently been applied to update the forecast volumes of activities throughout the AA4 period, and therefore influence AA5. In the absence of demonstration of these reviews, there is a risk that some investments may proceed that would otherwise be uneconomic should the revised assumptions be taken into account. We considered the implications of these issues in our assessment of proposed capex in Section 6.

11. We consider that ATCO's chosen method for opex forecasting, base-step-trend (BST) with specific forecasts for ancillary services costs and UAFG, is appropriate. However, we have concerns with aspects of ATCO's application of BST and some of the underlying assumptions, which are presented in Section 7.

12. ATCO has essentially relied on a forecast of economic conditions in WA improving and wages in its sector maintaining a premium, which we consider is not supported when reviewing more authoritative sources of data. Accordingly, we consider that lower real

wage growth escalator assumptions should apply, and this results in a corresponding reduction in ATCO's AA5 capex and opex, as presented in Sections 6 and 7.

13. Through a change in its regulatory accounting policy made after its AA4 allowance, ATCO has capitalised overheads at a considerably higher rate than was used in setting its allowance. As a result, we consider that ATCO has proposed as AA4 conforming capex $24.6m that would have been considered as opex if it had retained the capitalisation policy that was used in setting its revenue allowance. We consider that this should not be considered conforming capex, and we adjust for this amount in Section 5.

Our assessment of ATCO's AA4 capex

14. The information provided by ATCO in its AAI did not provide sufficient detail to understand the composition of its capex program, the variance to the ERA allowance, or why the capex incurred or expected to be incurred should be considered conforming capex under the NGR. A degree of assessment was possible only through our review of ATCO's responses to our information requests.

15. We find that ATCO has not fully justified its AA4 capex against the capex criteria, for reasons including that ATCO:

- has not provided adequate supporting justification for the projects and programs included in its actual/estimated AA4 capex, with examples of expenditure above or not included in the ERA capex allowance, and not documented in the supporting justification;
- provided insufficient analysis of risk and options to confirm that it has selected the most efficient risk treatment option; and
- provided insufficient analysis to support bringing forward projects and programs from AA5 (or later) into the AA4 period.

Our assessment of ATCO's proposed AA5 capex

16. For the proposed $276.1m Network sustaining capex, we find that:

- ATCO's strategy of replacing a portion of its leakiest mains and in close proximity to multiple dwellings is reasonable and is largely supported by semi-qualitative modelling, but that the full amount of pipeline proposed for replacement was not sufficiently justified in accordance with the capex criteria;
- ATCO's three security of supply and two Parmelia Gas Pipeline interconnection projects are based on an overstatement of risk and/or inadequate substantiation that the proposed expenditure satisfies the ALARP test;
- insufficient evidence was provided to support the proposed investment in SCADA and related infrastructure in accordance with the capex criteria; and
- the majority of the proposed End-of-life replacements are likely to satisfy the capex criteria.

17. For the proposed $174.3m Network growth capex, we find that:

- neither the proposed greenfield or brownfield growth capex is likely to satisfy the incremental revenue test due to the incremental capex and opex costs that ATCO has proposed;

- the majority of the balance of the proposed expenditure in this category is likely to satisfy the capex criteria.

18. For the balance of the proposed capex, we find that:
    - the lack of maturity of the options analysis and cost estimates for the individual programs in the IT category ($36.1m) and our concerns regarding the capacity of ATCO to deliver all ten IT projects in the AA5 period, lead us to conclude that ATCO is likely to require a lower level of capex than is proposed; and
    - we consider that the Structures and Equipment work programs are likely to meet the capex criteria, with the exception of the proposed growth-related fleet expenditure of $1.5m.

19. For the most part, we have adjusted proposed capex for all or part of specific proposed projects or programs, where we consider that the information ATCO has provided for our assessment does not demonstrate that the expenditure is likely to satisfy the capex criteria. For the Information Technology category, our adjustment is based on systemic issues that we have identified and described.

Our assessment of ATCO's proposed AA5 opex

20. ATCO has proposed a Base Step Trend forecast for all except its UAFG and Ancillary Services costs, using the ERA's AA4 allowance for 2019 as its starting point, and adjusting and escalating from that point.

21. Our assessed adjustment to ATCO's base-step-trend derived forecast results from (i) determining a revised base year value as an adjustment to ATCO's 2017 actual opex, (ii) applying different adjustments in establishing the base opex value, (iii) applying different opex step amounts, and (iv) applying different escalation factors.

22. We find that
    - ATCO's 2017 actual opex should be used as the starting point for defining base year opex rather than as an adjustment to the allowance that ERA previously applied for 2019 as proposed by ATCO;
    - different adjustments in establishing the base opex value are required, to reflect an efficient and representative base year including to reduce (i) ATCO's staff incentive costs, (ii) its BD and marketing costs, (iii) its IT costs, and (iv) to remove an additional staff incentive cost allowance;
    - different opex step amounts are required, where we concluded that the step change was either not justified or was removed as a consequence of the corresponding capex project/program not meeting the capex criteria, and being removed; and
    - lower escalation factors, reflecting lower real cost escalation and the impact of lower customer growth (as per our findings on ATCO's AA5 customer forecast).

23. For UAFG, we have assessed the impact on volume throughput from lower customer growth assumptions. In the absence of more sophisticated UAFG modelling, we have pro-rated UAFG quantities by the lower assumed throughput.

24. Our adjustments to ATCO's proposed step changes reduce the AA5 allowance. A greater impact arises from the rate of change adjustments, particularly the impact of our findings in favour of lower growth in customer numbers and reduced growth of the network.

Implications

25. In aggregate, our findings lead to the following expenditure allowance implications:

- For AA4 capex, we consider that $420.6, compared with ATCO's proposal to allow $496.0m, meets the capex criteria. This implies an adjustment of -$75.4m. The largest sources of adjustments are End of Life replacement (-$34.4m) and the multistorey risk reduction project (-$6.3m), both in the Network sustaining category, together with removing ATCO's additional overhead allocation (-$25.5m, after allowing for project-based adjustments).
- For AA5 capex, we consider that $242.6m compared with ATCO's proposed allowance of $509.3m, is likely to satisfy the capex criteria. This implies an adjustment of -$266.7m. The largest sources of adjustment are $158.2m to network growth and $97.7m to network sustaining capex, including adjustments of $0.6m and $5.9m respectively for the escalation factor.
- For AA5 opex, we consider that $308.8m compared with ATCO's proposed allowance of $357.4m, is likely to satisfy the opex criteria. This implies an adjustment of -$48.5m, comprising $47.9m network, corporate and IT and $0.6m for UAFG.

26. Our specific findings, the supporting information for those findings and our recommended adjustments to the capex and opex that ATCO has proposed are contained in Sections 5 to 7.

1 Introduction

1.1 Purpose and scope of requested work

1.1.1 Purpose

27. The Economic Regulation Authority (ERA), in accordance with its responsibilities under the National Gas Law (NGL) and the National Gas Rules (NGR), is currently reviewing ATCO Gas Australia's (ATCO) revised access arrangement (AA) proposal for the Mid-West and South-West distribution systems (the network) for the 5-year period from 1 January 2020 to 31 December 2024 (AA5).

28. To assist with its assessment of ATCO's AA5 proposal, the ERA has engaged Energy Market Consulting associates (EMCa) to review and provide technical advice on the following aspects:

- the capital expenditure (capex) incurred (or to be incurred) by ATCO in the current AA period of 5.5 years, which extends from 1 July 2014 to 31 December 2019 (AA4);
- ATCO's proposed capital expenditure (capex) for AA5;
- ATCO's proposed operating expenditure (opex) for AA5;
- the governance arrangements, forecast methodology and cost estimation processes employed by ATCO when developing its expenditure proposals; and
- other specific matters, including ATCO's KPIs and asset lives assumed for depreciation purposes.

29. The results of our technical assessment are set out in this report.

1.1.2 Scope of the review

30. In regard to ATCO's expenditure, the overarching objective of this review is to assist the ERA to determine whether the actual capex incurred, or to be incurred, by ATCO in AA4 and its proposed capex for AA5 complies with the criteria set out in rule 79 of the NGR and whether its proposed opex for AA5 complies with rule 91(1). To the extent that we

consider that such expenditure does not comply, the ERA has sought our technical advice on adjusted expenditures that could be considered to comply.

31. In carrying out this review, the ERA has asked us to evaluate a range of matters that can affect capex and opex including, amongst others:

- ATCO's substantiation and justification for forecast increases in opex and capex;
- ATCO's project governance arrangements (e.g. procurement practices and delivery models), and the methods or models used by ATCO to estimate its expenditure requirements and to prioritise areas of expenditure;
- the methodology ATCO has used to develop capacity and utilisation forecasts as part of developing its capex and opex forecasts;
- the extent to which ATCO has factored efficiencies into the opex and capex forecasts;
- ATCO's ability to deliver its proposed capex program;
- the asset lives assumed by ATCO when calculating depreciation; and
- the Key Performance Indicators (KPIs) used by ATCO to support its capex and opex forecasts including comparison with industry standards and any proposed changes to ATCO's operational and service level performance.

1.2 Regulatory framework

32. The provisions the ERA is required to have regard to when assessing ATCO's capex and opex proposals are set out in Part 9 of the NGR. In short, these rules require the ERA to accept ATCO's proposal if:

- the capex complies with the conforming capex criteria in rule 79 of the NGR and any forecasts or estimates underpinning the capex proposal are arrived at on a reasonable basis and represent the best forecast or estimate possible in the circumstances (rule 74(2)); and
- the opex complies with the criteria set out in rule 91(1) of the NGR and any forecasts or estimates underpinning the opex proposal satisfy rule 74(2).

33. The ERA's discretion under rules 79 and 91(1) is limited, which means it may not withhold its approval, if it is satisfied the opex and capex proposals comply with the relevant rules and/or provisions in the NGL.

1.3 Structure of this report

34. Our main findings are summarised in the Executive Summary at the beginning of this report.

35. In Section 2, we present a context overview of the capex and opex elements relevant to our review. This overview includes consideration of the expenditure trends and ATCO's forecasting performance of AA4 capex, by way of contextualising its forecast regulatory allowances for AA5 capex and AA5 opex.

36. In the subsequent five sections, we present the assessment that supports our findings:

- in Section 3, we describe our assessment of the governance and management framework that ATCO uses to plan and approve its expenditure, its business planning process, asset lives that have been assumed in ATCO's depreciation calculations, and management of KPIs, together with the implications on its forecast expenditure of any identified issues;
- in Section 4, we describe our assessment of ATCO's demand forecast and of the forecasting methodology and regulatory accounting matters that ATCO has used to determine its proposed capex and opex;
- in Section 5, we set out the results of our assessment of ATCO's AA4 capex incurred, or to be incurred, against the capex criteria and describe any issues we have identified with the expenditure;
- in Section 6 we set out our assessment of ATCO's proposed capex for the AA5 period; and
- in Section 7 we set out our assessment of ATCO's proposed opex for the AA5 period.

37. Further supporting information is provided in appendices.

1.4 Other

1.4.1 Information sources

38. In the course of carrying out this review, we have examined a large number of documents. This includes the AA Information (AAI) and other documents that ATCO provided to the ERA in support of its proposed AA, and a number of other significant documents that were provided by ATCO during on-site meetings (held on 9-10 October 2018), or in response to our information requests.

39. Our assessment is based on our observations from the onsite meetings, together with information supplied prior to, at, and following the onsite meeting pursuant to EMCa information requests. The last information provided to us and which we have incorporated into our assessment, was on 21st November 2018.

1.4.2 Rounding of numbers and real conversion

40. Numerical totals in tables may not present as being equivalent to the sum of the individual numbers due to the effects of rounding. Also, some numbers in this report may differ from those shown in ATCO's AA submission or other documents due to rounding.

41. This report refers to costs in real December 2019 dollars unless denoted otherwise.

2 Background

2.1 Introduction

42. In this section, we provide background context to the assessments which follow. We first provide an overview of the total capex for the AA4 and AA5 periods, and we include observations of ATCO's actual capex in AA4 against the ERA's AA4 capex allowance. We provide an overview of the total opex for the AA4 and AA5 periods, and we include observations of the actual opex in AA4 against the ERA's AA4 opex allowance.

43. We then outline our review approach for the assessment we have undertaken, and which is described in the remainder of this report.

2.2 ATCO's AA4 capex and proposed AA5 capex

2.2.1 ATCO's historical and proposed capex

44. ATCO has forecast total capex of $509.3m for the AA5 period (5 years). In the table below, we show the breakdown of capex in AA5 by capex category.

Table 1: Proposed AA5 capex by capex category

$m, real Dec 2019	Forecast (AA5)					Total AA5
Category	2020	2021	2022	2023	2024	(5 years)
Network Sustaining	56.9	53.3	55.8	57.6	52.5	**276.1**
Network Growth	33.8	34.2	34.9	35.0	36.5	**174.3**
Information Technology	7.4	8.8	6.4	5.5	8.0	**36.1**
Structures and equipment	5.3	6.0	3.2	4.1	4.3	**22.8**
Total	**103.4**	**102.2**	**100.4**	**102.2**	**101.3**	**509.3**

Source: AAI Table 5.2 and ATCO response to EMCa Question 4.

45. ATCO reports that it has incurred, or will incur, a total of $496.0m capex in the AA4 period (5.5 years) which includes $310.1m as actual and $185.9m as an estimate for years 2018 and 2019. In the table below, we show the breakdown of capex in AA4 by capex driver.

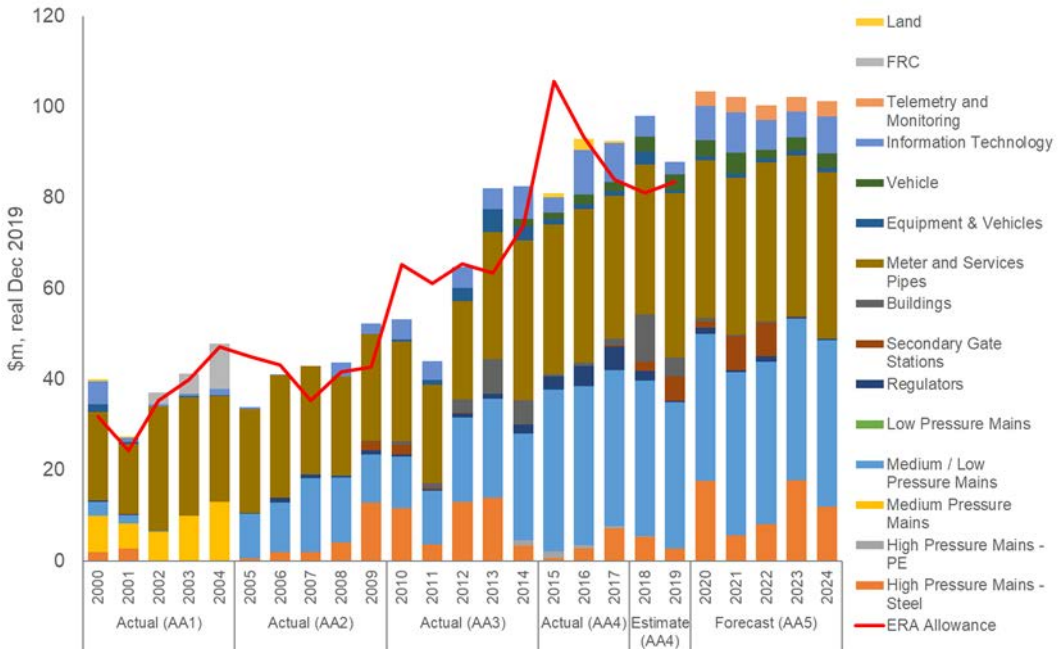
Table 2: Actual/estimate AA4 capex by capex category

$m, real Dec 2019	Actual (AA4)				Estimate (AA4)		Total AA4
Category	2014 (Jul-Dec)	2015	2016	2017	2018	2019	(5.5 years)
Network Sustaining	14.5	32.7	42.7	50.3	51.8	44.2	**236.2**
Network Growth	21.9	41.3	35.2	29.4	26.5	33.1	**187.4**
Information Technology	5.3	3.1	8.8	7.7	3.1	2.2	**30.2**
Structures and equipment	2.2	3.9	6.1	5.0	16.6	8.4	**42.1**
Total	**43.9**	**80.9**	**92.9**	**92.4**	**98.0**	**87.9**	**496.0**

Source: AAI Table 5.2 and ATCO response to EMCa Question 4.

46. In the figure below, we show the long-term trend of capex incurred during the Access Arrangement Periods from AA1 to AA5.

Figure 1: Capex trend for the access arrangement periods AA1 to AA5[2]



Source: Att. 18.1 Revenue & Pricing model

47. ATCO's total capex has been progressively increasing over time, driven primarily by increases in the asset categories of medium / low pressure mains, and meters and services pipes. ATCO is proposing a further increase during the AA5 period. ATCO's AA5 capex forecast is 13% higher than the actual/estimated capex for the same period in AA4 (last 5 years). ATCO describes the main driver of the increase as being a further increase in network sustaining capex associated with its PVC mains replacement program.

2.2.2 EMCa observations on capex trends and performance

48. ATCO forecasts spending $7.3m or 1.4% more than the ERA's regulatory capex allowance in the AA4 period, as shown in the table below. The cumulative capex in the first three years is less than the ERA allowance, however ATCO's forecast for the final two years would, if incurred, be materially greater than the allowance.

[2] For comparation purposes we converted AA3 figures from the year ending 30 June to year ending 31 Dec

49. The shift in timing of expenditure raises questions over the prudency of the delivered programs. We review this as part of our AA4 assessment.

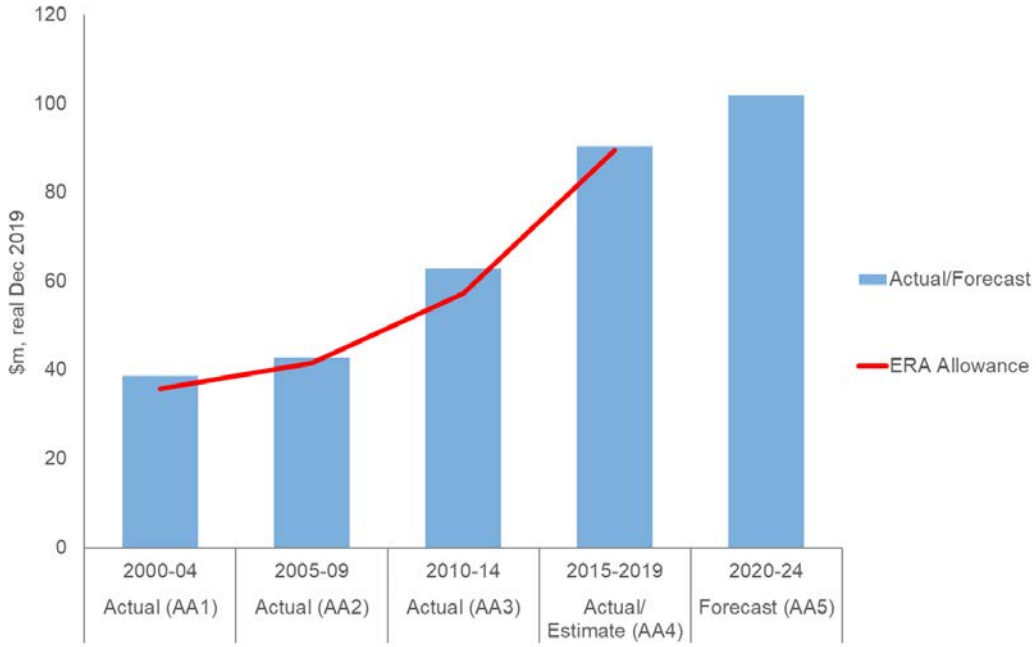
Table 3: Actual/estimated capex versus allowance in the AA4 period

$m, real Dec 2019	Actual (AA4)				Estimate (AA4)		Total AA4
Category	2014 (Jul-Dec)	2015	2016	2017	2018	2019	(5.5 years)
Actual/estimated capex	43.9	81.0	92.8	92.4	98.0	87.9	496.0
ERA Allowance	42.5	105.7	94.4	83.2	81.8	81.1	488.7
Variance	**1.4**	**-24.7**	**-1.6**	**9.2**	**16.2**	**6.8**	**7.3**

Source: AAI Table 5.2 and ATCO response to EMCa Question 4.

50. The figure below shows that ATCO's actual capex has matched its capex allowance consistently in AA4 and previous AA periods.

Figure 2: Annualised capex versus ERA allowance for periods AA1 to AA5



Source: AAI Table 5.2 and ATCO response to EMCa Question 4.

2.3 ATCO's proposed AA5 opex

2.3.1 ATCO's historical and proposed opex

51. ATCO has forecast total opex of $357.3m for the AA5 period (5 years). In the table below, we show the breakdown of opex in AA5 by opex category.

Table 4: Proposed AA5 opex by opex category

$m, real Dec 2019	Forecast (AA5)					Total AA5
Category	2020	2021	2022	2023	2024	(5 years)
Network, Corporate and IT	58.4	60.1	63.1	64.8	66.0	**312.4**
UAFG	6.3	6.2	6.1	5.9	5.8	**30.3**
Ancillary Services	2.8	2.9	2.9	3.0	3.0	**14.6**
Total	**67.5**	**69.2**	**72.1**	**73.7**	**74.8**	**357.3**

Source: Att. 18.1 Revenue & Pricing model

52. ATCO reports that it has incurred, or will incur, a total of $354.9m opex in the AA4 period (5.5 years) which included $218.0m as actual expenditure and $136.9m as an estimate for years 2018 and 2019. In the table below, we show the breakdown of opex in AA4 by opex category.

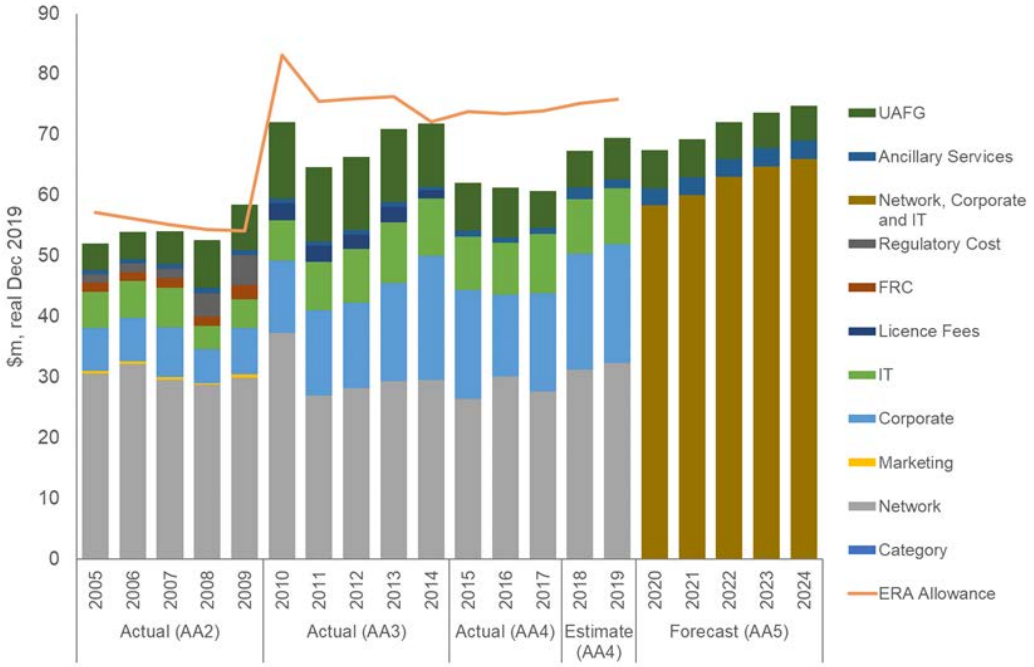
Table 5: AA4 opex by opex category

$m, real Dec 2019	Actual (AA4)				Estimate (AA4)		Total AA4
Category	2014 (Jul-Dec)	2015	2016	2017	2018	2019	(5.5 years)
Network, Corporate and IT	29.4	53.2	52.2	53.6	59.4	61.2	**309.1**
UAFG	4.4	7.9	8.2	6.0	6.1	6.9	**39.4**
Ancillary Services	0.2	0.9	0.9	1.0	1.9	1.5	**6.5**
Total	**34.0**	**62.0**	**61.2**	**60.7**	**67.4**	**69.5**	**354.9**

Sources: Att. 18.1 Revenue & Pricing model

53. In the figure below, we show the long-term trend of opex incurred during the Access Arrangement Periods from AA1 to AA5 against the ERA allowance.

Figure 3: Opex trend for the access arrangement periods AA2 to AA5[3]



Source: Sources: Att. 18.1 Revenue & Pricing model

54. ATCO's average opex has been relatively flat over the period AA3 to AA4, removing the influence of the outlier years. ATCO is proposing an increasing trend during the AA5

[3] For comparation purposes we converted AA3 figures from the year ending 30 June to year ending 31 Dec

period, based on a combination of step changes, real cost escalation and an assumed relationship between opex and defined growth drivers.

55. ATCO's proposed AA5 opex is an increase of 11.4% from the actual/estimated opex for the same period in AA4 (last 5 years).

2.3.2 EMCa observations on opex trends and performance

56. ATCO forecasts spending $51.2m (or 13%) less than the ERA's AA4 opex allowance. Whereas the ERA's AA4 allowance represented a slight increase from ATCO's 2014 expenditure level, ATCO markedly reduced its opex in 2015 and has maintained this lower level of spending despite continuing growth in customer numbers and extensions to its network.

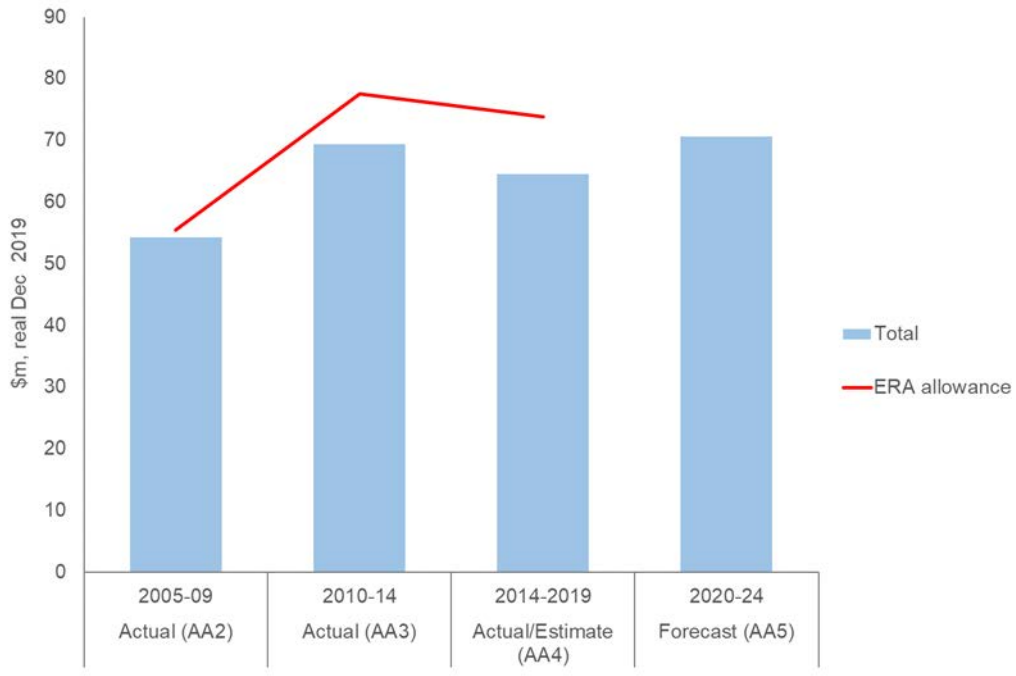
Table 6: Actual/estimated opex versus allowance in the AA4 period

$m, real Dec 2019	Actual (AA4)				Estimate (AA4)		Total AA4
Category	2014 (Jul-Dec)	2015	2016	2017	2018	2019	(5.5 years)
Actual/estimate	34.0	62.0	61.2	60.7	67.4	69.5	354.9
ERA allowance	33.9	73.9	73.5	74.0	75.2	75.8	406.1
Variance	**0.2**	**-11.8**	**-12.2**	**-13.3**	**-7.8**	**-6.3**	**-51.2**

Source: Sources: Att. 18.1 Revenue & Pricing model

57. The figure below shows that ATCO has underspent its opex allowance consistently in AA4 and previous AA periods.

Figure 4: Annualised opex versus allowance for the periods AA2 to AA5



Source: AAI Table 5.2 and ATCO response to EMCa Question 4.

2.4 Approach for our review

58. Our review has entailed:

- Carrying out a first pass review of ATCO's capex and opex proposals to identify any areas where there has been a material change in either:
    - the capex incurred (or to be incurred) by ATCO in AA4 relative to what was approved by the ERA in its 2015 Final Decision, with a focus on the material variances against the ERA allowance; and
    - the expenditure ATCO has proposed for AA5 relative to what it spent in AA4;
- Conducting a more detailed assessment of the capex and opex proposals using the review framework outlined in Appendix A and having regard to information provided by ATCO in its initial submission to the ERA, at on-site meetings, and in response to our information requests:
    - For capex, this typically involved review of various ATCO planning documents and business case documents for its projects and programs of work; and
    - For opex, we reviewed ATCO's forecasting methodology and relevant input assumptions; and
- Carrying out a high-level review of the remainder of ATCO's capex and opex proposals.

59. Our review has placed emphasis on those matters that are of greatest significance in driving the level of reference tariffs the ERA has been asked to approve. Accordingly, we have deepened our assessment process on such components of proposed expenditure to provide the ERA with the necessary supporting evidence and supporting logic on matters of most significance. Our review does not, nor is it intended to, represent an expenditure approval process and the specific projects, programs and activities that ATCO chooses to undertake are matters for ATCO's management judgment.

3 Governance and management matters

3.1 Introduction

60. To inform our assessment of the capex incurred (or to be incurred) by ATCO in the AA4 period and its proposed expenditure for the AA5 period, we have reviewed ATCO's approach to investment governance and management systems, procedures, and practices and compared them to good industry practice. We have also compared what ATCO's governance framework requires and the evidence we have seen, or otherwise, of consistent application of those requirements.

3.2 Investment governance framework

61. The figure below shows ATCO's investment governance hierarchy, the key features of which are:

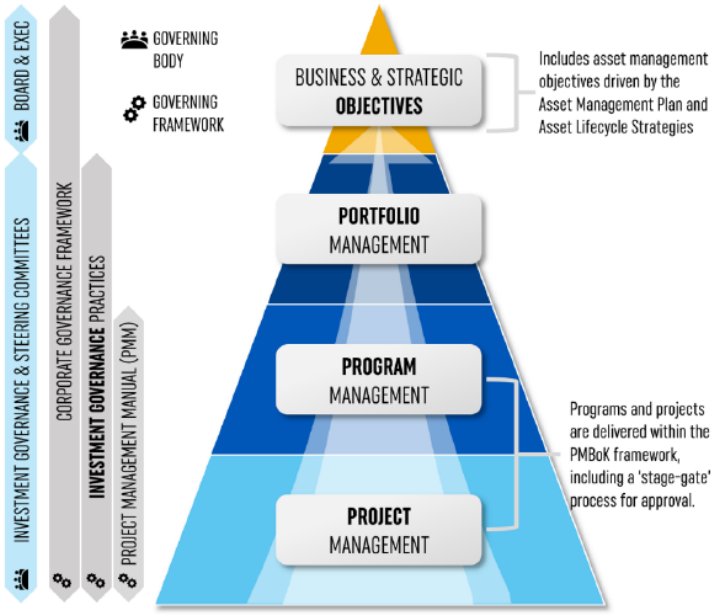
- business and strategic objectives set the overall direction for the business;
- portfolio development and execution oversight by executive, Board and other committees[4]; and
- a suite of investment policies, frameworks, practices, and procedures[5].

62. We consider that ATCO's investment governance hierarchy is consistent with good industry practice.

[4] Such as Risk Review and Audit Committee, Investment Governance Committee (IGC), Project Steering Committees

[5] Such as Asset Management Policy, Project Management Policy, Risk Management Framework

Figure 5: ATCO's investment governance hierarchy



Source: ATCO Investment Governance an Overview, page 2

3.3 Annual planning process

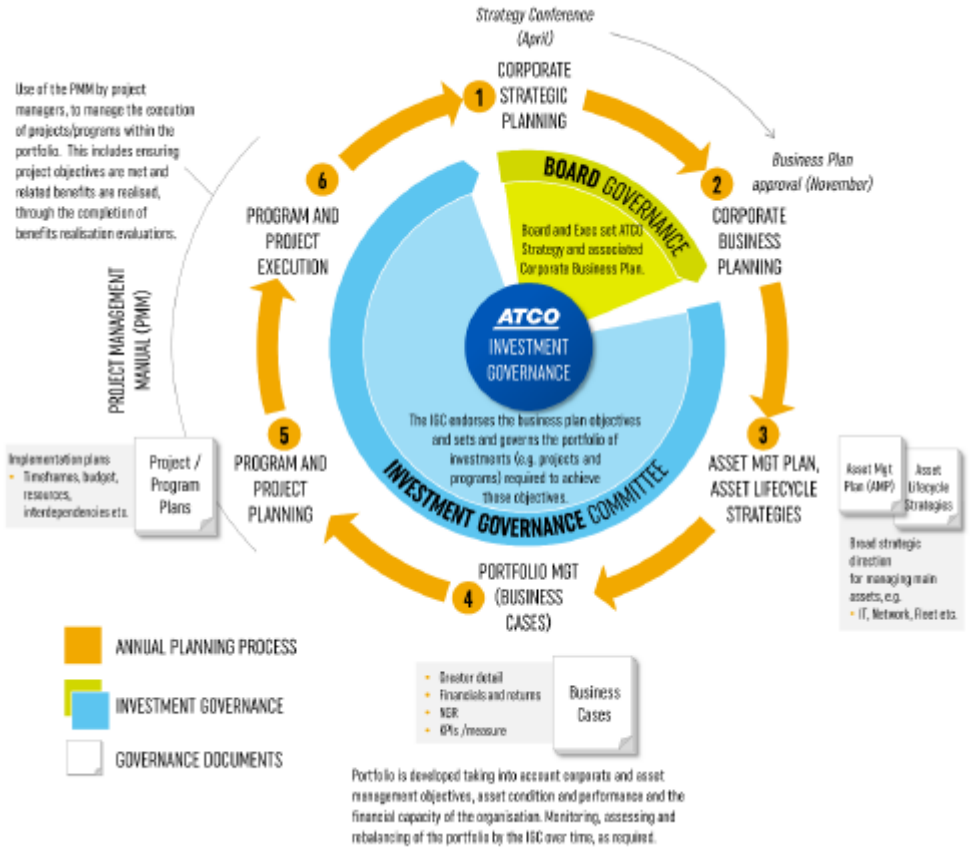
63. ATCO has developed the AA5 proposal capex and opex forecast by applying its annual planning process, as shown in Figure 6. ATCO identifies and sets strategic and business objectives, sets performance measures and targets, and identifies projects and programs of work (opex and capex, network and non-network) to deliver on the objectives and targets.

64. We consider that this planning process is consistent with good industry practice.

3.3.1 Corporate and business planning

65. Steps 1 and 2 in the annual planning process are designed to deliver an updated business plan that converts the strategic goals at the 'corporate' or global ATCO Group level into business objectives and activities for ATCO's GDS. We understand that ATCO applies an iterative process to update and agree its work and expenditure program and has applied this process for its AA5 proposal. We discuss the application of this process to deriving the AA5 expenditure forecast in Section 4 (Forecasting Methods and Assumptions). Other elements of its planning process are discussed below.

Figure 6: ATCO's annual planning process



Source: ATCO AAI, Section 6.3*, Figure 6.1*

3.3.2 Asset management Plan and Asset Lifecycle Strategies

66. ATCO's Asset Management Plan (AMP) incorporates the Strategic Asset Management Plan (SAMP). The SAMP outlines the long-term strategy for the GDS and alignment to the corporate strategy and Asset Management Policy, and sets the asset management objectives and asset lifecycle strategies. This approach and the content of the SAMP section is consistent with good industry practice[6]. The rest of the AMP '*describes the plans, programs and strategies for the management of the network assets presented by asset class...'*[7].

67. The AMP has many of the typical features consistent with good industry practice, however, it does not provide:

- clear identification of the planned and actual historical activity and expenditure for each asset class;
- discussion of the variance and the reasons for variance between planned and delivered work and expenditure;
- discussion of the outcomes (i.e. safety, risk, service performance, etc.) from what has been done (and expenditure incurred) and how this aligns with the expected benefits or otherwise;

[6] Noting that it is common for the SAMP and the AMP to be separate documents

[7] ATCO, *Asset Management Plan*, page 40

- identifiable links between the actual work and expenditure to the forecast work and expenditure (including the AA5 period); and
- clear identification of the changes between the current AMP and its predecessor.

68. This type of information is also not sufficiently discernible from the Asset Lifecycle Strategy (ALS) documents or business cases[8]. The ALS documents do provide a reasonable summary of the more detailed work activity and expenditure for the next ten years and the drivers of the expenditure.

69. The absence of the clear links to historical plans, expenditure (including variances) and performance outcomes, frustrates attempts to understand fully the basis for the planned work and is not reflective of good industry practice.

3.3.3 Portfolio management

70. In Step 4 of Figure 6, ATCO manages 'portfolio construction', portfolio prioritisation, and applies portfolio 'governance', where the portfolio is comprised of the programs and projects identified in the Business Plan. The Investment Governance Committee (IGC) provides overall portfolio management governance.

71. We observe from the documentation provided, close monitoring and control by ATCO of the portfolio of work to (i) achieve its initial capex portfolio budget (i.e. the ERA allowance), and (ii) out-perform the initial opex budget (i.e. the ERA allowance). ATCO is on track to achieve both of these targets at the end of the AA4 period.

72. It is evident that the overall capex budget was achieved through a combination of project and program changes, including:

- delivery of some projects under-budget and/or ahead of schedule, and others over-budget and/or behind schedule, which is typical during the course of the project lifecycle;
- 'roll-outs' or deferment of some work for various reasons, which is also typical; and
- 'roll-ins' or advancement of projects - network capital project roll-ins are typically to (i) address changes in risk/priorities, or (ii) to smooth work load.

73. However, based on our AA4 capex assessment, it appears that ATCO's focus on minimising the variance to its initial capex portfolio budget has been achieved, to a material extent, by rolling-in projects or other work activity to the AA4 period that need not be undertaken to prudently manage risk. We have not seen sufficient evidence of 'work smoothing' activity to alleviate our concerns.

74. We consider that a more prudent approach would be to underspend the capex budget, passing the savings to customers through lower tariffs over time, if bringing forward work is not justifiable based on risk.

3.3.4 Program and project planning

75. ATCO claims to manage the planning and delivery of its projects in accordance with its Project Management Manual (PMM). Figure 7 presents an overview of ATCO's project

[8] ALS reports are produced for each major asset class and look ahead ten years, outlining in more detail about the assets, the activities, action plans, and work programs to deliver the objectives and targets set in the SAMP

lifecycle management phases. We consider the PMM and the requirements therein have elements that are consistent with good industry practice.

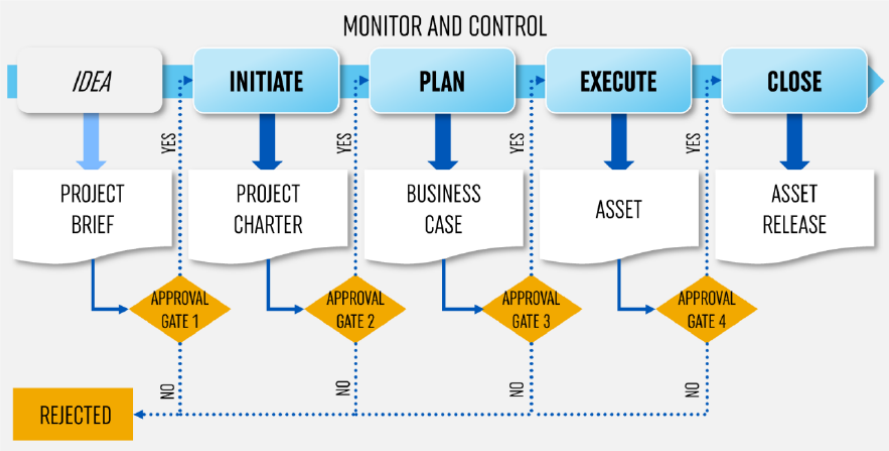
76. The approval gates are intended to represent progressive refinement of a project or program of work through to Business Case approval. In our experience, business cases are a critical governance tool, ensuring that the proposed investment is likely to be prudent and efficient (i.e. in regulatory terms and for the business more generally).

77. The AA4 business cases and supporting information are of variable quality, with our major concern being the lack of rigour applied to the cost-benefit analyses of the preferred option and alternatives, particularly in regard to:

- poor definition of the counterfactual ('No action' option);
- errors in the modelling;
- inconsistent application of recurrent capital costs and opex assumptions; and
- lack of analysis of the risk-cost to demonstrate satisfaction or otherwise of the ALARP test.

