Gas Distribution Benchmarking Partial Productivity Measures Acil Allen November 2014

Appendix 6.1

27 November 2014

Response to the ERA's Draft Decision on required amendments to the Access Arrangement for the Mid-West and South-West Gas Distribution System

Connecting WA to natural gas

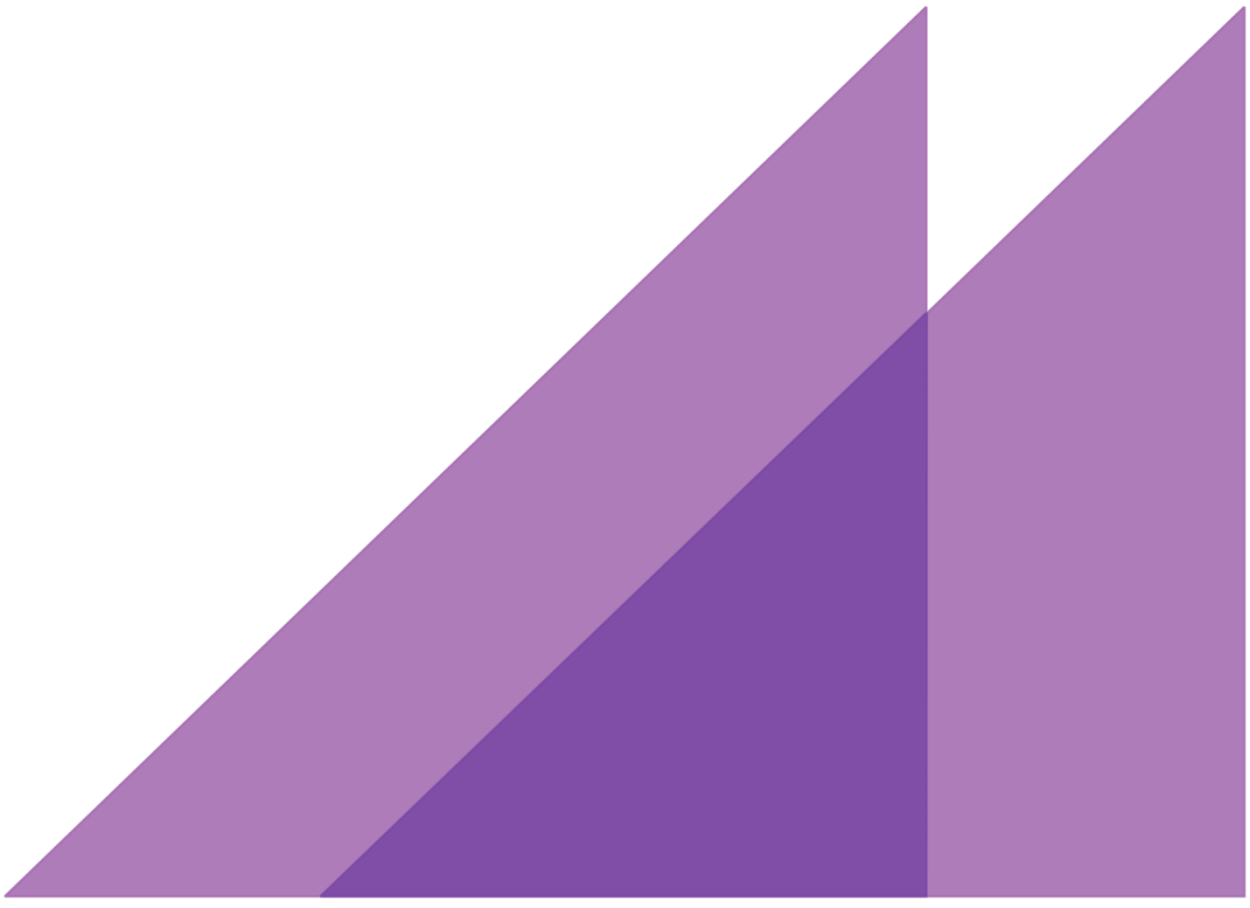
ACIL ALLEN CONSULTING

REPORT TO
ATCO GAS AUSTRALIA

24 NOVEMBER 2014

GAS DISTRIBUTION BENCHMARKING

PARTIAL PRODUCTIVITY MEASURES



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Compliance with the Code of Conduct for Expert Witnesses

I am a Principal of ACIL Allen Consulting and have prepared this expert report.

I have read, understood and complied with the Expert Witness Guidelines (Federal Court Practice Note CM 7, entitled "*Expert Witnesses in Proceedings in the Federal Court of Australia*") in preparing this report.

I have made all inquiries that I believe are desirable and appropriate and no matters of significance that I regard as relevant have, to my knowledge, been withheld from the report.

Necessary limitations to the scope and depth of the analysis undertaken, and the resulting findings that can be made based on the analysis, are outlined in the report.

Deirdre Rose
Principal

Consultant qualifications

Deirdre Rose, a Principal of ACIL Allen Consulting, has prepared this expert report. Deirdre has undertaken productivity and efficiency benchmarking of a range of regulated industries and government services over a period of close to 20 years.

Deirdre was initially trained in economic benchmarking techniques by leading international academics while a research economist at NSW Treasury.

Deirdre has undertaken economic benchmarking for regulators and regulated firms using a range of benchmarking techniques including Total Factor Productivity index number analysis and Data Envelopment Analysis.

A CV is provided in Appendix C.

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Executive summary

Study scope

ACIL Allen Consulting (ACIL Allen) has been engaged by ATCO Gas Australia (ATCO Gas) to update its benchmarking report prepared in March 2014 titled "*Gas Distribution Benchmarking Partial Productivity Measures*". The March 2014 report and this update benchmarks ATCO Gas against eight Australian gas distribution businesses.

In accordance with the Terms of Reference for the study, this is an expert report which:

- updates the analysis in the March 2014 report to include additional and updated actual data insofar as it is available
- undertakes a benchmarking analysis of ATCO Gas' expenditure forecasts against the expenditure proposals of other Australian gas distributors covering the same time period as ATCO Gas' access arrangement period.

This report has been prepared for use by ATCO Gas for its submission to the ERA and for use by the ERA in assessing that submission.

Benchmarking approach

This study estimates partial productivity performance indicators to benchmark the costs of the gas distributors. The performance benchmarks and operating environment indicators estimated in the study are shown below.

Performance benchmarks			Operating environment
Opex benchmarks	**Capex benchmarks**	**Totex benchmarks**	**Indicators**
Opex/km	Capex/km	Totex/km	Customers/km
Opex/customer	Capex/customer	Totex/customer	TJ/km
Opex/TJ delivered	Capex/TJ delivered	Totex/TJ delivered	TJ/customer
Opex as a percentage of the Regulated Asset Base (RAB)	Capex as a percentage of RAB	Totex as a percentage of RAB	

Note: Opex is operating expenditure; Capex is capital expenditure; Totex is capex + opex

Conclusions

Operating environment for ATCO Gas

Previous benchmarking studies of gas distributors (including the Marksman Report and various studies by Economic Insights) have identified customer density (customers per kilometre of mains) and energy density (energy delivered per customer and per kilometre of mains) as material drivers of cost and hence relative efficiency.

Higher customer density means that less pipelines and associated assets need to be built and maintained per customer, resulting in relatively lower costs and a relatively higher efficiency. Similarly, greater energy density has been associated with lower inputs to deliver a given volume of gas.

ATCO Gas has among the lowest energy density of the gas distributors in the sample and its energy density is declining. ATCO Gas' actual delivered gas has fallen by almost 18 per cent over the period from 2005 to 2014. ATCO Gas will continue to have the lowest energy density of the gas distributors over the period to 2019 (on a TJ per customer basis), based on the available forecasts. Depending on the extent to which low energy density drives costs, the very low energy density for ATCO Gas relative to the other businesses means that even it were equally efficient as other firms, its costs would be higher and hence it would not appear to be as efficient.

ATCO Gas is in the mid-range of customer density (as measured by customers per km of network) over the period from 2005 to 2014. ATCO Gas is forecast to remain at close to the 2014 customer density level over the period to 2019. Hence, this operating environment factor is not expected to result in higher costs for ATCO Gas relative to the sample. However, it does not provide ATCO Gas with a cost advantage and is unlikely to outweigh the cost disadvantage imposed by ATCO Gas' extremely low energy density.

Cost benchmarks

The efficiency analysis undertaken within this study is by its nature partial as individual cost categories are assessed relative to single outputs. In addition, the measures do not fully account for potential explanators of cost differences between the firms in the sample. This means that the efficiency measures do not provide a comprehensive picture of overall efficiency performance and the performance of individual firms may appear better or worse than they would if the measures accounted for these other explanators.

However, strengthening the insights from the analysis, a significant proportion of the gas distributors' costs are measured and compared, the costs have been normalised against a range of relevant output measures and assessed in conjunction with the most significant operating environment indicators of customer and energy density. This means that partial analysis presented in this report can provide useful insights into ATCO Gas' relative cost efficiency.

For the reasons outlined in the paper, it is considered that the indicators that show expenditure on a per km and a per customer basis are the most meaningful measures of partial cost efficiency when comparing ATCO Gas to the other Australian gas distributors.

Based on the results of the analysis, the opex and capex performance indicators for ATCO Gas suggest that they have efficient costs relative to the sample of Australian gas distributors, both over historical periods and over the AA4 period. For the AA4 period, this conclusion holds for ATCO Gas' original proposal and revised proposal.

ATCO Gas is not offered a cost advantage over other distributors by the most important operating environment drivers of differences in cost, i.e. by its energy density or customer density. Its low energy density would, all else being equal, be expected to place ATCO Gas at a cost disadvantage. In this circumstance, the low level of ATCO Gas' normalised opex and capex expenditures raises the question whether its expenditure has fallen to levels that are below what would be required to sustainably deliver required services over the long term.

The ERA draft decision will reduce unit opex and capex expenditure levels even lower, taking the opex and capex indicators to levels that are well below the 2013-14 sample average and the combined unit expenditure below the levels of the other Australian gas distributors. For example:

- 2019 opex per km to 37 per cent below the current (2013-14) sample average, widening the already considerable gap of 31 per cent between the industry average performance in Australia and ATCO Gas
- 2019 opex per customer to 41 per cent below the 2013-14 industry average, extending further the already significant current gap of 39 per cent between ATCO Gas' opex per customer and the industry average
- 2019 capex per km to 68 per cent below the current (2013-14) sample average, widening the current gap of 40 per cent between the industry average performance in Australia and ATCO Gas
- 2019 capex per customer to 67 per cent below the 2013-14 industry average, extending further the current gap of 41 per cent between ATCO Gas' opex per customer and the industry average
- 2019 opex + capex per km to 56 per cent below the current (2013-14) sample average, widening the current gap of 36 per cent between the industry average performance in Australia and ATCO Gas
- 2019 opex + capex per customer to 56 per cent below the 2013-14 industry average, extending further the current gap of 40 per cent between ATCO Gas' opex per customer and the industry average.