78. These issues are discussed further in Section 5 (AA4 Capex).

Figure 7: Overview of project lifecycle management at ATCO



Source: ATCO, Attachment 6.1 Investment Governance and Overview, page 13

79. The business cases provided in support of the AA5 projects and programs of work are in various stages of development, but our understanding is that none of the documents provided had been approved at 'gate 3'. For example:

- AA5 growth capex: no business cases were provided for the $174.3m proposed network growth expenditure[9];
- AA5 sustaining capex: unapproved business cases were provided for the majority of sustaining capex, however the relative lack of refinement of the critical documents supporting the AA5 expenditure was compounded by the absence of analysis to demonstrate that the projects addressing Intermediate level risks (as assessed by ATCO) satisfy the ALARP test. These factors combine to undermine ATCO's justification of its sustaining capex; and

[9] Only 'project briefs' (which have even less detail than the unapproved business cases) or reference to the relevant Asset Life Cycle report category provided

- AA5 IT capex: whilst business cases were provided for the five major projects/programs of work, they were confirmed at our on-site meeting with ATCO as being very preliminary. As discussed in Section 6, this undermines our confidence in the timing and proposed expenditure for the IT capex category.

3.3.5 Program and project execution

80. With two important exceptions, ATCO has provided sufficient evidence that it applies good project delivery disciplines to execute its work program[10]. Our concerns are with the apparent lack of:
    - robust change control management, and
    - robust close-out reports.

81. We requested[11] and had expected to see, but did not see, the reasons for project/program level variance, lessons learned and other relevant information in our review of AA4. Such analysis would have informed our assessment of proposals for AA5 to (i) confirm that ATCO follows its own process, and (ii) to help us understand ATCO's investment decision-making.

3.4 IT strategy

82. ATCO's IT Strategy document provides a reasonable explanation of ATCO's strategic objectives, assets, strategies, program governance model, and proposed expenditure. Our concerns with ATCO's proposed IT allowance largely relate to the current immaturity of the plans that it has based its proposal on.

3.5 Safety Case and risk management

83. ATCO's Safety Case describes the risk management systems ATCO uses to identify, assess and treat risks on the GDS. The Safety Case was accepted by Energy*Safety* (now Building and Energy) in 2011. It was recently updated in response to feedback from Energy*Safety*, with ATCO advising that it '*came into full effect on 18 July 2018 incorporating enhancements to ATCO's risk management framework and risk evaluation (including evaluation of significant risk treatment options as part of the process for assessing whether risk is ALARP)'*[12].

84. Whilst the Safety Case is a comprehensive document, we consider ATCO's approach to risk management to be materially deficient for the following reasons:
    - Likelihood assessment: its Formal Safety Assessment process does not refer to the normative requirements of AS4645:2018, which leads ATCO to a very conservative approach to its likelihood analysis[13];

[10] Including a sample of ATCO's management approach to monitoring and controlling budget and volume/scope throughout the project execution phase

[11] Including in response to our direct request for change control and project close-out reports

[12] ATCO, *Presentation for ERA/EMCa, Business Planning & Performance, 9 October 2018,* slide 26

[13] The likelihood of occurrence of identified threats

- Consequence assessment: ATCO has, in some cases, taken a conservative approach to assessing consequences, particularly in relation to deriving 'customer weeks lost', following a supply interruption or loss of containment event; and
- ATCO does not adhere to the normative requirement of AS4645.1 regarding the ALARP test (i.e. for projects assessed to present Intermediate risk) to provide '*[s]ubstantiation that the sacrifice (including cost) of further risk reduction measures is grossly disproportionate to the benefit gained from the reduced risk that would result'*[14].

85. We discuss ATCO's risk management framework further in Appendix B and the application of the framework in our assessment of ATCO's capex.

3.6 Key Performance Indicators

86. ATCO has proposed nine KPIs, including a new Asset health indicator, and revised targets for the existing performance indicators, as described in the table below.

Table 7: ATCO's proposed KPIs

Category	KPI description	Basis for target	AA4 target	AA5 target [1]
Customer service	1. % customer connection within 5 days	Current performance (average of last five years)	>99.5%	>98.7%
	2. % attendance to broken mains & services within 1 hr		>99.7%	>99.9%
	3. % attendance to loss of gas supply within 3 hrs		>99.7%	>99.9%
Network integrity	4. Public reported gas leaks /mains km	Current performance (average of last five years)	<0.7	<0.65
	5. SAIFI		<0.0044	<0.0041
	6. Unaccounted for gas (UAFG)	Expected performance in AA5	2.52% - 2.58%	2.55% - 2.46%
	7. Asset Health		n/a	100
Expenditure	8. Opex / km of main ($)	Expected performance in AA5	$5.08k	$4.7k - $4.9k
	9. Opex per customer connection ($)		$101	$89 -$92

Source: ATCO, AAI, pages 62-69; [1] where a range is indicated, this is from 2020 to 2024

Customer Service KPIs

87. The three Customer Service KPI targets are set based on the simple average of the performance over the last five years, on the basis that this reflects customer feedback that current performance is acceptable (i.e. do not invest to improve the level of performance). This approach results in two of the three AA5 targets seeking to attain a

[14] AS4645.1:2018, page 84

higher level of performance when compared to the corresponding AA4 targets. We consider the KPIs and the AA5 targets to be reasonable.

Network Integrity KPIs

88. Two Network Integrity KPIs[15] are set on the basis of current performance, both seeking to attain a higher level of performance when compared to the corresponding AA4 targets. We consider these two network integrity KPIs and targets to be reasonable.

89. The UAFG KPI is derived from ATCO's forecast performance in mitigating the sources of UAFG in the AA5 period. The KPI is appropriate, declining targets preferable to a flat target and, as discussed in Section 7 (AA5 Opex), we consider the annual AA5 targets to be reasonable.

90. The Asset Health KPI is new and responds to the ERA recommendation in its Final Decision for ATCO to develop an Asset Health indicator. ATCO describes the purpose of the AHI '*to demonstrate the value of proposed asset expenditure to our customers regarding improved asset health'*[16]. ATCO explains the derivation of the KPI as a combination of the SAIDI, SAIFI, service leaks, and meter leaks indices, with weightings attributed to each[17]. The index is established by setting the target to equal the expected performance in these four indices in 2024 – and therefore the Asset Health KPI target by 2024 is 100. We note that (i) the selected indices are all lagging indicators of performance, considered as a result of an event occurring on the network, rather than being indicative of the condition of the network, and inherent risk, and (ii) the index is derived from other KPIs.

91. In our review of the Asset Health KPI, we consider that:

- the rational for ATCO deriving an asset health indicator from other existing KPIs is not clear;
- an asset health index should be specified in such a way that it can be read as a leading indicator of performance;
- ATCO provides no annual estimate of the Asset Health KPI for the AA5 period, nor for the AA4 period. If it were to produce the historical Asset Health KPI for at least 2014 onwards, it would help with understanding the historical and forecast 'health' of the GDS as a result of its investment in the GDS;
- ATCO has not provided justification for the weightings applied in the development of the Asset Health KPI; and
- there is no evidence that ATCO has taken this KPI into account in developing its AA5 forecast or in (retrospectively) monitoring its historical performance.

Expenditure KPIs

92. The two expenditure-related KPIs are directly derived from ATCO's proposed expenditure and growth forecasts. Given the actual performance during AA4, the targets are reflective of a lower level of performance than was achieved during AA4. Whilst we

[15] Public reported gas leaks / mains km, and SAIFI

[16] ATCO, AAI, page 65

[17] ATCO, AAI, page 65; ATCO also advise that this KPI has been based on similar indices set by Australian Gas Networks (Victoria and Albury) and Ausnet

consider the method for setting the target to be acceptable, we note that the targets should be revised depending on the ERA's Final Decision (AA5 opex).

Link between KPIs and investment governance

93. We observe that in its AMP, discussion of actual performance against the nominated KPIs is said to be reported monthly[18]. ATCO has also developed leading KPIs which it monitors to help achieve the 'headline' KPIs discussed above. This is indicative of good industry practice.

Other KPIs

94. With the introduction of the Asset Health KPI, we do not consider that more KPIs in addition to those discussed above are necessary.

3.7 Implications for ATCO's proposal

95. We have identified a number of issues with ATCO's governance and management systems, procedures, and practices which individually and collectively undermine the credibility of ATCO's expenditure proposals, and accordingly we consider are systemic in nature. These include:
    - insufficient evidence of risk-based investment portfolio development and management;
    - inadequate links to historical plans, expenditure (including expenditure variances), and performance outcomes in critical documents;
    - lack of evidence of consistent and rigorous application of the investment governance framework;
    - immature justification documents for the capex portfolio, particularly growth capex;
    - poor project and program options analysis, including cost-benefit analysis;
    - risk management framework not fully compliant with the requirements of AS4645;
    - inadequate application of the ALARP test to investment decisions; and
    - inadequate presentation and application of its newly derived Asset Health KPI.
96. We have reflected the implications of these findings in our assessment of expenditure in Sections 5, 6 and 7.

[18] ATCO, Asset Management Plan, page 18

4 Forecasting methods, assumptions and regulatory accounting matters

4.1 Introduction

97. In this section, we describe and assess the forecasting methods and assumptions that ATCO has applied in developing its capex and opex forecasts. We first review ATCO's demand forecast, which includes its forecast customer connections and volumes, then we describe our assessment of ATCO's capex and opex forecasting methods, its real cost escalation assumptions, and asset life assumptions. Finally, in this section, we comment on the implications of our assessment for ATCO's proposal.

4.2 Demand forecast and regulatory test for growth-related investment

4.2.1 Context for our demand forecast assessment

98. Our terms of reference require us to investigate the key drivers behind ATCO's capacity and utilisation forecasts and how these have been used to develop its capex and opex forecasts. ATCO's forecast for new customer connections has a direct impact on its capex, since it drives the need for new service connections and associated mains extensions. Also, ATCO has proposed a growth element in its opex forecast, which it estimates as a direct function of growth in customer numbers and of growth in the length of its pipeline network.

99. ATCO's opex and capex forecasts are both therefore dependent on its demand forecast, with the primary driver, in both cases, being growth in new connections. Its volume forecasts are relevant in determining its tariffs.

4.2.2 ATCO's demand forecast

100. Since 2016, and despite continuing new connections, ATCO has observed a decline in total volumes (i.e. demand, TJ). The rate of new connections has also fallen. For example, the growth rate in B3 residential connections (which comprise 98% of total connections) fell from 2.7% in 2016 to 1.9% in 2017, and ATCO forecasts growth of only 1.2% per year in 2018 and 2019. ATCO has also lost some large customers (associated with tariff classes A1 and A2).

101. ATCO has based its forecasts on advice from Core Energy (CE), which is contained in a report provided by ATCO as part of its submission.[19] The following table shows ATCO's AA4 and forecast AA5 connections and associated volumes.

Table 8: AA4 and AA5 forecast numbers of connections and volumes[20]

Tariff class	AA4 actual			AA4 estimated		AA5 forecast				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A1										
Connections	74	76	76	73	72	72	72	71	70	69
Demand (TJ)	11,398	10,778	10,338	10,184	10,020	9,828	10,066	9,649	9,270	9,143
A2										
Connections	107	102	99	98	97	96	96	96	96	96
Demand (TJ)	1,854	1,820	1,814	1,770	1,718	1,669	1,630	1,592	1,555	1,519
B1										
Connections	1,445	1,520	1,600	1,672	1,744	1,816	1,885	1,949	2,010	2,069
Demand (TJ)	1,721	1,930	1,875	1,986	2,042	2,094	2,133	2,168	2,200	2,223
B2										
Connections	10,625	11,115	11,497	11,830	12,193	12,527	12,850	13,190	13,528	13,850
Demand (TJ)	1,292	1,369	1,343	1,372	1,399	1,419	1,436	1,453	1,469	1,477
B3										
Connections	686,911	705,513	718,911	727,270	735,731	747,479	759,437	771,652	784,165	796,954
Demand (TJ)	9,797	10,875	9,932	10,082	10,033	9,891	9,758	9,634	9,518	9,421
Total										
Connections	**699,160**	**718,325**	**732,182**	**740,943**	**749,836**	**761,990**	**774,341**	**786,958**	**799,867**	**813,038**
Demand (TJ)	**26,062**	**26,772**	**25,303**	**25,395**	**25,211**	**24,901**	**25,023**	**24,496**	**24,011**	**23,782**

Source: ATCO AAI supporting model - Att.18.1: Revenue and pricing model

102. From the information above, we can derive the actual and forecast net new connections, and average volumes (i.e. per customer) as shown in the table below. We note that this data shows net new connections (i.e. new connections net of disconnections); gross new connections are accordingly higher than the net figures shown in the table below.

[19] Attachment 9.1; Demand Forecast Report. Core Energy Group, June 2018

[20] ATCO defines the numbers of connections as the average number over each year. ATCO's forecasts shown here are based on Core Energy's. The figures in Core Energy's report (e.g. its table 5.2 on page 42) are on an inventory basis, showing opening and closing 'stock' of connections and accounting for the movements through connections, disconnections and removal of zero consuming connections within each year. The volumes provided in ATCO's model align with those in the Core Energy report.

Table 9: AA4 and AA5 net new connections and average volumes

Tariff class	AA4 actual		AA4 estimated		AA5 forecast				
	2016	2017	2018	2019	2020	2021	2022	2023	2024
A1									
Net new connections	3	-1	-3	-1	0	0	-1	-2	-1
Average Demand (GJ)	141,815	136,930	139,513	139,160	136,506	139,802	135,899	133,381	132,507
A2									
Net new connections	-5	-3	-1	-2	-1	0	0	0	0
Average Demand (GJ)	17,842	18,328	18,064	17,798	17,385	16,978	16,581	16,194	15,818
B1									
Net new connections	75	81	72	72	72	69	64	60	59
Average Demand (GJ)	1,270	1,172	1,188	1,171	1,153	1,131	1,112	1,095	1,074
B2									
Net new connections	490	382	333	363	335	323	339	338	322
Average Demand (GJ)	123.2	116.8	116.0	114.7	113.3	111.7	110.2	108.6	106.7
B3									
Net new connections	18,602	13,398	8,360	8,461	11,748	11,958	12,215	12,512	12,790
Average Demand (GJ)	15.41	13.82	13.86	13.64	13.23	12.85	12.49	12.14	11.82
TOTAL net new connections	**19,165**	**13,857**	**8,762**	**8,893**	**12,155**	**12,351**	**12,617**	**12,909**	**13,171**

Source: EMCa analysis from ATCO AAI supporting model Att. 18.1: Revenue and pricing model. Some numbers may not reconcile with the previous table, due to rounding

103. As the table above shows, ATCO estimates that new connections in 2018 and 2019 will be considerably less than in 2017. This comprises significant decreases for B1, B2 and B3 customers, and net disconnections of A1 and A2 customers. ATCO also forecasts a significant decline in average volumes across its B1, B2 and B3 customer classes in 2018 and 2019, with further decline in AA5.

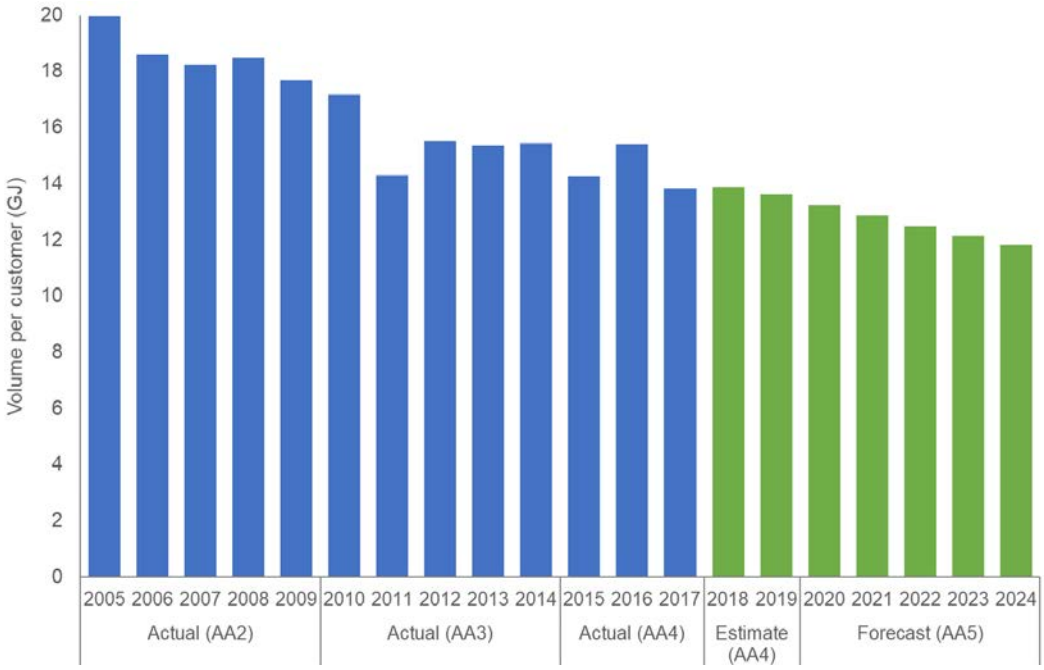
104. ATCO forecasts that new customer connections will revive in AA5, starting in 2020, led by a significant increase in B3 connections. Its longer-term trend shows a steep decline in customer growth rates since 2006, as shown in the following figure.

Figure 8: Time trend of ATCO's actual and forecast B3 connections

Source: EMCa analysis from ATCO AAI supporting model Att. 18.1: Revenue and pricing model. To acheieve a calendar-year series, some growth rates have been interpolated from ATCO data for different periods.

105. In the figure below, we show the time trend of ATCO's actual and forecast B3 volumes per customer, showing a steady decline. In our 2014 assessment for the ERA, we determined that volumes for new connections had fallen significantly, and that this dilution effect is reducing average customer volumes overall. However, it is also clear that existing customers are reducing their usage, as evidenced by the fact that ATCO's total volumes have fallen (and are projected to fall further in AA5), despite new customer connections.

Figure 9: Time trend of ATCO's actual and forecast B3 volumes per customer



Sources: EMCa analysis from ATCO AAI supporting model Att. 18.1: Revenue and pricing model. To acheieve a calendar-year series, some data has been interpolated from ATCO data for different periods.

4.2.3 Assessment of ATCO's demand forecast

106. In our assessment, we have focused particularly on ATCO's B3 forecast, which comprises almost all new connections. We have the following observations on the CE forecast that ATCO has used:

- CE assumes B3 disconnections at a constant rate of around 0.5% p.a., which it states is based on a historical average. With decreasing volumes, structural changes in household energy use and ATCO's increased fixed charges, an argument could be made for seeking to determine a trend rather than a static assumption;
- CE takes account of a current oversupply of housing with forecasts for new dwellings forecast to pick up from 2020. Based on the evidence presented, this seems reasonable and would support the forecast pick-up in new B3 connections from 2020;
- CE has taken account of removal of zero consumption B3 connections in 2018 which is a factor driving the low net increase in connections that we observe in the tables above;
- The ratio of B3 new connections to dwelling completions has been falling since 2009; however, CE has forecast for this decline to reverse with a modest increase in 2019. This assumption seems dubious and does not seem to be backed by evidence in CE's report;

- CE has forecast consumption per existing B3 customer to fall from 13.51 GJ in 2020 to 12.30 GJ by 2024, but for new customers connecting in 2020 to 'mature' to a peak use of only 9.23 GJ (after initially connecting with consumption of only 5.80 GJ). This seems consistent with evidence and explains the continuing decline in overall volumes in ATCO's forecast.

107. While we have reservations about some factors, the CE forecast for the B3 tariff class appears to account for the main trends in the observed data. We have not reviewed CE's forecasting model, however on the evidence of its methodology as presented in its report we have not identified any material concerns. However, these forecasts effectively assume that ATCO chooses to meet the demand for connection of new customers. As discussed in the following subsection, we have major concerns with the economics of such new connections from the data that ATCO has provided. Under the NGR, this would constrain ATCO's ability to include the capital costs of connecting these new customers as conforming capex into its RAB, and this may therefore constrain ATCO's willingness to connect them. Alternatively, if ATCO was to seek to recover any shortfall by way of a customer contribution from those customers, this would likely reduce the demand for new connections.

108. ATCO's forecasts for other tariff classes (A1, A2, B1 and B2) include zero or significantly declining numbers of new connections, and also declines in average consumption per customer. Our reading of CE's forecasting methodology and assumptions as presented in its report does not raise material concerns for the demand forecasts ATCO has used for these tariff classes, and which leads to an aggregate decline in volumes.

4.2.4 Regulatory justification based on incremental revenue test

109. As we describe in Appendix A, the NGR requires application of an 'incremental revenue' regulatory test to determine whether capex for new connections can be rolled into the RAB. If ATCO was to connect customers only to the extent that the associated capex meets this test, then this could imply a constraint on 'demand growth' to the extent that any such capex does not meet the required test.

110. ATCO has claimed that its proposed AA5 connections capex meets the regulatory test[21]. Following our information request, ATCO provided two models in support of this claim, one each for its AA5 forecast greenfields and its forecast brownfields B2 and B3 connections[22]. We have summarised these models and our assessment of them in Appendix C. Our assessment does not support ATCO's claims.

111. As we describe in Appendix C, we have two primary concerns with ATCO's modelling:

- ATCO's analysis is based on analysis over 50 years. In our 2014 report to ERA, we raised concerns with ATCO's analysis at that time showing a positive NPV only over periods of around 30 years[23]. In our opinion a positive NPV looking 50 years into the future does not represent reasonable evidence that ATCO's proposed growth investment would meet the incremental revenue test; and

[21] ATCO AAI, page 110

[22] B2 and B3 connections represent almost all of ATCO's forecast new connections.

[23] Review of technical aspects of the proposed access arrangement, EMCa report to ERA (2014), page 114

- The regulatory test is required to assess incremental revenues based on 'prevailing tariffs'[24]. However, ATCO's analysis as presented to us appears to factor in the tariffs that it has proposed to the ERA for AA5 and which represent significant increases for its B2 and B3 customers.

112. If we adjust the assumed tariffs to ATCO's prevailing tariffs, being its tariffs prior to AA5, then the NPV of its proposed greenfields and brownfields connections is negative in its modelling, even after 50 years. In Appendix C, we have demonstrated the outworking of this test.

113. Based on this assessment, we conclude in Section 6 that ATCO's proposed greenfields and brownfields connections capex, and associated mains extensions, does not meet the relevant regulatory test. If ATCO decides on this basis not to undertake such extensions to its network, then its demand growth will consequently be constrained.

4.2.5 Constrained demand growth

114. We have assessed an adjusted demand forecast on the basis of no new greenfields or brownfields connections in AA5, consistent with our finding in Section 6. Our assessment is based on adjusting CE's customer connection forecast to remove growth to the extent that ATCO's expenditure in meeting that growth would not be considered 'conforming capex', and utilising CE's assumptions regarding per-customer volumes for existing customers together with volumes over AA5 for those customers that are assumed to connect in 2018 and 2019. The results of this assessment are shown in the following table.

Table 10: Adjusted demand growth forecast, based on an assumption of no new greenfields or brownfields connections in AA5

Tariff class	AA4 actual			AA4 estimated		AA5 forecast				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A1										
Connections	74	76	76	73	72	72	72	71	70	69
Demand (TJ)	11,398	10,778	10,338	10,184	10,020	9,828	10,066	9,649	9,270	9,143
A2										
Connections	107	102	99	98	97	96	96	96	96	96
Demand (TJ)	1,854	1,820	1,814	1,770	1,718	1,669	1,630	1,592	1,555	1,519
B1		0								
Connections	1,445	1,520	1,600	1,672	1,744	1,816	1,885	1,949	2,010	2,069
Demand (TJ)	1,721	1,930	1,875	1,986	2,042	2,094	2,133	2,168	2,200	2,223
B2		0								
Connections	10,625	11,115	11,497	11,830	12,193	12,338	12,263	12,186	12,107	12,026
Demand (TJ)	1,292	1,369	1,343	1,372	1,399	1,384	1,364	1,343	1,321	1,296
B3										
Connections	686,911	705,513	718,911	727,270	735,731	739,695	735,958	732,161	728,303	724,382
Demand (TJ)	9,797	10,875	9,932	10,082	10,033	9,800	9,581	9,313	9,046	8,801
Total										
Connections	**699,160**	**718,325**	**732,182**	**740,943**	**749,836**	**754,017**	**750,274**	**746,463**	**742,585**	**738,642**
Demand (TJ)	**26,062**	**26,772**	**25,303**	**25,395**	**25,211**	**24,775**	**24,773**	**24,065**	**23,391**	**22,982**

Source: EMCa analysis

[24] See appendix A. We raised this issue also in our 2014 report (ibid page 114)

4.3 Capex forecasting

4.3.1 ATCOs approach

115. ATCO has forecast its expenditure requirements using a 'bottom up' approach by aggregating individual projects and programs for each capex category, in which:

- Unique capex project expenditures are identified and costed based on assessed building blocks or market based costs, with expenditure phased over the project time-frame to meet the required commissioning dates; and
- Volumetric capex project/program expenditures are projected based on forecasts of the volumes and unit costs for each volume project type.

116. ATCO claims[25] that its forecast capex is consistent with its AMP and Asset Lifecycle Strategy (ALS) documents.

4.3.2 Our assessment

117. We consider that there are some material deficiencies in ATCO's forecasting approach, including the governance of its forecasting process and the way in which performance is taken into account in justifying expenditure requirements.

Top-down challenge process is not asset-risk based

118. ATCO initially developed its forecasts using a bottom-up build process by incremental aggregation of detailed activity. Based on our experience, aggregate forecasts derived from such a process are more likely than not to overstate the expenditure requirements that will ultimately be delivered to meet the service performance outcomes of the business. We would expect to see senior management challenge the bottom-up result by applying at least a risk-based decision support tool and a financial model. The final expenditure position should demonstrably result in a balance between network risk, service performance, tariff impacts and stakeholder returns (or similar criteria).

119. Whilst ATCO has presented evidence that it has deployed a financial model to help understand tariff and shareholder impacts, we have not seen evidence of the use of an asset risk-based tool to help communicate the impact on overall risk levels and related KPIs of different expenditure levels.

120. We note that the majority of the network risks are ranked as Intermediate level (using the definitions in ATCO's risk management framework) and are therefore subject to the ALARP test. As mentioned in our governance and management review, we would expect to see senior management robustly challenge the inclusion of this work referring to the capex criteria, its Safety Case and the references to Australian Standards. We have not seen such evidence.

121. In the absence of such challenges we consider that the forecasting approach adopted by ATCO has included a level of conservatism that has led it to over-forecast its requirements.

[25] ATCO 2018 AAI, page 95

Limited application of benchmarking

122. Application of benchmarking can also be used as a means to apply a top-down check to the development of a bottom-up capex forecast. We found evidence of limited benchmarking included for ATCO's proposed IT capex only. Whilst ATCO purports to perform well against this measure, there is limited discussion on the factors that may separate ATCO against its peers, and to apply those same factors to benchmarking other parts of its capex forecast.

123. ATCO also refers to replacement rates, and to replacement ages of other gas utilities in developing its business cases for some of its network sustaining capex. However, the application of these measures is also limited, and therefore not suitable as a means to challenge the expenditure forecast at an aggregate level.

Expenditure forecasts not adequately linked to performance outcomes

124. In general, ATCO has not provided evidence of the performance improvements likely to result from its capex programme at a project or program level, or at the portfolio level. Similarly, ATCO does not adequately explain the potential performance impact if it does not undertake the proposed level of capex.

125. ATCO's business case process includes, among other things, a requirement to assess the benefits from proposed expenditure. We have found that with a few exceptions, ATCO does not quantify tangible benefits. Further, we are of the view that ATCO has provided insufficient evidence that the tangible benefits arising from the significant and increasing level of expenditure incurred in the current and previous access arrangement periods has been adequately taken into account when deriving the forecast expenditure.

Volume based forecasting approach is reasonable, but lacks adequate review and challenge of assumptions

126. A large proportion of ATCO's AA4 and proposed AA5 capex relates to variable volume activities, that are derived using an estimate of required volumes of activity (be it growth in connections or asset replacements) and unit rates, largely derived from historical costs.

127. Whilst ATCO's forecasting approach for volume-based activities is appropriate for these types of activities, ATCO does not appear to adequately review its assumptions pertaining to the volumetric inputs or economic analysis. We understand that as a part of ATCO's governance framework, as discussed in Section 3, regular reviews are planned to be undertaken of program base activities (i.e. annual). We did not see evidence of these reviews, or how the results of these reviews have consistently been applied to update the forecast volumes of activities throughout the AA4 period, and therefore influence AA5.

128. We observed that in many cases, assumptions developed at the time of an original business case or in the course of determining an ERA regulatory allowance are being applied throughout the AA period without review. In the absence of demonstration of these reviews, there is a risk that some investments may proceed that would otherwise be uneconomic should the revised assumptions be taken into account.

Lack of relationship between AA4 and AA5 proposed expenditure levels

129. We did not find adequate explanation of the activity delivered by ATCO across the AA4 and AA5 periods evidenced in its asset management plans or other information supporting its expenditure trends. This hindered our ability to adequately assess the prudent levels of so-called continuation programs, as it was not clear (i) what volume of activity was completed in prior years; (ii) what changes (if any) had been applied as a result of this new information; and (iii) how the proposed level of activity – both during the later years of AA4 and into AA5 – was representative of a prudent level of activity.

Cost estimation approach is reasonable

130. For the majority of ATCO's program-related expenditure (i.e. high-volume activity) it is undertaking, or is proposing to undertake, programs of work which it is familiar with, having done similar high-volume work 'routinely' over many years. The unit costs are derived from actual prices, which when delivered by external suppliers, is generally established through competitive tender. We therefore have no particular concerns with ATCO's basis for cost estimation for its high-volume work.

131. ATCO's project-related work (i.e. discrete activities) is again largely work that ATCO has done before a number of times and therefore has established cost building blocks based on historical costs. Large projects are typically delivered with external resources, with the cost for their services subject to some form of competitive process (e.g. tenders, pre-qualified panels). We are satisfied that this forms a reasonable basis for the historical costs.

132. The IT projects proposed for the AA5 period are largely new to ATCO and are complex and expensive. Whilst at an industry level there are building block cost benchmarks available to help with cost estimation, the actual architecture and detailed design and integration effort will heavily influence the cost. ATCO's cost estimates are at an early stage of development and we have assessed the proposed expenditure accordingly.

4.4 Opex forecasting

4.4.1 ATCO's approach

133. ATCO has developed its AA5 opex forecast for the aggregate of its network, corporate and IT requirements, using a Base Step Trend (BST) approach. It has developed specific bottom-up forecasts for its proposed AA5 costs for provision of ancillary services and UAFG, based on volumes and unit rates.

134. ATCO has also sought to justify its proposed opex by reference to inter-company benchmarks, and partial factor productivity analysis.

4.4.2 Our assessment

Appropriate choice of methods

135. We consider that the methods that ATCO has chosen, namely BST with specific forecasts for ancillary services costs and UAFG, are appropriate approaches for the components that ATCO has applied them to. We have concerns with aspects of ATCO's application of BST, and of some assumptions it has proposed, and which we describe in Section 7.

ATCO has overstated the implications of its benchmarking and productivity analysis

136. ATCO has incurred less opex annually to date in AA4 than in AA3, significantly less than it proposed to ERA for AA4, and also less than the ERA's allowance for this period. Given that it has also increased the number of customers served in this time, this presents as evidence of improved efficiency and improved productivity. ATCO's benchmarking evidence also indicates that its costs are low compared with its peers.

137. ATCO has referred to its 'outperformance' against the ERA allowance and its benchmarking results as providing '*…assurance that our base year reflects efficient costs*'.[26] It is possible, for example, to interpret ATCO's claimed 'outperformance' against the ERA's allowance as evidence of ATCO having proposed an inflated AA4 forecast, which was in fact considerably higher than ERA's determined allowance. We have noted also that productivity analysis that ATCO commissioned[27] shows that over the past 17 years, it has essentially not improved productivity. ATCO has proposed no productivity improvements in AA5.

138. A further factor, which we refer to in Section 4.7, is that it appears that ATCO altered its overheads capitalisation policy during AA4, such that it capitalised overheads to a greater extent; this would have had the effect of reducing its declared opex and increasing capitalisation into the rolled-forward RAB.

139. While ATCO's claimed 'outperformance' and its apparently favourable benchmarking could be taken as indicators of efficiency, we do not accept ATCO's assertion that it provides assurance that its base year cost is efficient. It does not absolve the need for examination of the base year cost and we do so in Section 7.

4.5 Real cost escalation factors

4.5.1 ATCO's approach

140. For all capex and opex that ATCO has based in $2019, ATCO has applied an escalator to allow for its forecast of real cost increases; in other words, its forecast of the extent to which its costs will increase above the general rate of inflation (CPI). ATCO has applied an average forecast of 1.64% per annum for real labour cost increases and has estimated that 62% of its opex is labour.

141. ATCO has assumed that materials costs do not increase in real terms. Therefore, the net impact of ATCO's labour escalation assumption is for opex to escalate at 62% of 1.64%, that is, by 1.017% per annum.

[26] ATCO AAI page 77

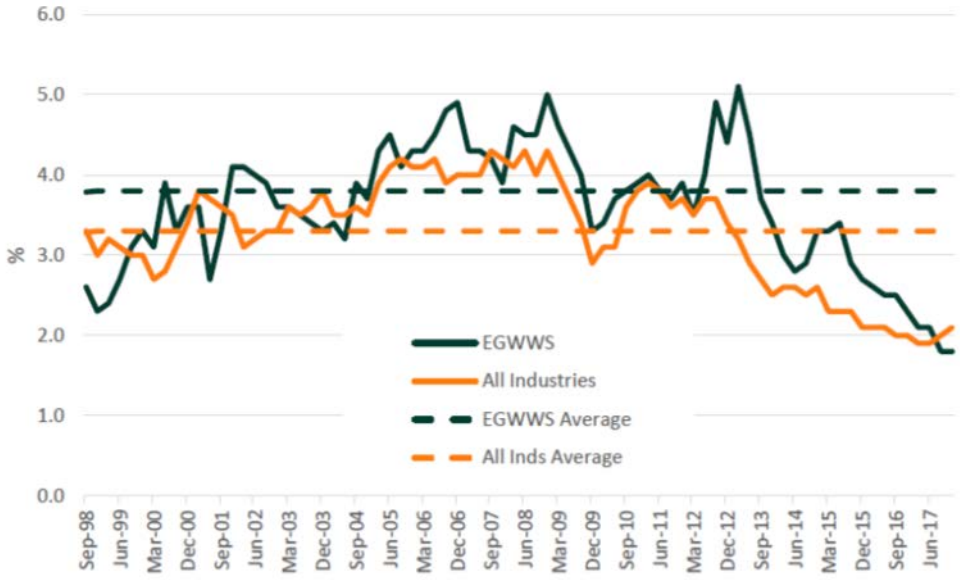
[27] The productivity performance of ATCO Gas' Western Australian Gas Distribution System, Economic Insights (16th July 2018)

4.5.2 Our assessment

Adopting a more reasonable basis for labour cost escalation

142. ATCO has relied on a report by Synergies Economic Consulting (Synergies) to support its proposed real labour cost escalation assumption[28]. In the report, Synergies states that wages have grown faster in the EGWWS[29] sector than for the 'all industries' average. However, Synergies observes that the mining boom has eased considerably over the last few years and since then the wages growth for EGWWS has slowed such that it is now broadly in line with wages growth in other sectors, as shown in the figure below. The figure also shows nominal wage growth currently at around CPI, meaning there is currently no real wage growth.

Figure 10: Percentage changes in All Industries wage price indices (corresponding quarter of previous year)



Source: ATCO supporting document – Att. 12.9 Wage Price Index Forecast, Figure 5

143. With real wage growth in 'all industries' and in the EGWWS sector currently close to zero, the 1.64% per annum real wage growth assumption that Synergies has recommended to ATCO essentially relies on economic conditions in WA improving and wages in the EGWWS sector regaining a premium of 0.5% over 'all industries'[30].

144. While Synergies has calculated a 20-year average premium of 0.5% for EGWWS over all industries, it can be seen from the figure above that there was little if any aggregate premium over the first 10 years. The premium that Synergies has calculated has largely arisen from the lag in EGWWS sector wages falling in the second decade of the data, relative to wages in 'all industries'. We consider this to be only a weak indicator that such a premium will develop again and persist over AA5.

[28] ATCO Attachment 12.9: Wage price index forecast. Report by Synergies economic consulting, April 2018

[29] Electricity, GAS, Water and Waste Services

[30] Ibid, page 35

145. The WA Treasury Economic forecast is for the nominal Wage Price Index to increase from 2.75% in 2019/20 to 3% in 2020/21 and 3.25% 20121/22[31]. After allowing for WA Treasury's CPI forecast over the period, this equates to 0.75%, 0.50% and 0.75% real wage growth in these three years respectively. On balance, we consider that this source provides a more authoritative assumption for real labour cost increases, and it is reasonable to assume that they will apply to the EGWWS sector. This real wage growth escalator averages 0.7% per annum over the period, after extrapolating to 2024.

Adjusting for real cost escalation

146. Applying ATCO's opex labour weighting of 62% results in an overall opex real price escalation forecast of 0.43% per annum. ATCO's opex model provides for real cost escalation as an input assumption. Accordingly, we are able to adjust this assumption and we have done so in Section 7.

147. ATCO's capex model also includes its real cost escalation assumptions, and in its model, ATCO has assessed the result of this through estimates of the relative components of labour and materials at the individual project level. In Section 6 we show this as a component of our overall capex adjustment for each of ATCO's capex categories in AA5.

4.6 Depreciation – asset economic life assumptions

4.6.1 ATCO's proposal

148. The table below compares the asset economic lives that ATCO has used when calculating depreciation in AA5 and the range of corresponding asset economic lives applied by a selection of gas utilities in the rest of Australia. We note that the documents we have relied upon for the other utilities do not have consistent descriptions of the asset categories.

149. ATCO has proposed the same asset economic lives for AA5 as those approved by the ERA in its AA4 Final Decision. Apart from 'Meter and services pipes', ATCO's AA5 asset economic lives are within the range of the corresponding asset economic lives applied by other utilities.

150. We infer from ATCO's AAI that 'Meters and services pipes' refer to the economic lives both of its meters and of the service pipes that connect from the mains to the meter, however ATCO does not define this category explicitly.

151. All the utilities have reduced their meter economic lives from 20 – 30 years assumed in previous regulatory submissions, to 15 years whereas ATCO assumes 25 years. Services pipes' economic asset lives assumed by other utilities are in the range 50-60 years, whereas if as appears ATCO has bundled these with meters, it has allowed only 25 years.

[31] https://www.treasury.wa.gov.au/Treasury/Economic_Data/Economic_Forecasts/

Table 11: A comparison of the economic asset lives proposed by ATCO and selected other utilities

Asset Categories	Economic Lives (years)	
	ATCO	Other gas utilities[32]
HP mains - steel	80	50 - 80[33]
HP mains - PE	60	50 - 80[34]
Medium pressure mains	60	40 - 60
Low pressure mains	60	50 - 60
Regulators	40	40 - 50
Secondary gate stations	40	40 - 50
Buildings	40	35 - 50
Meter and services pipes	25	15[35]
Service pipes	25	50 - 60
Plant & equipment	10	5 - 10
Vehicles	10	5 - 15
Information technology	5	5
Telemetry	10	10 - 20

Sources: ATCO AAI 2020-2024, page 123; Ausnet Services AAI 2018-2022, page 183; Multinet Gas AAI 2028-2022, page 119; AGA Victoria and Albury AAI 2018-2022, page 104; Jemena AAI 2018-2022, page 87; APT Allgas AAI 2011-2016, page 9; Australian Gas Networks SA AAI 2016-2021, page 162

4.6.2 EMCa assessment

152. Based on our review of the asset economic lives used by other regulated distribution pipelines it would appear that with the exception of the 'Meters and service pipes', the economic lives proposed by ATCO are reasonable.

153. ATCO combines Meters and service pipes as one category, assigning a 25 year asset life of 25 years. Other utilities provide asset lives for service pipes (50-60 years) and Meters (15 years) separately. ATCO's proposed meter economic life and service pipe economic life represent significant discrepancies from the national ranges.

4.7 Overheads capitalisation

4.7.1 AA5 capitalised overheads

154. ATCO defines overheads as '*all the necessary indirect costs of delivering the capex program, except for the labour and materials costs that can be directly allocated. Overhead costs are not directly attributable to capex projects and activities via a source document such as a work order, invoice or a timesheet, but are incurred as a result of delivering the capex program.*'[36]

[32] Descriptions vary from utility to utility

[33] Other utilities do not distinguish between steel and PE mains lives

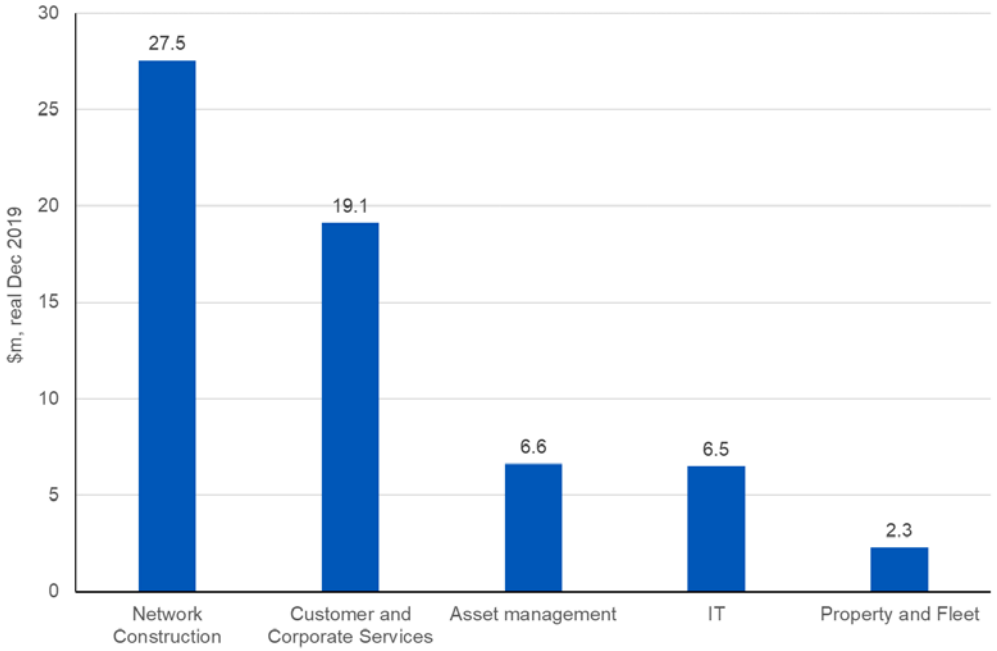
[34] Ibid

[35] Meters only

[36] ATCO AAI (2020-2024 Plan) page 116

155. In AA5, ATCO proposes to capitalise overheads of $62.1m as shown in the figure below.

Figure 11: Summary of proposed overheads for AA5



Sources: Figure 12.3 AAI document, page 116

156. ATCO uses the base-step-trend (BST) method to calculate its capitalised overheads using the 2017 actual result as the base year, adjusting it for recurrent and non-recurrent step changes, growth and price escalation. The capitalised overheads ATCO proposes for AA5 are summarised in the table below.

Table 12: Capitalised overheads for AA5

$m, real Dec 2019	2020	2021	2022	2023	2024	TOTAL
Base Year	11.2	11.2	11.2	11.2	11.2	55.9
Recurrent Step Changes	0.2	0.2	0.3	0.3	0.3	1.4
Non-Recurrent Step changes	0.0	0.0	0.0	0.2	0.2	0.4
Network and customer growth	0.2	0.4	0.5	0.7	0.9	2.7
Price escalation	0.1	0.2	0.4	0.5	0.6	1.8
TOTAL	**11.7**	**12.0**	**12.4**	**12.9**	**13.2**	**62.1**

Source: ATCO AAI table 12.19

4.7.2 AA4 capitalised overheads

157. During the onsite meeting, ATCO advised us that there was a change in capitalisation method that it applied during the AA4 period. ATCO provided further details through its response to our requests for information and which describes the change in capitalisation policy that ATCO applied.[37] The results of that policy are summarised in the table below, and compared between AA3, AA4 and ATCO's forecast for AA5.

[37] IR EMCa42 and EMCa43

Table 13: Summary of overhead capitalisation from AA3, AA4 and AA5

	AA3		AA4		AA5
	Allowance	Actual	Allowance	Actual	Forecast
Capex that attracts overheads ($,m)	252	233	383	323	376
Overhead (%)	15.0%	14.2%	15.9%	23.5%	16.5%
Overhead ($,m)	37.7	33.1	61.0	76.0	62.1

Source: ATCO response to EMCa42

158. As shown in Table 13 above, in percentage terms ATCO's actual capitalised overheads in AA3 was slightly less than the ERA allowance. For AA4, the ERA's allowance was again based on a rate of 15.0% of relevant capex[38] ATCO provided us with information that under the revised capitalisation policy it applied during AA4, it capitalised overheads equivalent to 23.5% of the 'capex that attracts overheads'; that is, an amount that is 8.5% higher than the basis on which ERA established its allowance. On its actual capex attracting overheads of $323m, this amounts to an additional capitalised overhead of $27.5m relative to the amount that would have been capitalised at an estimated 15.0% rate, under the policy that was applied for its allowance.

4.7.3 EMCa assessment

159. By capitalising overheads at a higher rate, ATCO is seeking to define the relevant opex as 'conforming capex' and to thereby include it in its RAB, to be rolled forward for recovery in AA5 and beyond. By doing so, having already recovered the amount as 'opex' through its AA4 revenue allowance, ATCO is effectively seeking to recover this proportion of its overheads twice.

160. Accordingly, for AA4 the capitalised overheads above the ERA allowance of $27.6m (including $2.1m already included in the project-based adjustment) do not meet the capex criteria. In Section 5.7 we show the net amount as a component of our overall capex adjustment. The regulatory accounting movement from opex to capex also to some extent explains ATCO's reduced opex, essentially as a regulatory accounting impact rather than as an efficiency impact.

161. For AA5 we reviewed ATCO's Base Step Trend model for capitalised overhead costs. We have applied an adjustment to the step changes and escalations for capitalised overheads that is proportionate to the adjustments we have made to ATCO's proposed opex, and which we describe in section 7. This results in a $2.0m reduction in capitalised overheads, after accounting for AA5 capex adjustments (which we describe in 6). This results in a 15.3% overheads capitalisation rate (relative to capex that attracts overheads) and which is therefore also similar to the AA4 overheads capitalisation allowance. We have applied this in our proposed AA5 capex adjustment.[39]

4.8 Implications for ATCOs proposal

162. We have identified a number of issues with ATCO's forecasting methodology and assumptions as presented which undermine the credibility of ATCO's proposal. These include:

[38] It is unclear to us why ATCO has represented the ERA's allowance as being based on 15.9%.

[39] See Adjustment Table in section 6.7. This reduction is also approximately in proportion to

- the demand forecast itself does not raise material concerns, however, as presented we consider that ATCO's proposed AA5 greenfield and brownfield growth capex does not satisfy the capex criteria, and would not without a capital contribution from customers or a lower assessed capital and/or incremental opex cost for those new connections. We discuss the impact of this on ATCO's proposed AA5 capex in Section 6;
- we have identified a number of issues in the application of the capex and opex expenditure forecasting methodologies that result in components of ATCO's forecast not meeting the capex and opex criteria as discussed in Sections 6 and 7 respectively;
- ATCO has essentially relied on a forecast of economic conditions in WA improving and wages in its sector maintaining a premium, which we consider is not supported when reviewing what we consider to be a more authoritative source of data from the WA Treasury. Accordingly, we consider that real wage growth escalation will be lower than has been applied by ATCO, resulting in a corresponding reduction in ATCO's capex and opex forecasts, as presented in Sections 6 and 7;
- We have identified major differences in ATCO's economic life assumption for meters and service pipes compared to a sample of other regulated utilities; and
- We consider that a proportion of ATCO's capitalised overheads does not meet the capex criteria for AA4, and we have reflected this in our adjustment in Section 5.

5 AA4 capex

5.1 Introduction

163. This section contains our assessment of the capex incurred (or to be incurred) by ATCO in AA4. We have undertaken this review using the assessment framework set out in Appendix A and having regard to our findings in Section 3 and Section 4 of this report.

164. As agreed with the ERA, we undertook:

- a more detailed review of those aspects of ATCO's AA4 capex program where there has been a material deviation between the expenditure incurred (or to be incurred) by ATCO and the ERA allowance[40]; and
- a high-level review of the other areas of ATCO's AA4 capex program.

165. The results of our review and our overall assessment of whether this capex satisfies the capex criteria for the purposes of determining the level of conforming capex under the NGR are set out below.

5.2 ATCO's proposed conforming AA4 capex

5.2.1 Comparison between ATCO's expenditure and the ERA approved allowance

Network sustain capex

166. ATCO proposed to spend $236.2m in the 5.5 years in the AA4 period (or $221.7m in the final 5 years) on network sustaining capex, representing 48% of the AA4 capex program[41]. In the table below, we show the composition of ATCO's network sustaining capex, which is $7.5m higher than the ERA allowance.

[40] From ERA's Final Decision, including as amended on 10 September 2016

[41] Based on the total capex of $496.0m

Table 14: Summary of AA4 capex for network sustaining capex[42] - $m, real Dec 2019

Category	Actuals (AA4)				Estimate (AA4)		Total
	2014 (Jul- Dec)	2015	2016	2017	2018	2019	2014-19
Actual/forecasts	**14.5**	**32.7**	**42.7**	**50.3**	**51.8**	**44.2**	**236.2**
Asset Replacement	*12.8*	*30.5*	*36.2*	*40.9*	*41.9*	*35.1*	*197.3*
Asset performance and safety	*1.8*	*2.1*	*6.5*	*9.4*	*9.9*	*9.1*	*38.8*
ERA allowance	**14.1**	**40.9**	**42.3**	**44.0**	**43.0**	**44.6**	**228.7**
Asset Replacement	*12.4*	*34.8*	*30.7*	*31.7*	*35.1*	*34.1*	*178.6*
Asset performance and safety	*1.7*	*6.1*	*11.6*	*12.4*	*7.9*	*10.6*	*50.3*
Adjustment to timing differences							*-0.3*
Variance to ERA allowance	**0.5**	**-8.3**	**0.4**	**6.3**	**8.8**	**-0.4**	**7.5**
Asset Replacement	*0.4*	*-4.3*	*5.5*	*9.2*	*6.8*	*1.0*	*18.7*
Asset performance and safety	*0.1*	*-4.0*	*-5.1*	*-2.9*	*1.9*	*-1.4*	*-11.5*
Adjustment to timing differences							*0.3*

Source: EMCa analysis from ATCO response to EMCa Question 4

167. According to ATCO[43], the variation of actual/estimated expenditure to the ERA allowance is primarily due to:

- prioritisation of replacing high risk metallic mains to ensure a safe and reliable network; and
- delay of the Parmelia Gas Pipeline (PGP) interconnections.

168. In its AAI, ATCO has presented telemetry and associated IT expenditure as:

- network sustaining capex when presenting the capex by driver; and
- IT capex when presenting capex by asset category.

169. We have included telemetry and associated IT expenditure in our assessment of network sustaining capex.

Network growth capex

170. ATCO proposed to spend $187.4m in the 5.5 years in the AA4 period (or $165.5m in the final 5 years) on network growth capex, representing 38% of the AA4 capex program[44]. In the table below, we show the composition of the network growth capex, which is $0.2m higher than the ERA allowance.

[42] There is a further adjustment included in ATCO's analysis of $0.3m that allows reconciliation with the total sustain capex as published in Table 5.4 of the AAI

[43] ATCO AAI

[44] Based on the total capex of $496.0m

Table 15: Summary of actual/estimate AA4 capex for network growth capex[45]

$m, real Dec 2019	Actuals (AA4)				Estimate (AA4)		Total
Category	2014 (Jul- Dec)	2015	2016	2017	2018	2019	2014-19
Actual/estimate	**21.9**	**41.3**	**35.2**	**29.4**	**26.5**	**33.1**	**187.4**
Customer Initiated	*19.4*	*39.0*	*34.1*	*24.6*	*25.5*	*33.1*	*175.8*
Demand related	*2.4*	*2.3*	*1.2*	*4.7*	*1.0*	*0.0*	*11.7*
ERA allowance	**21.2**	**34.8**	**42.3**	**30.8**	**29.4**	**28.2**	**187.2**
Customer Initiated	*18.8*	*29.7*	*29.9*	*29.5*	*27.1*	*26.9*	*161.9*
Demand related	*2.4*	*5.1*	*12.4*	*1.4*	*2.3*	*1.3*	*24.8*
Adjustment to timing differences							*0.6*
Variance to ERA allowance	**0.7**	**6.5**	**-7.0**	**-1.5**	**-2.9**	**5.0**	**0.2**
Customer Initiated	*0.6*	*9.3*	*4.2*	*-4.8*	*-1.6*	*6.3*	*13.9*
Demand related	*0.1*	*-2.8*	*-11.2*	*3.4*	*-1.3*	*-1.3*	*-13.1*
Adjustment to timing differences							*-0.6*

Source: EMCa analysis from ATCO response to EMCa Question 4

171. According to ATCO[46], the variation of actual/estimated expenditure to the ERA allowance within the category is primarily due to:

- lower than forecast demand growth that contributed to deferring various reinforcement projects, and due to refinements to ATCO's modelling assumptions;
- higher than forecast customer connections activity; and
- establishment of new contract rates in 2016 through a competitive tender process where 2017 was the first year, and ATCO has realised benefits from the new contracts.

IT capex

172. ATCO proposed to spend $30.2m in the 5.5 years in the AA4 period (or $24.9m in the final 5 years) on IT capex, representing 6% of the AA4 capex program[47]. In the table below, we show the composition of the IT capex which is $1.3m higher than ERA's allowance.

Table 16: Summary of actual/estimate AA4 capex for IT capex

$m, real Dec 2019	Actuals (AA4)				Estimate (AA4)		Total
Category	2014 (Jul- Dec)	2015	2016	2017	2018	2019	2014-19
Actual/estimate	5.3	3.1	8.8	7.7	3.1	2.2	30.2
ERA allowance	5.1	6.9	6.2	4.6	3.5	2.6	28.9
Variance to ERA allowance	**0.2**	**-3.9**	**2.6**	**3.1**	**-0.4**	**-0.4**	**1.3**

Source: EMCa analysis from ATCO response to EMCa Question 4

173. According to ATCO[48], the variation of actual/estimated expenditure to the ERA allowance is primarily due to:

- bundling of interdependent projects into a single program of work with clearly defined streams, phases and deliverables; and
- inclusion of a number of new initiatives not previously identified.

[45] There is a further adjustment included in ATCO's analysis of -$0.6m that allows reconciliation with the total sustain capex as published in Table 5.4 of the AAI

[46] ATCO AAI

[47] Based on the total capex of $496.0m

[48] ATCO AAI and ATCO's response to information request EMCa06

Structures and equipment capex

174. ATCO proposed to spend $42.1m in the 5.5 years in the AA4 period (or $40.0m in the final 5 years) on structures and equipment capex, representing 9% of the AA4 capex program[49]. In the table below, we show the composition of the network sustaining capex, which is $2.0m less than ERA's allowance.

Table 17: Summary of actual/estimate AA4 capex for structures and equipment capex

$m, real Dec 2019	Actuals (AA4)				Estimate (AA4)		Total
Category	2014 (Jul- Dec)	2015	2016	2017	2018	2019	2014-19
Actual/estimate	2.2	3.9	6.1	5.0	16.6	8.4	42.1
ERA allowance	2.2	23.1	3.7	3.7	5.9	5.8	44.2
Variance to ERA allowance	**0.0**	**-19.2**	**2.5**	**1.3**	**10.7**	**2.6**	**-2.0**

Source: EMCa analysis from ATCO response to EMCa Question 4

175. According to ATCO[50], the variation of actual/estimated expenditure to the ERA allowance is primarily driven by lower spend on fleet due to a combination of[51]:

- lower vehicle demand, due to fewer FTEs than forecast;
- standardised fleet specification and competitive vehicle pricing from market testing which resulted in savings in the purchase costs of passenger vehicles, utility vehicles and excavators; and
- extended replacement cycle of trucks from 5 to 8 years.

5.2.2 Changes in asset management and delivery approach during AA4

176. ATCO has advised that there were no material changes to asset management systems or approaches over AA4 that contributed to variances in the actual/estimated AA4 capex[52]. However, ATCO identified changes in project delivery and resourcing over AA4 that contributed to variances in actual/estimated AA4 capex, including[53]:

- Bundled replacement projects: ATCO bundled replacement projects such as metallic mains, odd size steel, cast iron and PVC to improve resource efficiency. ATCO maintains that as these projects are delivered using the same resource base, it is efficient to keep resources engaged in delivering the same annual volumes. ATCO claims that this achieved an optimised resource delivery of the projects;
- Improved contract model: In 2016, ATCO established a new contract model for external contractors for the installation of mains & services. The new contract model provides fixed competitive rates over longer terms, which ATCO claims drives efficiency as it utilises a schedule of rates that is bundled to include all associated costs (including traffic management, reinstatement, materials, labour and overheads);
- PVC insertion: ATCO commenced trialling PVC insertion in 2017 as a replacement methodology which it claims provides both reduced installation costs and reduced site footprint and disturbance. ATCO plans to increase the proportion of mains

[49] Based on the total capex of $496.0m

[50] ATCO AAI and ATCO's response to information request EMCa06

[51] Response to information request EMCa06

[52] Response to information request EMCa06

[53] Response to information request EMCa06

replaced using this method in delivering the proposed PVC mains replacement program in AA5; and

- 3rd party collaboration: ATCO claims that combining works with other utilities (e.g. the Water Corporation) in built up project areas is not only mutually cost beneficial to both organisations, but reduces the impact and repeat disturbance to residents, business and road users. ATCO cites by way of example, mains replacement in Subiaco and claims that combining work projects at this location has been well received by local governments and residents.

5.2.3 General observations

177. The information provided by ATCO in the AAI did not provide sufficient detail to understand the composition of the capex program, the variance to the ERA allowance, or why the capex incurred or expected to be incurred should be considered conforming capex under the NGR. A degree of assessment was possible only through our review of ATCO's responses to our information requests.

178. ATCO provided limited justification for its AA4 capex program in its AAI, comprising:

- a high-level summary of outcomes from the AA4 period[54];
- two compliance summaries[55], for expenditure totalling approximately $25m (or 5% of the AA4 capex); and
- eight business case documents[56], relating to further expenditure totalling approximately $20m (or a further 4% of the AA4 capex).

179. We asked ATCO to explain the material variances between the actual/forecast capex to be incurred in AA4 and the ERA allowance[57]. ATCO's response to our information requests did not explain the underlying variances in the capital program, but rather appeared to limit its focus to an explanation of the variances in the AA4 capex by asset class compared to the forecast approved by the ERA provided in Table 5.3 of its AAI.

180. We also requested ATCO to provide for each major project[58] the original business case (and the revised business case and/or change control, as appropriate), project close out report (if one had been prepared), and any other relevant documentation to convey the following:

- Explanation of the investment need;
- The key assumptions;
- Options and risk analysis;
- Basis for claimed cost efficiency;
- Basis for claimed delivery efficiency;

[54] Pages 28 - 35 of the AAI

[55] Attachment 5.2 Springboard program at $16.0m, and Attachment 5.3 Multistorey project at $9.1m.

[56] Attachments 5.4 to 5.11

[57] Information request EMCa05 and EMCa06

[58] ATCO sought clarification of this request and asked that we nominate specific projects. We therefore limited our request to review a sample of 20 major projects across different categories of AA4 expenditure.

- Evidence of the expenditure governance (including approved budget, ERA allowance, actual expenditure);
- The reason(s) for any material variance between the ERA allowance and the actual expenditure; and
- Benefits realisation (as relevant).

181. In response to our request, ATCO provided a sample of project-level information pertaining to some AA4 incurred capex. ATCO also provided a further summary as part of onsite meeting presentations at ATCO's offices. Again, this information fell well short of the level of information requested and did not adequately describe or support expenditure for the major projects.

182. In most cases ATCO did not explain variances to the ERA allowance at the project or program level in its supporting information with the level of evidence we would normally expect to see. Therefore, we undertook our own analysis of the expenditure provided in ATCO's capex models for AA4 together with the responses to our information requests, information provided to support the AA5 capex forecast, and information provided at the time of the AA4 submission, to infer the basis for the level of activity. We then sought to understand whether the variances to the ERA allowance presented an underlying issue of investment governance, and therefore whether the capex incurred or intended to be incurred during the AA4 period was likely to satisfy the capex criteria.

5.3 Assessment of network sustaining capex

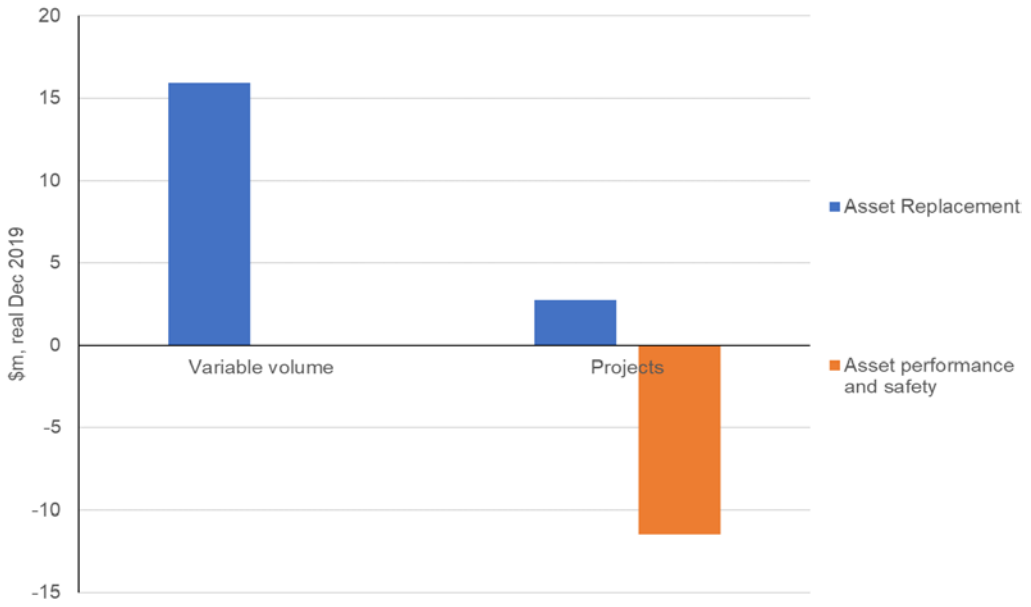
5.3.1 Expenditure variance analysis

Shift from safety & performance to asset replacement

183. We observe a large shift in expenditure from safety & performance projects and programs to asset replacement projects and programs, as illustrated in the figure below. We understand this was largely in response to ATCO's decision to accelerate the replacement of metallic mains and odd size steel mains to complete the program by 2019[59], resulting in a higher volume of replacement than was included in the ERA allowance. We review the justification for this change in the following sections.

[59] AAI 2020-24 Plan, page 34

Figure 12: AA4 network sustain capex variance analysis (actual vs. ERA allowance) - by network sustaining capex category

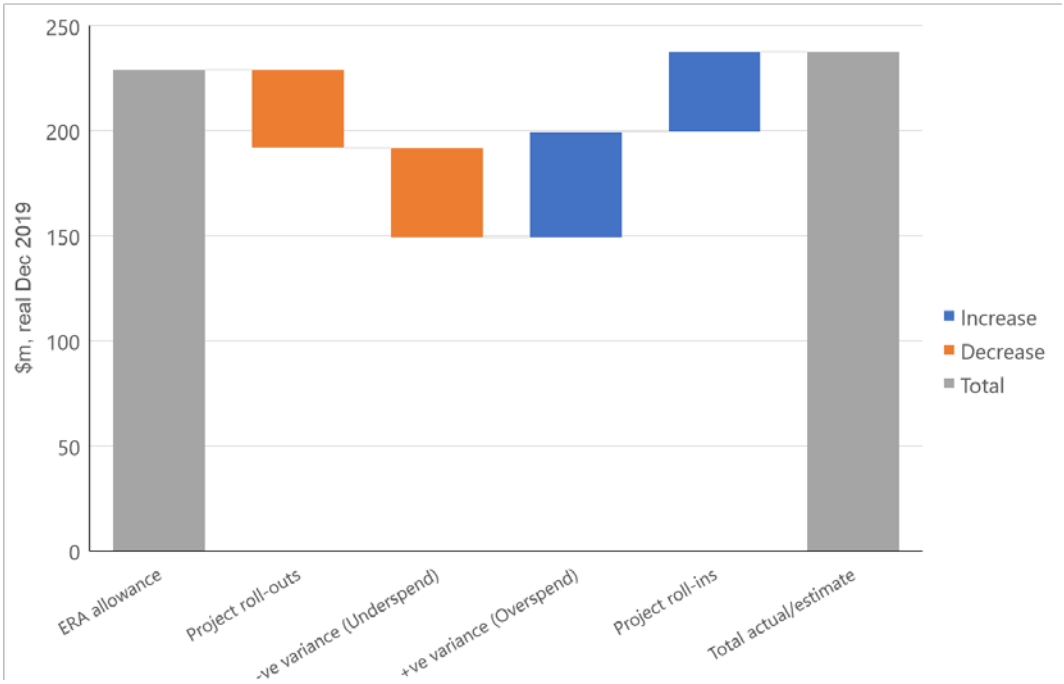


Source: EMCa analysis of AA4 capex spreadsheet provided in ATCO response to EMCa Question 4

Cost management

184. There is a large movement of capex projects in and out of the network sustaining capex portfolio, and yet ATCO forecasts to manage to within less than 5% of the ERA allowance, as shown in the figure below. Notwithstanding that there may not be a significant expenditure variance at the aggregate level, we have nevertheless examined the areas of additional spend for evidence as to whether ATCO may have sought to 'target the allowance' as opposed to incurring only expenditure that was suitably justified by reference to its expenditure governance framework.

Figure 13: AA4 network sustain capex variance analysis against ERA allowance – by cause



Source: EMCa analysis of AA4 capex spreadsheet provided in ATCO response to EMCa Question 4

185. We review the major projects in the following sub-sections.

5.3.2 Mains replacement program

186. The mains replacement program is the largest asset replacement program in AA4. ATCO expects to incur [redacted] (or 50% of its asset replacement expenditure) on this program, [redacted] more than the ERA allowance. The mains replacement program includes three end-of-life (EOL) replacement projects for metallic mains: (i) unprotected metallic mains; (ii) odd size unprotected steel; and (iii) cast iron. As a related program, we have also included here our assessment of the AA4 PVC mains replacement program.

AAP4056 EOL replacement – unprotected metallic mains

187. ATCO has provided a copy of its approved business case for replacement by the end of 2020 of all unprotected metallic mains, including ageing steel and galvanised iron mains, and all associated service connections. The business case comprises replacement of a total of 112.7km of pipeline at a total cost of [redacted] (nominal), leaving a residual of 27km to be replaced in AA5.

188. We understand that some other metallic mains were replaced under this program rather than the cast iron replacement program. However, we have not been provided with the level of expenditure associated with this decision.

189. From our review of the 2015 CEAR provided, the volume of replaced mains in the forecast is 112.7km, which is similar to the adjusted volume of 125km included in the

ERA allowance[60]. However, the total unprotected metallic mains to be replaced is re-estimated at 120.9km in the 2017 CEAR. No explanation is provided for this increase.

190. ATCO now expects to incur [redacted] capex for this program, being [redacted] above the ERA allowance of [redacted][61]. At an assumed unit rate of [redacted], this would equate to an additional replacement quantity in the order of 37km.

191. In its AAI, and during our on-site meeting, ATCO advised that it has '*accelerated the replacement of metallic mains and odd size steel mains to complete the program by 2019*'[63]. This accelerated program is at a replacement rate higher than allowed for in the ERA allowance, but at a similar rate to that proposed in its 2014 AMP and its 2014 Access Arrangement[64].

192. It seems likely that the additional volume of replacement of unprotected metallic mains, combined with the replacement of cast iron mains, explains the expenditure variance. However, ATCO has not provided such an explanation, or justification required under the Rules, that confirms that the decision to bring forward this replacement is prudent. Specifically, ATCO has not explained:

- how the additional expenditure satisfies the capex criteria, being at a level above that which was considered likely to be conforming capex in the ERA's Final Decision; nor
- the driver for the change in strategy, given comments in the Final Decision which state that '*ATCO has accepted the Authority's view that some replacement of unprotected metallic mains expenditure could be deferred*'[65].

193. In the absence of such an explanation we consider that ATCO has not demonstrated that the expenditure above that included in the ERA allowance satisfies the capex criteria.

AAP4038 EOL Replacement – Cast Iron

194. ATCO expects to incur $[redacted] capex for EOL replacement of cast iron mains, being [redacted] below the ERA allowance of $24.6m[66].

195. ATCO has provided a copy of its approved business case for replacement of all cast iron mains by 2018. The business case includes replacement of a total of 47.2km of pipeline at a total cost of [redacted] (nominal). This is approximately 11km lower than the total length included in the 2014 Access Arrangement and included in the ERA's Final Decision allowance.

[60] As a result of reducing the AAI total of 136km by 11km, to achieve a flat volume of 40km per year for all metallic replacement. Assuming that the reduction is made to the unprotected metallic mains only.

[61] ATCO's response to EMCa 04 Confidential capex AA4

[62] ATCO, 2015, Business case for EOL Replacement – Unprotected Metallic Mains, page 8

[63] ATCO, 2018, Fifth Access Arrangement – AA4 capital expenditure presentation for ERA / EMCa, slide 7

[64] ATCO had originally developed an accelerated replacement program of pipelines considered at higher risk due to age, maintenance history, and location in populated areas, that would be completed by 2019.

[65] ERA, as amended 10 September 2015, Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems, paragraph 623, page 144

[66] ATCO's response to EMCa 04 Confidential capex AA4

196. We consider this program is reasonable. Based on statements made by ATCO in its supporting information, it is likely that additional cast iron mains replacement has been undertaken under other mains replacement programs[67]. Assuming a unit rate of [redacted], given the same resources are used for the mains replacement program, the variance would account for approximately 14km of cast iron pipe replaced under alternate replacement programs. However, the volume or expenditure incurred for replacement of cast iron mains included in the other mains replacement programs has not been explained by ATCO.

197. Given this program has been completed prior to submission of the AA5 proposal, we would have expected that ATCO had completed a project close-out report confirming the cast iron replacement volume and expenditure. We requested copies of the project close-out reports for major projects, such as the mains replacement program, however no such reports were provided. ATCO instead provided a 'lessons learnt' register, that appears to relate to multiple programs. However, the lessons learnt register does not include commentary regarding the completed volumes, unit rates, expenditure governance or other aspects we would expect to find for any individual program or in aggregate.

AAP4048 EOL Replacement – Odd size unprotected steel

198. ATCO expects to incur [redacted] capex for EOL replacement of odd size unprotected steel, being [redacted] above the ERA allowance of $9.8m[69]. ATCO included three projects for odd size unprotected steel replacement in addition to its EOL replacement program for: (i) Pipeline 63 Fremantle; (ii) Tuart Hill;[70] and (iii) Maylands odd size steel replacement. Of these additional projects, actual expenditure has been incurred for Pipeline 63 only.

199. In support of the expenditure incurred on odd size unprotected steel pipeline, ATCO has provided a copy of its CEAR approval for replacement of 5.4km of odd size steel pipe[71] on Pipeline 63 at a total cost of [redacted].

200. A further CEAR is provided for an additional [redacted] capex for Pipeline 63 not identified in the original business case to complete the project, being a variation to the original CEAR of greater than 10%. The variation is associated with additional contractor costs and project capitalised interest. The CEAR provides a high-level statement of the composition of these costs but does not sufficiently outline any steps ATCO undertook to avoid increased costs for this program or to sufficiently justify the additional costs where they were not avoidable. Whilst we consider that ATCO could have explained this more robustly, on balance we consider that the increased costs of [redacted] for Pipeline 63 are reasonable. We assume that this project has now been completed.

[67] ATCO, 2015, Business case for EOL Replacement – Unprotected Metallic Mains, page 4, which states that some area[s] mainly in the LP network is being replaced under metallic main program instead of the cast iron program to allow more efficient replacement.

[68] ATCO, 2015, Business case for EOL Replacement – Unprotected Metallic Mains, page 8

[69] ATCO's response to EMCa 04 Confidential capex AA4

[70] Included with zero expenditure in Final Decision, and zero actual expenditure

[71] Due to poor welds and associated leaks

201. The total expenditure for which ATCO has provided supporting justification is [redacted], being less than the ERA allowance of $9.8m, and actual expenditure of [redacted].

202. We have not been provided justification of the remaining components of this program for the replacement of odd size unprotected steel that total [redacted]. In the absence of such an explanation we consider that ATCO has not demonstrated that the expenditure, in aggregate, above the ERA allowance in the Final Decision satisfies the capex criteria.

AAP4051 EOL PVC Mains & Services

203. ATCO expects to incur [redacted] capex for replacement of PVC mains and services, which is [redacted] higher than the ERA allowance.

204. In its AA4 submission, ATCO states that[72] '*Assessments conducted for the Safety Case recommend that PVC network replacement should be targeted in high density community use areas. Faults in PVC mains contribute to more than 80% of the annual reactive maintenance cost on mains and those mains with a diameter of 100mm or greater forming a large proportion of these costs. ATCO Gas Australia has identified 17 km of PVC pipes greater than 100mm diameter that require replacement during AA4.*'

205. However, the replacement volume undertaken in AA4 is significantly higher than this amount.

206. ATCO explains the cost variance as a result of:

- optimised project delivery for the mains replacement program, which resulted in the additional replacement of adjacent PVC mains; and
- commencing the trial of PVC insertion in 2017 as a replacement methodology which provides both reduced installation costs and reduced site footprint and disturbance. The proportion of mains replaced using this methodology will increase moving into AA5.

207. The information provided by ATCO to support this program focusses on replacement of first-generation unplasticised PVC (uPVC), which is at end of life and contributes to a higher leak rate than other pipe technologies. The value of the business case of [redacted] (nominal) is for proactive replacement of targeted sections of uPVC, with the total replacement of 20.9km in the AA4 period.

208. In the figure below, we show the actual/estimated expenditure for the PVC program, comparing the forecast included in the ERA allowance, Business Case and actual/estimated capex. There is a clear increase in volumes from 2017 compared to the business case and the ERA allowance.

[72] ATCO, 2014, Access Arrangement Information AA4, page 177

Figure 14: Actual/estimated expenditure for PVC replacement

209. The business case is broadly consistent with the rationale and volume of replacement included at the time of ATCO's AA4 submission, which indicated replacement of approximately 17.0km of PVC pipeline. The increase in the volume of replacement appears to have been influenced by:

- the introduction of the Mains Replacement Planning tool around 2017; and
- ATCO's subsequent decision to fast-track completion of the metallic mains replacement program, including adjacent PVC replacement, and inline PVC insertion.

210. However, ATCO has not explained the increase in replacement rate. Specifically, ATCO has not provided a project close-out report and change control that explains this change in strategy and program for AA4.

211. ATCO has not provided sufficient justification for the increases incurred in this program above the ERA allowance. In the absence of such an explanation we consider that ATCO has not demonstrated that the expenditure above the ERA allowance satisfies the capex criteria.

5.3.3 Other asset replacement projects

212. ATCO expects to incur $97.9m capex on the balance of the asset replacement program. We present our assessment of the significant (>$1m) projects that ATCO has, or intends to incur expenditure on during the AA4 period.

AAP4090 Multi-storey risk reduction

213. ATCO expects to incur [redacted] capex for risk reduction in multi-storey buildings, being [redacted] below the ERA allowance[73].

[73] When combining the projects for multistorey buildings and multi-occupancy buildings, both designated project AAP4090

214. ATCO has provided a document entitled 'Rule 79 Compliance Summary' to support the capex for the multi-storey risk reduction program, and specifically to: (i) demonstrate that the capex complies with the requirements of Rule 79 of the NGR; and (ii) demonstrate that ATCO has applied appropriate management procedures over the course of the project/program.

215. The Rule 79 Compliance Summary states that [redacted] (nominal) was included in the business case for the multi-storey buildings project, with the actual expenditure of [redacted] (nominal) for the AA3 and AA4 periods.[74] The increase is associated with an additional 182 meter locations requiring rectification, that also contributed to delaying project completion to 2016. However, only [redacted] (nominal) was planned to be incurred during the AA4 period, once expenditure incurred at the end of the AA3 period was removed.

216. Based on our review of the compliance summary document intended to demonstrate compliance with Rule 79, ATCO has only justified inclusion of [redacted] (nominal) or [redacted] real, and not the [redacted] it states has been incurred for this program[75].

217. At the onsite meeting, ATCO advised that the project was actually completed in April 2018, some two years after the completion date referred to in the provided information, having fully remediated 245 buildings. This suggests to us that having completed the original program, the program may have been subsequently extended. ATCO has not demonstrated that the decision to extend the scope of this program satisfies the capex criteria.

AAP4154 Routine Meter Change Programme (RMC)

218. ATCO expects to incur [redacted] capex for its routine meter change program, being [redacted] below the ERA allowance. According to the expenditure analysis ATCO provided, it will not complete the program as originally planned[76], or as stated in its AAI to be *'on track to replace an average of 30,000 domestic meters per year'*[77]. Based on the historical unit rates provided by ATCO, we calculate the number of replacements in AA4 as being closer to 70,000 or an average of approximately 13,000 per year.

219. ATCO has provided a copy of its business case approval for replacement of 151,685 domestic gas meters that have reached or are due to reach their approved end of in-service lives, at a total cost of [redacted] (nominal) over the AA4 period. The options analysis considers either completing the program or adopting a run to fail strategy.

220. The business case includes provision for staggered replacement lives: 18 years for older ME602 meters; and 25 years for newer M6EW meters. The expenditure profile increases in 2018 and 2019, due to the higher number of meters that will reach the end of service life of 25 years.

221. The domestic meter age profile (Figure 2.4 in ATCOs Asset Lifecycle Strategy for Metering Facilities) indicates that as of 31 December 2017, there are no meters beyond the service life of 18 years or 25 years that will require replacement. Whilst this has

[74] This includes a $20k credit (negative expenditure amount) in 2017 as a 'result of a purchase order from 2015 being reversed in 2017 due to receiving a credit for an open goods receipt.'

[75] No expenditure is recorded against the Multistorey Risk Reduction - Multi-Occupancy Buildings program also included in the ERA Final Decision

[76] The actual expenditure is estimated to be less than $200k for 2018 and zero for 2019.

[77] ATCO AAI, page 32

likely informed an opportunity for ATCO to pause / stop the routine meter replacement program, ATCO has not explained why there is no expenditure planned to be incurred for this program in 2019 and less than $0.2m for 2018.

222. According to ATCO's asset lifecycle strategy document[78], meter replacement continues in 2018 and at a higher level of replacement in 2019 to satisfy its compliance obligations at a cost of [redacted] (nominal) in 2019, although this is not included in the AA4 capex program. Similarly, the business case for the routine meter change program for AA5[79] also includes meter replacement quantities of approximately 35,500 in years 2018 and 2019.

223. It appears to us that despite claims that the meter replacement program is continuing in 2018 and 2019, ATCO has in fact stopped this program.

NFD4019 Mechanical fitting replacement

224. ATCO expects to incur [redacted] capex for a new program to replace mechanical fittings. The AMP submitted with ATCO's AA4 submission highlighted that the dominant failure modes causing leaks on the PVC network are: (i) deteriorated rubber O-rings used in mechanical fittings; and (ii) pipe brittleness for some of the older mains. ATCO's subsequent analysis identified the need to include a replacement program for older uPVC pipes, but not mechanical fittings.

225. ATCO has provided a copy of its business case approval which refers to replacement of 738 mechanical fittings, commencing with 138 replacements in 2015 and forecasting replacement of 150 units per annum thereafter. The program seeks to proactively replace mechanical fittings when identified during operational activities, rather than in response to an identified leak, having incurred expenditure in 2015 to replace 138 units, presumably as part of a trial.

226. The forecast replacement rate of 150 units per annum was based on a historical repair rate, making assumptions that whenever a section of uPVC was exposed, a mechanical fitting was present in 1 in 4 occasions. ATCO has not provided the underlying data used to inform these assumptions, nor the original risk assessment. ATCO indicated that an annual review of the data and assumptions will be undertaken; however, no such review has been provided to ascertain the risk level purported to being managed by ATCO.

227. Information provided in support of its AA5 plans, indicates that the AA4 program commenced as a result of a technical investigation in 2012, and the FSA[80] identified that[81] '*gas incident due to leak of mechanical compression fitting in residential area in the coast network is intermediate (NON-ALARP). The FSA recommended that compression coupling[s] in the coast network to be removed when identified.*' Further, ATCO plans to complete replacement of 829 units, at an average rate of approximately 166 per year, during AA5.

[78] Attachment 12.5 Asset Lifecycle Strategy Metering Facilities

[79] Attachment 12.39 Business case routine meter change (Domestic), Figure 2.1

[80] TCO RP 0116 Compression Coupling FSA

[81] Attachment 12.21 Business Case EOL Replacement – Mechanical fittings

228. On the basis of the FSA ATCO refers to, we consider that undertaking this program is consistent with good asset management practice. However, we have concerns with the rigour applied in the options analysis and NPV modelling, including:

- the business case includes just two options, to (1) proceed with the proactive replacement program, or (2) continue a reactive repair approach. No consideration is provided for repair (and not replace), or assessment of the impact of the complementary PVC mains replacement program to ensure there is no double counting;
- the NPV analysis for option 2 includes the incremental opex costs (not included in option 1) and also includes the capex costs of option 1, which appears to be an error. After correcting for this, and contrary to ATCO's business case, we find that option 2 has a lower NPV.

229. Notwithstanding the above areas of concern, we consider that on balance, the investment in this program to reduce known leak rate and safety risk associated with loss of containment is reasonable and reflects good practice.

Partial service relay replacement

230. ATCO expects to incur approximately [redacted] capex in AA4 to replace leaking services to maintain their safety and integrity. The capex is included in the variable volume capital works program, and therefore is distributed across multiple line items in the AA4 capex model[82]. ATCO will spend [redacted] less than the aggregate forecast allowed for in the ERA's Final Decision.