In this circumstance, it would be prudent for the ERA to verify whether the expenditure proposals contained within its Draft Decision require ATCO Gas to achieve cost levels that are insufficient to provide their required levels of service over the long term. Reducing costs below sustainable levels could impose higher costs on consumers e.g. if assets are allowed to deteriorate and quality of service to consumers suffers. This verification could usefully involve more sophisticated approaches to account for operating environment differences in any benchmarking relied on by the ERA, as the Australian Energy Regulator (AER) is proposing.

1 Introduction

1.1 Context

The Economic Regulation Authority of Western Australia (ERA) is undertaking a review of the Gas Access Arrangement for ATCO Gas Australia (ATCO) for the period 1 July 2014 to 31 December 2019 (also referred to as the as AA4 or fourth access arrangement period). ATCO Gas owns and operates the Mid West and South West Gas Distribution System. A fundamental aspect of the ERA's review is to assess the efficiency of ATCO Gas' proposed expenditure.

This benchmarking study has been commissioned in the context of assessing whether ATCO Gas is an efficient service provider. Benchmarking is used to compare the costs proposed by a regulated business against those of comparable firms. Benchmarking provides insights into the relative efficiency of firms' costs and the potential for efficiency and productivity improvements over time. The use of benchmarking analysis is becoming a more formalised part of regulatory processes in Australia, including under the Australian Energy Regulator's *Better Regulation* reform program.

In early 2014, ACIL Allen was engaged to update the analysis in the Marksman Consulting Services 2010 report, titled "*Gas Distributor Benchmarking Report Envestra South Australia and Queensland*" (the Marksman Report), providing updated benchmarks for the period 2005-06 to 2012-13. The Marksman Report compared the performance of nine Australian gas distributors (including ATCO Gas) using partial performance indicators benchmarking operating and capital expenditure.

ACIL Allen submitted a report on 11 March 2014 presenting the benchmarking analysis. The report, titled "*Gas Distribution Benchmarking Partial Productivity Measures"*, was submitted to the ERA.

On 14 October 2014 the ERA published its Draft Decision on ATCO Gas' proposed Access Arrangement for the period 1 July 2014 to 31 December 2019.

1.2 Scope

ACIL Allen is now engaged to prepare an expert report which:

- updates the analysis in its March 2014 report to include additional and updated actual data insofar as it is available
- undertakes a benchmarking analysis of ATCO Gas' expenditure forecasts against the expenditure proposals of other Australian gas distributors covering the same time period as ATCO Gas' access arrangement period.

The following additional specific questions are addressed within the report at the request of ATCO Gas:

- the basis on which data was sourced and the extent to which that data can be considered robust and appropriate for the benchmarking analysis
- the methodology used to ensure comparability of data between the analysed businesses

— the uses which can be made of a benchmarking analysis and any strengths and weaknesses of the analysis

— your view, as an expert, as to whether benchmarking is a useful mechanism for assessing the efficiency of a business

— how ATCO Gas performs relative to the benchmarks.

The full Terms of Reference (TOR) for the study are shown in Appendix B.

This report has been prepared for use by ATCO Gas for its response to the ERA Draft Decision and for use by the ERA in assessing that response.

1.3 Report structure

The report is structured as follows:

— section 2 provides an overview of the benchmarking study including a description of the benchmarking measures and the businesses included in the study

— section 3 addresses the questions posed by ATCO Gas regarding the use of benchmarking analysis

— section 4 describes the benchmarking data and addresses questions posed by ATCO Gas in relation to the data

— section 5 presents the performance indicators and expert opinion on their interpretation.

2 Overview of benchmarking study

This section provides an overview of the benchmarking approach used in the current study, the performance benchmarks estimated and the gas distributors included in the study.

2.1 Partial productivity benchmarking

In accordance with the Marksman Report and many other efficiency benchmarking studies, this study estimates partial productivity performance indicators (PPIs) to benchmark the costs of the gas distributors.

Gas distributors use a range of inputs including labour, pipelines, vehicles, information technology, land and materials. These inputs may be used more or less efficiently by different gas distributors and hence gas distribution services may be provided at lower or higher costs by different firms.

The benchmarking approach used in this study compares the cost efficiency of ATCO Gas against other Australian gas distributors via ratios of major cost inputs relative to the amount of services or output produced.

That is, the performance benchmarks are estimated as:

$$Performance\ benchmark = \frac{Input\ measure}{Output\ measure}$$

In the current benchmarking study, a significant proportion of the gas distributors' costs are measured and compared including:

- operating expenditure: key costs include maintenance, network operation and control and billing and revenue collection
- capital expenditure: encompasses mains renewals, network augmentation, IT and data systems and meters.

These costs are measured in relation to key outputs including the amount of gas delivered and the number of customers served.

A full listing of the performance benchmarks produced in the study is shown in Section 2.2.

The benchmarks measure the level of unit costs incurred by the nine Australian gas distributors providing comparable gas distribution services. Low unit costs relative to the sample can indicate that a firm is cost efficient. As explained in more detail in Section 3, there can also be other factors that explain costs differences between firms including:

- the relative quality of service they provide
- historical or legacy features of the business such as the relative age of the network and historical levels of maintenance and renewals expenditure
- for businesses such as gas distributors that make large, lumpy capital investments there can be temporal differences in measured efficiency due to their relative stage in the investment cycle
- a range of features of the environment in which the firms operate which impact on costs including customer and energy density and business regulations.

2.2 Performance benchmarks

Table 1 lists the performance benchmarks and operating environment indicators estimated in the study.

Key indicators of the operating environment of the gas distributors that may explain differences in costs are also presented.

Table 1 **Performance and operating environment indicators**

Performance benchmarks			Operating environment
Opex benchmarks	**Capex benchmarks**	**Totex benchmarks**	**Indicators**
Opex/km	Capex/km	Totex/km	Customers/km
Opex/customer	Capex/customer	Totex/customer	TJ/km
Opex/TJ delivered	Capex/TJ delivered	Totex/TJ delivered	TJ/customer
Opex as a percentage of the Regulated Asset Base (RAB)	Capex as a percentage of RAB	Totex as a percentage of RAB	

Note: Opex is operating expenditure; Capex is capital expenditure; Totex is capex + opex

The performance benchmarks and operating environment indicators are calculated for the nine Australian gas distributors described in Section 2.3 for the period from 2005-06 to 2019-20.

2.3 Benchmarked businesses

This study benchmarks ATCO Gas against eight Australian gas distributors. An overview of each firm included in the benchmarking study is provided in Table 2 including their service area coverage, key outputs and recent access arrangement periods (as the approved access arrangements and associated submissions provide a key data source for this study).

Table 2 **Benchmarked gas distribution businesses**

Gas distributor	2012 outputs	Access arrangement periods
Western Australia		
ATCO Gas Australia ATCO Gas owns, operates and maintains the reticulated gas infrastructure in Western Australia (WA) serving Geraldton, Kalgoorlie, Albany, Bunbury, Busselton, Harvey, Pinjarra, Brunswick Junction, Capel and the Perth greater metropolitan area including Mandurah	**2011/12** Network length 13,182 km Customers 640,099 TJ delivered 26,553	1 July 2014 - 31 December 2019 (WA ERA) 1 Jan 2010 to 2013/14 (WA ERA) 2005 to 2009 (WA ERA)
South Australia		
Australian Gas Networks SA Australian Gas Networks Limited (AGN), previously Envestra Limited, is now fully owned by the Cheung Kong Consortium. It is the largest gas distribution company in Australia with natural gas distribution networks and transmission pipelines in South Australia, Victoria, Queensland, New South Wales and the Northern Territory. AGN's South Australian gas distribution network serves Adelaide, Mt Gambier, Whyalla, Pt Pirie, Barossa Valley, Murray Bridge and Berri	**2011/12** Network length 7,786 km Customers 411,199 TJ delivered 33,231	8 July 2011 - 30 June 2016 (AER) July 2011 to 30 June 2016 (AER) 13 November 2006 to 30 June 2011 (ESCOSA)

Gas distributor	2012 outputs	Access arrangement periods
Victoria		
Australian Gas Networks Victoria AGN's Victorian gas distribution network serves the northern, outer eastern and southern areas of Melbourne, Mornington Peninsula, rural communities in northern, eastern and north-eastern Victoria, and south-eastern rural townships in Gippsland	**2012** Network length 10,226 km Customers 587,913 TJ delivered 55,420	1 January 2013 - 31 December 2017 (AER) 1 Jan 2013 – 31 Dec 2017 (AER) 1 Jan 2008- 31 Dec 2012 (ESC)
Multinet Multinet Gas serves customers throughout Melbourne's inner and outer east, the Yarra Ranges and South Gippsland	**2012** Network length 9,980 km Customers 670,180 TJ delivered 56,791	1 January 2013 - 31 December 2017 (AER) 1 Jan 2013 – 31 Dec 2017 (AER) 1 Jan 2008- 31 Dec 2012 (ESC)
AusNet Services AusNet Services (previously SP AusNet) distributes gas to customers across central and western Victoria. Its service area includes metropolitan Melbourne growth corridors including Caroline Springs and Werribee.	**2012** Network length 10,046 km Customers 616,324 TJ delivered 71,000	1 January 2013 - 31 December 2017 (AER) 1 Jan 2013 – 31 Dec 2017 (AER) 1 Jan 2008- 31 Dec 2012 (ESC)
ACT		
ActewAGL ActewAGL Distribution operates the gas distribution network in the ACT, Queanbeyan, Palerang and Nowra. The data presented in this report excludes Nowra, as it is excluded from the access arrangement	**2011/12** Network length 4,200 km (approx.) Customers 123,470 TJ delivered 7,696	1 July 2015 - 30 June 2020 (AER) 1 July 2010 - 30 June 2015 (AER) 1 January 2005 to 30 June 2010 (ICRC)
New South Wales		
Jemena Gas Networks Jemena Gas Networks distributes natural gas to 1.1 million homes and businesses in Sydney, Newcastle, the Central Coast and Wollongong as well as to over 20 country centres including those in the Central West, Central Tablelands, South Western, Southern Tablelands, Riverina and Southern Highlands regions of New South Wales. It is the largest gas distributor included in this study	**2011/12** Network length 24,221 km Customers 1,139,711 TJ delivered 90,489	1 July 2015 - 30 June 2020 (AER) 1 July 2010 - 30 June 2015 (AER) 1 July 2005 – 30 June 2010 (IPART
Queensland		
Australian Gas Networks Queensland AGN Queensland's gas distribution network serves customers in Brisbane (north of Brisbane River), Ipswich, Rockhampton and Gladstone	**2011/12** Network length 2,643 km Customers 87,550 TJ delivered 16,465	1 July 2011 - 30 June 2016 (AER) 1 July 2011 - 30 June 2016 (AER) 1 July 2006 to 30 June 2011 (QCA/AER)
Allgas Energy APT Allgas owns and operates gas distribution pipelines in Queensland and northern New South Wales that supply natural gas to customers in Brisbane (south of the river), and in other regional centres including Toowoomba and the Gold Coast	**2011/12** Network length 3,247 km Customers 87,315 TJ delivered 9,897	1 July 2011 - 30 June 2016 (AER) 1 July 2011 - 30 June 2016 (AER) 1 July 2006 to 30 June 2011 (QCA)

Note:
WA ERA – WA Economic Regulation Authority; AER – Australian Energy Regulator; ESCOSA – Essential Services Commission of SA; ESC – Victorian Essential Services Commission; IPART – Independent Pricing and Regulatory Tribunal; QCA- QLD Competition Authority

ATCO Gas has the second largest network among the benchmarked firms. However, its network is a little over half the size of Jemena Gas Networks in New South Wales. ATCO Gas serves a network that is closest in size to the Victorian gas distributors, but faces less than half their demand for gas. The characteristics of the gas distributors are described in more detail in Section 5.1 below.