231. ATCO has provided a copy of its CEAR and business case approval for replacement of 1,600 mechanical elbow fittings 'Philmacs' in 2017 at a cost of [redacted] (nominal). These fittings contribute approximately 1200 – 1600 leaks per year. The business case claims that ATCO replaced 1,659 service relays in 2016.

232. The options reviewed appear reasonable as does its assessment of unit cost.

Small asset replacement

233. ATCO has provided a copy of its CEAR and business case approval for small asset replacements comprising the following 9 separate replacement projects[83]:

- EOL Replacement – Reg Pit Lids;
- EOL replacement – HPR;
- EOL replacement – Anodes;
- EOL Replacement – Isolation Valves;
- EOL Replacement – Medium Pressure Pits;
- EOL Replacement – Meter Facilities;
- EOL Replacement – Telemetry;
- EOL Replacement – Non-billing Commercial Meters; and

[82] Comprising project identifiers AAP4102, SND, SNR, SNP and PSR

[83] Response to information request EMCa44 – Various WBS Small Asset Replacement APPROVED BC

- EOL Replacement – Billing Commercial Meters.

234. ATCO has provided project information for each component that collectively contribute to a forecast expenditure in AA4 program of [redacted], with a CEAR issued for approval in each year.

235. The drivers of these programs vary, however on balance we consider that the included expenditure satisfies the capex criteria.

Balance of the program

236. We did not find any material issues in the projects we reviewed in other parts of the asset replacement program.

5.3.4 Safety & Performance

237. ATCO expects to incur $38.8m capex for safety & performance related projects during AA4, being $11.5m lower than the ERA allowance. The major variances include:

- deferment of several pigging projects into AA5 resulted in the deferral of the installation of the launcher and receiver on the relevant pipelines;
- the Elizabeth Quay project was fully re-scoped based on further data and analysis. The implemented option was able to achieve the necessary risk reduction at lower cost than originally forecast;
- various reinforcement projects were deferred due to refinements to ATCO's modelling assumptions to align with a lower growth forecast;
- incorporating the HPR monitoring project into the over pressure shut-off valve (OPSO) project to optimise delivery; and
- deferment of PGP Interconnection projects into AA5 due to ongoing negotiations with APA.

238. We present our assessment of the significant (>$1m) projects that ATCO has, or intends to incur expenditure on during the AA4 period.

AAP4103 PGP Interconnection – Caversham

239. ATCO had included in its AA4 submission six transmission projects to interconnect to the PGP to improve security of supply at Bullsbrook, West Swan, Caversham, Wattle Grove, Wattleup and Nambeelup[84].

240. [redacted]

241. ATCO describes what it considers to be a credible scenario for the loss of supply on the DBNGP to include third party damage to un-looped sections south of the Mondarra gas storage facility or loss of the gas production facilities supplying the DBNGP, as part of its justification to proceed with the Caversham PGP interconnection. For loss of supply from DBNGP into the northern gas network, ATCO's business case assesses a total of

[84] ATCO, Access Arrangement Information submission March 2014

585,000 customers as being an intermediate level risk but not ALARP given a severity level of catastrophic and likelihood of hypothetical. At the completion of this project, the customers lost is reduced to 90,100.

242. These input assumptions appear to have been subsequently confined by ATCO to the loss of supply from the DBNGP at Caversham, which ATCO estimates would result in loss of 220,000 customers with a response time to return supply of 26.5 weeks.[85] Based on our interpretation of AS4645, this would continue to be an intermediate risk, and subject to the ALARP test.

243. ATCO has not provided evidence of its ALARP test but claims that completion of this project has reduced the customers at risk of loss of supply and maintains the intermediate risk rating.

244. We consider that based on the representations made during the AA4 submission, and the Final Decision, this investment is commensurate with good practice and that it was prudent based on the information available at the time. ATCO has also demonstrated an ability to defer other interconnection projects[86], and is relying on three interconnections with the PGP at the end of the AA4 period. We review the assumptions for progressing additional PGP interconnection projects as a part of our review of AA5 expenditure.

AAP4068 Facility Upgrade - OPSO Safety Devices

245. ATCO expects to incur [redacted] capex for the upgrade of OPSO devices, being [redacted] above the ERA allowance.

246. ATCO states in the supplied business case that '*EnergySafey has issued a corrective action request (CAR) to ATCO Gas A[u]Stralia in respect respect [sic] to the requirements of AS2885 and AS/NZS 4645.1 Network Management in regard to Network Pressure Control Element requirement for Gas distribution regulator and regulator meter infrastructure*'[87]. Specifically, that existing control devices are not in compliance with AS4645 sections 4.7.3, 6.3.3, Appendix H and Appendix J. ATCO has not provided a date of the CAR issued from EnergySafety nor has it nominated a required completion date for the works.

247. ATCO determined that there are approximately 456 units over 290 sites that require various levels of modification, and developed a program that was completed within two years of business case approval.

248. The business case appropriately determines solutions based on operating pressure, and whilst it does not include an options analysis, the selected option appears to be consistent with the minimum requirements to comply with the CAR, and the risk rating of High.

249. ATCO included [redacted] (nominal) in the business case approval for commencement in 2012 and completion by December 2013. Actual project commencement appears to be more like late 2014. In 2015, a further revised CEAR was raised due to increases in

[85] ATCO, (draft) Business Case: PGP Interconnection – Woodward Ave, Caversham, 24 August 2018, page vii (per document 1520-GCA1-SM-0412 PGP Interconnection Bernley Dr Caversham APPROVED BC & CEAR)

[86] The reasons stated in the onsite review meeting presentation was due to ongoing negotiations with APA, albeit that only a small number of projects initially planned for AA4 are proposed to be delivered in AA5

[87] ATCO Attachment 5.9 Approved business case OPSO Safety Devices, page 5

materials costs and allocable costs increasing the approval to [redacted] (nominal). There is an absence of detail to allow us to review the robustness of these cost increases. However, given the complexity associated with this program, the cost increases appear reasonable, and that it is reasonable to consider the resultant capex meets the capex criteria.

Balance of the program

250. ATCO proposes to incur [redacted] for a security of supply project commencing in 2019 and completing in 2020 for Caversham. Based on our review of the proposed expenditure for AA5 (included in section 6), we find that the project does not meet the capex criteria, and therefore any expenditure to be incurred in AA4 similarly would not meet the capex criteria.

251. We did not find any material issues in the remaining projects that we reviewed in the safety & performance capex category.

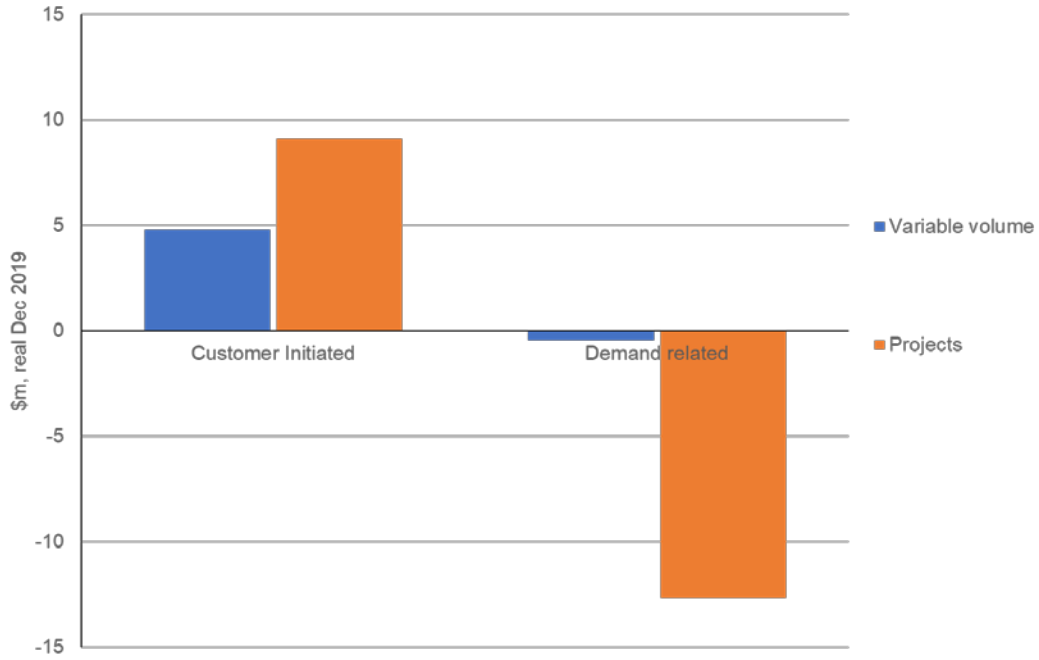
5.4 Assessment of network growth capex

5.4.1 Variance analysis

Shift from demand related to customer-initiated capex

252. We observe a large shift in expenditure from demand related projects to customer-initiated projects, as illustrated in the figure below. We understand this was largely in response to the drop in demand, as reflected in ATCO's modelling, and higher than forecast customer connections. Both factors are largely outside ATCO's management control.

Figure 15: AA4 network growth capex variance analysis – by capex driver

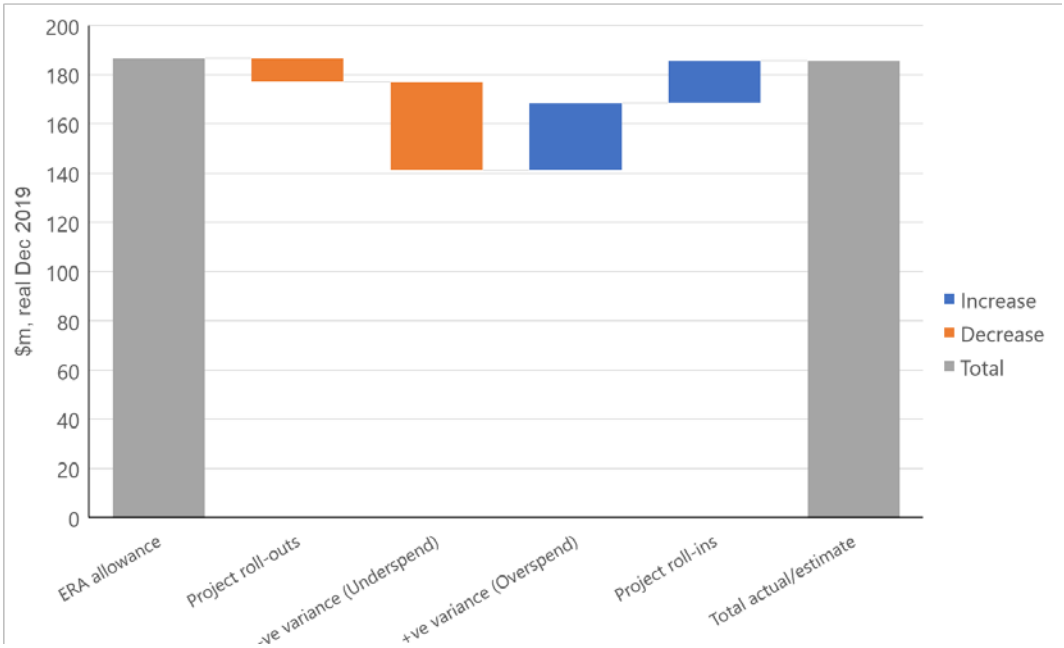


Source: EMCa analysis of AA4 capex spreadsheet provided in ATCO response to EMCa Question 4

Cost management

253. ATCO's actual and forecast expenditure for AA4 would result in it managing to within less than 1% of the ERA allowance, as shown in the figure below. As with network sustaining capex, we have examined justification for the variance in the components of expenditure, notwithstanding the small aggregate variance.

Figure 16: AA4 network growth capex variance analysis – by cause



Source: EMCa analysis of AA4 capex spreadsheet provided in ATCO response to EMCa Question 4

5.4.2 Customer initiated - variable volume

254. ATCO has provided a copy of a CEAR and NPV model for the customer-initiated works relating to urban expansion and the connection of new customers, referred to as variable volume capex, for the year 2018.

255. The growth component is driven by external factors such as economic conditions and housing affordability. ATCO presents the variable volume capex in the following five programs:

- Mains in greenfield subdivisions;
- New Connections (commercial and existing subdivisions);
- New Connection to domestic customers in new subdivisions – South region;
- New Connection to domestic customers in new subdivisions – North region; and
- Customer Initiated Gas Feeders & Gas Mains.

256. ATCO provides a single NPV assessment of the 2018 variable volume growth category, totalling $25.3m which shows a positive NPV. We have assumed a similar assessment has been undertaken for other years of the AA4 period to comply with the capex criteria, however, this has not been supplied to us.

257. We have a number of concerns with ATCO's growth NPV model, including:

- An error in disconnection modelling;
- Inclusion of unregulated revenue (and associated costs) from connection of customers in Kalgoorlie and Albany;
- Inclusion of a 'subs to masters' program that is not associated with new connection expenditure, and which also appears to be incorrectly modelled with a considerable overstatement of revenues;
- Higher volume assumptions than are shown in ATCO's demand data for AA5;
- A considerably lower assumed incremental opex cost than ATCO has presented for its similar AA5 analysis; and
- Presenting an NPV to 60 years.

258. We describe the issues and their impact on the analysis further in Appendix C. However, after correcting for them, our analysis nevertheless demonstrates a positive NPV within a reasonable period. For example, with a 25-year analysis horizon and following a series of corrections and adjustments to ATCO's model that we consider reasonable, our assessment is that the assumed tranche of new B2 and B3 connections provides a positive NPV of $2m after 25 years, and that the connections are NPV-positive after around 22 years.

259. We therefore conclude that the customer-initiated AA4 capex largely satisfies the capex criteria. However, as discussed further in Appendix C the conversion of sub-meters to master-meters (as a part of the subs to masters program) may represent a change in ATCO's revenue stream, but it does not represent new services that need to be built. Accordingly, any investment in such a program should be separately justified based on a positive NPV analysis. ATCO has not sufficiently justified inclusion of this program, and with the apparent error in tariff modelling included in the NPV assessment, it has not demonstrated that this program satisfies the capex criteria.

5.4.3 Demand growth - reinforcement projects

260. We present our assessment of the significant (>$1m) projects that ATCO has, or intends to incur expenditure on during AA4.

NFD4014 Growth Development Projects

261. ATCO expects to incur $3.3m capex for growth development, comprising customer-initiated projects which require extensions to the gas network to meet the customer's gas requirements, and which was not included in the ERA's Final Decision allowance.

262. [redacted]

- [redacted]
- [redacted]
- [redacted]

263. ATCO presents a positive NPV over the assessment period for the above projects based on incremental revenue from connection, and customer contributions based on ATCO's capital contribution policy.[88]

NFD4025 Reinforcement – Murdoch Drive

264. ATCO expects to incur [redacted] capex for a new project to reinforce the HP network (1.6km of DN150 steel along Murdoch drive) to maintain pressure to the HS127, being [redacted] above its approved business case. This project was not included in the ERA allowance.

265. [redacted]

266. ATCO's business case states that there are approximately 15,500 domestic customers and two commercial customers at risk of supply interruption if the work didn't proceed, and which would double in a worst-case severe winter scenario. Accordingly, this project was rated as an intermediate risk.

267. [redacted]

[redacted]

[redacted]

268. Notwithstanding the above, and accepting the modelling as presented by ATCO, the demand in the gas network would have likely triggered a need for reinforcement of this pipeline within the AA4 period.

269. ATCO has not explained the variation between the value of the business case, and the reported actual capex. We would expect to see, but have not seen, evidence of change controls or CEARs, and a project close-out report that explains the actual expenditure over the period 2016 to 2018 and apparent overspend on this project. In the absence of such an explanation, we consider that the expenditure above that included in the business case does not satisfy the capex criteria.

Elizabeth Quay & Perth CBD Risk reduction project[90]

270. ATCO expects to incur [redacted][1] capex to complete safety risk reduction works[92] and to meet the Metropolitan Development Authority's request for natural gas reticulation to the Elizabeth Quay development. The scope comprises:

- design and construction of a 2.5km DN150 steel pipeline and 2 HPRs to reinforce the gas supply to Elizabeth Quay and East Perth;
- installation of three new HPRs to reduce the operating pressure of the pipeline within the CBD; and
- to consolidate the city high-pressure network with the integration of the new steel pipeline and high-pressure regulator sets.

271. ATCO state in its business case[93] that the ERA approved an AA4 allowance of [redacted] for security of supply capex relating to the Perth CBD risk reduction project and [redacted] for growth capex for Elizabeth Quay, totalling [redacted].[94]

272. ATCO has provided its business case to complete the safety risk reduction (security of supply capex) totalling [redacted], which is in addition to [redacted] included in an earlier business case for the Elizabeth Quay mains extension (growth capex) in 2014. The business case for $5.0m included altering the mains extension to 150ST, however it did not separate the incremental expenditure for the growth capex to align with the ERA's Final Decision.

273. At our onsite meeting, ATCO advised that this project was fully re-scoped based on further analysis, and which has resulted in a lower cost solution. In response to our request for information, ATCO has provided examples of: (i) its market-based

[89] ATCO, Network Infrastructure Business Case, Reinforcement – Murdoch Dr Business Case, page 9

[90] Comprises three projects AAP4033, AAP4034 and AAP4035

[91] ATCO's response to EMCa 04 Confidential capex AA4

[92] Reduce the loss of containment risk associated with multiple fittings on the pipeline, assessed as a High risk

[93] ATCO, Attachment 5.5, Elizabeth Quay & Perth CBD Risk Reduction Approved Business Case and CEAR, page 7

[94] The business case did not state whether the values were expressed in nominal or real terms. We note that this figure closely approximates the total of [redacted] ($real, 2014) provided in ATCO's response to EMCa 04 Confidential capex AA4.

procurement of services; (ii) project cost controls; and (iii) a list of lessons learnt which indicate to us that good project management disciplines were in place for this project.

274. Based upon our review of ATCO's capex model, the expenditure incurred on this project is not materially different, and in fact lower for the growth capex than the ERA allowance. ATCO reviewed a number of options to mitigate the identified high risk associated with the CBD network, and risk of third-party damage on the extension to Elizabeth Quay. Whilst we have not been provided with the assumptions ATCO applied in its economic analysis undertaken as a part of the 2014 business case for the mains extension, it appears from its original submission that the NPV was positive. We are satisfied that the incurred capex satisfies the capex criteria.

Balance of the program

275. We did not find any material issues in the projects we reviewed in other parts of the safety & performance program.

5.5 Assessment of structures and equipment capex

5.5.1 Variance analysis

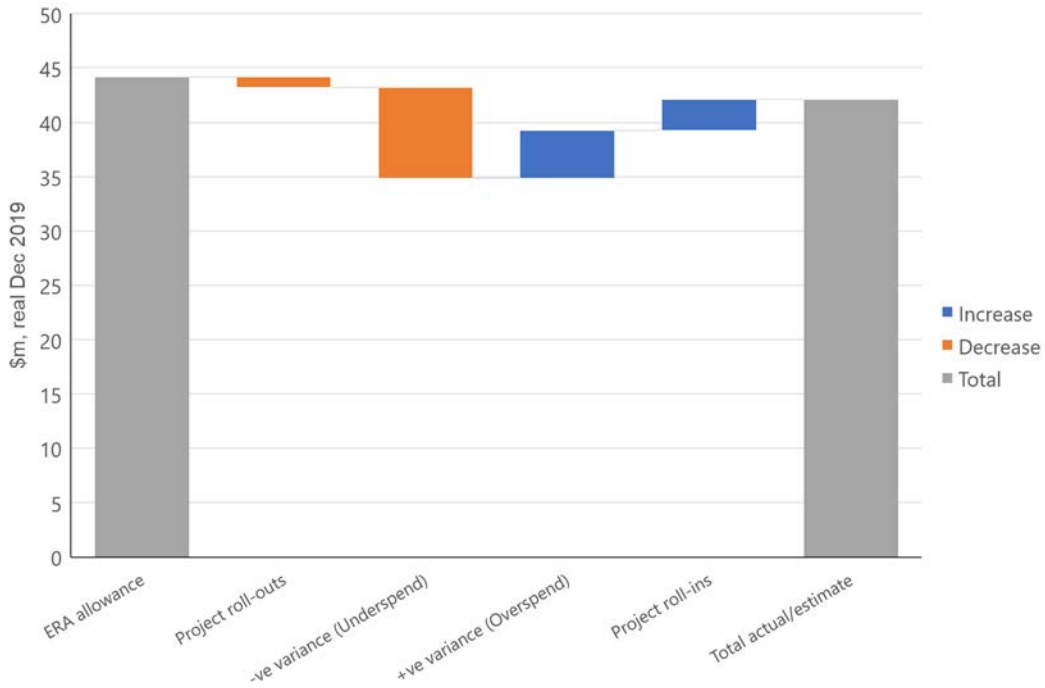
Reallocation between buildings and land

276. The variance between ATCO's AA4 actual/forecast capex and the ERA allowance is minor. However, ATCO has advised of a classification issue in the ERA Final Decision between the buildings and land asset classes, which generally allowed for a 50/50 split that was not reflected in the actual expenditure. We have taken this into account in our assessment.

Cost management

277. As shown in the figure below, there was a relatively large movement in capex projects in and out of the structures and equipment capex portfolio, but ATCO expects its aggregate expenditure to be within 5% of the ERA allowance. We have examined justification for the variance in the components of expenditure, notwithstanding the small aggregate variance.

Figure 17: AA4 structures and equipment capex variance analysis – by cause



Source: EMCa analysis of AA4 capex spreadsheet provided in ATCO response to EMCa Question 4

5.5.2 Depots and other building related works

278. ATCO expects to incur approximately $21.1m capex for its building works, $0.3m lower than the ERA allowance. This includes:

- completion of Jandakot redevelopment and training facility;
- replacement depots at Bunbury, Mandurah and Geraldton to replace the previously leased facilities in these regions;
- establishing new depots at Busselton and Joondalup;
- plans to replace Wangara depot with a new site in Balcatta; and
- deferment of CNG facilities.

Jandakot redevelopment

279. In the AA3 period the Jandakot Operational Centre was established at a cost of $14.0m, being $3.6m (35%) higher than the ERA allowance. ATCO advised that following review, the ERA considered the higher expenditure as conforming capex[95]. The Jandakot warehouse and training centre were the final phases of redevelopment at this site to be progressed during AA4

280. During the assessment of the forecast AA4 expenditure, the ERA questioned a number of the assumptions underpinning the proposed Jandakot training facility. It subsequently resolved to accept inclusion of the full value of this project subject to an ex-post review, in light of the business case and ATCO's cost benefit analysis.

[95] ATCO, Jandakot Redevelopment signed Business Case, page 12

281. During the AA4 period, ATCO expects to incur [redacted] capex to complete the warehouse redevelopment [redacted] and to establish its training centre [redacted] This level of project capex will exceed the ERA allowance for this project by [redacted]. ATCO states that it will reallocate capex from the planned Osborne Park / Balcatta land purchase. However, we consider that ATCO's business case for its warehouse and training centre does not adequately:

- respond to the concerns raised in the Final Decision, pertaining to the requirement to increase training above historical levels, or the basis of sustaining the higher level of training that appears to have been caused by the introduction of a new contractor;
- address why the additional expenditure, above the ERA allowance, satisfies the capex criteria;
- produce a reasonable counter-factual from which to compare the options, including to demonstrate any efficiencies associated with its recommended option. Moreover, ATCO has included a number of annual opex costs for its non-preferred options that are not explained or supported in its documentation; and
- consider the warehouse and training centre facility separately, including separate consideration of relocating these functions offsite.

282. Accordingly, despite ATCO's apparent objective of managing within its aggregate capex allowance by foregoing a planned land purchase, it has not sufficiently demonstrated that the additional AA4 capex for its warehouse and training centre satisfies the capex criteria.

Establishment and redevelopment of depots

283. ATCO expects to incur $3.1m capex within AA4 to establish new depots at Joondalup and Busselton. The depot at Joondalup is to cover the service area from Whitfords Avenue to Two Rocks, replacing previous plans to establish a depot at Yanchep. Joondalup was considered a more central location with better access to transport links. Busselton is established in addition to Bunbury due to the expansion of the network in the area and distances involved.

284. ATCO's AA4 plans include a further depot in the northern region to replace Wangara and to cover the area south of Whitfords Avenue to the CBD and east to Kalamunda. ATCO has indicated that the preferred site is likely to be in either the Malaga or Balcatta industrial areas. ATCO claims[96] that a business case is being developed to review the options available, and it is anticipated that a decision will be made in Q3 2018[97]. ATCO has revised the forecast expenditure for the project from [redacted] to [redacted] for the remainder of the AA4 period (as noted above). Once the new depot is established, ATCO indicates that a portion of the development of this site will be carried over into the AA5 period, which we review as a part of our assessment of AA5 capex.

285. Further expenditure of $3.5m for the redevelopment of depots located at Mandurah, Geraldton and Bunbury, and $0.4m for minor depot works is consistent with ATCO's property strategy, particularly moving to an 'own and operate' business model for depots (per its AA4 submission) to deliver lower costs to customers.

[96] Attachment 12.8 Asset Lifecycle Strategy Property Plant and Equipment (PPE)

[97] Therefore, this information was not available at the time of preparing the AA5 proposal

286. The projects are consistent with the plans included in ATCO's AA4 submission and the ERA's Final Decision, and we have therefore not undertaken a further review of the requirements for the expansion of the depots in accordance with ATCOs Safety Case and related input assumptions.

287. In the supporting documentation provided by ATCO, it has: (i) undertaken a needs analysis to determine the available options for meetings ATCO's medium term resourcing requirements; (ii) undertaken a market review for available properties, (iii) undertaken an assessment of options including upgrade to its current facility (if relevant), purchasing an existing property, leasing a property, or purchasing land and building a fit-for-purpose facility; and (iv) completing a cost-benefit analysis of its recommended option.

288. In our view ATCO has undertaken a robust assessment of options and is essentially delivering the projects identified in its AA4 submission and which were accepted as part of the allowances in the ERA's Final Decision. We therefore consider that ATCO's expenditure on these projects satisfies the capex criteria.

5.5.3 Fleet

289. ATCO expects to incur [redacted] capex for its fleet management program, [redacted] lower than this component in the ERA's AA4 allowance. ATCO implemented its fleet ownership strategy during 2013 to deliver a lower cost solution to customers, and during the AA4 period has implemented a number of changes to its fleet requirements that have resulted in a further reduction to the required level of expenditure. We have not identified any issues with this expenditure.

5.5.4 Plant and equipment

290. ATCO expects to incur [redacted] capex for its plant and equipment replacement program, [redacted] lower than the ERA allowance. We have reviewed information that ATCO provided, and we have not identified any issues with this expenditure.

5.5.5 Research and development

Clean Energy Innovation Hub

291. ATCO proposes to establish a Clean Energy Innovation Hub (CEIH) at its Jandakot site at a cost of [redacted][98] to enable research into the commercial application of cleaner energy in micro-grid systems in the near term as well as incorporating the production, storage and use of hydrogen in the energy mix.

292. ATCO claims[99] that '*[t]he CEIH will investigate and demonstrate how various cleaner energy sources and energy storage solutions can be integrated into an effective energy grid; combining gas (including renewable gases such as hydrogen and biogas), electricity, and heat for use in homes and industry*.'

293. According to its business case, the project estimate is higher at around [redacted], with a contribution from the Australian Renewable Energy Agency (ARENA) of [redacted] to

[98] ATCO's response to EMCa 04 Confidential capex AA4, which differs to the value of [redacted] included in Table 1 of ATCO's Business Case for ATCO H2Micro – Jandakot Clean Energy Innovation Hub Demonstration Project

[99] ATCO AAI, page vii

support the project. The variance of $0.3m is not explained by ATCO. The CEIH construction is due to be completed by 2019.

294. Whilst there is a relatively weak link to saving energy costs, this project appears to be primarily positioned as a research & development initiative, for marketing purposes and for a potential future commercial benefit to ATCO. We consider that it is not therefore justified against any of the capex criteria for inclusion in ATCO's RAB, for the purpose of establishing haulage charges to its customers.

Blue flame kitchen

295. In its Final Decision, the ERA did not approve inclusion of any costs associated with ATCO's Blue Flame Kitchen in AA3 as they did not meet the capex criteria. Accordingly, costs incurred in AA4 and included by ATCO similarly do not meet the capex criteria.

5.5.6 Balance of projects

296. There are additional small costs associated with structure and equipment related capex that we consider are likely to meet the capex criteria.

5.6 Assessment of IT capex

5.6.1 Expenditure variance analysis

Expenditure profile appears front-loaded

297. The variance between AA4 actuals/forecast and the ERA allowance is minor. However, there is a clear bias to delivery of programs at the start of the AA4 period associated with project 'Springboard'.

298. In the compliance summary document produced for the Springboard program, ATCO states[100] that '*[d]elivery under the umbrella of the Springboard Program was considered efficient because many of these initiatives were interdependent and required similar expertise. This resulted in IT capex from the later years in AA4 being brought forward to the earlier years, in order to fund the initiatives and hence take advantage of the efficiency opportunity.*'

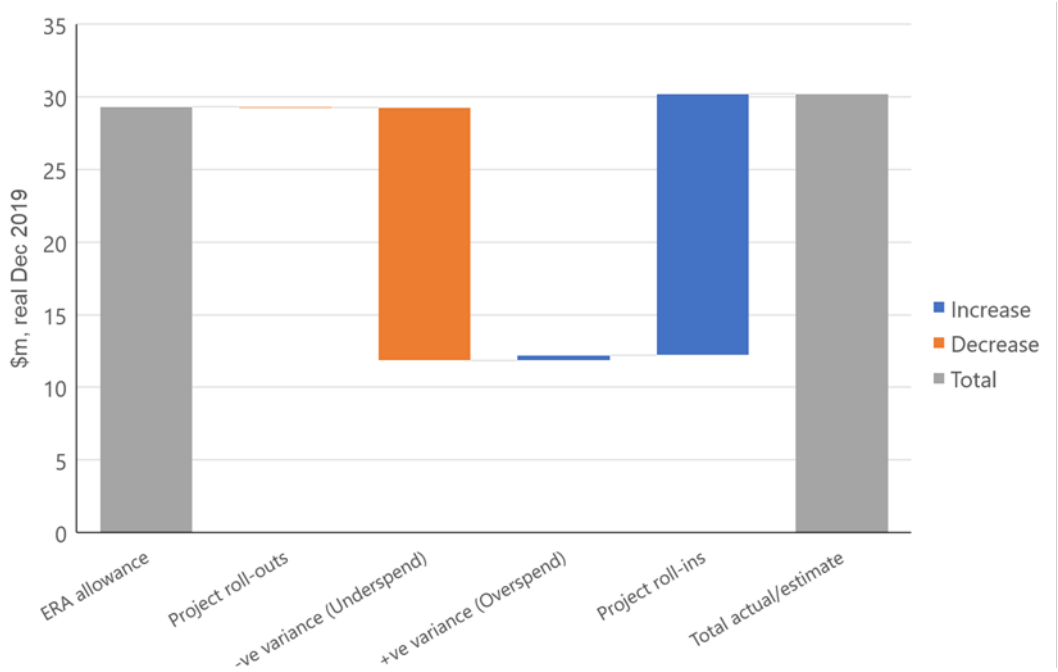
299. We therefore reviewed a number of projects commencing in the latter years of the AA4 period, specifically years 2018 and 2019.

Cost management

300. In aggregate ATCO expects its AA4 IT spend to be within 5% of this component of the ERA's allowance. However, as shown in the figure below, there are large movements of capex projects in and out of the IT capex portfolio, relative to ATCO's AA4 plans. We have examined the rationale behind these significant changes.

[100] Attachment 5.2 Compliance Summary Springboard

Figure 18: AA4 IT capex variance analysis – by cause



Source: EMCa analysis of AA4 capex spreadhsset provided as part of EMCa04

5.6.2 Springboard program

301. ATCO expects to incur [redacted] capex for the Springboard program (previously entitled Business Transformation Program). The Springboard program was introduced to deliver a portfolio of improvement projects more efficiently.

302. According to ATCO, the approved projects comprising the original Springboard program – TMS, SAM and MIS[101] – totalled [redacted] (nominal). This was increased following business cases and change control to [redacted] (nominal).

303. ATCO states[102] that '*[t]he expenditure identified as required to deliver the Springboard Program exceeded the AA4 forecasts, because the scope of deliverables was considerably expanded, compared with the set of initiatives identified in the 2014 IT Work Plan that formed the initial basis for the Springboard Program (i.e. AGA-11; AGA-14; AGA-15; AGA-18, and AGA-22). That is, Springboard delivered those five IT Work Plan initiatives plus a number of new initiatives as well as initiatives that had previously been identified as part of other items in the IT Work Plan. Delivery under the umbrella of the Springboard Program was considered efficient because many of these initiatives were interdependent and required similar expertise*.'

304. We have reviewed the justification provided for the Springboard program and consider that the drivers of the program are aligned with good practice and delivery of such a program is likely to deliver an efficient solution. The benefits included in the business case documents provided are reasonable and support investment in this program to deliver a positive economic benefit. We would have expected to, but did not, see

[101] Task Management System, Strategic Asset Management and Management Information System

[102] Attachment 5.2 Compliance Summary Springboard

evidence of ATCO's approach to benefits realisation from these initiatives, as evidence of good practice for management of IT programs.

305. ATCO has demonstrated how its approval and delivery of the program aligns with its investment governance framework. The program delivered a similar set of initiatives to that proposed in its AA4 submission, and which was included in the ERA's AA4 allowance. ATCO delivered the program for lower capex than ATCO management approved in its business case.

306. On balance, we accept ATCO's claim that the initiatives are likely to deliver positive economic value and that they satisfy the capex criteria.

5.6.3 Asset management optimisation

307. ATCO expects to incur [redacted] capex for a new asset management optimisation initiative. We requested ATCO provide evidence to support inclusion of this program into the AA4 capex program, identified as 'New-10'. ATCO advised[103] that '*Asset Management Optimisation is a Program within the Asset Management and Service Delivery Excellence program that is to be completed in AA5*.'

308. Accordingly, we consider that inclusion in the AA4 capex program is in error, and does not meet the capex criteria.

5.6.4 GIS Upgrade

309. ATCO expects to incur [redacted] capex for a new GIS upgrade initiative, all of which is expected to be incurred in 2019. We requested ATCO provide evidence to support inclusion of this program into the AA4 capex program, identified as 'New-11'. ATCO advised[104] that '*[t]he Business Case for the GIS Upgrade has not be [sic] written at this point in time. We are currently working with Esri [sic] to finalise our Location Strategy which will deliver the roadmap to feed into the Business Case. The Project is not scheduled to commence until Q2 2019.*'

310. From review of the project brief, the upgrade appears to relate to replacement of peripheral applications of Infrastructure Browser Information System (IBIS) and Network Data Visualisation (NDV) and not the GIS engine. The mislabelling of the intended project has the potential of over-stating the apparent risk to normal operations.

311. Whilst a project business case has not yet been developed, ATCO's planning information indicates project commencement is more likely to be in 2020, at the commencement of AA5. Accordingly, we consider that inclusion of this program in the AA4 capex program is in error, and does not satisfy the capex criteria.

5.6.5 Balance of projects

312. There are a large number of smaller IT capex projects included in the AA4 capital program which we consider are likely to meet the capex criteria on the basis of being essential routine BAU expenditures.

[103] Response to information request EMCa47

[104] Response to information request EMCa47

5.7 EMCa adjustment assessment

5.7.1 Compliance with capex criteria

313. Our assessment of the capex incurred and to be incurred in the AA4 period has been based on ATCO's AAI and supporting information, though as noted earlier, this was limited. To a greater extent, we have necessarily based our assessment on our observations from the onsite meetings that we held with ATCO, together with information supplied pursuant to EMCa information requests.

314. Our adjustments for AA4 capex arise directly from our assessment of projects and programs where we consider from the information ATCO has provided that the expenditure does not satisfy the conforming capex criteria in rule 79(1), in accordance with Appendix A. We have taken a strict view of our obligations to advise the ERA based on the information that ATCO has provided to us. It is possible therefore that further information from ATCO may lead us to different conclusions.

5.7.2 Aggregate adjustment assessment

315. Our assessed adjustment to ATCO's AA4 capex has been applied to each capex category. We have made an adjustment for all or part of specific project or program expenditures, where we consider that the information ATCO has provided for our assessment does not demonstrate that the expenditure satisfies the capex criteria.

316. In the absence of better information, we have tended to default to the ERA's allowance where the project or program was previously considered by the ERA as part of its AA4 decision process. Where a relevant project or program was not proposed to or considered by the ERA in its AA4 decision, we have proposed an adjustment based on information provided in ATCO's business case documentation.

317. We have produced our adjustments based on the timing of the projects and programs where possible, and have sought to reflect any delays to the project against the capex allowance[105].

318. The aggregate impact of our assessed adjustments would imply a reduction to ATCO's AA4 capex (over 5.5 years) of $75.4m, which represents 15.2% of ATCO's actual/estimated capex of $496.0m. The adjustments shown in the table below represent those aspects of ATCO's AA4 capex for which it has not provided evidence that satisfies us that the expenditure satisfies the capex criteria.

[105] For example, the expenditure for the Jandakot redevelopment occurred two years later than was proposed in the capital allowance, and therefore the timing of the capital allowance has also been deferred.

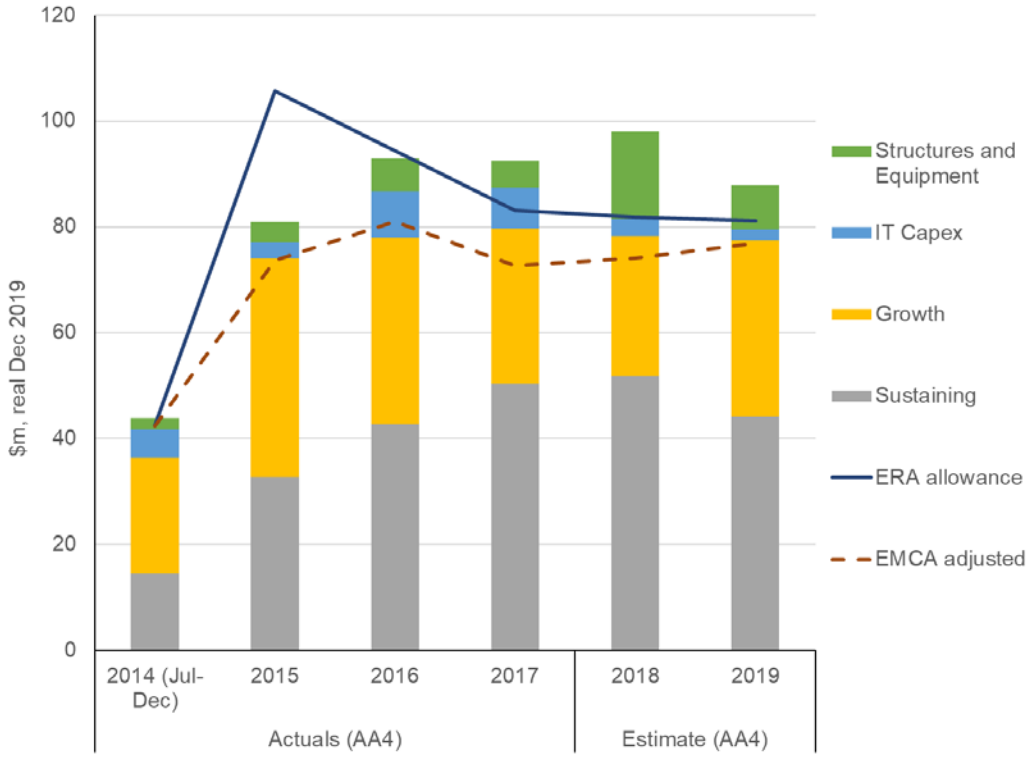
Table 18: Adjustments in AA4 period by capex category

$m, real Dec 2019	Actuals (AA4)				Estimate (AA4)		Total
Category	2014 (Jul- Dec)	2015	2016	2017	2018	2019	2014-19
Network sustaining	**14.5**	**32.7**	**42.7**	**50.3**	**51.8**	**44.2**	**236.2**
[redacted]							
Adjusted Network sustaining	14.4	32.4	36.2	38.7	35.9	37.1	194.7
Network Growth	**21.9**	**41.3**	**35.2**	**29.4**	**26.5**	**33.1**	**187.4**
[redacted]							
Adjusted Network Growth	21.9	41.3	37.5	27.3	24.6	32.1	184.7
IT	**5.3**	**3.1**	**8.8**	**7.7**	**3.1**	**2.2**	**30.2**
[redacted]							
Adjusted IT	5.3	3.1	8.8	7.7	3.1	0.9	28.9
Structures & Equipment	**2.2**	**3.9**	**6.1**	**5.0**	**16.6**	**8.4**	**42.1**
[redacted]							
Adjusted Structures & Equipment	2.1	3.9	6.1	5.3	11.9	8.4	37.7
Total actual/estimate	43.9	80.9	92.9	92.4	98.0	87.9	496.0
[redacted]							
Total adjusted	**42.3**	**73.6**	**81.0**	**72.7**	**74.1**	**76.9**	**420.6**

Source: EMCa analysis

The following graph illustrates the effect of the assessed adjustments against ATCO's proposed conforming AA4 capex.