3 Use of benchmarking

This section addresses the questions in the TOR regarding the use of benchmarking.

3.1 Benchmarking to assess efficiency

— *your view, as an expert, as to whether benchmarking is a useful mechanism for assessing the efficiency of a business*

The economic regulation of monopoly service providers aims to ensure services of a desired quality are provided at efficient cost. Benchmarking is useful in this context as it provides objective, empirical measures of the productivity and efficiency of regulated firms.

Productivity is the maximum level of output attainable from inputs given the current state of technology and is represented by an efficient production frontier. Efficiency analysis compares the performance of individual companies in relation to the production frontier, that is, whether they are on or beneath the efficient frontier.

Benchmarking can be used to compare the cost efficiency of a regulated firm over time and against the performance of other similar firms. When undertaking benchmarking it is important to recognise that economic performance can be affected by:

- efficiency change, for example, due to improvements in the use of existing technologies, scale efficiency or allocative efficiency
- technological change through the creation of new technologies
- the environment in which production occurs, as these environmental factors can drive costs but are outside the control of firm. In the case of gas distributors relevant environmental factors could include:
  - characteristics of the customer base such as size and geographical spread the determine energy and customer density
  - government regulations
- historical or legacy factors such as the condition and age profile of assets
- the quality of services provided.

Different approaches to benchmarking and the quality and availability of data will determine the ability to measure some or all of these contributors to overall efficiency.

Total factor productivity (TFP) measures seek to capture the multiple inputs used and outputs produced within a single measure. Common benchmarking techniques include index number TFP analysis, Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA). The use of partial measures of productivity is also common. Partial productivity assesses output relative to a single input such as labour or operating costs. This approach is used in this benchmarking study.

In recognition of the value of benchmarking for assessing the efficiency of firms, it is increasingly used as part of the process of determining efficient cost for regulated network service providers (NSPs) in Australia. Under the AER's Better Regulation reform program, economic benchmarking techniques are being used in current price reviews for electricity NSPs to analyse their efficiency over time and compared to their peers, to estimate a top down forecast of expenditure and to estimate productivity change. The AER intends to use a range of benchmarking methodologies. However, these will include TFP approaches such

as multilateral index numbers. The AER's benchmarking analysis will also use a range of approaches to ensure that significant operating environment differences between the NSPs are accounted for and hence that more accurate measures of efficiency and productivity are obtained.

The use of efficiency benchmarking is common as part of economic regulatory processes internationally, including in New Zealand, the United Kingdom and Ireland and many European countries including the Netherlands, Austria and Denmark.[1]

It is important to recognise that due to the limitations of data and of the benchmarking techniques, the efficiency and productivity measures produced are typically approximate rather than exact. There are often challenges associated with accounting for differences in relevant operating environment factors, in accurately measuring inputs and outputs and in gaining comparable, quality data over long time periods.

3.2 Uses, strengths and weaknesses

— *the uses which can be made of a benchmarking analysis and any strengths and weaknesses of the analysis*

This question is answered in relation to the benchmarking approach that has been used in this study, i.e. in relation to partial performance indicators (PPIs). PPIs are a valid approach to assess cost efficiency over time and/or between firms.

The strengths of the PPI approach are that:

— comparable data is typically available to produce these measures

— they are simple to calculate

— they can be readily understood and interpreted and hence aid transparency between regulated firms and regulators

— they are commonly used by industry and economic regulators

— insights are provided into individual areas of cost performance that are not available from more summary measures.

The ACCC and AER (2012) recently reviewed the use of PPIs and found that they had been used by a number of energy regulators to assess the cost efficiency of electricity and gas distributors including in Australia, New Zealand, Ireland, the United Kingdom and the Netherlands.

However, it is important to understand that there are limits to the information that the partial indicators provide. As their name indicates, partial measures provide measures of performance in relation to a single input or aspect of performance, but do not provide a measure of the overall economic performance of a firm or insights into the trade-offs that different firms make between inputs (e.g. capital, labour) over time or between locations. The comprehensive efficiency benchmarking techniques including TFP analysis, DEA and econometric approaches are used to provide these more comprehensive performance measures.

These limitations do not invalidate or undermine the use of PPIs, but must be recognised when interpreting the measures. This is true of all efficiency and productivity measurement approaches.

[1] Useful reviews of this overseas experience are provided in ACCC and AER (2012), WIK-Consult (2011) and the Brattle Group (2008).

This study, in common with the Marksman Report and many other studies that have used PPIs, jointly assess a range of partial cost performance indicators and operating environment indicators. This retains the positive features of the measures (such as their ease of interpretation), while strengthening the insights that can be gained.

4 Benchmarking data

This section describes the data used for the benchmarking study and answers the data-related questions in the TOR.

4.1 Data definitions

4.1.1 Inputs

Operating expenditure

The operating expenditure amounts used in this benchmarking study reflect the costs classified as operating expenditure within each businesses' Access Arrangement. This typically includes a range of operating costs (including network operations, regulatory costs and billing cost), maintenance costs (including for pipelines, meters and network control) and other management and administration costs.

As had been identified in the Marksman Report, unaccounted for gas (UAFG) is treated differently between the jurisdictions. As a result, it has been excluded from operating costs for this study. Debt raising costs have also been removed where included in reported operating expenditure. This has also been done to account for differences in the treatment of these costs over time and between the businesses. Full retail competition (FRC) associated expenditure, carbon costs and government levies are included in the reported operating costs within this study.

The expenditure data sourced for the benchmarking study were reported in a range of nominal and constant dollar values within the source documents. All dollar amounts have been converted to September 2014 dollars using the Australian Bureau of Statistics All Groups, Weighted average of eight capital cities, CPI (Series ID: A2325846C).

Capital expenditure

The capital expenditure amounts used in this benchmarking study reflect the costs classified as capital expenditure within each businesses' Access Arrangement.

4.1.2 Outputs

Network length

The network length for the gas distributors includes the mains that the businesses classify as low, medium and high pressure distribution mains and transmission pressure mains operated above 1,050kPa.

Customers

The customer number measure is the total number of customers including residential and non-residential volume customers and contract customers.

Gas delivered

The gas delivered measure is the total gas delivered to the above customers measured in Terajoules (TJ).

4.1.3 Regulatory asset base (RAB)

In accordance with the Marksman Report, measures of costs as a percentage of RAB are provided. The measure of RAB is the closing value for each year.

4.2 Data sources

— *[describe] the basis on which data was sourced*

ACIL Allen compiled a benchmarking database for the nine gas distributors for the period from 2005-06 to 2019-20.

The benchmarking data were sourced from public reports including:

— gas distributor Access Arrangement Information statements

— regulatory determinations by the AER and jurisdictional regulators

— AER performance reports

— annual and other reports published by the businesses

— consultant reports prepared as part of access arrangement review processes.

A reference list is provided in Appendix D.

The data for ATCO Gas were drawn from a mix of public sources including its current Access Arrangement Information and from data provided to ACIL Allen for this benchmarking study.

For the period from 2005-06 to 2013-14, the benchmarking study relies to the greatest extent possible on data from reported actual costs and outputs, rather than on forecasts. Where it has been necessary to use forecasts, the data reflect final forecasts agreed with the regulator (and amended by appeal where relevant). For this period, approximately 30 per cent of the data items used are forecasts.

Beyond 2013-14, the benchmarking analysis uses the forecasts contained in access arrangements as follows:

— Australian Gas Networks South Australia: current access arrangement which applies for the period 8 July 2011 to 30 June 2016

— Victorian gas distributors (Australian Gas Networks Victoria, Multinet and AusNet Services): current access arrangement which applies for the period 1 January 2013 to 31 December 2017

— Jemena Gas Networks: access arrangement proposal for the period from 1 July 2015 to 30 June 2020 (dated 30 June 2014). The proposal and supporting documents have been submitted to the AER and are currently subject to review.

— Queensland gas distributors (Australian Gas Networks Queensland, Allgas Energy): current access arrangement which applies for the period 1 July 2011 to 30 June 2016.

In many cases, the access arrangements do not provide forecasts of mains length. Hence, for the forecast period, ACIL Allen has sought actual mains length data up to 2014 from alternative sources including company reports. For a small number of observations, mains length has been estimated based on reported mains length in the year before and after the

missing year. This assumption should not affect the analysis given that network length does not change substantially from year to year.

4.3 Ensuring data comparability

— *[describe] the methodology used to ensure comparability of data between the analysed businesses*

As indicated above, the benchmarking study relies on cost (operating and capital expenditure) and output (including length of network, number of customers and gas delivered) data that were reported publicly by the gas distributors and, in most cases, verified by their economic regulator.

Within the time available for this study, it was not possible to undertake a detailed review of the data items used in the study to ensure comparability between the businesses. However, high level checks of the basis on which each data item is defined among the firms were undertaken.

A number of prior benchmarking studies of Australian gas distributors have also been examined to understand the appropriate sources of data and to draw on the experience of these studies in ensuring that the data used was comparable across the firms. The previous reports were submitted as part of regulatory processes and include Marksman Consulting Services (2010), Economic Insights (2014), Economic Insights (2012a), Economic Insights (2012b), Marchment Hill Consulting (2012), Economic Insights (2010), ACTEWAGL (2009a), WorleyParsons (2007) and Meyrick and Associates (2004). The lessons from those studies in terms of ensuring data comparability have been applied in ACIL Allen's updated analysis.

4.4 Data suitability for benchmarking

— *[describe] the extent to which that data can be considered robust and appropriate for the benchmarking analysis*

The public data used in the study is robust and appropriate for benchmarking analysis. The rationale for this view is that the data were:

— prepared by the gas distribution businesses and their experts

— subject to scrutiny by the economic regulator and in many cases also by expert consultants to the economic regulator.

As noted above, the time available for this study has limited the extent of the analysis of data comparability. Therefore, this study relies on the previous significant testing of the data for comparability in other similar benchmarking studies, as well as a high level review of the basis on which the data items are defined between the firms. This process is considered to be sufficient to provide a benchmarking dataset that is appropriate for benchmarking analysis.