Figure 19: ATCO AA4 capex, ERA allowance and EMCa adjusted



Sources: EMCa analysis and ATCO response to EMCa Question 4

6 Proposed AA5 capex

6.1 Introduction

319. This section contains our assessment of the forecast capex allowance proposed by ATCO in the AA5 period. We have undertaken the review using the assessment framework set out in Appendix A, the risk management assessment in Appendix B, and with regard to the findings in Sections 3, 4, and 5 of this report.

320. The results of our review and our overall assessment of whether the proposed capex satisfies the capex criteria for the purposes of determining the level of conforming capex under the NGR are set out below.

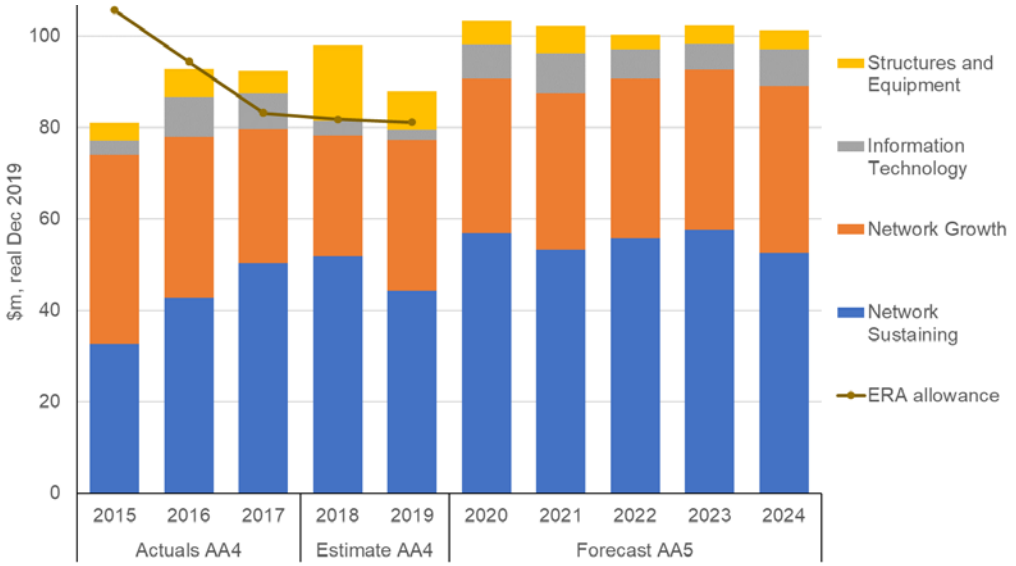
321. The quoted adjustments in sections 6.2 to 6.6 do not account for the adjustment of the escalation factor, which is -$7.4m overall. Refer to the adjustment table in section 6.7 for the total adjustments.

6.2 ATCO's proposed AA5 capex allowance

6.2.1 AA5 capex trend and drivers

322. In the figure below, we show ATCO's AA4 capex (actual and estimated) and its forecast AA5 capex by cost driver. The annual average capex proposed by ATCO in the AA5 period is 13% higher than in the AA4 period.

Figure 20: AA4 vs AA5 capex by capex category



Source: EMCa analysis from AAI, Tables 5.2 , 5.4 and 12.1, and ATCO response to EMCa Question 4.

323. In the table below, we show ATCO's proposed expenditure in AA5 by capex category and by year. The major increase from the last five years of AA4 period is the proposed $54.4m (24.6%) increase in network sustaining capex. The proposed $17.1m reduction in structures & equipment capex is more than offset by increases in proposed network growth and IT capex of $8.7m (5.3%) and $11.2m (44.8%), respectively.

Table 19: AA5 forecast capex versus AA4 capex by capex category

$m, real Dec 2019	AA4 (5.5 years)	AA5 (5 years)					Total
Category	Total 2014-19	2020	2021	2022	2023	2024	2020-24
Asset Replacement	*197.3*	*34.6*	*37.7*	*40.4*	*37.3*	*38.1*	*188.0*
Network Safety and Performance	*38.8*	*22.3*	*15.6*	*15.4*	*20.4*	*14.5*	*88.1*
Network sustaining	**236.2**	**56.9**	**53.3**	**55.8**	**57.6**	**52.5**	**276.1**
Customer Initiated	*175.8*	*32.8*	*34.0*	*34.4*	*35.0*	*36.4*	*172.6*
Demand	*11.7*	*1.0*	*0.1*	*0.5*	*0.0*	*0.1*	*1.7*
Network Growth	**187.4**	**33.8**	**34.2**	**34.9**	**35.0**	**36.5**	**174.3**
Information Technology	**30.2**	**7.4**	**8.8**	**6.4**	**5.5**	**8.0**	**36.1**
Fleet		*3.6*	*4.7*	*1.9*	*3.0*	*3.2*	*16.4*
Facilities, Plant and Equipment		*1.7*	*1.3*	*1.3*	*1.1*	*1.1*	*6.5*
Structures and equipment	**42.1**	**5.3**	**6.0**	**3.2**	**4.1**	**4.3**	**22.9**
Total	**496.0**	**103.4**	**102.2**	**100.4**	**102.2**	**101.3**	**509.3**

Source: EMCa analysis from Access Arrangement Information Table 12.1 and ATCO response to EMCa Question 4.

6.3 Assessment of network sustaining capex

6.3.1 Introduction

324. The table below shows the major sources of proposed expenditure under the network sustaining category. The expenditure for Asset replacement and for Asset performance & safety in the table below differs slightly from ATCO's summary table in the AAI[106], however the total Network sustaining capex is similar at $276.1m.

[106] ATCO, AAI, Table 12.3, page 97

Table 20: AA5 forecast network sustaining capex by project grouping

$m, real Dec 2019 Projects	Total AA5
Asset replacement	
PVC mains replacement	127.4
Meter replacement program	27.3
End of life replacement program	33.6
sub-total	**188.4**
Asset performance & safety	
Security of supply projects	49.1
SCADA projects	12.6
PGP interconnection projects	13.5
Other network sustaining capex	12.7
sub-total	**87.8**
Total sustaining capex	**276.1**

Source: EMCa analysis from AAI, pages 98-109

325. Appendix B contains an assessment of the requirements of ATCO's Safety Case and its risk management approach which we draw upon in our assessment of ATCO's proposed AA5 network sustaining capex. The key conclusion in Appendix B is that we consider that the relevant elements of the formal safety assessment process in Appendix B of AS4645.1:2018 should be the reference for the 'likelihood of occurrence of each threat' (referred to as 'frequency' by ATCO) in all cases, rather than ATCO's alternatives.[107] ATCO's measures for the 'Remote' and 'Hypothetical' likelihood classes are up to an order of magnitude more conservative than AS4645.1:2018.

6.3.2 PVC mains replacement program

326. ATCO proposes replacing 305km of PVC mains and service connections with polyethylene (PE) mains at a cost of $127.4m over the AA5 period. The driver for replacement is reduction of a safety-related risk associated with loss of containment, specifically the possibility of a fatality from exploding leaked gas in built-up areas. ATCO states[108] that: '*[t]he PVC Replacement Program has been developed to ensure that the risk associated with these ageing assets is reduced to ALARP.'*

327. ATCO derives the risk of a fatality from individual pipe sections (expressed as fatality risk per km per year) using its Mains Replacement Priority Tool (MRP Tool). Whilst we have not reviewed the MRP Tool itself[109], we have reviewed ATCO's supporting documentation which provides an overview of the Tool.

328. The MRP Tool was developed with external assistance using a similar concept created for the Office of Gas and Electrical Markets in the UK. We observe that:

- the modelling process, the input data, and the underlying assumptions combine to produce quantitative outputs that are estimates of the risk of a fatality from ATCO's PVC mains;

[107] ATCO's consequence classes and risk matrix are similar to AS4645.1:2018

[108] ATCO, Attachment 12.22, EOL Replacement – PVC Business Case, page 1

[109] As this is not within our scope of work

- the modelling leads to proposed replacement of the leakiest assets (large diameter PVC mains) in ATCO's network in the highest risk (built up) areas; and
- it results in significantly less pipeline length assessed to be at end-of-life than using an age-based replacement criterion[110].

329. The key output of the MRP Tool applied by ATCO in its PVC replacement business case is the 'Individual Risk', which is the risk of a fatality (likelihood of a fatality per km per year).[111]

330. ATCO has assigned a severity class of 'Major' to the Individual Risk because it assumes it is the risk of a single fatality[112]. This is a reasonable classification. The table below shows the results of the application of ATCO's risk management framework and MRP Tool to its PVC mains[113]. We also compare the ATCO likelihood, severity, and risk level with the corresponding definitions in AS4645.1.

Table 21: ATCO's PVC pipeline risk assessment vs application of AS4645.1:2018[114]

Likelihood of a fatality (per km per annum) MRP Tool output	ATCO				AS4645.1:2018		
	Likelihood class	Severity class	Risk rating	Length of PVC pipe (MRP Tool output)	Likelihood class	Severity class	Risk rating
Equal to and higher than 10^{-4}	Unlikely or Occasional	Major	High	0.765 km	Remote or Unlikely	Major	Intermediate or High
Between 10^{-5} and 10^{-4}	Remote	Major	Upper Intermediate	171 km	Remote	Major	Intermediate
Between 10^{-6} and 10^{-5}	Remote	Major	Lower intermediate	1613 km	Hypothetical	Major	Low
Less than 10^{-6}	Hypothetical	Major	Low	7676 km	Hypothetical	Major	Low

Source: EMCa analysis from ATCO 2020-2024 Plan, Table 12.4, page 99 and ATCO EOL Replacement - PVC Business Case (Attachement 12.22), table 1.2, page 5

331. ATCO claims that the PVC pipeline considered to present High risk was replaced in the AA4 period. As shown in the table above, ATCO has introduced risk rating definitions 'upper intermediate' and 'lower intermediate' (which are not featured in its corporate risk matrix) as a means of distinguishing PVC pipe it expects to migrate to high risk over the next 5-6 years as their condition deteriorates. In the AA5 period, ATCO proposes to replace the 171km of PVC mains that presents 'Upper Intermediate' risk in the table above, plus:

- 106 km of other PVC mains identified by the MRT Tool as having '*a predicted leak rate higher than the average leak rate of the intermediate zone'* and which *'typically interconnect segments of pipeline planned for replacement and share a similar poor condition and predicted leak rate'*[115]*;* and

[110] ATCO, Attachment 12.22, *EOL Replacement – PVC Business Case*, page 2

[111] *Ibid, Figure 3.2,* page 5

[112] Major consequence (people dimension) = up to two fatalities

[113] The length of PVC mains in each likelihood class shown in the table is an outworking of the application of the Individual Risk for each pipeline section; we have not audited the derivation of the pipeline length calculations

[114] The ATCO 2024-2024 Plan includes 106km of Intermediate risk PVC pipe that is not rated as such by the MRP Tool

[115] ATCO, AAI, page 99

- *'An additional 10% of mains … to achieve program efficiencies'*[116].

332. Applying the AS4645.1:2018 safety assessment process described in Appendix B and using the MRP Tool output indicates that 171km of PVC pipe presents an Intermediate risk and is therefore subject to the ALARP test. The condition of the 106km of PVC mains was identified by the MRP Tool as being as bad or worse than the average Intermediate risk PVC main, however [redacted]. No information is provided regarding the risk rating of the other 10% (28km) identified for replacement.

333. ATCO's business case identifies a negative NPV for the proposed project of $114.7m and it states[118] that '[*t]he benefit of this option is that the risk is treated to a level deemed ALARP.*' ATCO informed us at our on-site meeting that it does not undertake a cost-benefit analysis to determine whether proposed safety-related investment satisfies the ALARP test.

334. In the absence of a cost-benefit analysis from ATCO, we have estimated the monetised risk avoided by replacing the PVC mains using ATCO's MRP Tool outputs. This indicates that replacing the 277km of PVC pipeline rated as Intermediate risk by the MRP Tool may satisfy the ALARP test. However, in the absence of adequate information regarding the risk profile of the additional 10% (28km, $11.7m) of mains proposed to be replaced for 'efficiency purposes' we are not convinced that this expenditure satisfies the capex criteria.

335. ATCO considered two alternative network solutions, including[119]:

- replacing 1890km of PVC mains at a cost of $700m, which it identifies as all the Intermediate risk PVC pipe on the network; or
- replacing fittings along the selected 305km of PVC mains, rather than replace the pipe itself at a cost of $251m.

336. Based on application of AS4645.1:2018, the 1613 km of PVC pipeline referred to by ATCO as 'Lower Intermediate', presents as Low risk and does not require treatment. ATCO's first option is therefore not supportable. ATCO's second option is much more expensive than the preferred approach according to ATCO's analysis and is clearly not preferable to the selected approach.

337. If it were to adopt age-based replacement, ATCO estimates that 800km of PVC pipeline would need to be replaced. ATCO also considers three non-network options, which do not appear individually or collectively to be preferable to the selected option.

338. The cost estimate for the work is based on recent average historical unit rate costs (which vary with pipe size, ground material, and replacement technique). We consider this to be an adequate basis for the cost estimate. The proposed volume of work is

[116] ATCO, AAI, page 99

[117] ATCO, Attachment 12.22, EOL Replacement – PVC Business Case, page 14

[118] ATCO, Attachment 12.22, EOL Replacement – PVC Business Case, page 15

[119] ATCO, Attachment 12.22, EOL Replacement – PVC Business Case, page 11

demonstrably within the capacity of ATCO and its contractors to deliver based on recent historical performance.

339. In conclusion, we consider that:

- ATCO has identified the need to replace a portion of the leakiest pipe in its network and it has selected pipeline presenting the highest safety risk (fatality due to gas explosion near multiple buildings);
- replacing less than 1% of the PVC mains per year over the AA5 period is not an excessive amount considering that it is or will be the leakiest pipeline class in the network and that ATCO is targeting the leakiest (large diameter) PVC mains for replacement;
- replacing 277km of PVC mains at a pro-rated cost of $115.7m is likely to satisfy the capex criteria;
- however, ATCO has not provided sufficient information to support its proposed $11.7m expenditure on a further 28km of PVC mains replacement in order to satisfy the capex criteria.

6.3.3 Meter replacement program

340. ATCO proposes replacing [redacted] domestic meters over the AA5 period at a cost of [redacted] and replacing [redacted] rotary-type commercial meters at an estimated cost of [redacted].

341. The driver for replacement of the domestic meters is compliance with regulatory requirements for domestic and commercial meters in GSSSR Part 3 – Metering: section 16 which requires that all domestic meters are replaced at intervals not exceeding 18 years. Alternatively, the meters can be replaced at an older age if approved by the Director of Building and Energy.

342. ATCO received approval in September 2008 to extend replacement of M6EW meters' in-service life to 25 years, with ME602 meters still to be replaced after 18 years in-service[120]. The identified domestic meters will reach the approved end of service life in the AA5 period.

343. The driver for replacement of 50 commercial (rotary billing) meters is to ensure metering accuracy.[121]

344. ATCO considered only the one alternative to its proposed domestic meter replacement project, that is 'no action'. For domestic meter replacements, ATCO assessed the risk of 'no action' to be High, primarily on the basis of 'severe' reputational and financial consequences. We consider this rating to be reasonable.

345. We expected to see the option of seeking approval for further deferment of meter replacement from the Director of Building & Energy in the business case. We inquired about this omission at the on-site meeting with ATCO and we were satisfied that the prospects for further extension of time for either meter types are low.

[120] ATCO, Attachment 12.39, Routine Meter Change (Domestic) Business Case, page 1

[121] ATCO, Attachment 12.19, EOL Replacement – Billing Commercial Meters Project Brief, page 1

346. The unit cost for replacement is based on recent prices (negotiated rates established by competitive tender for contractors). Deliverability risk appears to be low.

347. ATCO considered only the one alternative to its proposed commercial meter replacement project: 'no action'. Its assessment of zero cost for the 'no action' option contradicts statements in the main body of its business case which states that refurbishment is required as an alternative to replacement. The risk of 'no action' is rated by ATCO as low[122].

Conclusions

348. We consider that the proposed expenditure of $26.6m on replacement domestic meters is likely to satisfy the capex criteria because:

- ATCO has a regulatory compliance obligation;
- ATCO had previously sought and received an extension of in-service life for one of the two types of meter;
- the assumed volumes are based on actual asset in-service lives, and
- the unit costs appear to be reasonable.

349. For commercial meters, ATCO's 'no action' option at zero cost and low risk presents as a more favourable option than ATCO's recommended approach. Based on ATCO's presented information, we therefore consider that the proposed $0.6m expenditure is unlikely to satisfy the capex criteria.

6.3.4 End-of-life replacement program

Risers & Services

350. ATCO advises that it commenced replacing risers and services that leak gas with fully fused polyethylene solutions in 2014 and that approximately 1,600 leaking services have been replaced each year based on 'reactive' leak detection.[123] The results of ATCO's Leak Survey FSA indicate there are potentially an additional 1600 leaks per annum from this source and that the leak surveys should be undertaken to 'proactively' detect the leaking risers and services. ATCO proposes capex of $17.7m based on replacing an average of [redacted] risers and services per annum.

351. We consider ATCO's untreated risk ranking of Intermediate to be reasonable. ATCO has not provided any information to demonstrate that replacing [redacted] risers and services per annum satisfies the ALARP test. Nonetheless ATCO is required to eliminate leaks when detected and we consider that (i) it is prudent to undertake leak surveys, at least in built-up areas where the risk is highest; (ii) it is likely that its leak surveys will proactively reveal more leaks. We consider that ATCO has selected the appropriate option[124] and that the basis for its cost estimates is reasonable.

[122] *Ibid,* page 2

[123] ATCO, Attachment 12.40 Service Relay & Riser Replacement Business Case, page vi, noting that in this and other relevant documents the annual replacements range from 'more than 1000 to 2,000 p.a. detected in an ad hoc manner (e.g. by customers; meter readers)

[124] ATCO considers an alternative based on full service replacement which is more than double the cost of the preferred option

352. We have reviewed the expenditure profile and unit costs for work done and forecast to be done in the AA4 period and the work supports ATCO's claimed 1,600 average annual 'reactive' riser and service replacements volume.

353. We consider that provision for [redacted] riser and service replacements per year at a total estimated cost of $17.7m is likely to satisfy the capex criteria, based on current knowledge.

Regulator sets and metering facilities

354. ATCO proposes spending $6.1m on EOL replacement of seven different regulators and meter facility types. We consider that ATCO's justification for the programs of work is in line with good asset management practice and we consider that its expenditure forecasting approach is also reasonable[125]. However, despite ATCO's expenditure forecasting approach resulting in no replacement of PRS in AA5, ATCO has brought forward replacement of a PRS from the AA6 period to AA5 ($2.5m)[126]. We do not consider that ATCO has provided sufficiently compelling information to support the need to replace the nominated PRS in AA5.

355. We therefore consider that only $3.6m in this expenditure category is likely to satisfy the capex criteria.

Mechanical compression fittings

356. ATCO proposes replacing mechanical compression fittings which are prone to leaking when they are identified during operational activities (i.e. opportunistic replacement). The proposed expenditure of $4.5m is based on historical costs and volumes. ATCO has assessed the residual risk after it undertakes the work to be Intermediate and ALARP, although there is no analysis to demonstrate this.

357. ATCO considered two alternatives to the preferred approach: (i) wrap and leave the identified fittings when found, and (ii) no action (i.e. cease the current program). ATCO's analysis of the 'wrap and leave' option is that it is more expensive over time than the preferred option due to double handling. This seems to be a reasonable conclusion. ATCO has assessed the 'no action' risk as Intermediate and not ALARP, although it has not provided evidence to support how it arrived at this conclusion.

358. Although ATCO's documentation does not include quantified analysis to support this work, based on our engineering judgement, we consider it likely that the 'opportunistic' replacement program is prudent and that the estimated cost is likely to satisfy the capex criteria

Telemetry

359. ATCO proposes $3.6m on a staged replacement of [redacted] telemetry units. The primary driver is improving the integrity of the telemetry in the network by replacing EOL devices with new modern devices. The telemetry equipment provides accurate data for customer billing and it generates data on flow and pressure that informs distribution network operation, modelling and planning.

[125] Forecast expenditure based on age but make actual timing decisions based on condition and/or safety and/or lifecycle cost

[126] ATCO Attachment 12.3 Asset Lifecycle Strategy Pressure Regulating Facilities, Figure 4.1, page 25

360. ATCO proposes a staged replacement approach with serialised telemetry equipment (such as data loggers) replaced between 8 and 15 years in accordance with manufacturers' recommendations, and non-serialised telemetry equipment (such as cabinets), based on condition.

361. Prior to 2012, ATCO followed a run-to-failure replacement strategy. A proactive approach was introduced to replace telemetry assets to reduce operational costs. ATCO has provided sufficient information to demonstrate that the revised asset strategy is effective[127]. Given the relatively small unit cost, large volume, and characteristics of the serialised telemetry equipment, we are satisfied that a condition-based approach (not considered as an option) is unlikely to be preferable to the selected option. Similarly, the other options considered by ATCO are not superior.

362. We are satisfied that the strategy is sound, and the proposed expenditure is likely to satisfy the capex criteria.

Other EOL projects and programs

363. The other three projects/programs amount to $1.7m over five years. We have considered the information in the Project Briefs and business cases provided and we consider that the proposed expenditure is likely to satisfy the capex criteria.

Conclusions

364. Of the $33.7m end-of-life replacement AA5 capex proposed by ATCO, we consider that $31.2m or 93% is satisfy the capex criteria.

6.3.5 Security of supply projects

365. ATCO proposes three security of supply projects totalling $49.0m, with the driver being the risk to security of gas supply from third party damage. ATCO has calculated the frequency of loss of gas supply to end customers from specific GDS pipeline segments per annum and has assessed the consequence in terms of customer weeks lost (i.e. before gas supply is restored).

366. We first consider the derivation of each of these components of ATCO's risk assessment before assessing the justification for the three projects.

Frequency - loss of gas supply

367. ATCO's method for estimating the frequency of a third-party incident causing pipeline puncture (leading to loss of containment, LOC) is documented in its report '*HP Steel Pipeline Semi-Qualitative Risk Assessment'*. ATCO steps through the derivation of its overall predicted failure rate for each pipeline segment, applying a combination of UK industry data[128] and its own data. It identifies and applies four risk reduction factors (RRF) to the baseline failure (puncture) rate to '*provide a more realistic prediction of failure probability for each pipeline segment…'*[129].

[127] For example, Attachment 12.24 Business Case EOL Replacement – Telemetry CONFIDENTIAL, Figure 2.1, page 3 shows the strategy is reducing maintenance activities (saving opex)

[128] Op. cit,

[129] Depth of cover, surveillance (patrol) interval, Design Factor, pipe wall thickness per ATCO *HP Steel Pipeline Semi-Qualitative Risk Assessment,* page 6

368. Our concern is that ATCO assumes that a LOC via a puncture will result in a total supply outage, such that '*it is assumed that positive pressure will not be maintained for parts of the network downstream of the LOC event*'[130]. This is a conservative assumption because, based on our experience, the likelihood of shutting off the downstream system will vary with the location and size of the puncture. Other operational/repair methods will determine if a complete shutdown is required. Such options include:

- lowering the pipeline pressure, fitting a temporary repair clamp, and then completing a full repair under controlled conditions (noting that some load shedding may be required);
- allowing the leak to continue (under reduced pressure) and constructing a temporary by-pass, then doing a full repair (some load shedding may be required also for this option); or
- isolating the leak by closing upstream and downstream valves, implementing load shedding and effecting a temporary repair (bolt on repair clamp) or a permanent repair.

369. Even if a network must be shut down (i.e. none of the above operational/repair methods is practicable) positive network pressure can be maintained by load shedding, and air ingress into the network can be prevented.

370. We therefore consider it reasonable for ATCO to include a fifth RRF to account for the likelihood that no isolation is required. We are not aware of an instance where network isolation following a puncture has been required anywhere in Australia and we consider it unlikely that network isolation will be required for a puncture of the GDS pipeline segments identified by ATCO to pose the highest customer supply risk.

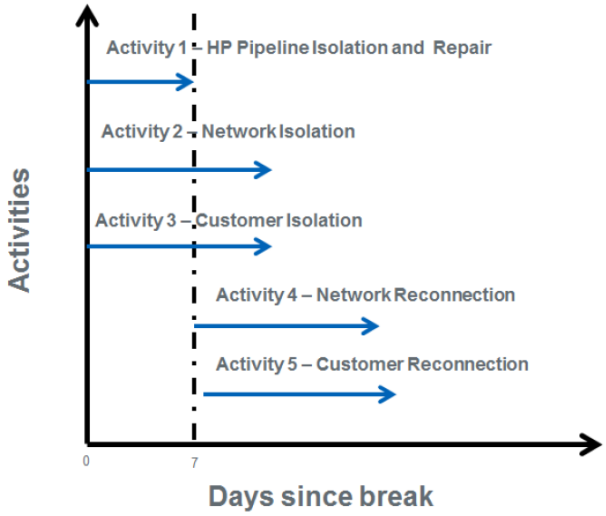
Consequence – customer weeks lost

371. ATCO's method for estimating customer weeks lost is documented in its report *Supply Interruption Customer Weeks Lost Assessment* (TCO RP 0287). To minimise the risk of air ingress into the network, ATCO assumes that *'each impacted gas consumer downstream of the break will require isolation. In addition, the network will have to be isolated into manageable sections to allow effective gas purging during recommissioning'*[131]*.* It assumes the sequence of events shown in the figure below.

[130] *Ibid*

[131] ATCO, *Supply Interruption Customer Weeks Lost Assessment,* page 5

Figure 21: ATCO sequence of events for customer reconnection



Source: ATCO, Supply Interruption Customer Weeks Lost Assessment, page 7

372. The table below summarises ATCO's key assumptions in deriving the customer weeks lost for various scenarios and our assessment of them.

Table 22: Assessment of ATCO's customer reconnection activity assumptions

Activity	ATCO assumptions	EMCa comments[132]
HP pipeline isolation and repair	7 days - 4 days to procure/pre-test the new section of steel pipeline; one day each to weld, conduct non-destructive testing, and commission the repaired section	3 days is a more reasonable estimate - as part of its Emergency Preparedness, ATCO should have tested pipe and fittings in an Emergency Store; other steps should take no more than one day in an emergency
Network isolation Network reconnection	- 4 hours per crew (competent) per isolation point - excavation by contractors one isolation/purge point per 50 customers - 3-person crews for each isolation/purge point - 16 trucks are available to isolate - one truck (3 crew) per isolation point	Network isolation (or sectionalisation) is unlikely to be required (per LOC) and even if it is, more reasonable assumptions are: - 4 hours per crew per section/isolation - sectionalisation size of 1,500 - 2,000 customers - many more trucks available - one truck (2-3 crew) per isolation point
Customer isolation	- 10 min per property per resource - isolation of inaccessible meters has negligible impact	A more reasonable estimate is 5 min per customer[133]
Customer reconnection	- 21 min per property per resource - one operator per customer	21 minutes is a reasonable estimate

Source: ATCO, Supply Interruption Customer Weeks Lost Assessment

373. ATCO has determined the number of personnel available for each of the above activities and has assumed what we consider to be very conservative estimates of the resources that can and would be brought to bear in an emergency. Specifically, in our view, vehicles, equipment and qualified personnel is unlikely to be a constraint for the customer isolation and reconnection work because:

[132] Based on EMCa's experience

[133] Victoria 1998 Longford incident: 1.2 million customers were isolated in 10 days

- emergency planning will enable rapid response, including mobilising the hundreds of other gas fitters with vehicles and equipment in WA (i.e. that are not ATCO contractors); and
- ATCO has assumed 37 qualified personnel and their vehicles will be required to attend to routine (BAU) matters during the 'catastrophic' emergency. Whilst some staff would need to be redirected for the most urgent work (e.g. class 1 leaks), we consider it more likely that all resources will be made available to assist with emergency response including cancelling planned works, and that ATCO's BAU resource assumption is unnecessarily conservative.

374. The limiting factor is likely to be specialist gas equipment and not trucks. Emergency spares and/or rapid procurement plans should be proactively prepared to reduce customer outage time.

375. ATCO's modelling results in a scenario with more than 100,000 customer weeks being lost when 30,000 customers are involved in the isolation, repair, reconnection sequence, with the number of customer weeks lost increasing exponentially with increasing customers lost. In arriving at these results, ATCO has undertaken some sensitivity analysis which shows, for example, that by doubling the number of customers per isolation point to 100, the customer weeks lost is reduced by about 45%. Similarly, adding 7 more trucks (i.e. 23 up from 16) reduces the customer weeks lost by 25%[134]. Based on our experience, and by considering ATCO's sensitivity analyses, we consider that with good emergency planning and preparation, the average customer restoration time should be at most 14 days.

376. In summary, we consider that:

- Frequency - ATCO's methodology for calculating the frequency of third-party pipeline damage leading to the network isolation should include a further RRF to account for the low likelihood that a puncture (loss of containment) leads to the need for network isolation; and
- Consequence - taking into account our assumptions in ATCO's model in the table above, we estimate that the number of customer weeks lost is unlikely to be greater than 100,000 unless supply to more than 50,000 - 60,000 customers is lost.

Caversham project

377. ATCO has determined that third-party damage to several network pipeline segments presents a High risk and has proposed $15.75m capex to install bypasses on two pressure relief stations (PRS) and linking the Parmelia Gas Pipeline (PGP) to a third PRS. ATCO has determined that the frequency of such loss of supply is 'Remote' and that the number of customer weeks lost is a 'Catastrophic' consequence[135, 136]:

- 50,121 customers affected with 237,049 customer weeks lost (between 7 and 59 days to reconnect the customers) in one scenario; and
- 37,197 customers affected with 137,462 customer weeks lost (between 7 and 44 days to reconnect the customers) in another scenario.

[134] ATCO, Supply Interruption Customer Weeks Lost Assessment, Figure 4-2, page 14

[135] ATCO, Attachment 12.46 Security of Supply – Caversham Business Case, 31 August 2018, page 4

[136] These estimates are significantly lower than the stated loss of 220,000 and 26.5 weeks (186 days) in the draft Business Case dated 24 August 2018 referred to in section 5.3.4 for the proposed new Caversham gate station

378. ATCO evaluated two other network options: (i) looping high risk segments and installing isolation valves; and (ii) no action. The first option is slightly more expensive than ATCO's preferred option and ATCO concludes that the 'no action' option is not feasible due to its risk rating of High[137].

379. ATCO also considered two non-network options: (i) concrete slabbing; and (ii) increased pipeline patrol frequency. It considers that although slabbing provides a 'strike' frequency reduction of 90%, this is not sufficient to reduce the risk levels within the Caversham region to an acceptable level. However, ATCO has provided no analysis to support this claim in its business case. Similarly, ATCO estimates that patrolling the pipeline segments daily instead of weekly will reduce the corresponding RRF from 0.75 to 0.1. However, ATCO contends that this is not sufficient to reduce the risk to an acceptable level[138].

380. Based on our assessment of the options discussed above:

- applying AS4645.1:2018 measures and, if necessary, increasing the surveillance to daily, results in the likely frequency rating of third-party damage leading to the need for network isolation reducing to 'Hypothetical' (i.e. less than 1:10,000);
- the number of customer weeks lost is likely to be less than 100,000 in either of the two scenarios considered, leading to a consequence level of Major; and
- we consider the scenario to have an overall risk level of Intermediate, in which case an ALARP test would be required, as described in Appendix B. ATCO has not undertaken such a test.

381. ATCO advised that it has assumed the worst-case outcome in the consequence scenarios it has presented and is waiting for the results of a condition assessment of pipeline HP28 which was scheduled for September 2018[139]. If the results allow ATCO to operate HP28 normally, the required capex is reduced to $0.7m[140].

382. The possibility that the bulk of the $15.0m proposed capex may not be required, combined with our other findings pertaining to the overly conservative nature of ATCO's risk assessment, leads us to conclude that the proposed expenditure is unlikely to satisfy the capex criteria.

Two-Rocks Project

383. ATCO has determined that third-party damage to three segments of pipeline in the Two Rocks area presents a High risk by 2024 (the current risk is rated as Intermediate) and has proposed $26.5m capex to install a new Gate Station on the DBNGP and [redacted] of new pipeline (looping). ATCO has determined that the frequency of such loss of supply is 'Remote' and that the number of customer weeks lost is a 'Catastrophic' consequence:

- 56,737 customers affected with 298,362 customer weeks lost (between 7 and 67 days to reconnect the customers) under one scenario; and

[137] ATCO's risk acceptance criteria a High risk must be reduced to Intermediate of lower.

[138] *Ibid,* page 3-5

[139] *Ibid,* page 5

[140] *Ibid,* page 15

- 41,306 customers affected with 166,224 customer weeks lost in another (the restoration range is not provided) [141].

384. The risk is currently rated as Intermediate because ATCO installed remotely controlled isolation valves which has reduced the number of customers exposed to loss of supply to 19,000. The increase to 56,737 customers at risk by 2027 is due to forecast growth in customer numbers.

385. ATCO evaluated five other network options: (i) LNG virtual pipeline, (ii), Muchea connection and looping, (iii) DBP interconnection, (iv) ERM interconnection, and (v) no action.

386. [redacted]

387. ATCO also considered two non-network options: (i) concrete slabbing, and (ii) increased pipeline patrol frequency. For the same reasons espoused in the Caversham project business case discussed above, ATCO does not consider these options to be sufficient to reduce the risk from High[142].

388. Our assessment of the frequency, consequence and overall risk level is as for the Caversham case discussed above where we consider the risk to be Intermediate and should therefore be subject to the ALARP test. We further consider that the ALARP test is unlikely to be satisfied and therefore we do not consider the expenditure satisfies the capex criteria.

Bunbury Project

389. ATCO has determined that third-party damage to a [redacted] segment of pipeline in the Bunbury area presents a High risk and has proposed $7.6m capex to install partial looping. ATCO has determined that the frequency of such loss of supply is 'Remote' and that the number of customer weeks lost is a 'Catastrophic' consequence:

- 37,140 customers affected with 137,4083 customer weeks lost (between 7 and 44 days to reconnect the customers)[143].

390. ATCO evaluated three other network options: (i) a Kemerton connection; (ii) LNG virtual pipeline, and (ii) no action. The first and second options are significantly more expensive than ATCO's preferred approach and because of its High risk assessment it concludes that 'no action' is not feasible.

391. ATCO also considered two non-network options: (i) concrete slabbing, and (ii) increased pipeline patrol frequency. For the same reasons espoused in the Caversham project

[141] ATCO, Attachment 12.44 Security of Supply – Two Rocks Business Case, page 2-5

[142] *Ibid,* page 8-10

[143] ATCO, Attachment 12.45 Security of Supply – Bunbury Business Case, page 3

business case discussed above, ATCO does not consider these options to be sufficient to reduce the risk from High[144].

392. Our assessment of the frequency, consequence and overall risk level is as for the Caversham case discussed above, where we consider the risk to be Intermediate and should be subject to the ALARP test. We further consider that the ALARP test is unlikely to be satisfied and therefore we do not consider the expenditure satisfies the capex criteria.

Further comments based on our experience

393. There are hundreds of supply pipelines in Australia which have been through AS 2885 Safety Management Studies that have concluded that similar supply threats to that described by ATCO have a Hypothetical or Remote likelihood and a Major (not Catastrophic) consequence, giving a Low or Intermediate risk. The Intermediate risk scenarios are then considered ALARP as the cost to loop or otherwise backup supply is disproportionate to lowering the risk further.

394. From our experience, therefore, ATCO would be out of step with Australian industry practice if it was to proceed with the proposed security of supply projects, and the cost of doing so would place an unwarranted premium on its prices.

Conclusions

395. Based on industry practice, and our assessment of assumptions in ATCO's business cases, we consider that none of ATCO's proposed security of supply expenditure is likely to satisfy the capex criteria.

6.3.6 SCADA projects

SCADA and Infrastructure

396. The business case[145] seeks approval to install SCADA and infrastructure (including telemetry and communication devices) for enhanced remote-control capability and operational technology integration into business applications at a capex cost of [redacted][146] and with opex of [redacted] in aggregate over the AA5 period. The stated drivers are: (i) emergency risk management (to prevent catastrophic loss of supply); (ii) to support network growth and capacity; and (iii) to reduce UAFG.

397. With respect to the emergency risk management driver, ATCO is proposing expenditure to 'improve the response time' for an event with a Remote frequency of occurrence (1:1000 years – 1:100,000 years) or Hypothetical frequency (1:1,000,000 million years or lower), depending on the location of the pipeline. For reasons discussed in Section 6.3.5, we do not consider that ATCO's assessment of High risk from a pipeline loss of containment event is adequately substantiated – we consider the overall risk to be Intermediate at most and therefore subject to the ALARP test. We do not consider there is sufficient basis for the proposed expenditure in the AA5 period on reducing security of

[144] *Ibid,* page 5-6

[145] ATCO, Attachment 12.53 Business Case SCADA System and Infrastructure CONFIDENTIAL

[146] The project analysis includes [redacted] for an IT program (Network Digitisation and intelligence) to support the Operational technology program of works – it is included in Attachment 12.53 *Business Case SCADA and Infrastructure CONFIDENTIAL;* there is a typographical error in the first paragraph of the Executive Summary (should be [redacted] not [redacted])

supply risk and therefore the claimed benefit from saving $3.6m every seven years[147] is invalidated.

398. We note the presumed benefits in AA6 and beyond described in the business case, which do not include the claimed benefit from 'reduced emergency management risk', result in an estimated positive NPV of $0.9m[148]. However, our assessment of the NPV analysis[149] for the preferred option 1 reveals that:

- the assumed benefits in ATCO's NPV analysis[150] appear to be greater than described in its business case[151];
- the capex costs are numbers with no basis for them provided;
- ATCO does not appear to fully account for future replacement of its SCADA and other infrastructure in accordance with asset lives that are much shorter than ATCO's NPV analysis period;
- the present value breakeven period for the project is 35 years, well in excess of the 10-year asset economic lives of the SCADA and other infrastructure;
- the sensitivity analysis does not consider reduced benefits as a scenario – even a small reduction in assumed benefits will result in a negative NPV.

399. We do not consider that the NPV analysis is sufficiently robust nor compelling to support the proposed investment of [redacted].

400. ATCO has considered the option of developing its current data acquisition infrastructure ('Neon') to enhance remote control capability but assesses this to have a higher capital cost and a lower NPV than the preferred case. ATCO also considered the 'no action' option and whilst this has the lowest capital cost [redacted] and no opex, ATCO's analysis is that it has a negative NPV.

401. In summary, ATCO has not provided sufficient justification for the proposed expenditure to satisfy the capex criteria.

Enhanced Data Acquisition

402. ATCO proposes expenditure of [redacted] capex and annual opex of [redacted] in aggregate over AA5 to: (i) ensure compliance with the GSSR and AS4645.1:2018; and (ii) ensure critical HP pipeline corrosion mitigation controls are functional to reduce the risk of asset deterioration to ALARP. ATCO claims that the project will realise tangible benefits from UAFG reduction from 2025 onwards[152]. It is linked to the SCADA infrastructure ATCO proposes installing in 2020 per the discussion in the preceding section.

[147] ATCO, Attachment 12.53 Business Case SCADA System and Infrastructure CONFIDENTIAL, page 10

[148] ATCO, Attachment 12.53 Business Case SCADA System and Infrastructure CONFIDENTIAL, Tables ES.2 and 2.1 state an NPV benefit of $10.1m but the cost benefit description on page 10 and the NPV spreadsheet provided both identify $0.9m as the NPV

[149] ATCO, SCADA FET – Option 1 (CONFIDENTIAL)

[150] Remote optimisation of the GDS for pressure and flows, and increasing capacity of networks enables better design decisions

[151] Including growth in benefits from 'remote optimisation of the GDS for pressure and flows' from [redacted] in 2025 to [redacted] pa by 2040 and onwards

[152] ATCO, Attachment 12.54 Business Case Enhanced Data Acquisition CONFIDENTIAL

403. ATCO assesses the current and residual risk for the three options presented[153] to be Intermediate. In our view there is inadequate justification of the risk rating for odorant failure and it is likely to overstate the risk[154]. We consider a risk rating of low is more reasonable, in which case all three identified risk events[155] would have a low or negligible rating.

404. ATCO's NPV analysis includes: (i) benefits attributable to UAFG reduction which are largely unsubstantiated, and which appear to be duplication of the benefits claimed in the SCADA and infrastructure project discussed in the preceding section; (ii) a payback period of 29 years (even with what we consider to be optimistic benefits); and (iii) no sensitivity analysis with reduced benefits.

405. We consider that there are likely to be more cost-effective approaches to acquiring data to provide the potential benefits stream. We expect that trials using relatively cheap data loggers or other temporary measures will provide the required substantiation or otherwise of the assumed benefits, from which a business case could be developed. Until that work is done, we do not consider that the investment has been adequately justified.

Automated Meter Reading (AMR)

406. ATCO proposes spending [redacted] over the AA5 period to install AMR device enabled meters (mainly domestic), different meter types (with in-built remote communication) or data acquisition (telemetry and communications) on existing Metersets to remotely access customer usage data over a 10-year trial period. The driver for the expenditure is '*customers' future preference for natural gas is eroded by limited metering options restricting developers' installation options and customers' ability to manage their future energy mix'*[156]. ATCO rates the risk (to ATCO) as negligible. ATCO estimate a positive NPV for the project of $0.1m. It appears that the tangible benefit included in the NPV analysis is from reduced opex[157], beginning in 2025.