5 Performance benchmarks

The performance indicators that benchmark the operating environment, operating expenditure and capital expenditure of the gas distribution businesses are presented below. The benchmarks are presented in the tables in Appendix A.

5.1 Operating environment

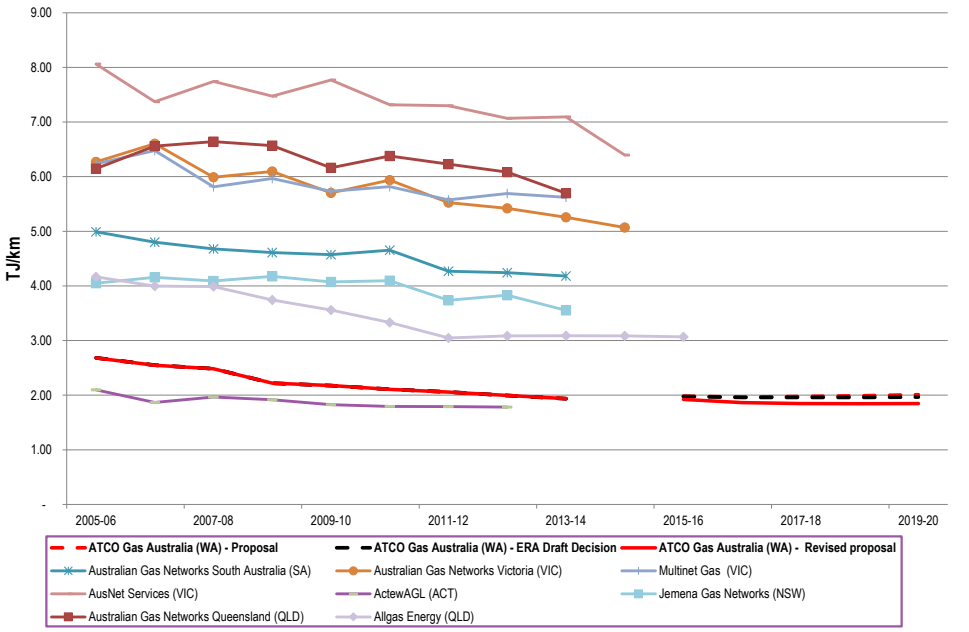
Costs between firms may differ due to their individual actions and decisions and due to the characteristics of the environment in which they operate. The features of the external environment may drive costs but are outside of the control of the business. Relevant environmental factors could include labour, safety and environmental regulations, the geographical size and spread of the customer base, the level of population growth and legacy issues such as the age of the network.

Previous benchmarking studies of gas distributors (including the Marksman Report and various reports by Economic Insights) have identified customer density (customers per kilometre of mains) and energy density (energy delivered per customer and per kilometre of mains) as material drivers of cost and hence relative efficiency.

Higher customer density means that less pipelines and associated assets need to be built and maintained per customer, resulting in relatively lower costs and a relatively higher efficiency. Similarly, greater energy density has been associated with lower inputs to deliver a given volume of gas.

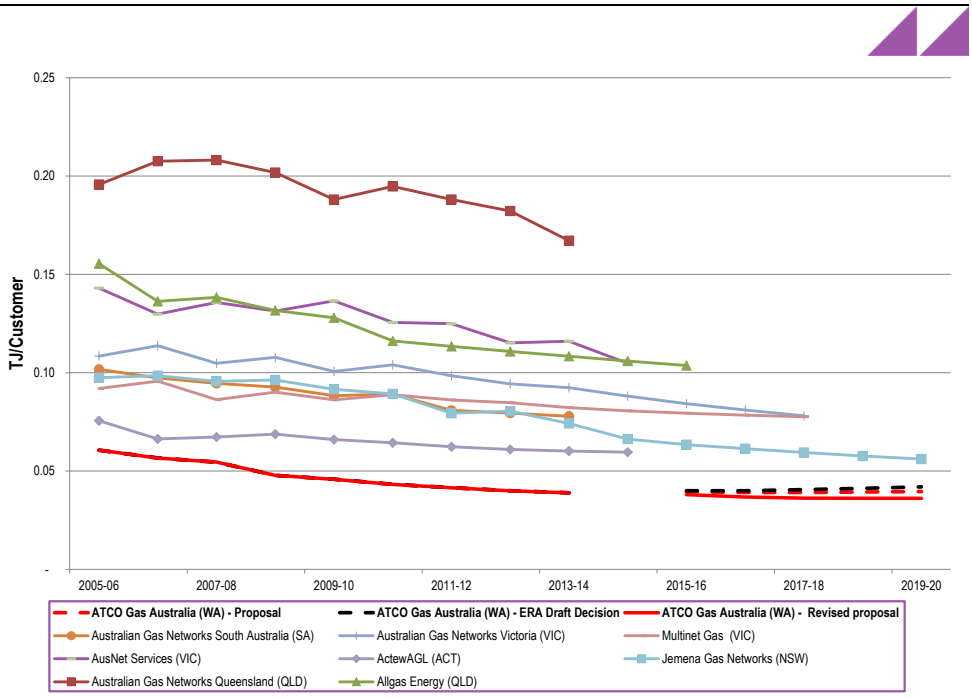
Energy and customer density measures for the nine gas distributors are shown in Figures 1 to 3 below.

Figure 1 **Energy density (TJ per mains km)**



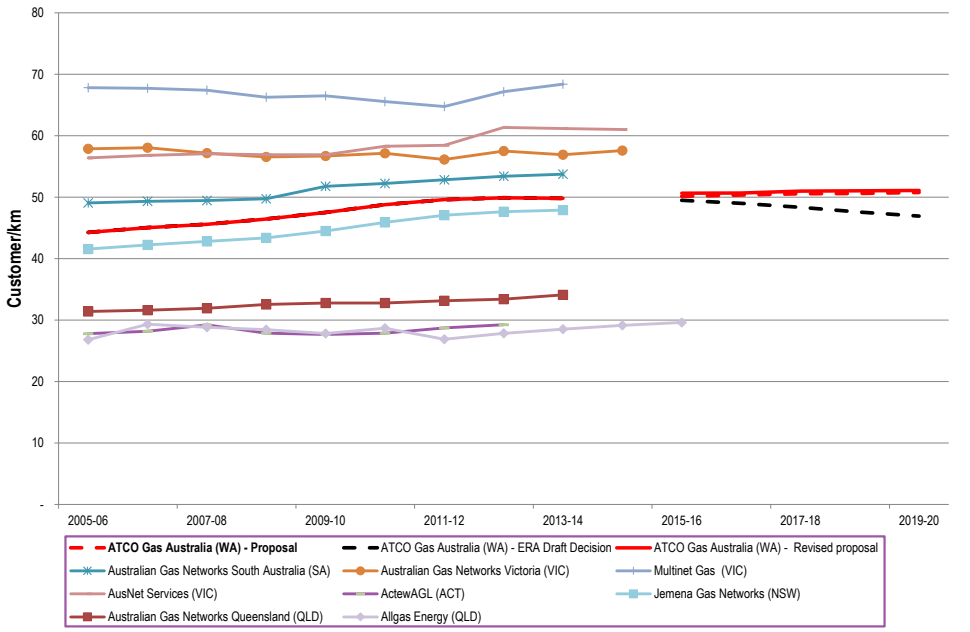
Note: ATCO Gas data to 2013-14 are actuals. Mains km forecast data for gas distributors other than ATCO Gas unavailable for later years.

Figure 2 **Energy density (TJ per customer)**



Note: ATCO Gas data to 2013-14 are actuals.

Figure 3 **Customer density (customers per km mains)**



Note: ATCO Gas data to 2013-14 are actuals. Mains km forecast data for gas distributors other than ATCO Gas unavailable for later years.

ATCO Gas is consistently among the lowest energy density of the gas distributors in the sample and its energy density has declined since 2005. ATCO Gas' gas distribution network provides significant coverage to commercial and residential customers in its service area. However, the milder climate in Western Australia means that household gas consumption for space heating is low relative to colder climate regions (such as Victoria) and is used more for hot water. Even so, ATCO Gas' energy density is well below that of the Queensland gas distributors, which would also be expected to have lower energy densities being located in warmer climates.

ATCO Gas' low energy density could also reflect a different customer mix relative to the other distributors e.g. the mix of industrial, commercial and residential customers. For example, ACTEWAGL also has relatively low energy density, which could be due to a higher proportion of residential customers.

The WA Economics and Industry Standing Committee Inquiry into Domestic Gas Prices (2011) provided comment on declining household gas consumption in WA, which was attributed to customers switching to reverse cycle air-conditioning for heating and from gas to solar hot water. Declining energy density is common across all of the gas distributors in the study and reflects the findings of previous studies that have observed a long term trend of declining average gas usage.

ATCO Gas' actual delivered gas has fallen by almost 18 per cent over the period from 2005 to 2014. ATCO Gas will continue to have the lowest energy density of the gas distributors over the period to 2019 (on a TJ per customer basis), based on the available forecasts. Depending on the extent to which low energy density drives costs, the very low energy density for ATCO Gas relative to the other businesses means that even it were equally efficient as other firms, its costs would be higher and hence it would not appear to be as efficient.

ATCO Gas is in the mid-range of customer density (as measured by customers per km of network) over the period from 2005 to 2014. ATCO Gas is forecast to remain at close to the 2014 customer density level over the period to 2019. Hence, this operating environment factor is not expected to result in higher costs for ATCO Gas relative to the sample. However, it does not provide ATCO Gas with a cost advantage and is unlikely to outweigh the cost disadvantage imposed by ATCO Gas' extremely low energy density.

5.2 Opex indicators

Four operating cost (opex) partial indicators are provided below:

- opex per kilometre of mains
- opex per customer
- opex per TJ
- opex as a percentage of the Regulatory Asset Base (RAB).

In the analysis below, opex is expressed in September 2014 constant dollars.