407. There are insufficient details provided in the business case to support the positive NPV assessment and it is not clear what new information will be gained from the trial that cannot be gleaned from other trials and studies around the world.

Conclusions

408. We do not consider that any of the proposed $12.6 m expenditure under this capex category nor the [redacted] network digitisation and intelligence program under the IT program (but included in the analysis in this category) is likely to satisfy the capex criteria.

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[153] Daily manual data acquisition; No new action (continue with current manual read frequency)

[154] For example, ATCO rates the third party odorant system failure to be a Catastrophic consequence, which we consider to be excessive in the absence of compelling information referenced to the AS4645.1:2018 risk management process, as discussed in Appendix B of this report.

[155] The other two being equipment failure on MPR causing disruption to customer gas supply and corrosion protection fault leading to a degradation in pipeline integrity

[156] ATCO, Attachment 12.55 Business Case Automated Meter Reading CONFIDENTIAL, page vi

[157] ATCO identify the '[p]otential to minimise additional operational resources to deliver retailer services thus reducing costs to ATCO and the Retailers (the Users of the GDS). ATCO has estimated the annual benefits for the AA5 expenditure as [redacted] beginning in 2025 and [redacted] ongoing from 2030. Source: ATCO, Attachment 12.55 Business Case Automated Meter Reading CONFIDENTIAL, page 5

6.3.7 PGP interconnection projects

Forrestfield

409. ATCO proposes spending [redacted] to interconnect with the PGP at Forrestfield to reduce what ATCO assesses to be an Intermediate risk associated with the loss of the DBNGP. The rating of Intermediate risk is based on[158]:

- a frequency of Hypothetical; and
- a consequence of Catastrophic due to the predicted loss of supply to 220,000 customers, resulting in 4 million customer weeks lost (based on ATCO's assumption of 257 days to restore all customers).

410. Whilst we consider that ATCO's assessment of 4 million customer weeks lost is grossly overstated, if we accept ATCO's analysis that 220,000 customers lose supply from the hypothetical event, it is likely that the customer weeks lost would be greater than 100,000 (and therefore in any case would be rated as catastrophic). We therefore consider that ATCO's overall risk rating of Intermediate is reasonable in this case.

411. ATCO considered two other network options in its business case: (i) ATCO build, own and maintain the gate station with APA operating it; and (ii) no action. Whilst we have concerns with the assumptions underpinning the cost estimate (capex and opex) of the first of these options, it remains materially more expensive than the preferred option which is based on APA maintaining and operating the gate station. ATCO does not consider the 'no action' option to be acceptable as it '*does not address the risk of losing 220,000 customers as a result of a DBP failure'*[159].

412. For the reasons discussed in Appendix B, we consider that ATCO needs to properly apply the ALARP test to demonstrate that the proposed expenditure satisfies the capex criteria. It has not undertaken this analysis and we consider it unlikely that cost-benefit analysis will support the project, particularly if the impact of the proposed development of the Waitsia gas field development is accounted for[160].

Rockingham

413. ATCO assesses the risk of loss of supply to 92,000 customers in the Rockingham network for an extended period from the loss supply of the DBP to be Intermediate.

414. Our assessment of ATCO's proposed [redacted] PGP interconnection to mitigate this risk is similar to the Forrestfield PGP interconnection project assessment above.

Deferral of PGP interconnection projects

415. ATCO planned to undertake five PGP interconnection projects in the AA4 period but will only complete one (at Caversham), having deferred two into the AA5 period (as discussed above) and the other two beyond 2024. Negotiations with APA have been cited as a reason for delays, however based on the information provided, we do not consider this sufficient to explain the extent of the deferrals. In our view, ATCO's

[158] ATCO, Attachment 12.32 PGP Interconnection Business Case – Forrestfield, page 1

[159] *Ibid,* page 5

[160] The Waitsia development near Dongara is likely to connect to the DBP and PGP and, if so, will reduce the risk of loss of supply from the DBP

decision to defer the four other projects beyond the AA4 period is a further indication that the benefit in terms of reduced risk is outweighed by the cost.

Conclusion

416. We do not consider that either of the proposed AA5 PGP interconnection projects are likely to satisfy the capex criteria.

6.3.8 Other network sustaining capex projects and programs

Inline inspections – facility upgrade

417. ATCO has an obligation under AS2885 to demonstrate high pressure (HP) pipeline structural integrity. ATCO has five HP pipelines which it has identified for in-line inspection (ILI) during the AA5 period. The alternative to ILI is excavation and direct inspection at locations where Direct Current Voltage Gradient (DCVG) indicates defects. Relying on DCVG alone is not consistent with good industry practice. ATCO proposes $9.2m capex for design, procurement and installation of the components to make each pipeline capable of ILI and $2.5m opex in AA5[161].

418. We are satisfied that the ILI approach is consistent with good industry practice, that the nominated pipelines are due for ILI, and that the cost estimate is likely to satisfy the capex criteria as it is based on ATCO's cost estimation for similar work in the AA4 period.[162]

Network improvements

419. ATCO has proposed a total of $4.0m on five projects and programs over the AA5 period, including:

- Meter compliance – a proposed $1.4m program is to replace high-risk, non-compliant meters in the CBD and 'City Centre Areas'[163]. This is a continuation program from AA4;
- Step touch mitigation systems – a $1.2m program that is a continuation of work required to comply with a Building and Energy Division Corrective Action Request. The program is planned to run from 2017 – 2029[164];
- Facility upgrade - PRS security – the proposed $0.5m capex is to install palisade fencing around selected pressure reduction station sites to provide a higher level of security against unauthorised entry[165];
- Pressure monitoring devices (PMD) – the proposed $0.5m expenditure is for 30 PMDs to gather real-time pressure data remotely; and

[161] ATCO, Attachment 12.43, Facility Upgrade – Pigging Infrastructure Business Case, pages 1-4. We note that in its opex forecast, ATCO has proposed $3m rather than the $2.5m stated in attachment 12.43.

[162] ATCO is undertaking an upgrade project in 2019

[163] ATCO, Attachment 12.47 Meters Compliance Project, page iii

[164] ATCO, Attachment 12.30 Facility Upgrade – Step & Touch Hazard Mitigation Business Case, pages vi - 7

[165] ATCO, Attachment 12.31Business Case Facility Upgrade – PRS Security CONFIDENTIAL, page v

- Vehicle protection – the proposed $0.4m capex[166] is to protect high pressure regulator facilities against damage from vehicle impact. It is part of a continuation program from AA4.

420. We are satisfied that each of these programs of work is prudent and that the proposed expenditure is likely to satisfy the capex criteria.

Conclusion

421. We consider that the $12.6m AA5 capex for the ILI program and network improvement programs proposed by ATCO[167], is prudent and likely to satisfy the capex criteria.

6.4 Assessment of proposed network growth capex

422. As shown in the table below, the majority of growth capex is directed to facilitating new domestic customer connections in new subdivisions bordering the existing ATCO network.

Table 23: AA5 Network growth capex by project groupings

$m, real Dec 2019 Projects	Total AA5
New customer connections	
sub-total	**165.7**
Total network growth	**174.3**

Source: EMCa analysis from AAI

6.4.1 Greenfield and brownfields customer connections

423. We summarise ATCO's forecast new connections in Section 4. These total 78,969 greenfields connections[168] and 4,065 brownfields connections[169] over AA5, or an average of 16,607 per year.

[166] ATCO's AAI, page 109 refers to $0.2m capex for this project, however ATCO's AA5 Capex Forecast Model CONFIDENTIAL, AMP Table worksheet cell J325 shows $0.414m capex, which we have relied upon

[167] $0.5m for the Facility upgrade – PRS Security project is captured under Facilities, Plant and Equipment.

[168] ATCO, Attachment 12.41 Greenfields new Connections Project Brief, Table 4.3 page 6

[169] ATCO, Attachment 12.42 Brownfields new Connections Project Brief, Table 4.3 page 9

Incremental Revenue Test

424. Under the NGR, expenditure on new connections must pass either an economic test or an incremental revenue test in order for it to be capitalised into the RAB. ATCO has undertaken an incremental revenue test.

425. As discussed in Section 4 (and with supporting analysis in Appendix C) we have assessed ATCO's incremental revenue analysis, which ATCO has provided for its B2 and B3 connections, and which comprise almost all forecast connections. We find that it does not support the proposed capex. The positive NPV that ATCO has presented is incurred only after 50 years, which we consider unreasonably long for such an investment, especially given ATCO's rapidly worsening per-customer usage. Further, ATCO has used its proposed increased tariffs in its analysis, rather than its prevailing tariffs (as required in the Rules). As we illustrate in Appendix C, adjusting for this leads to a negative NPV that persists no matter the analysis period, including after 50 years.

426. It is a requirement of the Rules that such growth capex can be accepted into the RAB only if it meets this test; however, ATCO has not satisfactorily demonstrated that it does so.

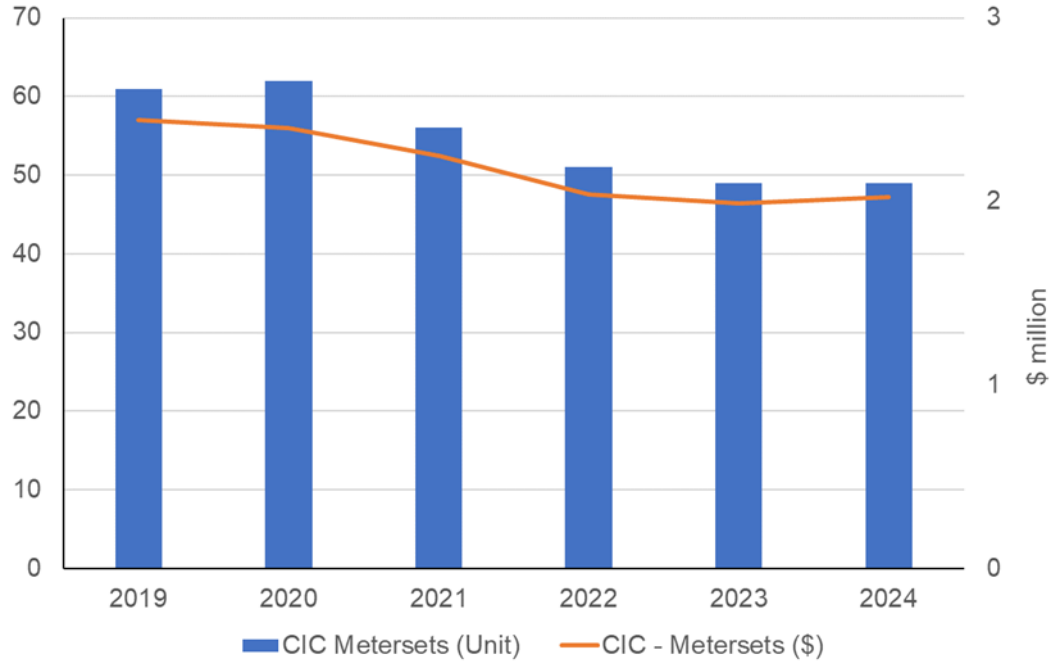
427. From our review, we observe that the analysis is naturally sensitive to assumed capex costs of new connections and also to the assumed incremental opex cost for supporting each new customer and for maintaining the associated addition to ATCO's network. The negative economics are essentially a function of the incremental capex and opex costs that ATCO has proposed for its AA5 allowances.

Customer Initiated Commercial (CIC) metersets and AL18 meters

428. The CIC meterset connection project covers meter installations larger than AL18. ATCO forecasts connection of [redacted] CIC metersets in the AA5 period based on '*the trend in total commercial connections from third party demand forecast'* [170]. The figure below shows the assumed trend in CIC metersets volume and the corresponding capex (using ATCO's average unit rate of [redacted]), which is estimated using historical costs and adjusted to scope of the project).

[170] ATCO, Attachment 12.5 Asset Lifecycle Strategy Metering Facilities, page 22-23

Figure 22: Forecast AA5 CIC metersets volume and capex



Source: ATCO, Assest Lifecycle Strategy Metering Facilities, Tables 4.1 and 4.4

429. On the basis of the information provided, we consider the proposed expenditure on CIC metersets is likely to satisfy the capex criteria.

430. AL18 new meter connections are customer-initiated standard installations and form part of the variable volume activities. ATCO proposes connecting a steady 22 new AL18 meters per year in the AA5 period at a total cost of $0.7m. Given our concerns regarding ATCO's growth outlook and ATCO's own forecast decline in third party demand for CIC metersets (per Figure 22), we consider only half this amount is likely to satisfy the capex criteria.

Growth development

431. Developers on occasion develop tracts of land so far from the existing gas network that, in some cases, the cost of the infrastructure required to connect to the new developments needs to be offset by a developer capital contribution to achieve a positive project NPV. ATCO proposes capex of $10.4m in the AA5 period. Forecasting the volume is performed by a combination of factors, predominantly collaboration with developers. The cost estimate is developed using defined contractual rates[171]. We consider this approach to be reasonable and that the proposed expenditure, in conjunction with capital contributions, is likely to satisfy the capex criteria.

432. ATCO has allowed $1.3m for meter upgrades to respond to customer-initiated requests, which is based on historical volume and unit costs. We consider this to be a reasonable estimate, noting that we would expect a capital contribution from customers for this work.

433. ATCO has also made a provision of $2.8m over the AA5 period for 'subs to masters' conversions, which are described as customer initiated. We requested that ATCO identify the documentation to support the proposed expenditure, but insufficient

[171] ATCO, Attachment 12.4 Asset Lifecycle Strategy Pipelines, Mains and Services, page 33

information was provided in ATCO's response to form a view that the forecast is likely to satisfy the capex criteria [172].

434. ATCO has allowed -$7.6m in its capex forecast to account for capital contributions towards the work described above to achieve economically justified investments, with the amount based on historical ratios. This approach is reasonable.

Network reinforcements

435. ATCO has provided six Project Briefs covering $1.7m total capex over five years targeted at four high growth areas[173] and two upstream regulator upgrades. ATCO uses an industry standard software model ('SynerGi') to identify when network reinforcement projects are required to maintain capacity.

436. Whilst this may be a slightly optimistic forecast given our concerns regarding ATCO's growth outlook, the four areas identified are known high residential growth areas. Any delay in activity if lower than expected growth eventuates will not have a material effect on ATCOs total AA5 capex expenditure.

Conclusions

437. Based on the findings above we find that ATCO has not provided sufficiently compelling information for $157.5m (90%) of the proposed $174.3m AA5 capex to satisfy the capex criteria.

6.5 Assessment of proposed IT capex

438. The table below shows the five sub-categories of forecast AA5 IT capex, with the Application Renewal program representing almost 70% of the proposed $36.1m. The Application renewal program comprises six projects with timing based on impending lack of vendor support for existing applications and/or the release of major upgrades.

[172] Information Request EMCa 12, 19 September 2018

[173] Queens Park, Secret Harbour, Atwell, and North Metro

Table 24: Forecast AA5 IT capex

$m, real Dec 2019 Projects	Total AA5
Energised and Responsive Customer Engagement	2.9
Network Digitisation and Intelligence	1.3
Asset Management and Service Delivery Excellence	2.0
Enterprise and Employee Enablement	4.9
Application renewal	
[redacted]	
sub-total application renewal	24.9
Total IT capex	**36.1**

Sources: AAI table 12.4 and Att. 12.17 table ES.4

Quality of the supporting information is inadequate

439. ATCO has provided five[174] business cases to support the five projects/programs listed in the table above. The business cases have not yet been through the designated capital expenditure governance process at Gate 1. Whilst ATCO's IT strategy provides the context for the upgrade work, the quality of the business case information falls well short of that which is required to justify the expenditure as proposed in the AA5 period in the majority of cases[175]. In reviewing the IT business cases, we found in one or more instances that:

- only one option other than the preferred approach is presented, and that is 'no action'. The preferred option is often replacement. ATCO advised at our on-site meeting that options such as extending vendor support will be explored during the more detailed project analysis, but that this is yet to be undertaken;
- the claimed safety, reliability, productivity, and efficiency benefits are largely vague, unsubstantiated qualitative statements; and
- cost estimates are preliminary – engagement with vendors is only in the preliminary stages. Whilst the costs of programs were estimated with assistance from Deloitte, the resulting P50 estimates were subsequently modified by ATCO staff[176]. Based on our experience with IT projects at this stage of their project lifecycle, the accuracy is unlikely to be better than ±30%.

IT Asset strategy provides an adequate roadmap

440. The IT Asset Strategy document provides sufficient information to support the case for at least considering each of the recommended projects and explains how they fit within ATCO's IT and OT landscape and detailed IT architecture. However, strategy

[174] Network Digitisation and Intelligence project described within Attachment 12.53 Business Case SCADA System and Infrastructure CONFIDENTIAL

[175] The exceptions being the SAP Support packs, and the GIS upgrade

[176] ATCO, Attachment 12.13 Information technology Asset Strategy, page 71

documents do not provide sufficient justification for individual programs of work – compelling business cases and supporting evidence are also required.

441. The IT strategy document and the business case for the application renewal suite of projects demonstrates that ATCO has considered the challenges with the project development and delivery lifecycle for each of the projects and the challenges associated with delivering ten significant and complex projects in the space of five years. However, we remain concerned about the degree of activity and therefore the burden on staff during this time. For example, in 2022 and 2023 ATCO's proposed program would involve four and five projects respectively running concurrently. We consider there is considerable risk of overall program slippage towards the end of AA5 of at least 12 months[177].

Network digitisation and intelligence project is considered in sustaining capex category

442. The justification for the network digitisation and intelligence project ($1.3m) was included in the SCADA system and infrastructure program of work[178]. We did not consider there was sufficient justification for that program. We also note the link to the proposed AMR program which we do not support. By extension, the network digitisation and intelligence program is, in our view, not adequately justified.

Conclusions

443. With the exception of the Network digitisation and intelligence project, we consider there is a reasonable case for the identified projects progressing in one form or another. However, the cost and timing of the projects are far from certain, due primarily to the immature state of the 'business cases' provided for our review. We consider that a 20% reduction (-$7.0m) to the balance of the proposed aggregate expenditure of $34.8m will represent expenditure that is likely to satisfy the capex criteria. This is on the basis of (i) future progressive refinement of the business cases, including more robust options analysis (including cost-benefit analyses) and cost estimates, and (ii) a rigorous portfolio level review of the corporate risk of trying to deliver so many projects in a five year period, given most bring system integration challenges. We consider that these factors will lead to less expenditure being required in the AA5 period. Taking into account the -$1.3m adjustment for the Network digitisation and intelligence project, we propose an adjustment of -$8.3m to the proposed AA5 IT capex.

6.6 Assessment of proposed structures & equipment

444. The table below shows the structures & equipment expenditure categories of $22.8m for AA5, being $17.2m (43%) less than the last five years of AA4, primarily due to less depot-related work. The dominant expenditure category is Fleet capex, which in turn is dominated by age-based replacement at $15.9m (or 97%), with the balance of $0.4m growth-driven. The remaining $6.5m of the structures and equipment expenditure

[177] CC&B expenditure of [redacted] is all due to be incurred in 2023 and 2024

[178] ATCO, Attachment 12.53 Business Case SCADA System and Infrastructure CONFIDENTIAL, section 3.1.2

forecast is directed towards plant & equipment replacement which is also largely age-based.

Table 25: Forecast AA5 structures & equipment capex

$m, real Dec 2019 Projects	Total AA5
Fleet	16.4
Facilities and plant and equipment	
Facility improvement	*0.5*
New Depot - Osborne Park (Building)	*0.7*
Facility Upgrade – PRS Security	*0.5*
Plant and equipment	*4.8*
sub-total facilities and plant and equipment	6.5
Total Structure & Equipment Capex	**22.9**

Sources: AAI table 12.15 & 12.16

6.6.1 Fleet

445. Total AA5 forecast fleet capex comprises $1.5m for demand driven additional asset activities[179] with the balance of $14.5m assumed to be for EOL vehicle replacement.[180]

Fleet replacement

446. ATCO forecasts its long-term replacement plan for fleet assets using age-based life cycles, with actual replacement decisions based on vehicle utilisation and condition[181]. The fleet strategy document not only provides the asset strategy but also the detailed asset plan for each fleet class, including detailed costing. This is detail we would expect to see in asset plans and in a business case.

447. There is sufficient information in this case to allow us to conclude that:

- ATCO has an adequate understanding of its fleet assets;
- it has a logical replacement plan and forecast for asset class and each vehicle based on a simple age model;
- ATCO refined its fleet management approach during the AA4 period[182], resulting in reduced expenditure and this has been accounted for in its forward estimate; and
- ATCO's unit costs are based on tendered prices.

448. Overall, we consider the proposed $14.5m for fleet replacement is reasonable and is likely to satisfy the capex criteria.

[179] Sourced from ATCO, Att 12:50 Capex Forecast Model CONFIDENTIAL, Fleet, Capital Projects Growth, Reference

[180] Derived from ATCO, Att 12:50 Capex Forecast Model CONFIDENTIAL, Fleet, Reference total AA5 expenditure less Capital Projects Growth

[181] ATCO, Attachment 12.7 Asset Lifecycle Strategy Fleet, page vii - viii

[182] *Ibid,* page 24

Growth-driven fleet

449. ATCO bases its forecast fleet driven by network growth on the workforce plan, which is aligned to the program of network activities in the asset management plan. ATCO has identified that 24 new vehicles are required in six fleet asset types[183].

450. Based on our findings regarding network growth capex, we consider it would not be prudent for ATCO to plan for additional fleet.

6.6.2 Plant and equipment

451. The forecast plant and equipment expenditure is $4.7m, based primarily on historical costs and a run-to-failure strategy. Some plant is replaced if newer technology provides safer or improved operational performance[184]. The information included in ATCO's reference document provides adequate information for us to conclude that ATCO's asset strategy, its asset management approach, and its underlying asset knowledge are sufficient to form a reasonable cost estimate. On this basis the proposed expenditure is likely to satisfy the capex criteria.

6.6.3 Facilities

452. ATCO proposes spending $1.8m on: (i) depot minor works, forecast based on historical levels (about $100,000 per annum across seven depots); (ii) a disaster recovery facility in Osborne Park ($0.7m); and (iii) improved security at selected PRS compounds ($0.5m to upgrade fences and gates).[185]

453. Based on the information provided, we are satisfied that the proposed expenditure is justified.

6.7 EMCa adjustment assessment

6.7.1 Compliance with capex criteria

454. Our assessment of ATCO's proposed AA5 capex is based on ATCO's AAI and supporting information. To a significant extent, our assessments are based on our observations from the onsite meetings that we held with ATCO, together with information supplied pursuant to EMCa information requests.

455. We have taken a strict view of our obligations to advise the ERA based on the information that ATCO has provided us. It is possible therefore that further information from ATCO may lead us to different conclusions.

[183] *Ibid,* page 15 - we assume that some of the 24 vehicles are required for providing un-regulated and non-reference capital growth projects based on information in ATCO, Att 12:50 Capex Forecast Model CONFIDENTIAL, Fleet, Reference total AA5 expenditure less Capital Projects Growth

[184] ATCO, Asset Lifecycle Strategy Property Plant and Equipment (PPE), page

[185] There is no reference in the proposed AA5 capex forecast to expenditure associated with replacing the Wangara depot referred to in our assessment of AA4 capex

6.7.2 Aggregate adjustment assessment

456. Our assessed adjustments to ATCO's proposed AA5 capex allowance have been applied to each capex category. For the most part, we have adjusted proposed capex for all or part of specific proposed projects or programs, where we consider that the information ATCO has provided for our assessment does not demonstrate that the expenditure is likely to satisfy the capex criteria. For some categories, we have made adjustments based on systemic issues that we have identified and described, and which tend to reflect the preliminary nature of justification as currently presented, or generic issues.

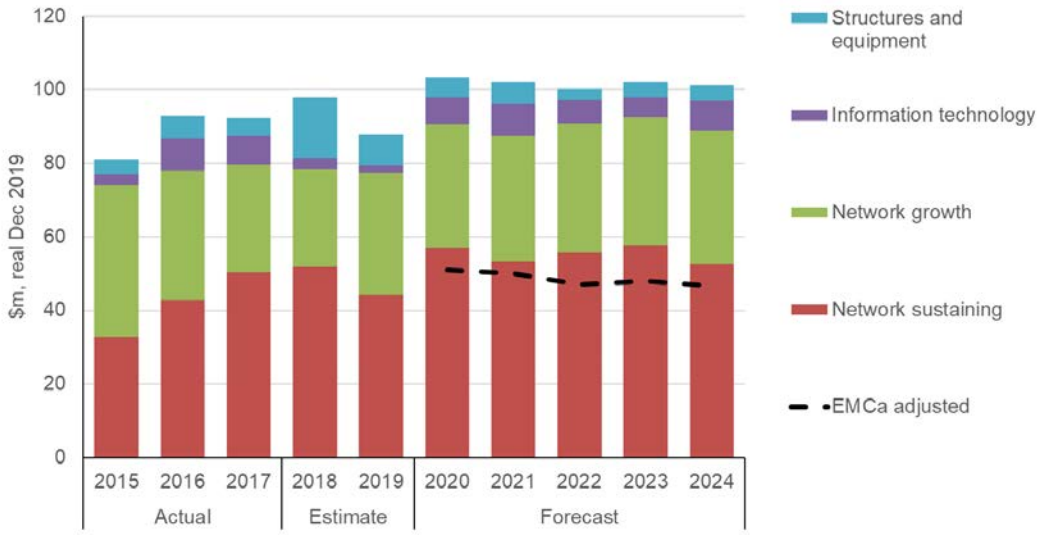
457. The aggregate impact of our assessed adjustments is a reduction to the proposed AA5 capex of $266.0m, which represents 52% of ATCO's estimated capex requirement of $509.3m. The adjustments over 5 years are shown in the table below.

Table 26: AA5 adjustment by capex category

$m, real Dec 2019							Total
Category		2020	2021	2022	2023	2024	AA5
Network sustaining							
	ATCO proposed	56.9	53.3	55.8	57.6	52.5	**276.1**
less	EMCa projects/program adjustments	-18.5	-17.3	-18.2	-18.8	-17.1	**-89.9**
less	escalation adjustment	-0.6	-0.9	-1.2	-1.5	-1.7	**-5.9**
less	overhead capex allocation adjustment	-0.4	-0.4	-0.4	-0.4	-0.3	**-1.9**
	EMCa adjusted	37.4	34.6	36.1	37.0	33.4	**178.4**
Network growth							
	ATCO proposed	33.8	34.2	34.9	35.0	36.5	**174.3**
less	EMCa projects/program adjustments	-30.5	-30.9	-31.6	-31.6	-32.9	**-157.5**
less	escalation adjustment	-0.1	-0.1	-0.1	-0.1	-0.2	**-0.6**
less	overhead capex allocation adjustment	0.0	0.0	0.0	0.0	0.0	**-0.2**
	EMCa adjusted	3.2	3.2	3.2	3.2	3.3	**16.1**
Information technology							
	ATCO proposed	7.4	8.8	6.4	5.5	8.0	**36.1**
less	EMCa projects/program adjustments	-1.7	-2.0	-1.5	-1.3	-1.8	**-8.3**
less	escalation adjustment	-0.1	-0.2	-0.2	-0.2	-0.3	**-0.9**
	EMCa adjusted	5.6	6.6	4.8	4.0	5.9	**26.9**
Structures and equipment							
	ATCO proposed	5.3	6.0	3.2	4.1	4.3	**22.8**
less	EMCa projects/program adjustments	-0.4	-0.4	-0.2	-0.3	-0.3	**-1.5**
less	escalation adjustment	0.0	0.0	0.0	0.0	0.0	**0.0**
	EMCa adjusted	4.9	5.6	3.0	3.8	4.0	**21.2**
TOTAL							
	ATCO proposed	103.4	102.2	100.4	102.2	101.3	**509.3**
less	EMCa projects/program adjustments	-51.1	-50.6	-51.4	-51.9	-52.2	**-257.2**
less	escalation & overhead adjustments	-1.2	-1.6	-1.9	-2.3	-2.5	**-9.5**
	Total EMCa adjusted	**51.0**	**50.0**	**47.0**	**48.0**	**46.6**	**242.6**
	Total adjustment ($)	*-52.3*	*-52.2*	*-53.3*	*-54.2*	*-54.7*	*-266.7*
	Total adjustment (%)	*-51%*	*-51%*	*-53%*	*-53%*	*-54%*	*-52%*

Source: EMCa analysis

Figure 23: ATCO Proposed AA5 capex allowance and EMCa adjusted



Sources: EMCa analysis

7 Proposed AA5 opex

7.1 Introduction

458. In this section, we first summarise ATCO's proposed AA5 opex allowance and the basis on which ATCO has sought to justify its proposed expenditure.

459. In Section 7.3, we review and assess the methodology and assumptions by which ATCO has developed its forecast opex allowance. In Section 7.4 we assess adjustments that we consider would result in an opex allowance that meets the requirements of the NGR.

7.2 ATCO's proposed AA5 opex allowance

7.2.1 Proposed AA5 opex

460. ATCO's aggregate actual and estimated expenditure for AA4 is shown in the table below, followed by its proposed opex allowance for the AA5 period. AA4 was for 5.5 years, whereas AA5 is for 5 years so the aggregate expenditures are not directly comparable. However, ATCO is proposing $357.3m in AA5, which compares with $320.9m for the last 5 years of AA4 (noting also that the last two of those years are ATCO's estimates).

Table 27: ATCO's opex in AA4(5.5 years)[186]

$m, real Dec 2019	Actual (AA4)				Estimate (AA4)		Total AA4
Category	2014 (Jul-Dec)	2015	2016	2017	2018	2019	(5.5 years)
Network	13.9	26.4	30.1	27.7	31.3	32.4	**161.7**
Corporate	11.3	18.1	13.6	16.2	19.1	19.5	**97.8**
IT	4.3	8.8	8.5	9.7	9.0	9.3	**49.6**
Licence Fees	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Network, Corporate and IT	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
UAFG	4.4	7.9	8.2	6.0	6.1	6.9	**39.4**
Ancillary Services	0.2	0.9	0.9	1.0	1.9	1.5	**6.5**
Total	**34.0**	**62.0**	**61.2**	**60.7**	**67.4**	**69.5**	**354.9**

Source: AAI Table 11.2 and Att. 18.1 Revenue & Pricing Model

Table 28: ATCO proposed allowance for AA5 (5 years)

$m, real Dec 2019	Forecast (AA5)					Total AA5
Category	2020	2021	2022	2023	2024	(5 years)
Network, Corporate and IT	58.4	60.1	63.1	64.8	66.0	312.4
UAFG	6.3	6.2	6.1	5.9	5.8	**30.3**
Ancillary Services	2.8	2.9	2.9	3.0	3.0	**14.6**
Total	**67.5**	**69.2**	**72.1**	**73.7**	**74.8**	**357.3**

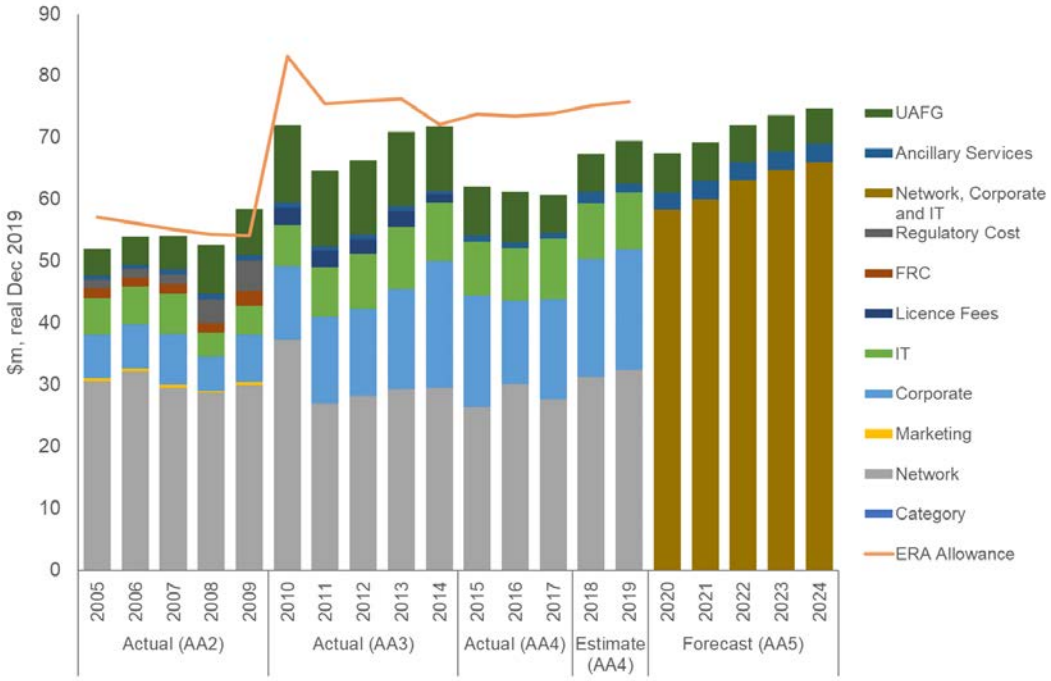
Source: AAI Table 11.2 and Att. 18.1 Revenue & Pricing Model

461. ATCO's longer-term expenditure trend is shown graphically below. ATCO has produced its AA5 opex forecast for the sum of network, corporate and IT as a combined amount, and has produced specific forecasts for UAFG and Ancillary Services costs[187].

[186] Note that varying lengths of the Regulatory Control Periods - AA4 is 5.5 years and ATCO proposed AA5 will be 5 years.

[187] In its AAI, ATCO also provided a bottom-up forecast for each of these components for comparison purposes. This amounts to more than its proposed forecast. We have assessed only the forecast that ATCO has proposed to ERA.

Figure 24: ATCO's trend opex compared with ERA allowances[188]



Source: EMCa graph derived from Att. 18.1 Revenue & Pricing Model

462. For AA4, ATCO expects to have spent $51.2m (13.2%) less than the ERA's allowance for this period. On a year-by year basis, the business markedly increased opex in AA3 relative to AA2 but has reduced opex in the three years of AA4 to date. ATCO has forecast a significant opex increase in the final two years of AA4 (i.e. in 2018 and 2019). At a category level, some trend features in AA4 are that:

- ATCO forecasts network opex increasing from 2017 to 2018 and further in 2019;
- ATCO forecasts corporate opex increasing from 2017 to 2018 and further in 2019: and
- ATCO's IT opex has increased from 2016 to 2017, but ATCO forecasts this to decrease again in 2018.

463. As the diagram above shows, ATCO's proposed AA5 allowance for the aggregate of network, corporate and IT is for a starting-point in 2020 that is a material increase from its most recent actual opex (i.e. in 2017), with year-by-year increases proposed through to 2024. ATCO's proposed UAFG allowance is similar to its 2017 actual cost, while its proposed allowance for Ancillary Services opex is approximately $2m higher than its actual costs up to 2017.

464. In aggregate, ATCO proposed allowance for AA5 ($357.3m) is 11% higher than the last five years of ATCO actual/estimate of AA4 ($320.9m).

[188] The original figures in ATCO Tariff model from 2010 – 2014 are year ending 30 June. For comparation purpose, we converted them to year ending 31 December.

7.2.2 Basis on which ATCO has sought to justify proposed AA5 opex

Network, corporate, IT and licence fees

465. ATCO has proposed an opex allowance for the aggregate of these opex components, using a base-step-trend approach. In summary, ATCO has calculated this by:

- determining a 2019 'Adjusted Base Year' allowance by:
  - starting with the 2019 opex allowance from ERA's previous decision;
  - deducting the extent to which ATCO's actual opex in 2017 was less than the ERA's 2017 allowance;
  - deducting the extent to which the ERA's 2019 allowance had a component for ATCO's AA5 regulatory preparation cost, and
  - adding the extent to which ATCO's 2017 employee incentive costs exceeded the ERA's 2017 provision for such cost component;
- adding three recurrent and five non-recurrent step changes; and
- applying trend increases to the above, to allow for:
  - ATCO's forecast relationship of opex with output growth, comprising a weighted combination of its forecast growth in its customer numbers and its pipeline length, and
  - ATCO's forecast real labour cost growth.

466. ATCO has sought to justify each of these elements in its forecasting approach, and we have assessed its forecast by assessing each of them in turn.

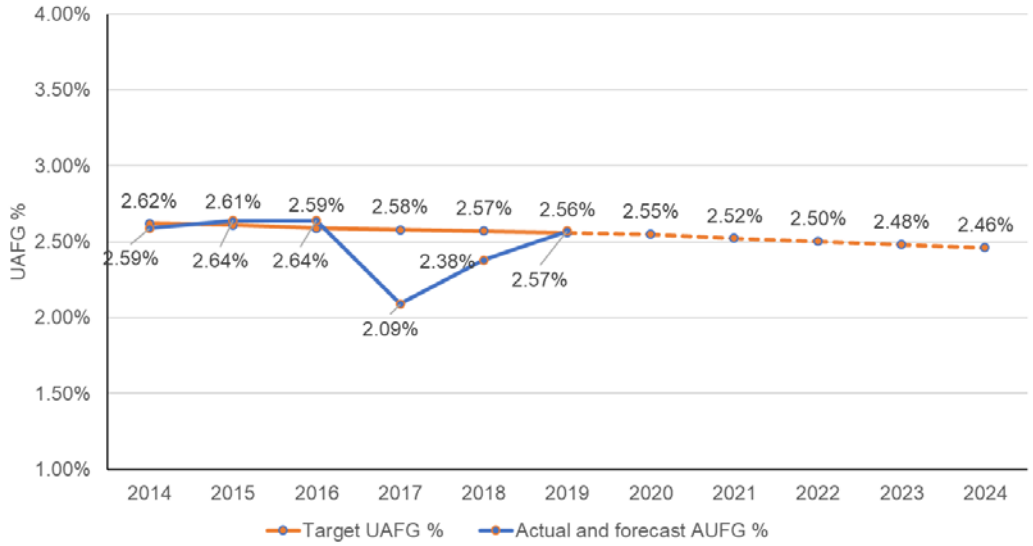
UAFG

467. ATCO has forecast its UAFG cost based on:

- its forecast UAFG volume as a percentage of its forecast gas sales volumes; and
- its assumed gas price.

468. ATCO's forecast AA5 UAFG volume represents a similar, though slightly lower, rate of UAFG relative to its sales volumes than in AA4, as shown in the following diagram.

Figure 25: ATCO actual and proposed UAFG volumes



Source: EMCa graph derived from ATCO Supporting document Att. 11.2 Figure 3.1 and Table 4.1

469. ATCO has currently applied a [confidential] gas price forecast, however it proposes to update this based on a tender process that it will begin in late 2018.

Ancillary services

470. ATCO has proposed a significant increase in Ancillary Services costs relative to its 2017 actual costs. It has explained this as resulting from its inclusion of Special Meter Reading as a new Ancillary Service cost, with these costs in turn being driven by two factors: customer churn to competing gas retailers; and from inclusion of indirect costs in unit rates.

7.3 Assessment of proposed opex

7.3.1 Base year justification

ATCO's method for determining 'base year' opex

471. EMCa considers that it is not valid for ATCO to use the ERA's opex allowance for 2019 as a base year starting point for projecting opex from 2020 to 2024. The ERA determined this allowance in its Final Decision in 2015 and we consider it to be preferable to use the more current information that is now available.

472. ATCO has sought to relate this approach to a method referred to in an AER guideline[189]. Although the AER's guideline does refer to such a methodology, it relates this to use of the 'Efficiency Benefits Sharing Scheme' (or EBSS), which is not part of ATCO's current or proposed Access Arrangement.

473. The AER's Guideline states that '*[i]f actual expenditure in the base year reasonably reflects the opex criteria…[then it]…will set base year opex equal to actual expenditure for those cost categories using the revealed cost approach.'* We consider that this

[189] AER provides a guideline document entitled Better regulation; Expenditure Forecast Assessment Guideline for Electricity Distribution (November 2013). This guideline document is categorised as part of AER's gas forecasting methodology on its website.

represents a valid methodology, and accordingly that ATCO should use its most recent actual expenditure as its starting point, adjusting this to the extent that this figure does not represent an efficient or representative base expenditure level. ATCO's most recent full-year declared actual opex is for 2017.

ATCO's claim on the representativeness of its 2017 opex

474. ATCO has used its 2017 actual opex to determine a variance against ERA's 2017 allowance, and which it has then deducted from the ERA's 2019 allowance, as above. In this regard, ATCO's 2017 actual opex, and any adjustments made to it, are therefore relevant.

475. ATCO claims that it '*…did not identify any additional expenditure in 2017 that would not be incurred in AA5*'. EMCa sought information from ATCO to provide us with disaggregation of ATCO's 2017 opex, information on variances at a disaggregate level between its 2016 and 2017 opex, and on its disaggregated forecast for 2018 and 2019. ATCO provided us this information.

476. Our assessment is that there are three elements of ATCO's 2017 opex that we consider are not justified as part of a representative base year figure. These are:

- The staff bonus amount and a subsequent adjustment made by ATCO;
- Business Development (BD) and marketing costs; and
- IT costs.

Base year staff bonuses

477. ATCO states that it paid $0.7m more in staff bonuses in 2017 than it did in 2016. It describes these as '*short term incentive payments*'.[190] ATCO states that such incentives are a '*normal part of doing business*' and that they are '*generally targeted at senior executive, managerial and professional roles*'[191].

478. In addition to increasing its bonus payments in 2017, ATCO states in its AAI[192] that it further added an adjustment to its actual opex '… *for actual employee incentives …versus the provisional amount in the regulatory financial statements.*' We observe this as a $0.657m base year addition to its 2017 actual opex that ATCO has included in its base-step-trend calculations.

479. EMCa does not consider that ATCO has justified including either the full quantum of staff bonuses paid in 2017 or adding a further amount to that base year expenditure, as costs that should reasonably be incorporated into its proposed AA5 opex allowance. ATCO's information shows that there were minimal bonuses paid in 2014 and 2015, and its 2017 bonuses seem to represent a high-water mark.

480. Given that by 2017 it would have been evident that ATCO had achieved a significant opex saving relative to the ERA's allowance for this period, it is understandable that it chose to pay bonuses (or that its HR performance regime was such that relevant staff were entitled to them). Our view is that these should rightly be paid by the company from the 'outperformance' cost reductions that it made and should not translate into a

[190] ATCO response to IR19, and which was repeated in response to IR41

[191] Although we are concerned only with opex here, ATCO states that it also capitalised a portion of bonus costs

[192] AAI page 77

future higher regulatory cost allowance to the disbenefit of ATCO's gas customers in AA5.

Base year BD and marketing cost

481. In the opex breakdown information it provided[193], ATCO discloses that it incurred $3.8m in 2017 on corporate BD and marketing. ATCO's information shows that this was an anomalously high figure, with its previous expenditure having been $2.4m in 2016 and $1.4m in 2015.

482. In our 2014 report to the ERA on ATCO's AA4 proposal[194], we noted that ATCO had not justified what at that time was a significant proposed increase in BD and marketing, from an average of $1.5m per year that it had incurred in the previous 3 years, to an average of $4.6m per year in AA4 (or $25.4m over the 5.5 year period). We recommended allowing a continuation of ATCO's then most-current actual expenditure of $1.8m per annum and disallowing the proposed increase.

483. ATCO has provided its Business Development and Marketing Strategy document on a confidential basis, in response to one of EMCa's information requests[195]. The document sets the scene for its strategy in noting that whereas it had previously forecast increasing volumes, these have decreased within AA4 despite growth in customer numbers. Whereas around the time of its AA4 decision in 2015 ATCO had forecast connection growth of 8.4%, volume growth of 5.1% and a decline in average consumption of 3.1%, it now expects connection growth of only 6.4%, a 4.7% fall in volumes and an average consumption decline of 11.1%[196]. ATCO also flags several other significant likely negative changes to its commercial environment.

484. To counter those factors ATCO proposes BD and marketing expenditure that effectively includes in its base-step-trend method an escalated equivalent of the $3.8m it spent in 2017.

485. ATCO appears to rely principally for justification on an analysis that its spend per customer is below the average of its peers in the Eastern States, although we observe that the economics of gas for household use in WA are very different. While ATCO's document includes multiple assertions as to how maintaining customers and their volumes is to the benefit of existing customers, it does not demonstrate that its proposed expenditure can be reasonably expected to achieve this. Its initiatives to date in AA4 do not seem to have achieved its intended outcomes.

486. On inspection of ATCO's BD and marketing strategy, there are components of expenditure that would appear to be required regardless, in the process of assisting its existing and prospective customers. It is a business and strategic decision for ATCO as to which of the initiatives in its BD and marketing strategy it should continue and to what level. In aggregate however, ATCO has not made an evidenced case for the expenditure it proposes. Moreover, with gas retail competition having ramped up considerably in recent years, there is an argument that gas retailers are now providing a

[193] Provided in response to EMCa's IR39

[194] Review of Technical Aspects of Proposed Access Arrangements, EMCA, June 2014)

[195] IR39

[196] ATCO Business Development and Marketing Strategy (June 2018), page 19

considerably greater profile to the use of gas in WA than has previously been the case, without ATCO's expenditure.

487. For the purpose of the current decision, we consider that it would be reasonable to allow the same level of BD and marketing opex in real terms for AA5 as ERA allowed for AA4. For future determinations we consider that the ERA should continue to seek information from ATCO to evidence the outcomes achieved from its BD and marketing spend. This evidence is necessary to determine the extent to which it is acceptable for such expenditure to be included in ATCO's future revenue allowances based on benefits to existing consumers.

Base year IT

488. At $9.7m, ATCO's 2017 IT cost was $1.2m higher than in 2016 and also $0.7m higher than it has budgeted for 2018. ATCO has explained that $0.5m of the increase arose from a reclassification from 'Corporate' and it has provided evidence to us of this accounting transfer.

489. While we are inclined to the merits of revealed cost, the 2017 figure is an anomaly and we consider that it is not appropriate to take a single-year figure where that is the case. After allowing for the reallocation of $0.5m from Corporate, the 2016 figure was $9.0m which is also the same as ATCO's forecast for 2018. The average of the three years from 2015 to 2017 is also $9.0m. We consider that an amount of $9.0m represents a more representative revealed cost base figure.

7.3.2 Rate of change

There are two elements to rate of change in ATCO's proposal, which comprise:

- allowing for output growth; and
- allowing for real price growth.

Output growth

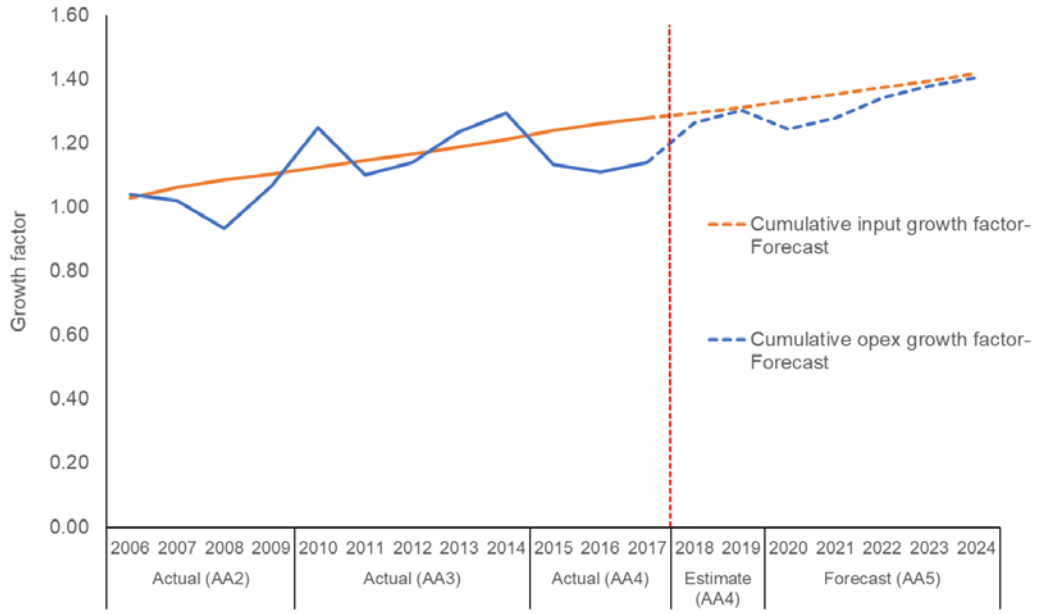
490. ATCO has proposed escalating opex based on a combination of its forecast customer growth and forecast growth in pipeline length, with 45% and 55% weightings respectively for these factors. ATCO has not factored productivity growth into its forecast.

491. Whilst we would have expected to see some productivity growth, even if only through increasing economies of scale, this does not seem to be evident from its input/output data. Following an information request, ATCO provided us with a report on ATCO's productivity performance which shows that ATCO's opex productivity has been relatively flat since around 2007[197].

492. We also undertook a simple comparison of ATCO's opex and the combination of weighted growth factors that ATCO has used for its proposed AA5 escalation. For both factors, we produced an index of 1.0 as at 2006, and compared the historical and projected growth trends as shown in the figure below.

[197] The productivity performance of ATCO Gas' Western Australian gas distribution system; Economic Insights (July 2018). See for example ibid figure 3.3, page 24, O&M Partial Productivity Index.

Figure 26: Comparison of indices of ATCO's opex and its proposed growth escalation factors



Source: EMCa analysis from ATCO data

493. Back-casting these factors shows a reasonable correlation, consistent with ATCO's expert report and, on this evidence, we accept the mechanism of ATCO's proposed escalation factors. However, as discussed in Section 6, we do not consider that ATCO's proposed growth expenditure is justified and, on this basis growth-related opex escalation is similarly not justified.

494. We also note that in AA4 to date, ATCO has moved below the escalation trend line, which could be considered evidence of improved productivity in this period. Our analysis shows that the significant increases in opex in 2018 and 2019 that ATCO has forecast would (if they transpire) appear to eliminate those gains. The further step changes in AA5 that ATCO has proposed would continue this loss of what would therefore appear to have been only a temporary improvement. We return to this matter in our discussion on ATCO's proposed step increases.

Labour and materials escalation

495. As discussed in section 4.5.1, ATCO has assumed for its proposed allowance that labour costs will increase in real terms by 1.64% per annum, and materials cost will not increase in real terms, resulting in a 1.017% real opex cost escalator.

496. In our assessment of ATCO's real cost escalation assumption which we describe in section 4.5.2, we reject ATCO's proposed assumptions and determine an alternative opex real price escalation forecast of 0.43% per annum.

7.3.3 Step change adjustments

ATCO's proposed opex step changes are summarised in the following table.

Table 29: ATCO's proposed opex step changes ($m, real Dec 2019)

Step change	ATCO proposed amount
Recurrent:	
SCADA and enhanced data acquisition	$2.32m (over 5 years)
Leak survey	$5.03m (over 5 years)
PGP interconnection	$1.19m (over 5 years)
Non-recurrent:	
Mains reclassification	$0.59m (over 5 years), based on needing to add additional mains into Network Information System
Hazardous remediation	$0.77m (over 5 years)
Pipeline inspections	$3.05m (over 5 years)
AA6 expenditure	$2.9m (over 5 years, but all in final 2 years of AA5)
Asset and business management systems review	$0.72m (over 5 years – but all in 2022)

Pipeline inspections and AA6 regulatory expenditure

497. ATCO has proposed including two 'non-recurrent' steps changes, being for pipeline inspections and for preparing and managing its AA6 regulatory process.

498. ATCO already undertakes pipeline inspections and it incurs additional regulatory costs at the time that it prepares and submits its Access Arrangements. Both of these activities are undertaken on a cyclical basis. The relevant expenditure is not represented within ATCO's 2017 Base Year and it is therefore reasonable to allow for these specific activities in AA5.

499. The magnitude of both proposed steps is in line with ATCO's 'revealed costs' and we consider it reasonable to conclude that these two step changes satisfy the opex criteria.

Recurrent leak survey

500. The need for the proposed leak surveys arises from ATCO's 2017 Safety Case and ATCO has provided a 'Project Brief' for the proposed additional work[198]. EMCa has reviewed this and, while there does appear to be a case for enhanced leak survey and repair, the case for expenditure at the proposed level is not well made in ATCO's documentation. We flag the following observations:

- The Project Brief is recent, having been prepared in July 2018 and amended in August 2018 for AA5 submission. While ATCO is currently undertaking trials, it has not yet reached the stage of having defined the specific program that it will undertake;

[198] Attachment 11.4, Additional Leak Survey and Repair (confidential), (31st August 2018)

- The Project Brief refers to AS4645 as justification, though it notes that this is not mandatory;
- The Project Brief summarises practices in the Eastern States gas companies, but it is clear that there is considerable variation in those practices and it could not be claimed that ATCO would be following a common practice;
- ATCO has included in its proposed opex an allowance for repairs where it finds leaks. ATCO has also proposed a capex project for replacement of services and risers where it finds leaks[199]. ATCO has not referred to this capex project in its opex Project Brief or vice versa, despite the apparent inter-relationship;
- ATCO's risk assessment ranks only one risk event – being High Density Community Use – as 'high', and ranks the other two risk events as 'intermediate;
- ATCO refers to possible more efficient means for undertaking the leak detection using vehicles. While it states that this is not currently an 'approved' method in WA, it provides no evidence as to whether it needs such approval for a non-mandatory program or why it should not seek approval if this is an effective and efficient option.

501. The Project Brief represents a future work activity which we would expect ATCO to refine and rationalise. We consider that it is reasonable to include such a project as a 'step', on the basis that this work was not included in ATCO's 2017 opex, and that a program of this nature is reasonable. However, there are indications in ATCO's Project Brief that that the capex replacement of risers and services, which we have considered in section 6.3.4, will reduce recurrent leak-related opex. In the absence of further information, and reflecting the combined potential impact of the factors described above, we consider it reasonable to allow 50% of what ATCO has currently proposed.

Opex related to SCADA and data acquisition and PGP interconnection projects

502. In Section 6, we have provided reasons why we consider that ATCO has not justified its proposed allowances for a SCADA and Data Acquisition project, and for an additional interconnection to the PGP. On the basis that neither of these project allowances is accepted, the associated opex would not be required.

503. If the projects did proceed, ATCO has posited benefits including operational cost savings. However, ATCO has not evidenced realisation of these benefits as offsets to any operational costs associated with these projects.

504. We consider it not reasonable to include these two proposed step changes.

Mains reclassification, Hazardous remediation and Asset and business management systems review

505. ATCO has proposed three step changes that we consider to be routine operational expenses, comprising:

- collation and maintenance of data on existing assets, commensurate with them being reclassified as 'mains';
- hazardous remediation activities; and

[199] As described in ATCO Business case 12.40.

- an asset and business management systems review which ATCO anticipates undertaking in 2022.

506. EMCa considers that none of these three proposed steps satisfy criteria to be considered as step increases that are not otherwise accounted for in ATCO's opex forecasting methodology. ATCO has not provided evidence that they are driven by material external changes, such as compliance requirements and, in our experience, they can more reasonably be viewed as part of the churn of activities that are encountered in the normal course of business. Each of these proposed steps is less than $1m in aggregate over the five-year period.

507. As discussed in Section 7.3.2, we have correlated ATCO's opex growth over time against the growth escalators it has used. In doing so, we would expect that many changes in 'requirements' or in the nature of its opex will have occurred and these are essentially inherent in ATCO's historical opex growth data. In projecting forward on the same basis, we consider that a reasonable view is that such relatively minor changes in ATCO's requirements are absorbed in the combined effect of the base-step-trend methodology that it has applied, including its assumption of no overall improvement in opex factor productivity.

508. We consider that it is not reasonable to include these three steps changes in ATCO's AA5 opex allowance.

7.3.4 UAFG expenditure

ATCO's proposal

509. In its AAI, ATCO proposes an AA5 allowance of $30.32m for UAFG. ATCO has provided a confidential supporting document entitled Unaccounted for Gas Forecasting and Pricing Strategy. ATCO has based its UAFG cost allowance on three elements, including:

- forecast UAFG rates;
- forecast gas volumes; and
- an assumed gas price.

UAFG rate

510. ATCO has described its UAFG performance over AA4 and which shows a minimal decline from 2.59% in 2014 to 2.57% in 2019. ATCO explains that its UAFG is calculated on an annual rolling average basis. Some measurement issues affected ATCO's estimation of UAFG in 2017, with a rolling average carry over effect in 2018, but ATCO expects the resolution of these issues will manifest from the 2019 estimate.

511. ATCO is forecasting a slightly greater fall in UAFG, to 2.46% by 2024, taking account of the continuing effect of its prioritisation of leaking mains in its mains replacement program. ATCO has also presented benchmarking information which, while its shows considerable variation in UAFG rates across Australian gas distributors, does indicate that ATCO is currently at the lower end of this range.

512. While taking account of the measurement challenges that ATCO refers to, on balance EMCa considers that ATCO has adequately supported its UAFG rate assumption.

Throughput

513. ATCO's throughput assumption is its demand forecast, which we reviewed in Section 4.2. As stated there, our analysis indicates that further growth in residential customer connections would, in aggregate, not satisfy the required economic growth test and we have recommended an amended forecast. In line with ATCO's UAFG methodology, we would expect this reduced throughput (and associated lower growth in mains extensions and new services) to also reduce the volume of UAFG.

Gas price assumption

514. For the purpose of its AAI, ATCO has assumed an average price of [redacted] for make-up gas. ATCO states that ERA has accepted that ATCO '*…will update the UAFG pricing based on actual tendered UAFG pricing rates in line with ATCO's procurement processes*.' Accordingly, we have not reviewed the current 'placeholder' price.

7.3.5 Ancillary services

515. ATCO proposes a significant step increase in its Ancillary Services cost allowance, from $1.5m in 2019 to $2.8m in 2020 and with a further increase to $3.0m by 2024. ATCO explains that the step increase is as a result of its proposal to include special meter reads as a new Ancillary Service from 2020. The increase is essentially consistent with inputs in ATCO's opex model, which show costs of $1.2m for special meter reads starting in 2020, based on a requirement for 96,000 such reads.

516. As shown in ATCO's Demand Forecast Report[200], the demand for special reads increased from 63,077 in 2016 to 119,622 in 2017, primarily driven by retail churn[201]. In that report, Core Energy has forecast continuing demands for special reads based on retail churn volumes of around 100,000 customers per year over AA5.

517. ATCO's history for retail churn at these levels is short, and an argument could be made for churn to settle at a lower ongoing level once pent-up demand for first-round churn dissipates. While this would have a direct effect on ATCO's costs, it would have an equally direct effect on its revenues since both costs and revenues are volume-driven. An alternative view on churn volumes through to 2024 would be speculative at this stage and, in any case, from a regulatory viewpoint the forecasting variance will essentially self-correct.

518. ATCO has applied a unit cost of $12.82 for AA5 special reads, compared with an AA4 unit cost of $18.67, and ATCO's other AA5 unit costs assumptions are materially similar to current costs[202].

519. On balance, we consider that ATCO has taken reasonable steps to prepare its Ancillary Services cost forecast.

[200] Attachment 9.1, Demand Forecast Report, Core Energy (June 2018)

[201] Ibid, page 59

[202] ATCO's AAI supporting model 18.1 Revenue & Pricing Model PUBLIC; tab 'Load_Tariffs'

7.4 EMCa adjustment assessment

7.4.1 Source of adjustments

520. Our assessment of adjustments results from:

- adjustments to ATCO's methodology and assumptions for forecasting the aggregate of Network, Corporate and IT components using a base-step-trend approach; and
- an adjustment to ATCO's forecast UAFG cost, based on lower growth assumptions (as presented in Section 4.2).

521. EMCa has not recommended adjustment of ATCO's proposed Ancillary Services costs.

7.4.2 Adjustments to ATCO's proposed opex allowance

522. Our assessed adjustment to ATCO's base-step-tend derived forecast results from:

- determining a revised base year value as an adjustment to ATCO's 2017 actual opex, rather than as an adjustment to the allowance that ERA previously applied for 2019;
- applying different adjustments in establishing the base opex value;
- applying different opex step amounts; and
- applying different escalation factors.

523. Our assessed adjustment to the components that ATCO has forecast using a base-step-trend approach, is an opex allowance reduction (over 5 years) of $47.9m. This represents 15.3% of ATCO's proposal for $312.4m.

524. For UAFG, we have assessed the impact on volume throughput from lower customer growth assumptions, as described in our assessment of ATCO's demand forecast in Section 4. The lower customer growth assumptions also imply a lower growth in length of the pipeline network over AA5. In the absence of more sophisticated UAFG modelling, we have pro-rated UAFG quantities by the lower assumed throughput.

525. In the table below, we present our assessment of the impact of our findings on ATCO's proposed opex. For clarity, and to show the materiality of each of the issues we have identified, we have laid out each of the elements in the adjustment calculation, with a side-by-side comparison of ATCO's calculations and our adjusted calculations. Stepping through the calculations in the table, we have:

- first set out the calculation of the defined 'base year opex'. For ATCO's calculation, this derives from the ERA's 2019 allowance, while our calculation derives from ATCO's 2017 actual expenditure;
- set out the adjustments that ATCO made and the adjustments that we have made to this base year value;
- used this value to form a base for each of the five years of AA5, and so the aggregate amount for AA5 is five times the adjusted base year amount; and
- finally, we have added the allowances for step changes, rate-of-change effects and the category-specific costs (UAFG and Ancillary services). These amounts are aggregates for the five years, noting that the line items vary from year to year.

526. As can be seen here, while we favour use of ATCO's 2017 actual opex as the starting point for defining base year opex, the net effect of doing so in this instance is relatively small. The majority of our assessed $21.1m adjustment over 5 years that results from adjustments to the 'efficient base year' value, arises from our findings on ATCO's staff incentive costs, BD and marketing costs, and IT costs in its base year and our finding on the additional staff incentive amount that ATCO has sought to include.

527. Our adjustment to ATCO's proposed step changes reduces the AA5 allowance by $8.1m. A greater impact arises from the rate of change adjustments, particularly the impact of our findings in favour of lower growth in customer numbers and reduced growth of the network.

Table 30: Assessment of resulting adjustments to opex

$m, real Dec 2019 Description	ATCO proposal	EMCa adjusted	*EMCa adjustment*
Definition of base opex			
ATCO base (2019 ERA allowance)	75.8		
less variance between 2017 ERA allowance and 2017 actual	(13.3)		
ATCO base after adjusting for 2017 variance	62.5		
ess ATCO adjustment for AA5 submission expenditure in 2019	(1.2)		
ATCO derived base opex	61.4		
EMCa base opex (2017 actual)		60.7	
plus real price escalation to 2019		0.2	
Base opex	**61.4**	**60.9**	***(0.4)***
Adjustments to base opex			
Adjustments to Network, Corporate and IT:			
Staff incentives	0.7	(0.7)	
BD and marketing	-	(1.9)	
IT	-	(0.7)	
Aggregate adjustments to Network, Corporate and IT	0.7	(3.3)	*(4.0)*
Deduct UAFG and Ancillary Services in 'base'			
UAFG	(6.2)	(6.0)	
Ancillary services	(1.1)	(1.0)	
UAFG and Ancillary Service allowances	(7.3)	(7.1)	*0.2*
Efficient base year opex (for application of BST)	**54.8**	**50.5**	*(4.2)*
Efficient base opex for BST, extrapolated over 5 years	**273.8**	**252.7**	***(21.1)***
Step changes (aggregate amount over 5 years)			
Pipeline inline inspections	3.0	3.0	
AA6 regulatory preparation	2.9	2.9	
Additional leak surveys	5.0	2.5	
SCADA and data acquisition project	2.3	-	
PGP interconnection project	1.2	-	
Mains reclassification data process	0.6	-	
Hazardous remediation	0.8	-	
Asset and business management systems review	0.7	-	
Total for step changes	**16.6**	**8.5**	***(8.1)***
Rate of change over AA5			
Output growth	13.0	-	
Real price escalation	9.0	3.4	
Total for rate of change	**22.1**	**3.4**	***(18.7)***
Total BST	**312.4**	**264.5**	***(47.9)***
Category-specific			
UAFG	30.3	29.7	
Ancillary services	14.6	14.6	
Total for category-specific	**45.0**	**44.3**	***(0.6)***
Total AA5 opex allowance	**357.4**	**308.8**	***(48.5)***

Source: EMCa analysis, from ATCO's Base Step Trend sheet in its opex model

528. These adjustments are shown in the table below in annual terms. This table compares with Table 11.2 in ATCO's AAI.

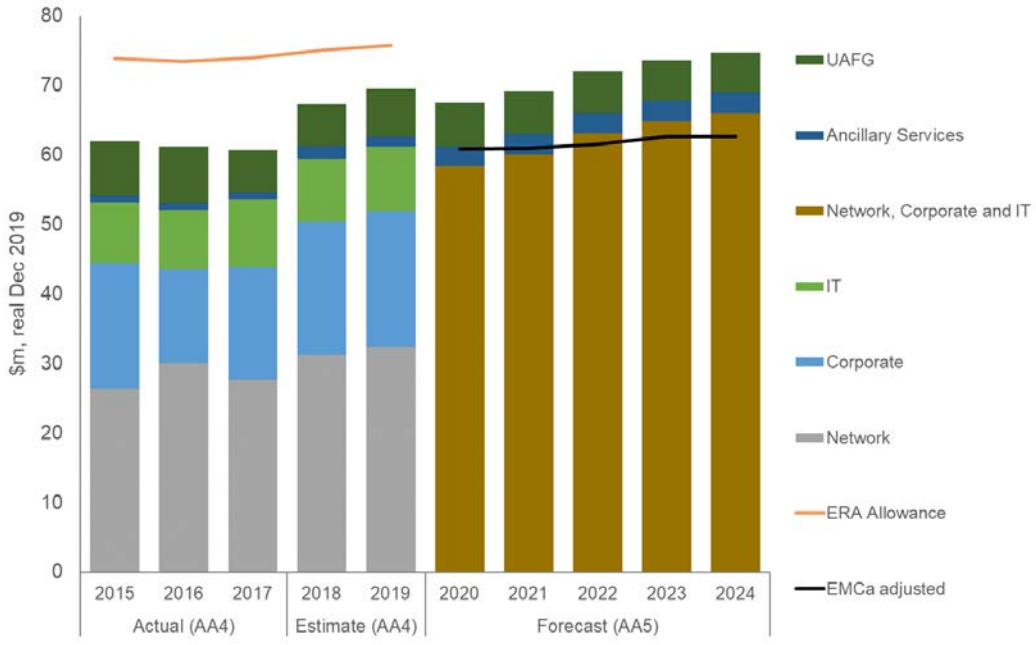
Table 31: Comparison of ATCO proposed opex and EMCa adjusted opex

$m, real Dec 2019 Description	2020	2021	2022	2023	2024	Total AA5
Network, corporate and IT						
ATCO Proposed	58.4	60.1	63.0	64.8	66.0	**312.4**
less EMCa adjusments	-6.6	-8.2	-10.3	-10.8	-11.9	**-47.9**
EMCa adjusted	**51.8**	**51.9**	**52.7**	**54.0**	**54.1**	**264.5**
UAFG						
ATCO Proposed	6.3	6.2	6.1	5.9	5.8	**30.3**
less EMCa Adjusment	0.0	-0.1	-0.1	-0.2	-0.2	**-0.6**
EMCa adjusted	**6.3**	**6.2**	**5.9**	**5.7**	**5.6**	**29.7**
Ancillaries						
ATCO Proposed	2.8	2.9	2.9	3.0	3.0	**14.6**
less EMCa Adjusment	0.0	0.0	0.0	0.0	0.0	**0.0**
EMCa adjusted	**2.8**	**2.9**	**2.9**	**3.0**	**3.0**	**14.6**
Total						
ATCO Proposed	67.6	69.2	72.0	73.7	74.8	**357.4**
less EMCa Adjusment	-6.7	-8.3	-10.5	-11.0	-12.2	**-48.5**
Total EMCa adjusted	**60.9**	**61.0**	**61.6**	**62.7**	**62.7**	**308.8**
Total adjusment (%)	*-9.9%*	*-11.9%*	*-14.5%*	*-14.9%*	*-16.2%*	-13.6%

Source: EMCa analysis, from ATCO's Base Step Trend sheet in its opex model

529. In the figure below, we show a plot of EMCa's adjusted AA5 opex laid over ATCO's actual expenditure in AA4 and its proposed opex allowance for AA5.

Figure 27: ATCO actual and proposed opex and EMCa adjusted opex



EMCa analysis

Appendix A Review framework

530. In this appendix we firstly provide a summary of the requirements of the National Gas Law (NGL)[203] and the National Gas Rules (NGR)[204], and describe the review framework (based on the requirements of the NGL and NGR) that we have applied in our assessment of the capex and opex proposals included in ATCO's revised access arrangement.

531. We have not been requested by the ERA to document compliance of the capex and opex proposals with the individual rules and tests included in the NGR as a part of our assessment.

National Gas Law and National Gas Rules

532. As the owner (service provider) of a covered pipeline, ATCO is required to submit a full AA to the ERA and to obtain its approval for the price and non-price terms and conditions of access to the reference service(s) ATCO provides through the Mid-West and South-West distribution systems. The current AA expires on 31st December 2019.

533. When assessing the AA, the ERA is required to have regard to:

- the access arrangement provisions set out in Part 8 of the NGR;
- the price and revenue regulation provisions set out in Part 9 of the NGR; and
- the National Gas Objective (NGO) and the revenue and pricing principles (RPP) set out in sections 23-24 of the NGL.

534. Of particular relevance in this context are the provisions the ERA is required to consider when assessing the capex and opex elements of ATCO's revised AA proposal, which are set out in Part 9 of the NGR. An overview of these provisions is provided below.

Capex provisions

535. By virtue of the operation of rules 77(2)(b) and 78(b) [205], the ERA is required to carry out both:

- an ex post assessment of the capex incurred (or to be incurred) by ATCO in AA4 to determine whether it satisfies the conforming capex criteria in rule 79(1); and
- an ex ante assessment of the capex ATCO proposes to incur in AA5 to determine whether it is likely to satisfy the conforming capex criteria in rule 79(1).

[203] The National Gas Access (WA) Act 2009 adopts a modified version of the National Gas Law (National Gas Access (Western Australia) Law).

[204] Under the National Gas Access (Western Australia) Law, the National Gas Rules applying to Western Australia is version 1 of the National Gas Rules, as amended by the AEMC in accordance with its rule making power under section 74 of the National Gas Access (Western Australia) Law.

[205] Rule 77(2) sets out how the opening value of the capital base at the commencement of a new AA period is to be calculated, while rule 78 sets out the value of the capital base during the AA period is to be calculated. In short, these two rules only allow conforming capex to be rolled into the value of the capital base.

536. Conforming capex is defined in rule 79(1) as capex that satisfies the following criteria:

- the capex 'must be such as would be incurred by a prudent service provider acting efficiently, in accordance with good industry practice, to achieve the lowest sustainable cost of delivering pipeline services' (the 'prudent service provider test') (r. 79(1)(a)), and
- the capex must be justifiable on one of the following grounds (r. 79(1)(b)):
  - (a) the overall economic value of the expenditure is positive (the 'economic value test') (r. 79(2)(a)) [206]; or
  - (b) the present value (PV) of the expected incremental revenue exceeds the PV of the capex (the 'incremental revenue test') (r. 79(2)(b)) [207]; or
  - (c) the capex is necessary to:
    - (i) maintain and improve the safety of services (r. 79(2)(c)(i)); or
    - (ii) maintain the integrity of services (r. 79(2)(c)(ii)); or
    - (iii) comply with a regulatory obligation or requirement (r. 79(2)(c)(iii)); or
    - (iv) maintain the service provider's capacity to meet levels of demand for services existing at the time the capex is incurred (r. 79(2)(c)(iv)); or
  - (d) the capex is divisible into two parts, with one part referable to incremental services and justifiable under 79(2)(b) and the other part referable to a purpose under 79(2)(c) and justifiable on this basis (r. 79(2)(d)).

537. In accordance with rule 79(6), the ERA's discretion under rule 79 is limited. It cannot therefore withhold its approval of the capex incurred by ATCO in AA4 or the capex it proposes to incur in AA5, if it is satisfied the capex complies with:

- the criteria set out above;
- rule 74(2), which states that any forecast or estimate must be arrived at on a reasonable basis and represent the best forecast or estimate possible in the circumstances; and
- any other relevant provision in the NGL and/or the NGR.

538. Finally, in determining whether capex is efficient and complies with other criteria prescribed in the rules, rule 71 states that the ERA may, without embarking on a detailed investigation, infer compliance from the operation of an incentive mechanism or any other basis the ERA considers appropriate. It must, however, consider, and give appropriate weight to, submissions and comments received.

[206] Rule 79(3) sets out the matters to be considered when applying the economic value test. In short, this rule only allows consideration to be given to the economic value directly accruing to the service provider, gas producers, users and end-users when determining whether the overall economic value of the capex is positive.

[207] Rule 79(4) sets out what is to be considered when applying the incremental revenue test. In short, this rule requires:

- a tariff to be assumed for the incremental services based on (or extrapolated from) prevailing reference tariffs, or an estimate of the reference tariffs that would have been set for comparable services if those had been reference services; and
- incremental revenue to be taken to be the gross revenue to be derived from the incremental services less incremental opex; and
- the discount rate is to be based on the rate of return implicit in the reference tariff.

Conforming capex vs non-conforming capex

539. Where the capex proposed by ATCO (in whole or in part) is found to:

- satisfy rule 79, it will be considered conforming capex for the purposes of rules 77(2) and 78 and rolled into the capital base (i.e. it will be included in the derivation of the reference tariff(s)); or
- not satisfy rule 79, it will be considered non-conforming capex and excluded from the capital base (i.e. it will be excluded from the reference tariff(s)).

540. In this context that while non-conforming capex cannot be recovered through the reference tariff(s), ATCO may still undertake this form of capex and either:

- recover that expenditure, or a portion thereof, through a surcharge (r. 83) or a capital contribution (r. 82); or
- include the investment in a notional fund, referred to as the 'speculative capital expenditure account', which may be rolled into the capital base at a later date if the capex is found to satisfy the conforming capex criteria (r. 84).

Opex provisions

541. The criteria the ERA is required to consider when assessing ATCO's proposed opex for AA4 are set out in rule 91 of the NGR, which is reproduced below:

> *Operating expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of delivering pipeline services.*

542. The ERA's discretion under this rule is limited (r. 91(2)), which means the ERA may not withhold its approval, if it is satisfied ATCO's proposal complies with:

- the criteria set out in rule 91(1);
- rule 74(2), which states that any forecast or estimate must be arrived at on a reasonable basis and represent the best forecast or estimate possible in the circumstances; and
- any other relevant provisions in the NGL and/or the NGR.

543. In a similar manner to capex, rule 71 states that in determining whether opex is efficient and complies with other criteria prescribed in the rules, the ERA may, without embarking on a detailed investigation, infer compliance from the operation of an incentive mechanism or any other basis the ERA considers appropriate. It must, however, consider, and give appropriate weight to, submissions and comments received.

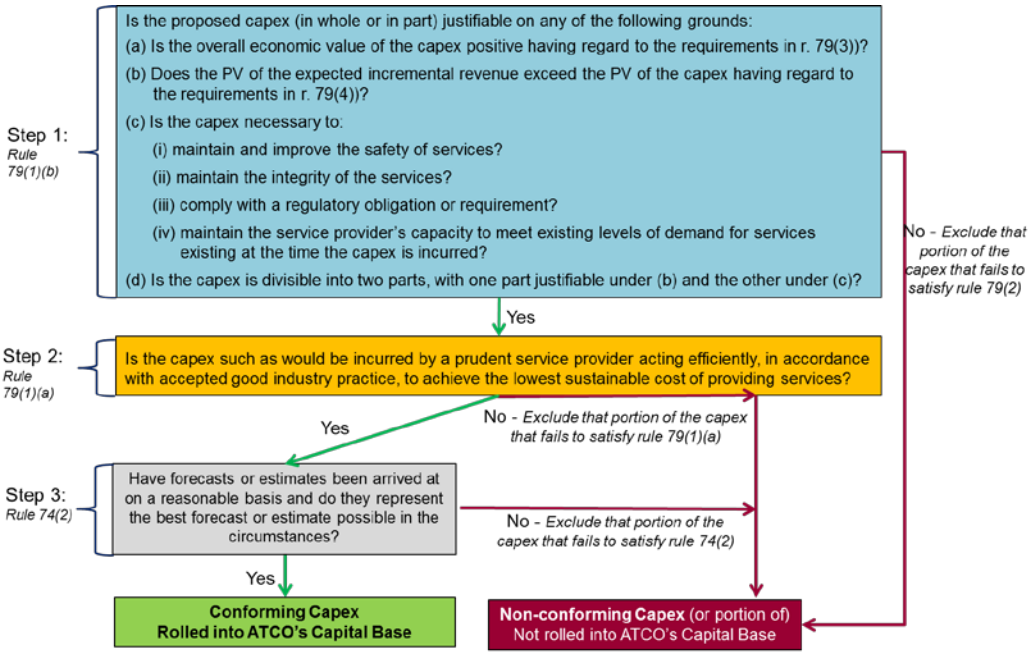
Assessment framework

544. An overview of the frameworks we have used to assess ATCO's capex and opex proposals is provided below.

Capex assessment framework

545. The framework we have used to assess whether the capex incurred (or to be incurred) by ATCO in AA4 and its proposed capex for AA5 can be considered conforming capex is depicted in the figure below.

Figure 28: Capex assessment framework



546. As the figure above highlight highlights, the framework consists of three steps, which are based on the specific requirements set out in rules 79 and 74(2). Where there is discretion as to which ground is relevant under rule 79(2), we have based our assessment on the grounds that ATCO has identified, and we have reviewed the evidence ATCO has provided in support of this ground. Further detail on the matters we have considered in each step is provided below.

Step 1: Is the expenditure justifiable on a ground set out in rule 79(2)?

547. The first matter we have considered when assessing ATCO's capex proposal is whether the expenditure can be justified on any of the grounds set out in rule 79(2).

548. For those capex projects (or a portion thereof) that ATCO has claimed the economic value is positive (r. 79(2)(a)) or that the expenditure satisfies the incremental revenue test (r. 79(2)(b)), we have had regard to a range of matters, including:

- rules 79(3) and 79(4), which set out how the economic value of a project and the present value of incremental revenue are to be calculated; and
- the analysis ATCO provided in support of its claim and its underlying assumptions.

549. For those capex projects (or a portion thereof) where ATCO has claimed the expenditure is necessary to maintain the safety or integrity of the services, comply with a regulatory obligation and/or maintain the capacity to meet existing levels of demand (r. 79(2)(c)), we have, amongst other things, had regard to:

- ATCO's Asset Management Plan (AMP);
- the WAGN Gas Distribution System Safety Case (Safety Case) and the formal safety assessments (FSA) carried out by ATCO;

- the Gas Standards (Gas Supply and System Safety) Regulations 2000;
- Australian Standards AS/NZS4645 (Gas Distribution Networks) and AS2885 (Pipelines – Gas and Liquid Petroleum Pipelines);
- other regulatory requirements that ATCO is required to comply with; and
- the analysis ATCO provided in support of its claim and its underlying assumptions.

550. As the figure above indicates, if the capex project in whole, or in part, is found to:

- be justified under rule 79(2), we have then considered whether it satisfies the prudent service provider test in rule 79(1)(a) (Step 2); and
- not be justified under rule 79(2), then we have deemed the expenditure to be non-conforming capex.

Step 2: Does the capex satisfy the prudent service provider test in rule 79(1)(a)?

551. The second matter we have considered is whether the proposed expenditure on capex projects that are justified under rule 79(2) is 'such as would be incurred by a prudent service provider acting efficiently, in accordance with good industry practice, to achieve the lowest sustainable cost of providing the service'.

552. In conducting this assessment, we have considered a range of matters (some of which are more or less relevant to particular projects or programmes of work), including:

- the project governance framework employed by ATCO, the key elements of which are ATCO's: business planning process; AMP and Safety Case; investment governance arrangements; IT strategy and AMP; forecasting methodology; procurement policies; and risk management plan;
- the project management and procurement processes employed by ATCO on particular projects and the nature of any outsourcing arrangements it has entered into (e.g. competitive tender or related party transaction);
- ATCO's capability to deliver the proposed projects efficiently in the time proposed;
- the extent to which ATCO has adequately assessed and accounted for any benefits from productivity or efficiency enhancing programs (benefits realisation);
- the actual costs incurred by ATCO in AA4 relative to what it has proposed for AA5;
- ATCO's compliance with Australian standards: AS/NZS4645 and AS2885; and
- benchmarking of approaches and/or costs against other gas pipelines and/or regulated businesses provided by ATCO.

553. As the figure above indicates, where the expenditure in whole, or in part, is found to:

- satisfy the prudent service provider test, we have considered whether the proposed expenditure satisfies rule 74(2) (Step 3); and
- not satisfy the prudent service provider test, then we have excluded that portion of the expenditure that is deemed to fail this test.

Step 3: Do any forecasts or estimates comply with rule 74(2)?

554. The final matter we have considered is whether the forecasts or estimates underlying those capex projects that are justifiable under rule 79(2) and satisfy the prudent service

provider test, have been arrived at on a reasonable basis and represent the best forecast or estimate possible in the circumstances, as required by rule 74(2).

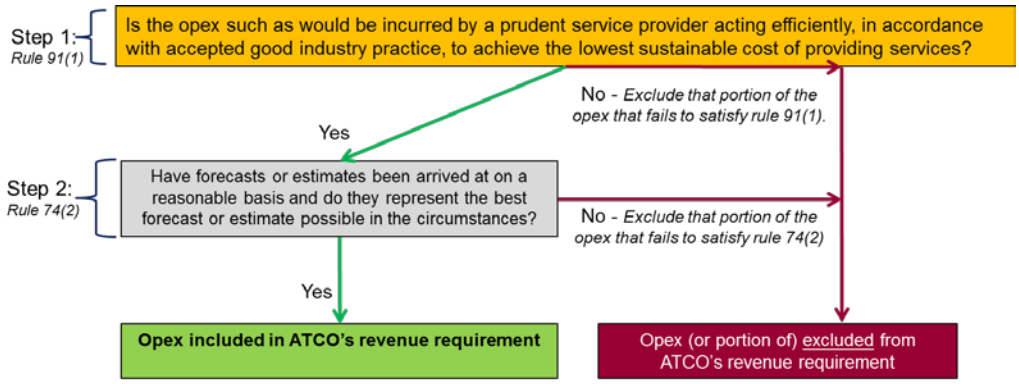
555. As the figure above highlights, where the forecasts and/or estimates are found to:

- satisfy this rule, the proposed expenditure has been deemed to comply with the conforming capex criteria; and
- not satisfy this rule, then we have excluded that portion of the expenditure that fails to satisfy this rule, on the grounds that a prudent service provider would not expect to incur this expenditure (r. 79(1)(a)).