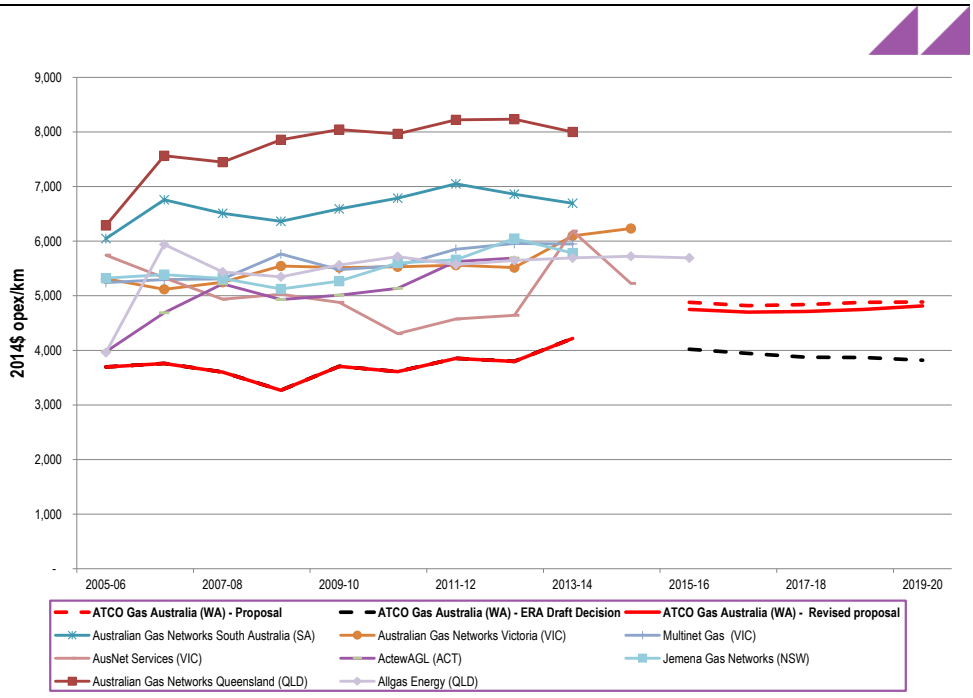
The partial performance indicators provide a unit cost measure. A lower unit cost indicates efficient costs relative to the sample.

Sections 5.2.1 to 5.2.4 assess each of the individual opex partial indicators. Section 5.2.5 provides overall interpretation and conclusions regarding the opex indicators.

5.2.1 Opex per mains km

Figure 4 shows opex per km for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figure shows ATCO Gas' opex per km under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 4 **Opex per km**



Note: Opex in $Sept 2014. ATCO Gas data to 2013-14 are actuals. Mains km forecast data for gas distributors other than ATCO Gas are unavailable for later years.

ATCO Gas has the lowest opex per km of the nine gas distributors over the period from 2005-06 to 2013-14, ranging from $3,695 in 2005-06 to $4,218 in 2013-14. As shown in Table 3, over the period from 2005-06 to 2013-14, ATCO Gas' opex per km ranged between:

- 27 and 31 per cent below the sample average, reaching 40 per cent below the average in 2008-09
- 41 and 47 per cent below the highest cost distributor, reaching nearly 60 per cent below in 2008-09
- 7 and 26 per cent below the next lowest cost distributor to ATCO (ATCO Gas is the lowest cost on an opex per km basis), with opex per km 34 per cent below in 2008-09.

Table 3 **Analysis of opex per km indicator**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Average (sample)	5,065	5,538	5,447	5,470	5,562	5,578	5,774	5,821	6,077
Maximum (sample)	6,286	7,565	7,448	7,857	8,044	7,965	8,222	8,232	8,000
Minimum (sample excl ATCO)	3,961	4,689	4,936	4,930	4,880	4,306	4,575	4,641	5,694
ATCO % difference to average	-27%	-32%	-34%	-40%	-33%	-35%	-33%	-35%	-31%
ATCO % difference to maximum	-41%	-50%	-52%	-58%	-54%	-55%	-53%	-54%	-47%
ATCO % difference to minimum	-7%	-20%	-27%	-34%	-24%	-16%	-16%	-18%	-26%

Notes: The sample average includes ATCO Gas. The minimum excludes ATCO, which is the lowest cost distributor as measured by opex per km.

Figure 3 shows that ATCO Gas' opex per km will remain well below the 2013-14 costs of the other distributors over the AA4 period to 2019.

Under the ERA's Draft Decision, by 2019 ATCO's opex per km would be:

- 37 per cent below the current (2013-14) industry average opex per km
- 33 per cent below the current lowest cost gas distributor other than ATCO Gas.

This widens what is an already considerable gap between the industry average performance in Australia and ATCO Gas, imposing a requirement to achieve significantly lower costs than 2013-14 levels on an opex per km costs.

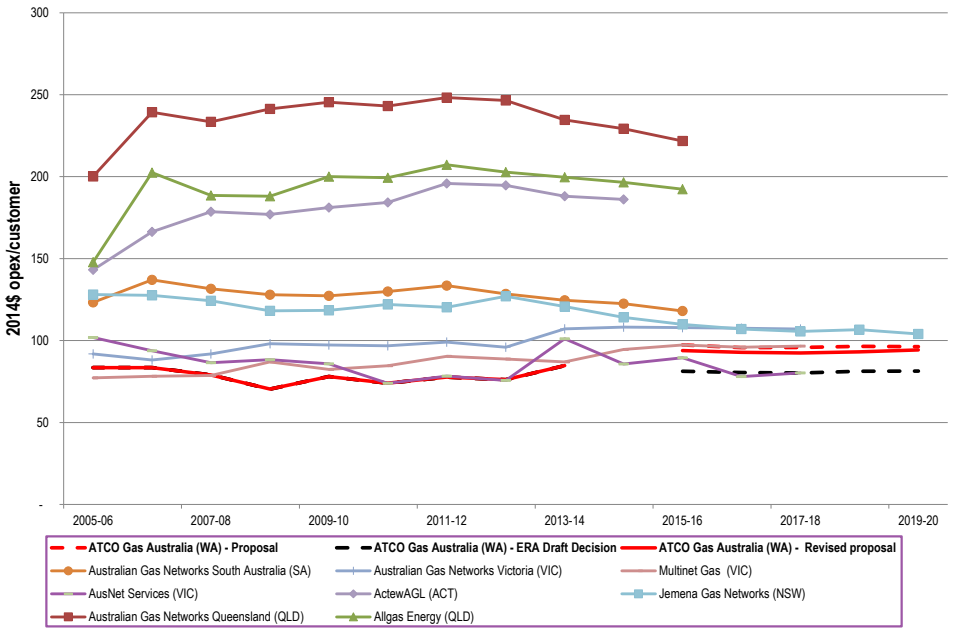
Under ATCO Gas' revised proposal it will remain at modest opex per km cost levels. By 2019 ATCO Gas will still have a significantly lower opex per km than current industry cost levels at:

- 21 per cent below the 2013-14 sample average
- 15 per cent below the lowest cost gas distributor in 2013-14 other than ATCO Gas.

5.2.2 Opex per customer

Figure 5 shows opex per customer for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figure shows ATCO Gas' opex per customer under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 5 **Opex per customer**



Note: Opex in $Sept 2014. ATCO Gas data to 2013-14 are actuals.

As with opex per km, ATCO Gas is among the lowest cost of the nine Australian gas distributors on an opex per customer basis.

ATCO Gas consistently has the lowest or second lowest opex per customer, ranging from $83 in 2005-06 to $85 in 2013-14.

As shown in Table 4, over the period from 2005-06 to 2013-14, ATCO Gas' opex per customer ranged between:

- 31 and 39 per cent below the sample average, reaching 47 per cent below the average in 2008-09
- 58 and 64 per cent below the highest cost distributor, reaching just over 70 per cent below in 2008-09
- 8 per cent above and 3 per cent below the next lowest cost distributor to ATCO, with opex per customer 19 per cent below the next lowest cost distributor in 2008-09.

Table 4 **Analysis of opex per customer indicator**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Average (sample)	122	135	132	133	135	134	139	137	139
Maximum (sample)	200	239	233	241	245	243	248	247	235
Minimum (sample excl ATCO)	77	78	79	87	82	74	78	76	87
ATCO % difference to average	-31%	-38%	-40%	-47%	-42%	-45%	-44%	-45%	-39%
ATCO % difference to maximum	-58%	-65%	-66%	-71%	-68%	-70%	-69%	-69%	-64%
ATCO % difference to minimum	8%	7%	0%	-19%	-5%	0%	-1%	1%	-3%

Notes: The sample average includes ATCO Gas. The minimum excludes ATCO Gas.

ATCO Gas' opex per customer is forecast to remain among the lowest in Australia over the AA4 period at similar levels to the Victorian gas distributors and below Jemena (the largest gas distributor).

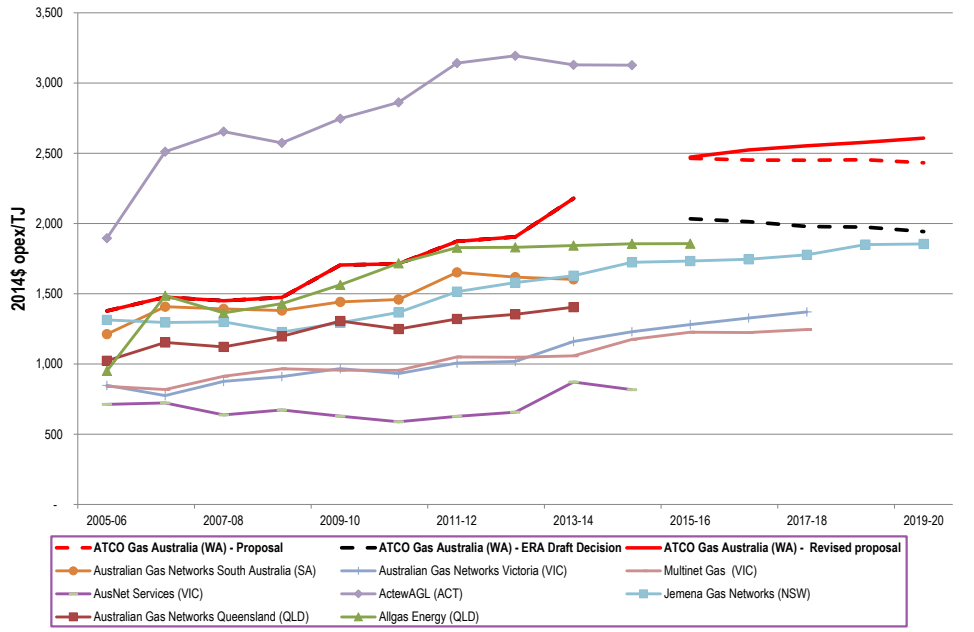
Under the ERA draft decision, by 2019 ATCO Gas' opex per customer would be 41 per cent below the 2013-14 industry average, extending further the already significant current gap of 39 per cent between ATCO Gas' opex per customer and the industry average.

Under ATCO Gas' revised proposal, opex per customer will remain at low levels. It will be 32 per cent below the 2013-14 sample average in 2019.

5.2.3 Opex per TJ

Figure 6 shows opex per TJ for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figure shows ATCO Gas' opex per TJ under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 6 **Opex per TJ**



Note: Opex in $Sept 2014. ATCO Gas data to 2013-14 are actuals.

ATCO Gas compares quite differently to the other gas distributors on this measure. ATCO Gas' opex per TJ is $1,378 in 2005-06 and increases to $2,178 in 2013-14. When compared against the average across the distribution firms, ATCO Gas' opex per TJ was 22 per cent higher than the average in 2005-06 and 32 per cent higher in 2013-14.

The stark difference in this partial opex indicator relative to the opex per km and opex per customer indicators is due to ATCO Gas' very low energy density. ATCO Gas' low energy density relative to the sample is illustrated and discussed in section 5.1. ATCO Gas' low energy density means that there are relatively less TJ delivered resulting in a higher cost per TJ in comparison to the other gas distributors.