Opex assessment framework

556. The figure below sets out the framework we have used to assess ATCO's proposed AA5 opex.

Figure 29: Opex assessment framework



557. The questions considered under steps 1 and 2 of this framework are broadly the same as those considered under steps 2 and 3 of the capex assessment framework. The matters that we have considered when applying this framework are therefore largely the same as those set out in the earlier section of this Appendix, albeit focused on opex rather than capex.

558. The only additional matters that we have considered under Step 1 of this framework, which are not relevant to capex are:

- the methods used by ATCO's parent company (the ATCO Group) to allocate corporate overheads to ATCO and the extent to which:
  - the ATCO Group provides services that justify this as an expenditure item recoverable through regulated tariffs; and
  - there is any overlap in services provided by ATCO and the ATCO Group.
- the nature of any discretionary opex projects proposed by ATCO (e.g. business development and marketing) and the extent to which these projects are expected to yield a net economic benefit for consumers.

Appendix B ATCO's risk management framework

Introduction

559. In this appendix we compare ATCO's risk management approach with the requirements of AS/NZS 4645.1 *Gas Distribution Networks Part 1: Network Management* (AS4645), and where relevant AS2885.1 Pipelines-Gas and liquid petroleum (AS2885) as relevant.

Requirements of ATCO's Safety Case

560. ATCO must comply with a number of regulations, including the *Gas Standard (Gas Supply and System Safety) Regulations 2000* (GSSR) which, among other things, requires that ATCO must comply with its accepted safety case to provide assurance that the management, development, maintenance and operation of the GDS is delivering satisfactory safety outcomes[208].

561. ATCO's Safety Case[209] has been prepared to comply with AS4645.1:2008, AS 2885.1:2007 and AS2885.3 2001[210]. It was accepted to form the primary reference to meet the safety and technical compliance of the ATCO gas network by the Director of Energy Safety[211] on 28 July 2011. It was last revised on 1 December 2017[212] to incorporate feedback from Energy*Safety.*

562. We note that AS4645.1:2018 was published in February 2018, having been released in draft form in 2017. ATCO appears to have adopted the updated standard, however this is not been reflected in its Safety Case. ATCO advised during the onsite meeting, that the differences between the 2008 and 2018 versions of AS4645 are not significant, and do not have a material impact on the proposed expenditure in AA5. We observe that in relation to risk management, the differences are to introduce quantitative measures for the frequency (or likelihood) of events in the updated AS4645.1:2018 that did not exist in AS4645.1:2008 or AS2885.1.

ATCO's risk management framework and comparison with AS4645

563. ATCO's Risk Management Framework refers to ATCO's Risk Management Guideline, which includes ATCO's semi-quantitative and qualitative description of likelihood

[208] *GSSSR*, Regulation 37

[209] Gas Distribution System Safety Case, document TCO PL00005, Rev 6, 01/112/17

[210] ATCO, *Safety Case*, page 15

[211] Now the Director of Building and Energy

[212] ATCO *Gas Distribution System Safety Case*, pages 3, 5

classes. The table below compares the ATCO definitions with the corresponding definitions included in AS4645.1:2018[213].

Table 32: Comparison of ATCO's likelihood classes with AS4645.1:2018

Likelihood class	ATCO description	AS4645 description
Frequent	More than once per year	Expected to occur once per year or more typically 1 or more times PA
Occasional	One per year to one in a hundred years (1 to 10-2 per year)	May occur occasionally in the life of the gas distribution network, but possible typically 0.01-0.02 times PA
Unlikely	One in a hundred years to one in ten thousand years (10^{-2} to 10^{-4} per year)	Unlikely to occur within the life of the gas distribution network, but possible typically 0.01-0.02 times PA
Remote	One in ten thousand years to one in a million years (10^{-4} to 10^{-6} per year)	Not anticipated for this gas distribution network at this location typically 10^{-3} to 10^{-5} times PA
Hypothetical	Less than one in a million years (<10^{-6} per year)	Theoretically possible but has never occurred on a similar gas distribution network

Source: EMCa analysis from ATCO Technical Compliance Risk Management Guideline Rev 5, Table 4-4, page 20-21; AS4645.1:2018 Table B2, page 82

564. ATCO's descriptions for 'Remote' and Hypothetical' are an order of magnitude more conservative (risk averse) than the AS4645.1:2018 definitions. This is an important factor when ATCO combines the Likelihood class with the 'severity class' to determine the risk rating of events. ATCO advises that it selected the quantitative ranges by referring to a British Standards Institution (BSI) publication[214] in the absence of suitable Australian criteria. We are surprised that ATCO chose to rely on the BSI publication given that:

- the new version of AS4645.1:2018 was published in February 2018, having been available in draft since 2017; and
- ATCO's analysis of customer weeks lost published in April 2018 takes into account AS4645.1:2018, the results of which are relied upon in the same Network sustaining Business Cases as part of its expenditure justification.

565. It appears that ATCO has 'cherry picked' the definitions from the BSI publication, including a more conservative approach to the assessment of likelihood. We consider that the applicable reference for likelihood class is AS4645.1:2018 Table B2.

566. ATCO's measures of consequence (severity classes) differ between its documents. Its Risk Management Framework document only presents the measures for the financial

[213] AS4645.1:2008 only refers to qualitative likelihood descriptions for each of the likelihood classes and is therefore not presented here for comparison

[214] *BSI Standards Publication PD 8010-3:2009+A1:2013 Pipeline Systems - Part 3: Steel Pipelines on Land - Guide to the Application of Pipeline Risk Assessment to Proposed Developments in the Vicinity of Major Accident Hazard Pipelines Containing Flammables*, per ATCO Safety Case, page 83

dimension[215]; whereas its Risk Management Matrix document presents measures for five dimensions. However, in relevant Business Cases it refers to AS4645.1:2018 for the supply dimension which also differs from the description in its Risk Management Matrix document[216].

567. The table below shows a comparison of ATCO's measures of severity class for the people and supply consequence dimensions[217] and the corresponding descriptions in AS4645.1:2018.

Table 33: Severity class measures – supply and people consequence dimensions

Consequence dimension	ATCO[218]		ATCO[219]		AS4645.1: 2018	
	Severity class		Severity class		Severity class	
	Catastrophic	Major	Catastrophic	Major	Catastrophic	Major
People	More than 2 fatalities	Up to 2 fatalities; Several people with life threatening or permanently disabling injuries	Not presented	Not presented	Multiple (more than 3) fatalities result	Few fatalities, (1 to 3) or several people with life-threatening injuries
Supply	Interruption of supply affecting > 25,000 customers	Interruption of supply affecting > 5,000 customers	>100,00 customer weeks lost	>50,000 customer weeks lost	Interruption >100,000 consumer weeks	Interruption >50,000 consumer weeks

Source: ATCO, Risk Management Matrix, page 2, ATCO Supply Interruption Custoer Weeks Lost Assessment, page 14 and AS4645.1:2018, Table B1, page 81

568. ATCO's people consequence dimension as described in the table above is slightly more conservative (i.e. more risk averse) than the normative requirements of AS4645.1:2018. As ATCO has not presented a compelling reason for its measures, we have based our assessment on the AS4645.1:2018 measures.

569. The supply dimensions used in Network sustaining business cases are aligned AS4645.1:2018.

570. ATCO's risk matrix is shown in the figure below. There is no material difference between it and the equivalent Table C3 in AS4645.1:2008 and Table B3 AS4645.1:2018.

[215] ATCO, *Risk Management Framework,* page 22

[216] Furthermore, ATCO does not appear to present any severity descriptions in its Risk Management Guideline.

[217] These are the most important dimensions in ATCO's justification of the need for the proposed AA5 Network sustaining capex

[218] ATCO Risk Management Matrix

[219] ATCO Supply Interruption Customer Weeks Lost Assessment

Figure 30: ATCO's risk matrix

FREQUENCY	CONSEQUENCE				
	1 Trivial	*2 Minor*	*3 Severe*	*4 Major*	*5 Catastrophic*
5 Frequent	5 Low	10 Intermediate	15 High	20 Extreme	25 Extreme
4 Occasional	4 Low	8 Low	12 Intermediate	16 High	20 Extreme
3 Unlikely	3 Negligible	6 Low	9 Intermediate	12 High	15 High
2 Remote	2 Negligible	4 Negligible	6 Low	8 Intermediate	10 High
1 Hypothetical	1 Negligible	2 Negligible	3 Negligible	4 Low	5 Intermediate

Source: ATCO Gas Australia Risk Management Matrix, page 2

571. The Safety Case includes reference to ATCO's Risk Management Framework[220], which in turn presents ATCO's risk tolerance (or acceptance) criteria for the Extreme, High, Intermediate, Low and Negligible risk ratings, as shown in the figure below. Importantly, ATCO requires (consistent with the relevant Australian Standards) that any intermediate risk can only be accepted if it is demonstrated to be ALARP, and an ALARP test is applied consistent with the Australian Standard.

572. The risk acceptance criteria are broadly consistent with the risk treatment actions in Table C4 of AS4645.1:2008 and with Table B4 in AS4645.1:2018.

Figure 31: ATCO's risk acceptance criteria table

Extreme	Modify the threat, frequency or consequence so that the risk is reduced to "Intermediate" or lower. Reduce the risk immediately. Management responsibility must be specified.
High	Modify the threat, frequency or consequence so that the risk is reduced to "Intermediate" or lower. Management responsibility must be specified.
Intermediate	Where the risk rank is confirmed to be "Intermediate" and, if possible, modify the threat, frequency or consequence to reduce the risk rank to "Low" or "Negligible". Where the risk cannot be reduced to "Low" or "Negligible", action shall be taken to: a. Remove threats, reduce frequencies and/or reduce severity of consequences where reasonably practicable to do so; and b. Demonstrate ALARP. Management responsibility must be specified.
Low	Review risk control system and procedure and monitor to determine if the risk rating changes and requires reassessing. Management responsibility must be specified.
Negligible	Review the risk rating at the next review interval. Manage with routine procedures

Source: ATCO Risk Management Framework, Appendix B

Demonstration of ALARP and comparison with AS4645

573. The Safety Case states that the requirements for demonstrating whether or not an Intermediate risk is ALARP is defined in its Technical Compliance Risk Management Guideline (Risk Management Guideline) and involves:

[220] *ATCO Australia POS Risk Management Framework (AA-RSK-FWK-01)16* – Version 2.0 (Feb 2016)

- *Identifying options for further risk reduction;*
- *Then, determining practicality and the level of risk reduction achieved for each option; and*
- *Review and approval of risk reduction measure(s) selected for implementation.*[221]

574. Where additional/alternative controls are identified, the Risk Management Guideline states '*the feasibility of these options should be assessed in terms of practicality and risk reduction benefit (in order to determine whether it is a reasonable action)…'*[222].

575. AS4645.1:2018 requires (among other things) that '*any risk that is determined to be intermediate shall be assessed to confirm that the risk meets the ALARP test. A risk cannot be considered as meeting the ALARP test until and including the following has been completed:*

(a) Analysis of the means of further reducing the risk, including an analysis of various option.

(b) Review as to the reasons why these further means have not been adopted.

(c) Substantiation that the sacrifice (including cost) of further risk reduction measures is grossly disproportionate to the benefit gained from the reduced risk that would result[223].

576. Importantly, AS/NZS4645 does not envisage risk mitigations at any cost. We consider that ATCO's Risk Management Guideline does not adequately represent the normative requirements of AS4645.1:2018 for the ALARP test. Specifically, in regard to part (c) we consider that economic cost-benefit analysis is required to substantiate that costs are not *grossly disproportionate* to the risk reduction benefit.

577. Appendix B of AS4645.1:2018 refers to AS2885.1 for further guidance on the application of ALARP and methodology for undertaking formal ALARP assessments. Whilst presented as informative rather than normative, Appendix G of AS2885 states[224] that *'[d]etermining if the risk from a specific threat has been reduced to ALARP involves an assessment of the risk to be avoided, the cost (in money, time and trouble) involved in avoiding the risk and a comparison of the two. Determining ALARP is in effect a cost-benefit analysis.'*

578. Where relevant, in our assessment of ATCO's AA5 capex proposal, we refer to the ALARP requirements of AS4645.1:2018 and the need to substantiate (including via a cost benefit analysis or similar) the ALARP test.

[221] ATCO, *Safety Case*, page 81

[222] ATCO, *Technical Compliance Risk Management Guideline*, page 12

[223] *AS4645.1:2018*, part B5.2, pages 83-84, noting that these requirements are essentially the same as in AS4645.1:2008 part C5.2, pages 63-64

[224] AS2885.1:2012 Appendix G, page 192

Summary

579. ATCO's Safety Case[225] has been prepared to comply with AS/NZS 4645.1:2008 (among other things). ATCO's risk management documents refer variously to three main sources in managing network risk: AS4645.1:2008; AS4645.1:2018, and a BSI standard. We consider that the applicable Australian Standard is AS4645.1:2018. By comparing ATCO's measures and definitions with this Standard, we conclude that:

- ATCO's measures of likelihood are more risk averse;
- ATCO's and AS4645.1 'consequence' measures are the same for the Supply dimensions, and similar for the People dimension;
- risk matrix and risk assessment criteria published by ATCO and AS4645.1:2018 are materially the same; and
- ATCO's guidance on the application of the ALARP test is inadequate.

580. As we have not seen compelling reasons from ATCO to support its alternative measures, definitions and criteria, we refer to the AS4645.1:2018 measures, definitions and criteria in our AA5 capex assessment.

[225] Gas Distribution System Safety Case, document TCO PL00005, Rev 6, 01/112/17

Appendix C Growth economic test analysis

Growth NPV test for AA4 B2 and B3 connections

The analysis ATCO has presented

581. We have reviewed the model that ATCO has provided to support its claim that its AA4 new connections meet the 'incremental revenue test' set out in rule 79(2)(b).[226] In summary, ATCO's model:

- Presents incremental revenues based on tariff assumptions, for a single-year tranche of 15,658 new connections, connecting in 2018, and 1,000 'subs to masters' conversions;
- Incorporates a capital cost for these connections, an ongoing incremental maintenance cost, an ongoing UAFG cost and a 'refresh' of 'meters and services' capital costs after 25 years and again after 50 years;
- Calculates incremental project cashflows, being incremental revenue less capital costs less incremental operating costs less tax payable. The incremental cashflows are inflated into nominal terms;
- Calculates the NPV of those cashflows over a 60-year analysis horizon, using a nominal post-tax WACC of 5.34%.

582. For this tranche, ATCO has assumed a capital cost of $25.3m. ATCO presents the NPV as positive $26.2m.

Our assessment

583. We first investigated ATCO's model to understand the primary steps in its calculations. We observed the following that appear to be modelling errors or matters for caution in operating the model:

- There is a block of data entry cells for 'average connection costs', however these are not used to calculate the assumed capex for the connections, and which instead comes from another area in the model with hard coded values;
- There is a block in which disconnection rate assumptions can be entered, however ATCO's model applies this as only a single tranche of disconnections 25 years after the original connections, whereas we expect that the intention is to be able to model ongoing disconnections after this time;
- From 2022, the B3 subs to masters assumption applies the B1 tariff to these customers, resulting in revenue stepping from around $114,000 per year to $1m per year from that year to the end of the modelling period.

584. We corrected for these matters in testing ATCO's analysis.

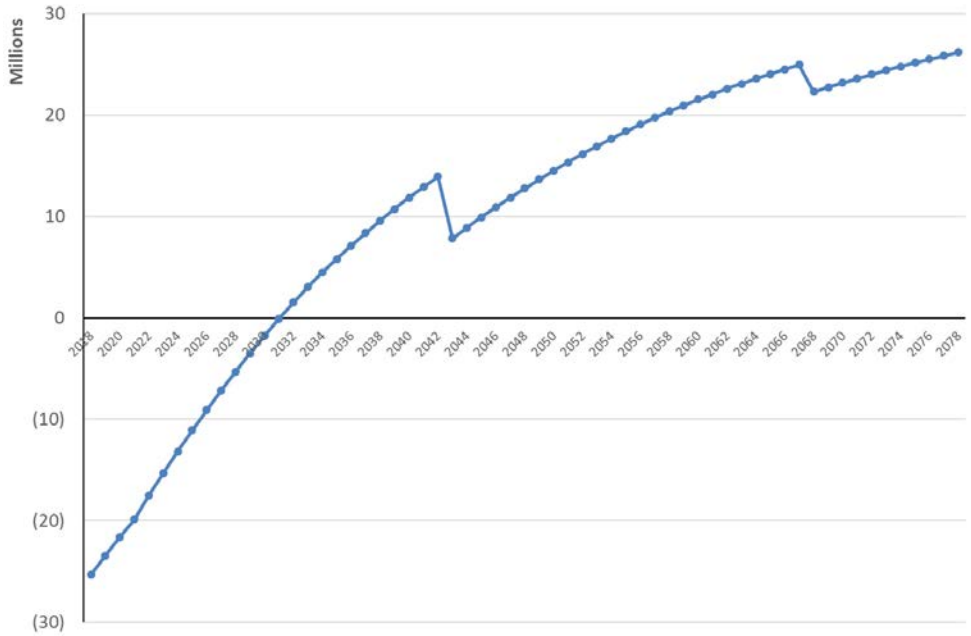
[226] See Appendix A for our precis of the relevant rules

585. We then reviewed ATCO's assumptions, and found the following matters for concern:

- The model includes assumed new connections at Kalgoorlie and Albany, neither of which are part of the GDS regulated network;
- Conversion of subs to masters may represent a change in ATCO's revenue stream, but it does not represent new services that need to be built. Including these (and with the apparent error in tariff above) adds materially to the modelled cashflows;
- ATCO assumes incremental load of 12.0 GJ/customer for the main customer class, being B3 new connections, with an assumed load degradation of 0.2% per annum. This is considerably higher than the volumes that ATCO has presented for 2018 connections in its AA5 growth NPV test, and which start at 6.1GJ in the year of connection and ramp up to 9.5 GJ after 2 years;
- ATCO has used lower connection costs in this model than it has in its AA5 model: for example, ATCO has assumed a weighted average of $899 per B3 connection for meters and services, compared with $1,168 in its AA5 model and $544 per customer for mains extensions versus $595 in its AA5 model;
- ATCO has used lower incremental maintenance cost assumptions in this model than it has in its AA5 model: for example, ATCO has assumed an incremental operating cost of $11.11 per customer per year in this model, compared with $58.09 per customer per year in its AA5 model;
- ATCO has calculated its NPVs for an assumed 60-year connection period. Notwithstanding its modelled costs for replacing meters and services within this period, this is a very long time over which to assume continued and essentially unchanged customer use of this gas pipeline network, as evidenced in ATCO's own BD and Marketing strategy document.

586. To better understand how the NPV builds over time, we established an annual PV calculation in ATCO's model, and accumulate this over time. The final year accumulated PV is the same as the NPV that ATCO presents. These graphs are able to show when the NPV turns positive, and to capture the effects of the replacement cycles. We present first our illustration of PV build-up, from the model as presented by ATCO in the figure below.

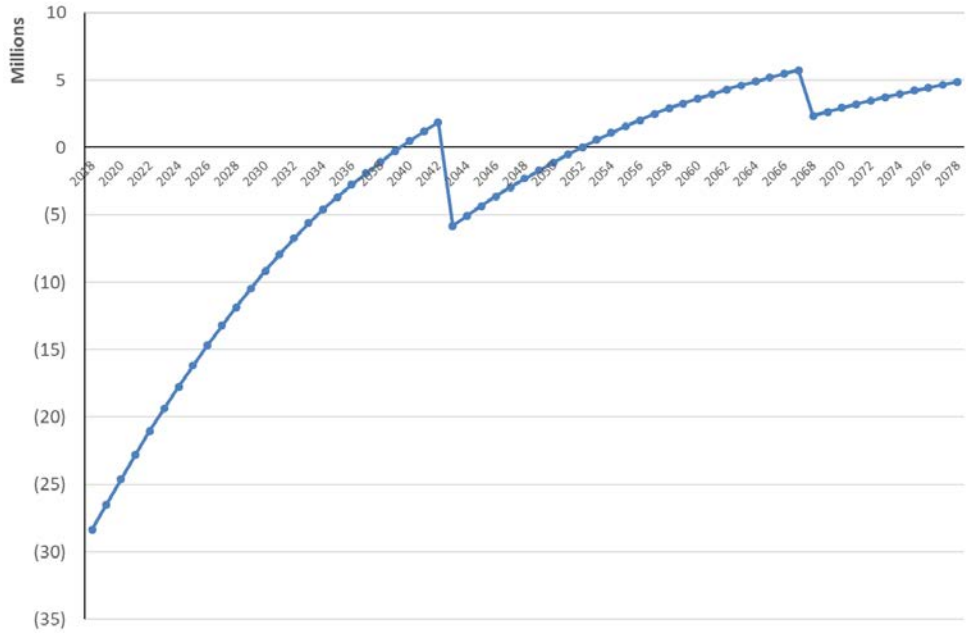
Figure 32: AA4 growth NPV analysis – ATCO base case as presented



Source: EMCa analysis from ATCO's 'variable volume' model

587. In the figure below, we present our analysis in which we have tested the strength of ATCO's conclusions by changing assumptions as indicated above.

Figure 33: AA4 growth NPV analysis – incorporating EMCa adjustments



Source: EMCa analysis
Specific assumptions adjusted: Kalgoorlie and Albany connections excluded; subs to masters transfers excluded (revenue and associated costs); disconnections commence after 10 years and continue at ATCO's assumed annual rate thereafter; assumed volumes reduced to be same as for AA5; costs per connection increased to be same as for AA5.[227]

[227] ATCO's cost assumptions in its AA4 model are presented in $2018, whereas its cost assumptions in its AA5 model are presented in $2019. We have not adjusted for the inflation difference between these two years, however we consider it not to be material to our assessment.

588. With these adjustments, the NPV of incremental revenue is considerably less than ATCO has presented. Given especially the assumed need to replace meters and services after 25 years, we would tend to discount assumed revenues beyond that time, however the NPV is positive at that point, having turned positive 21 years after the initial connections.

589. At a late stage in our assessment process, ATCO presented the basis for its assumed incremental maintenance costs per customer which, as noted above, are considerably less than the assumption it has used in its AA5 modelling. ATCO's calculations show that it has derived this amount from 'avoidable costs' by tariff class from its AA4 tariff model, divided by its customer numbers (for that tariff class). The avoidable cost assumptions are required to be presented as part of the justification for structured tariffs.[228]

590. 'Avoidable costs' as defined for tariff structuring purposes are not the same as 'incremental maintenance costs' such as are required in the 'incremental revenue test' and we observe that ATCO's method for calculating its AA4 assumption is quite different from its method for AA5. As a sensitivity, we tested the higher incremental maintenance cost assumption that ATCO has used in its AA5 model in its AA4 model and, when we do so, its AA4 model produces a negative NPV.

591. While ATCO's assumed incremental maintenance cost values for its AA4 test are much lower than for its AA5 test, we observe that in AA4 ATCO achieved customer growth while at the same time reducing its opex. It could be argued based on ATCO's performance that it did not incur an 'incremental maintenance cost' for the incremental customers it connected in this period.

592. On this basis, and noting that there is minimal margin for negative influences on revenues or costs, we consider it is reasonable to accept ATCO's claim that in aggregate its B2 and B3 connections satisfied the incremental revenue test at the time at which ATCO committed to these connections and related mains extensions.

Growth NPV test for AA5 Greenfields connections

The analysis ATCO has presented

593. ATCO has presented a model to support its claim that its AA5 greenfields connections meet the incremental revenue test. Structurally, the model is similar to its AA4 model, though there are some differences in assumptions. In summary, ATCO's model:

- Presents incremental revenues based on tariff assumptions, for the full AA5 proposal for B2 and B3 connections, comprising 78,969 customers, or an average of 15,794 per year;
- Incorporates a capital cost for these connections, an ongoing incremental maintenance cost, an ongoing UAFG cost and 'refreshes' of 'meters and services' capital costs after 25 years from each tranche of original connections;

[228] ATCO response to Information Request EMCa051

- Also incorporates an apportionment of HP/MP reinforcement capex (though this is small in comparison to the other capex);
- Calculates incremental project cashflows, being incremental revenue less capital costs less incremental operating costs less tax payable. The incremental cashflows are inflated into nominal terms;
- Calculates the NPV of those cashflows over a 50-year analysis horizon, using a nominal post-tax WACC of 5.48%.

594. In aggregate, this model incorporates capital costs of $144.5m, and ATCO claims an NPV of $18.7m after 50 years, and a payback period of 37 years.

Our assessment

595. ATCO's AA5 model corrects issues that we noted with its AA4 analysis. Specifically:

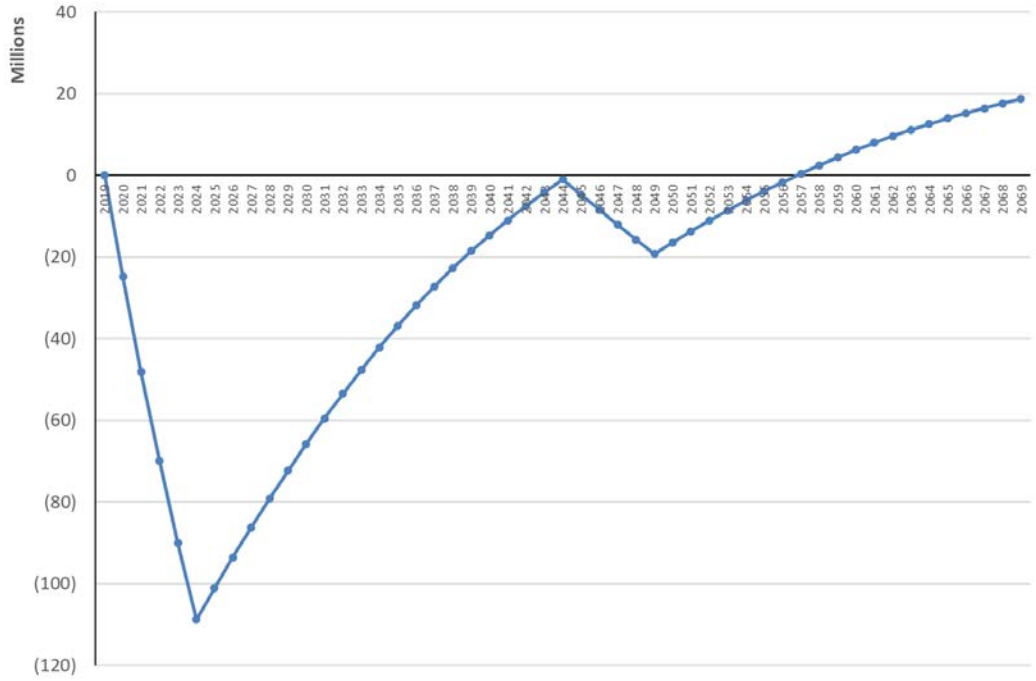
- It covers only the regulated GDS, and does not include assumed connections in Kalgoorlie or Albany;
- It does not include assumed revenues from subs to masters conversions;
- It appears to correctly model assumed disconnections, at a rate of 0.5% p.a. commencing 10 years after each tranche is originally connected;
- Connection costs are calculated from a series of transparent per-customer input assumptions and are higher than ATCO assumes in its AA4 model.

596. As indicated in our assessment of ATCO's AA4 analysis, its AA5 model also has considerably lower incremental volume assumptions which are modelled as continuing to decline over the AA5 period.

597. As with ATCO's AA4 model, we are concerned by modelling that presents an NPV result over a 50-year period. ATCO's customer connections and their usage have changed radically over the past five to ten years, and its forecasts even in 2015 proved to be optimistic. As we did with its AA4 model, we established an annual PV calculation in ATCO's model and accumulated this over time, in order to examine how the NPV builds up and the time by which it becomes positive.

598. The results of this analysis are shown in the figure below.

Figure 34: AA5 Greenfields growth NPV analysis – ATCO base case as presented



Source: EMCa analysis from ATCO AA5 Greenfields model

599. As a check, it can be seen that the final year accumulated PV in our build-up is $18.75m, which is the same as the NPV that ATCO presents.

600. Year-by-year modelling such as this shows that the NPV does not become positive before the first cycle of replacements of meters of services is assumed to occur 25 years after the initial connections. As ATCO has stated, it does not become positive until 37 years after the initial connections, that is, in 2057.

601. In assessing ATCO's model, we find that it has assumed considerable increases in its B2 and B3 tariffs, as shown (for B3) in the table below. This is consistent with its proposal to ERA, as presented in its AAI.[229] It should be noted too that in ATCO's model, the tariff in the final year shown here is extrapolated (in real terms) across the rest of the analysis period (i.e. to year 50) and so has a significant effect on the outcome of the analysis.

Table 34: ATCO's B3 tariff assumptions in its AA5 model[230]

B3 Tariffs	1-Jan-19	1-Jan-20	1-Jan-21	1-Jan-22	1-Jan-23	1-Jan-24
GJ/Customer per year at step 2 of tariff	48%	48%	48%	48%	48%	48%
Fixed Charge	116.97	116.97	116.97	116.97	116.97	116.97
First 1.825 GJ	0.00	0.00	0.00	0.00	0.00	0.00
Usage >1.825 <= 9.855 GJ	4.88	8.38	8.57	8.77	8.97	9.18
Usage > 9.855 GJ	2.11	6.22	6.36	6.51	6.66	6.81

Source: ATCO's AA5 greenfields NPV model.

602. ATCO's tariff assumptions in its AA4 model are shown in the table below. The fixed charge is similar, noting that these costs are in $2018. However, comparing the usage tariffs in the final year, and which ATCO then assumes apply in this model (in real

[229] ATCO AAI, pages 165 and 166

[230] Tariff is $2019

terms) to year 60, the tariffs it assumes in its AA5 analysis are approximately two to three times those in its AA4 model.

Table 35: ATCO's B3 tariff assumptions in its AA4 model

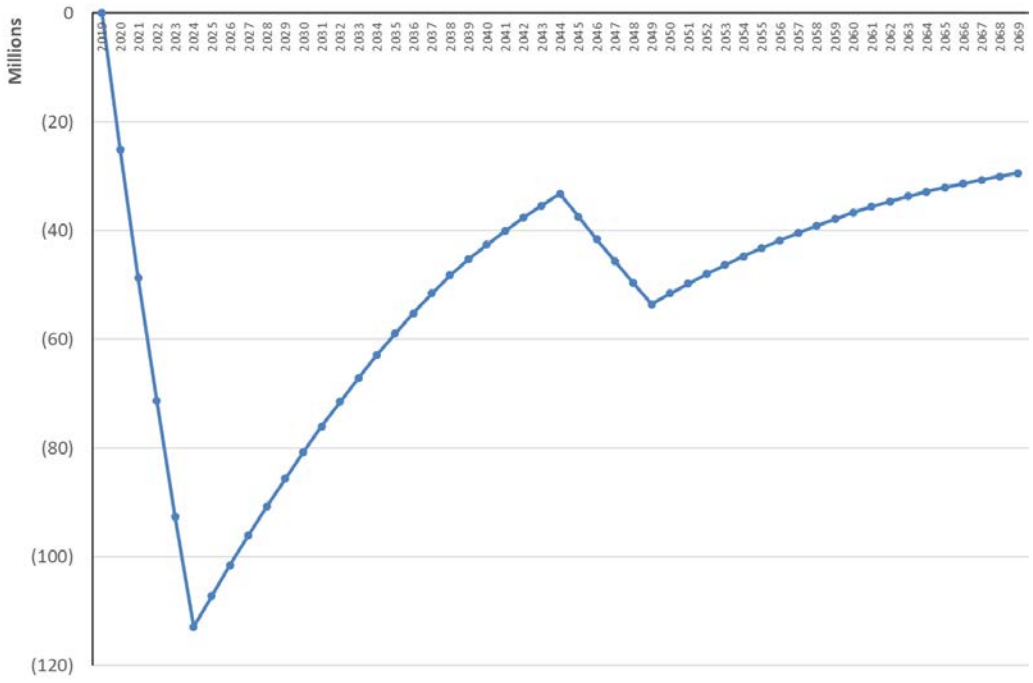
B3 Tariffs	1-Jan-18	1-Jan-19	1-Jan-20
GJ/Customer per year at step 2 of tariff	50%	50%	50%
Fixed Charge	104.77	114.67	114.67
First 1.825 GJ	0.00	0.00	0.00
Usage >1.825 <= 9.855 GJ	7.77	5.08	4.95
Usage > 9.855 GJ	3.35	2.19	2.14

Source: ATCO's AA4 BP 2018 model

603. For reasons that we described in our 2014 report to the ERA, we consider it is not valid (and implicitly circular) in an incremental revenue test to assume tariff increases that do not yet apply. Rule 79(4) requires that 'prevailing' tariffs are used and we consider that a reasonable interpretation of this is that they should be tariffs that apply prior to adopting any changes to such tariffs that are the subject of the current regulatory determination.

604. We tested the sensitivity of ATCO's AA5 model to maintaining the 2019 tariff assumptions in its modelling, rather than assuming the increase that it has sought from ERA starting in 2020. The result is shown below and, under this test the NPV is negative even with a 50-year analysis period. At the first 'replacement' refresh at 25 years, the NPV is negative $32m, and after 50 years it is still negative $29m.

Figure 35: AA5 Greenfields growth NPV analysis – incorporating EMCa adjustment to remove ATCO's assumed increase from prevailing tariffs



Source: EMCa analysis

605. As a further observation, we note that in its AA4 model, ATCO has assumed incremental maintenance costs of $46.76/year for B2 customers and $11.11 for its B3 customers. We note that it has much higher cost assumptions for larger customers, ranging up to an assumed $11,956.70/year for each new A1 customer (however these higher values are not used in its model, which covers only B2 and B3 connections).

606. In its AA5 model, ATCO has assumed an incremental maintenance cost of $58.09/year for each new customer. Its model includes this same assumed value for all customer classes and this may be a valid blended average. However, because ATCO is specifically aiming to demonstrate the economics of B2 and B3 connections, the assumption is over five times higher for B3 customers than it assumed in its AA4 modelling, and slightly higher also for B2 customers.

607. We sought further information from ATCO to verify this assumption.[231] In its response, ATCO confirmed the assumption and provided its calculations. We also undertook a 'sense check' by considering the 'growth' component of ATCO's forecast AA5 opex, which ATCO specifically identifies in its opex modelling (as we describe in Section 7) and determining an incremental opex cost from this for its AA5 forecast new connections. This sense check essentially verifies that ATCO's assumption in its incremental revenue test model is broadly consistent with the growth escalator it has assumed for its opex proposal.

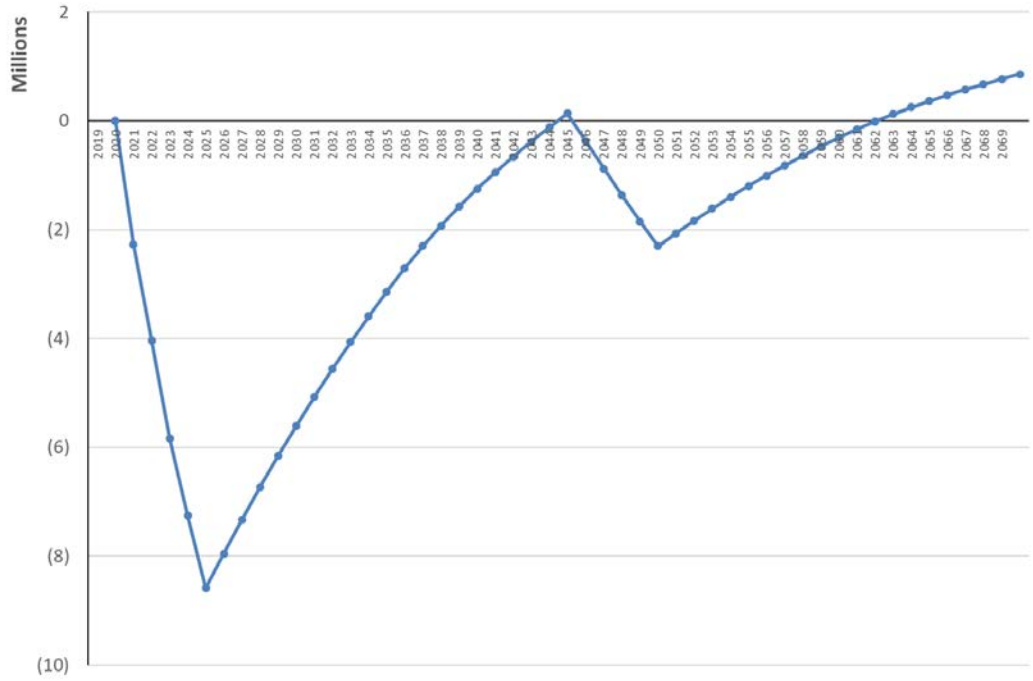
608. A corollary of this is that, if ATCO's growth-related incremental opex requirements are less than it has proposed to ERA, then this would support a lower incremental opex assumption in its incremental revenue test model and this in turn, would improve the apparently unfavourable economics of new connections.

Growth NPV test for AA5 Brownfields connections

609. We reviewed ATCO's model provided to support its AA5 brownfields incremental growth test. This model functions in the same way as its AA5 greenfields model but contains only an assumed 4,065 brownfields B2 and B3 connections, or an average of 813 per year.

[231] ATCO's Response to information request EMCa 50

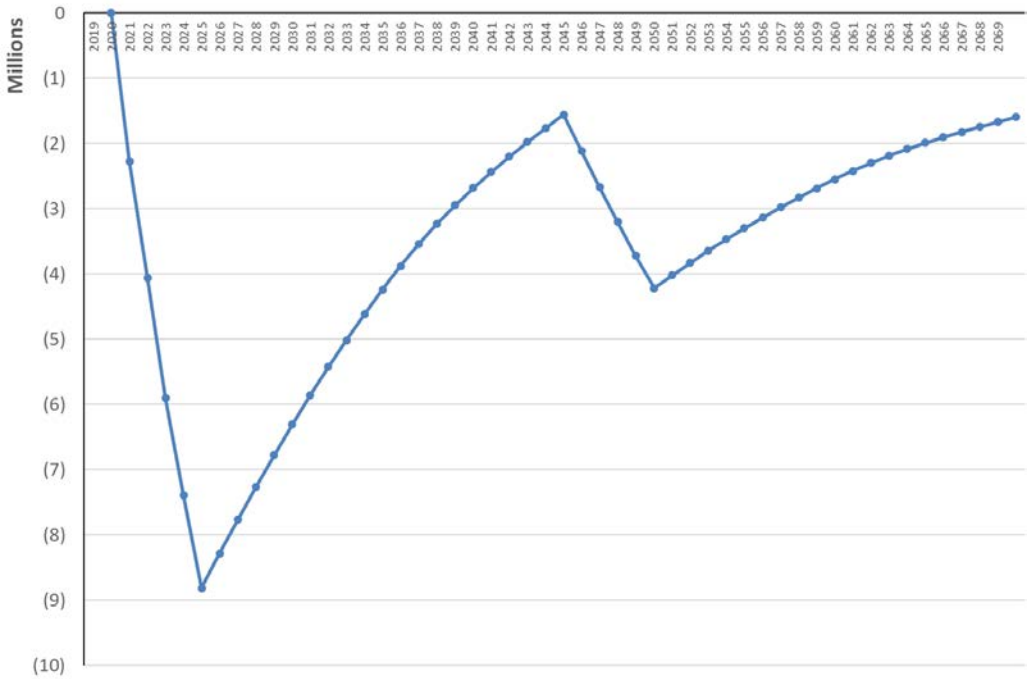
Figure 36: AA5 Brownfields growth NPV analysis – ATCO base case as presented



Source: EMCa analysis from ATCO AA5 Brownfields model

610. With ATCO's prevailing (i.e. 2019) tariffs assumed, ATCO's incremental revenue test would remain negative over the entire period, with an NPV of negative $1.1m at 25 years, and negative $1.0m still at 50 years.

Figure 37: AA5 Brownfields growth NPV analysis – incorporating EMCa adjustment to remove ATCO's assumed increase from prevailing tariffs



EMCa analysis from ATCO AA5 Brownfields model

Conclusion on ATCO's incremental revenue test

611. We find a range of errors and some questionable assumptions in ATCO's modelling. This includes what we consider to be an unreasonably long analysis time period, assumed increases to tariffs and considerably different assumed relationships between connections growth and opex growth in ATCO's AA4 and AA5 models.

612. On balance, we consider it was reasonable for ATCO to form the view that its AA4 growth capex met the required test, at the time when it committed to those investments.

We consider that ATCO's proposed AA5 growth capex, which is primarily connections capex, does not meet the incremental revenue test.