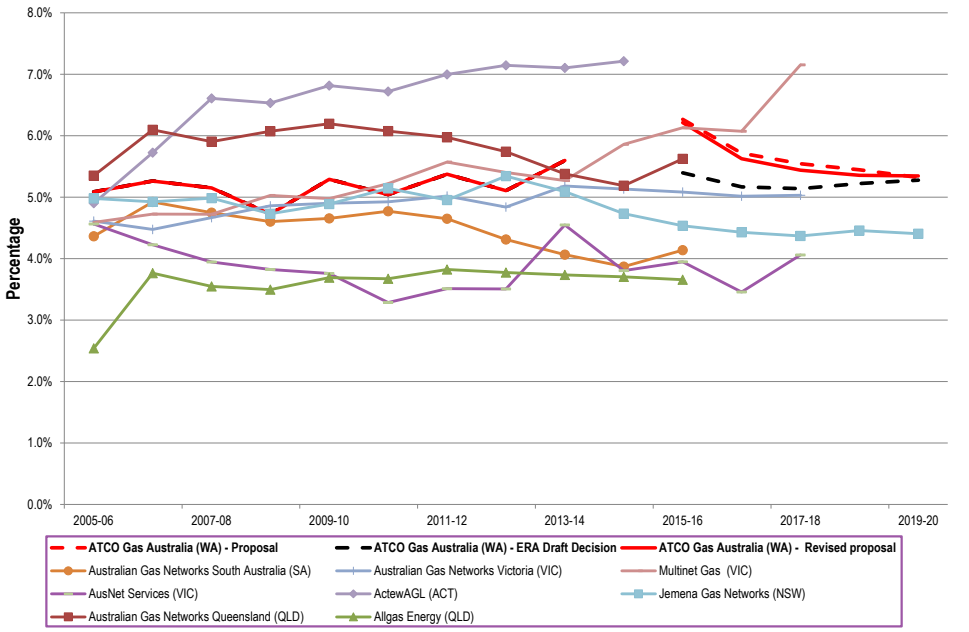
Given the significant difference between ATCO Gas and the other gas distributors in terms of their energy density, this measure is likely to be less useful in a partial performance indicator context. More sophisticated approaches to efficiency measurement can better account for differences in operating environment factors that drive cost differences between firms (including energy density) and provide more accurate efficiency comparisons.

As ATCO Gas' energy density will continue to decline over the AA4 period and be well below that of the other gas distributors, this is reflected in persistently higher opex per TJ over the AA4 period under any of the expenditure proposals, including that reflected in the ERA's draft decision and ATCO Gas' revised proposal.

5.2.4 Opex as a percentage of the RAB

Figure 7 shows the final opex performance indicator, opex as a percentage of RAB. It is shown for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figure shows ATCO Gas' opex as a percentage of RAB under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 7 **Opex as a percentage of RAB**



Note: ATCO Gas data to 2013-14 are actuals.

As explained in the WorleyParsons (2007) report:

> Expressing expenditure as a proportion of the Regulated Asset Base (RAB) is a commonly used tool to normalise data between distributors, on the basis that the more assets there are in the network (and hence higher RAB), the greater the need for both Opex and Capex.

However, an important qualification that would be made to this statement is that the RAB, due to different valuation approaches, may not always provide an accurate measure of the relative size of the asset base between firms. A more stable and accurate measure is likely to be provided by normalising costs relative to the physical network size (in km) as shown in Figure 4 above. The difficulty of determining appropriate monetary measures of capital is a common concern raised in the efficiency benchmarking literature and, as a result, physical measures such as the length of the network are often preferred.

Opex as a percentage of RAB for ATCO Gas, as shown in Figure 7, is in the mid to higher range of the sample over the full study period, ranging between 5.09 per cent in 2005-06 to around 5.3 per cent in 2019 under each of the expenditure proposals (i.e. the ATCO Gas original proposal, the ERA draft decision and the ATCO Gas revised proposal).

5.2.5 Conclusions regarding opex efficiency

It is considered that the opex per km and opex per customer partial indicators are the most meaningful measures of partial opex efficiency.

The opex per TJ measure is strongly influenced by the low energy density of ATCO Gas relative to the sample. This makes it difficult to separately identify the extent to which this measure reflects a true cost efficiency difference and the extent to which is reflects the energy density difference to the other distributors.

As noted above, RAB is likely to be a less accurate and stable measure of the asset base to use to normalise opex relative to a physical measure. RAB valuations can be affected by quite arbitrary differences and revaluations over time. Hence, opex per mains km is the preferred partial efficiency indicator.

The analysis of the preferred opex performance cost indicators – opex per km and opex per customer – would suggest that ATCO Gas is cost efficient in relation to its operating cost relative to the sample of firms.

When compared on a per km and per customer basis, ATCO Gas' opex is well below that of the sample average. This is the case historically and as forecast in the AA4 period expenditure proposals.

For example, the opex per km measures show that:

- ATCO Gas historically ranged between 27 and 31 per cent below the sample average, reaching 40 per cent below the average in 2008-09
- by 2019 ATCO Gas would be 21 per cent below the 2013-14 sample average under ATCO Gas' revised proposal
- by 2019 ATCO Gas would be 37 per cent below the 2013-14 sample average under the ERA draft decision.

The opex per customer measures show that:

- ATCO Gas historically ranged between 31 and 39 per cent below the sample average, reaching 47 per cent below the average in 2008-09
- by 2019 ATCO Gas would be 32 per cent below the 2013-14 sample average under ATCO Gas' revised proposal
- by 2019 ATCO Gas would be 41 per cent below the 2013-14 industry average under the ERA draft decision.

As noted in ACIL Allen's March 2014 report, the consistently low unit opex costs for ATCO Gas relative to the other gas distributors could warrant further investigation to understand whether there are factors in addition to cost efficiency that are driving this outcome. In particular, does ATCO Gas have operating environment features that provide it with a cost advantage over other gas distributors.

As identified in section 2.1 and in many other benchmarking studies, energy density and customer density are generally found to be the two most important operating environment factors in explaining differences in costs between gas distributors. Other, but potentially less important, factors could include:

- levels of investment, with periods of under-investment (including in maintenance) providing a short-term cost advantage that generally cannot be sustained over the long term
- differences in quality of service provided, with a lower quality of service being less costly
- age profile of assets, with a newer stock of assets likely to be less costly to maintain.

ATCO Gas' characteristics in terms of these environmental factors and the impact on their costs relative to the other gas distributors is considered below.

Neither ATCO Gas' relative energy density nor customer density would be expected to place it at a cost advantage relative to the other gas distributors and hence explain its very low unit opex costs. ATCO Gas has the lowest energy density of the gas distributors. This indicates that its costs should, all else being equal, be higher than those of the other distributors. ATCO Gas' customer density is in the mid-range of the gas distributors, providing neither a distinct advantage nor disadvantage.

In relation to the other factors listed above, in the time available for this study it has not been possible to investigate the position of ATCO Gas relative to the other gas distributors in the sample. However, given the low level of ATCO Gas' normalised opex expenditures, it would appear that the concern is not that ATCO Gas' opex is at an efficient level (which it appears to be), but rather whether it is at a high enough level to be sustainable over the longer term.

In this circumstance, best regulatory practice would require the ERA to verify whether the opex expenditure proposal contained within its Draft Decision is requiring ATCO Gas to achieve opex cost levels that are insufficient to provide their required levels of service over the long term. Reducing costs below sustainable levels could also impose higher costs on consumers e.g. if assets are allowed to deteriorate and quality of service to consumers suffers. This verification could involve more sophisticated approaches to account for operating environment differences in any benchmarking relied on by the ERA, as the AER is proposing.

5.3 Capex indicators

Four capital expenditure (capex) partial indicators are provided below:

- capex per kilometre of mains
- capex per customer
- capex per TJ
- capex as a percentage of the Regulatory Asset Base (RAB).

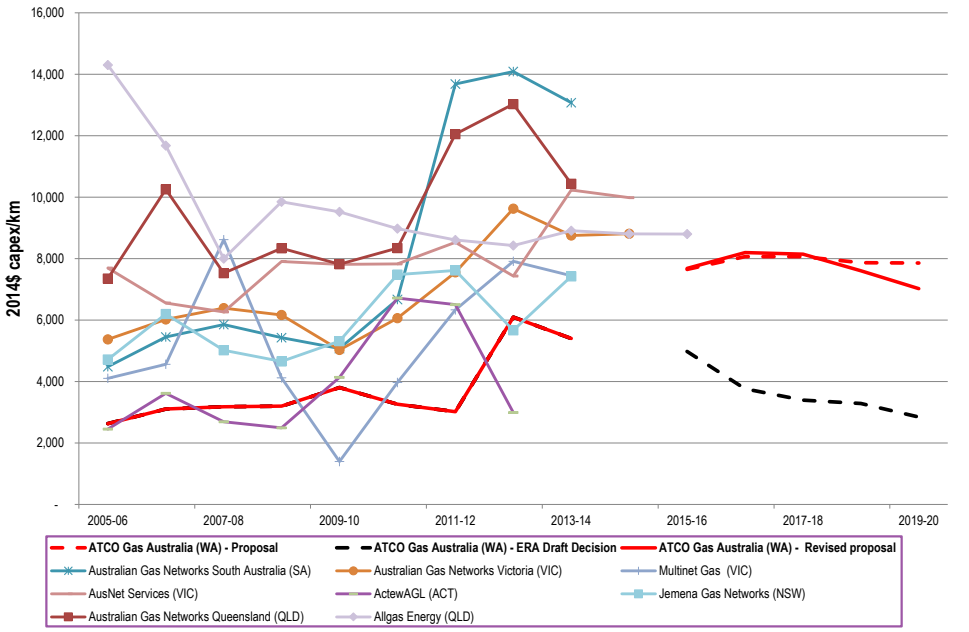
In the analysis below, capex is expressed in September 2014 constant dollars. The partial performance indicators provide a unit cost measure. A lower unit cost indicates efficient costs relative to the sample.

Sections 5.3.1 to 5.3.4 assess each of the individual capex partial indicators. Section 5.3.5 provides overall interpretation and conclusions regarding the capex indicators.

5.3.1 Capex per mains km

Figure 8 shows capex per km for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figure shows ATCO Gas' capex per km under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 8 **Capex per km**



Note: Capex in $Sept 2014. ATCO Gas data to 2013-14 are actuals. Mains km forecast data for gas distributors other than ATCO Gas are unavailable for later years.

Historically, ATCO Gas has had among the lowest capex per km of the nine gas distributors, ranging from $2,629 in 2005-06 to $5,399 in 2013-14.

ATCO Gas' capex per km has been relatively stable over the period before increasing in 2012-13, which according to ATCO Gas is due to necessary expenditure on safety performance improvements such as asset replacement and leak reduction. The capex per km of many of the other gas distributors has also increased significantly in recent years.

The actual reported capex for some gas distributors (such as Multinet Gas) has varied sharply over the study period, providing significant volatility in this and the other capex performance indicators on a year-on-year basis.

Further analysis of the capex per km indicator is provided in Table 5.

Table 5 **Analysis of capex per km indicator**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Average (sample)	5,899	6,381	5,948	5,794	5,544	6,588	8,210	8,362	8,958
Maximum (sample)	14,300	11,678	8,619	9,849	9,521	8,977	13,679	14,085	13,073
Minimum (sample excl ATCO)	2,451	3,617	2,689	2,491	1,396	3,966	6,330	2,993	7,421
ATCO % difference to average	-55%	-51%	-47%	-45%	-31%	-51%	-63%	-27%	-40%
ATCO % difference to maximum	-82%	-73%	-63%	-68%	-60%	-64%	-78%	-57%	-59%
ATCO % difference to minimum	7%	-14%	18%	28%	172%	-18%	-52%	104%	-27%

Notes: The sample average includes ATCO Gas. The minimum excludes ATCO.

As shown in Table 5, over the period from 2005-06 to 2013-14, ATCO Gas' capex per km ranged between:

- 55 and 40 per cent below the sample average, reaching 63 per cent below the average in 2011-12
- 82 and 59 per cent below the highest cost distributor.

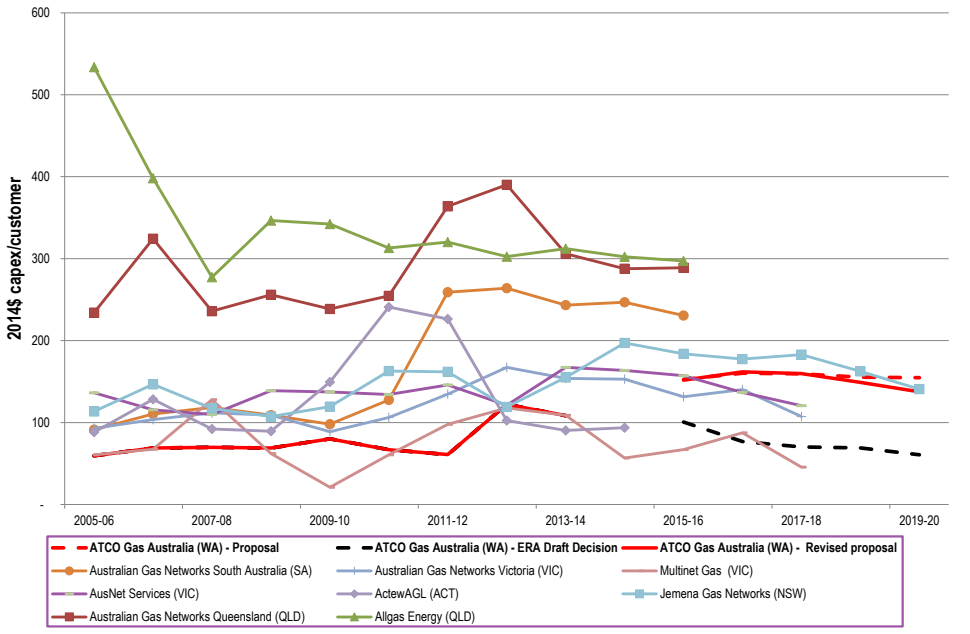
With the highly volatile movements in capex expenditure among the gas distributors, including Multinet Gas and ACTEWAGL, at times ATCO Gas' capex per km has been well below the next the next lowest cost distributor to ATCO and at times well above the lowest cost distributor.

Figure 8 shows that the ERA's draft decision would take ATCO Gas' capex per km to a level that is well below the 2013-14 average, at 68 per cent below the 2013-14 average by 2019. Under ATCO Gas' revised proposal, ATCO Gas' 2019 capex per km would be 22 per cent below the 2013-14 average.

5.3.2 Capex per customer

Figure 9 shows capex per customer for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figure shows ATCO Gas' capex per customer under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 9 **Capex per customer**



Note: Capex in $Sept 2014. ATCO Gas data to 2013-14 are actuals.

ATCO Gas consistently has among the lowest capex per customer, ranging from $59 in 2005-06 to $108 in 2013-14.

As shown in Table 6, over the period from 2005-06 to 2013-14, ATCO Gas' capex per customer ranged between:

- 62 and 41 per cent below the sample average, reaching a maximum of 69 per cent below the average in 2011-12

— 89 and 65 per cent below the highest cost distributor, reaching 83 per cent below in 2011-12.

As discussed above, there are large movements in capex spending from year to year that mean the ATCO Gas does not always have the lowest capex per customer.

Table 6 **Analysis of capex per customer indicator**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Average (sample)	157	163	140	143	142	163	197	190	183
Maximum (sample)	534	398	277	346	342	313	364	390	312
Minimum (sample excl ATCO)	60	67	92	62	21	61	98	102	90
ATCO % difference to average	-62%	-58%	-50%	-52%	-43%	-59%	-69%	-36%	-41%
ATCO % difference to maximum	-89%	-83%	-75%	-80%	-77%	-79%	-83%	-69%	-65%
ATCO % difference to minimum	-2%	2%	-24%	11%	281%	10%	-38%	19%	20%

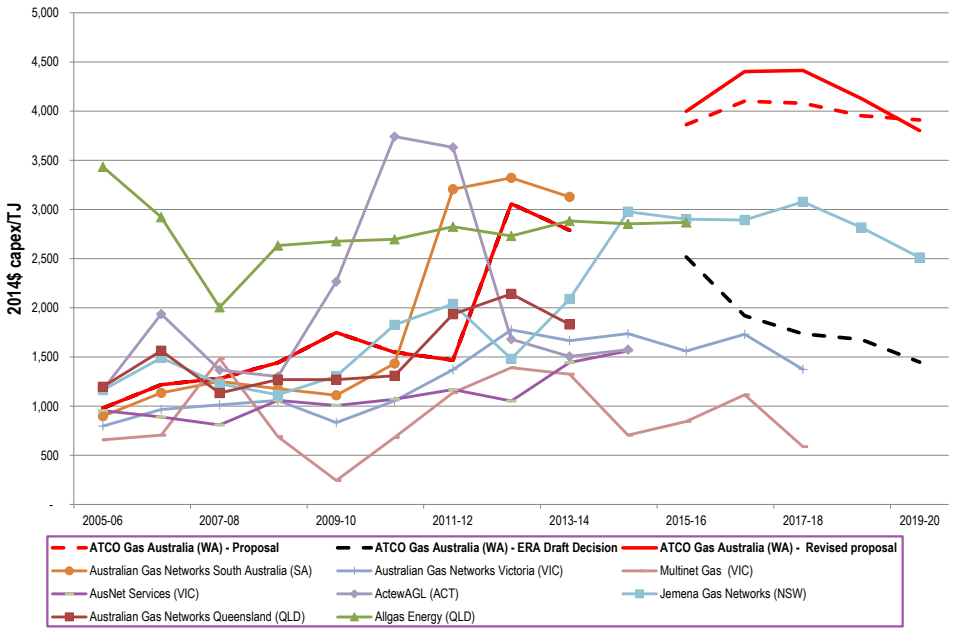
Notes: The sample average includes ATCO Gas. The minimum excludes ATCO Gas.

The ERA's draft decision would take ATCO Gas' capex per customer to a level that is well below the 2013-14 average, at 67 per cent below the 2013-14 average by 2019. Under ATCO Gas' revised proposal, ATCO Gas' 2019 capex per customer would be 25 per cent below the 2013-14 average.

5.3.3 Capex per TJ

Figure 10 shows capex per TJ for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figure shows ATCO Gas' capex per TJ under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 10 **Capex per TJ**



Note: Capex in $Sept 2014. ATCO Gas data to 2013-14 are actuals.

As discussed in more detail in sections 5.2.3 and 5.2.5, ATCO Gas will compare quite differently to the other gas distributors on this measure due to its low energy density. Given the significant difference between ATCO Gas and the other gas distributors in terms of their energy density, this measure is likely to be less useful in a partial performance indicator context. More sophisticated approaches to efficiency measurement can better account for differences in operating environment factors that drive cost differences between firms (including energy density) and provide more accurate efficiency comparisons.

ATCO Gas' capex per TJ is $980 in 2005-06 and increases to $2,788 in 2013-14. When compared against the average across the gas distributors, ATCO Gas' capex per TJ was 22 per cent below the average in 2005-06 and 35 per cent higher in 2013-14.

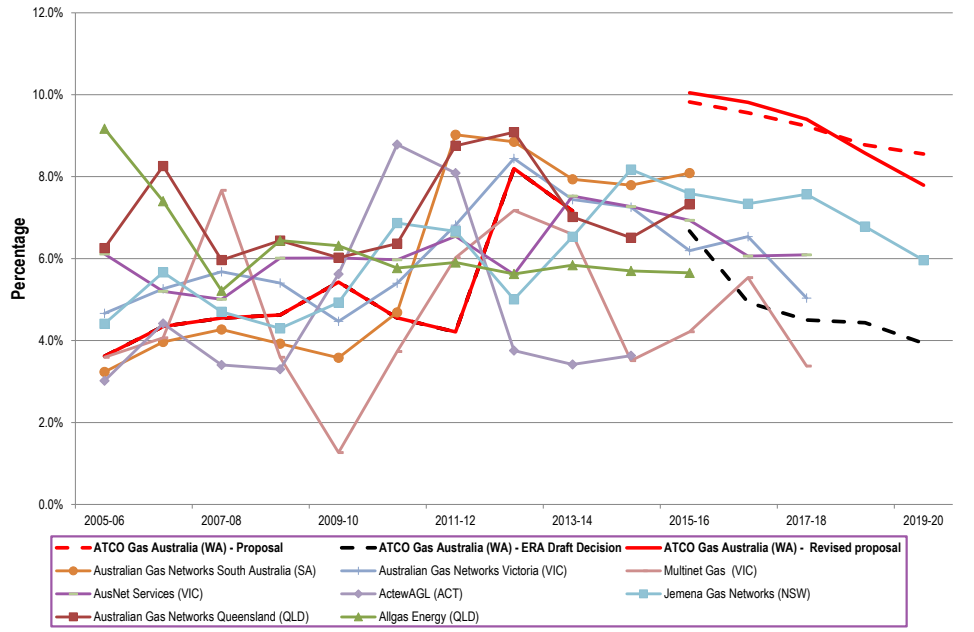
ATCO Gas' energy density will continue to decline over the AA4 period. This means that ATCO Gas would be expected to incur higher capex than the distributors, all of which have higher energy densities (all else being equal). This would be due to the nature of its operating environment rather than due to cost inefficiency.

Although ATCO Gas faces this operating environment disadvantage, the ERA draft decision would reduce ATCO Gas' 2019 capex per TJ to 30 per cent below the sample average in 2013-14. Under ATCO Gas' revised proposal, its 2019 capex per TJ would be 83 per cent above the 2013-14 sample average.

5.3.4 Capex as a percentage of RAB

Figure 11 shows capex as a percentage of RAB for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figure shows ATCO Gas' capex as a percentage of RAB under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 11 **Capex as a percentage of RAB**



Note: ATCO Gas data to 2013-14 are actuals.

For the reasons discussed in sections 5.2.4 and 5.2.5, RAB is likely to be an inferior measure of the asset base relative to using a physical measure, such as the length of the network.

Capex as a percentage of RAB for ATCO Gas ranges between 26 per cent below and 8 per cent above the sample average from 2005-06 to 2013-14.

The ERA draft decision would reduce ATCO Gas' 2019 capex as a percentage of RAB to 40 per cent below the sample average in 2013-14. Under ATCO Gas' revised proposal, its 2019 capex as a percentage of RAB would be 18 per cent above the 2013-14 sample average.

5.3.5 Conclusions regarding capex efficiency

For the reasons outlined in section 5.2.5, it is considered that the capex per km and capex per customer partial indicators are the most meaningful measures of partial capex efficiency.

When compared on a per km and per customer basis, ATCO Gas' capex is well below that of the sample average. This is the case historically and as forecast in the AA4 period expenditure proposals.

For example, the capex per km measures show that:

- ATCO Gas historically ranged between 55 and 40 per cent below the sample average (between 2005-06 and 2013-14)
- by 2019 ATCO Gas would be 22 per cent below the 2013-14 sample average under ATCO Gas' revised proposal
- by 2019 ATCO Gas would be 68 per cent below the 2013-14 sample average under the ERA draft decision.

The capex per customer measures show that:

- ATCO Gas historically ranged between 62 and 41 per cent below the sample average

— by 2019 ATCO Gas would be 25 per cent below the 2013-14 sample average under ATCO Gas' revised proposal

— by 2019 ATCO Gas would be 67 per cent below the 2013-14 industry average under the ERA draft decision.

These capex performance indicators suggest that ATCO Gas has efficient capital expenditure costs in relation to the sample of firms.

However, the caution sounded in relation to the opex efficiency measures in section 5.2.5 also applies to the capex efficiency measures. That is, ATCO Gas is not offered a cost advantage over other distributors by the most important operating environment drivers of differences in cost, i.e. by its energy density or customer density. Its low energy density would be expected to place ATCO Gas at a cost disadvantage. In this circumstance, the low level of ATCO Gas' normalised capex expenditures raises the question whether it has been at a high enough level to sustainably deliver required services over the long term.

As shown, the ERA draft decision would reduce normalised capex costs to well below the current (2013-14) sample average level of unit capex costs. As noted in section 5.2.5, in this circumstance, best regulatory practice would require the ERA to verify whether the capex expenditure proposal contained within its Draft Decision is requiring ATCO Gas to achieve capex cost levels that are insufficient to provide their required levels of service over the long term.

5.4 Total expenditure indicators

Three total expenditure (opex + capex) partial indicators are provided below:

— total expenditure (opex + capex) per kilometre of mains

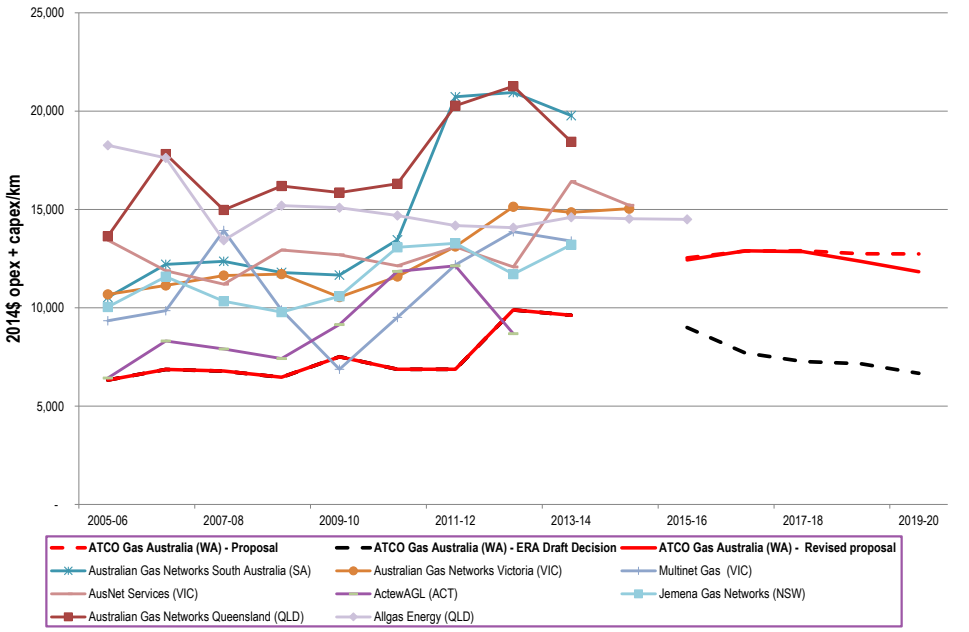
— total expenditure (opex + capex) as a percentage of the Regulatory Asset Base (RAB)

— total expenditure (opex + capex) per customer

— total expenditure (opex + capex) per TJ.

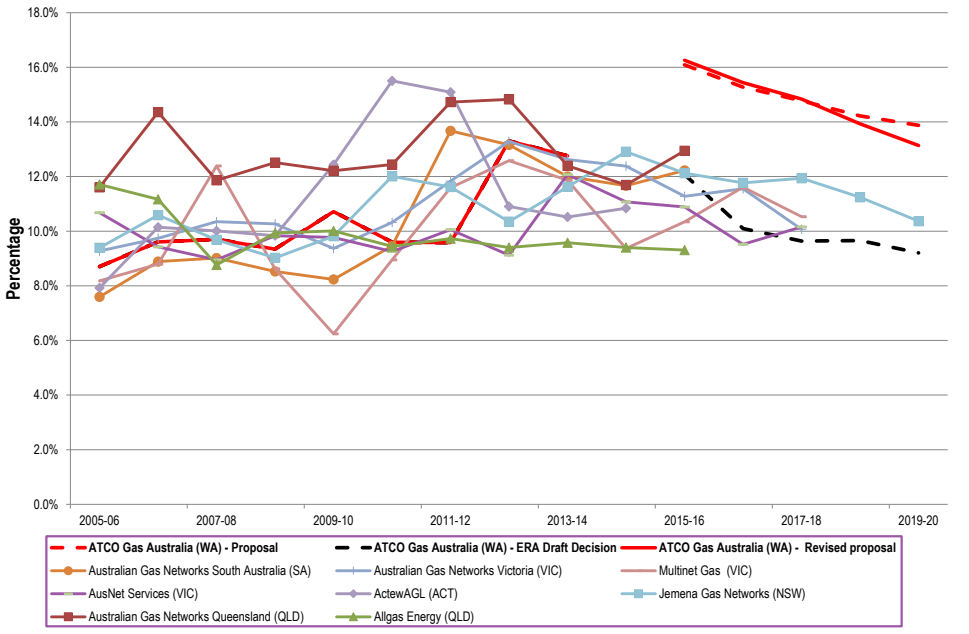
The first two indicators, presented in Figure 12 and Figure 13 respectively, are alternative measures of total costs relative to the asset base. As explained above, the cost per mains km measure is considered a more stable measure of cost performance. The figures show the opex + capex indicators for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figures show ATCO Gas' opex + capex indicators under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 12 **Opex + capex per km**



Note: Expenditure in $Sept 2014. ATCO Gas data to 2013-14 are actuals. Mains km forecast data for gas distributors other than ATCO Gas are unavailable for later years.

Figure 13 **Opex + capex as a percentage of RAB**



Note: ATCO Gas data to 2013-14 are actuals.

As would be expected, these indicators follow the same trend as has been observed for the individual opex and capex partial indicators.

The opex + capex per km indicator shows that:

- ATCO Gas historically ranged between 42 and 36 per cent below the sample average (between 2005-06 and 2013-14)

— by 2019 ATCO Gas would be 21 per cent below the 2013-14 sample average under ATCO Gas' revised proposal

— by 2019 ATCO Gas would be 56 per cent below the 2013-14 sample average under the ERA draft decision.

The opex + capex as a percentage of RAB indicator shows that:

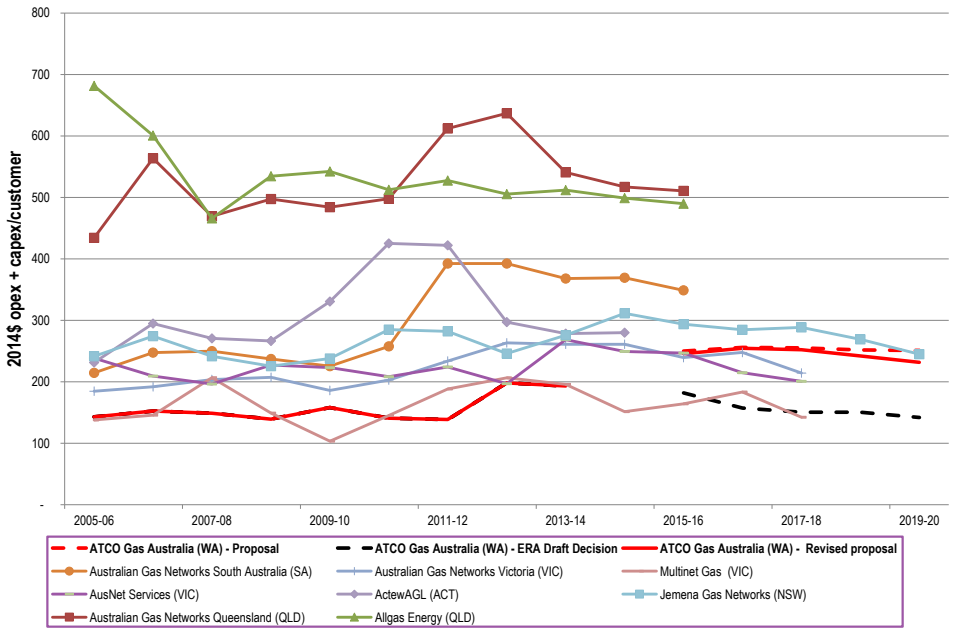
— ATCO Gas historically ranged between 8 per cent below and 9 per cent above the sample average (between 2005-06 and 2013-14)

— by 2019 ATCO Gas would be 12 per cent above the 2013-14 sample average under ATCO Gas' revised proposal

— by 2019 ATCO Gas would be 21 per cent below the 2013-14 industry average under the ERA draft decision.

Figure 14 shows opex + capex per customer for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figure shows ATCO Gas' opex + capex per customer under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 14 **Opex + capex per customer**



Note: Expenditure in $Sept 2014. ATCO Gas data to 2013-14 are actuals.

The opex + capex per customer indicator shows that:

— ATCO Gas historically ranged between 49 and 40 per cent below the sample average (between 2005-06 and 2013-14)

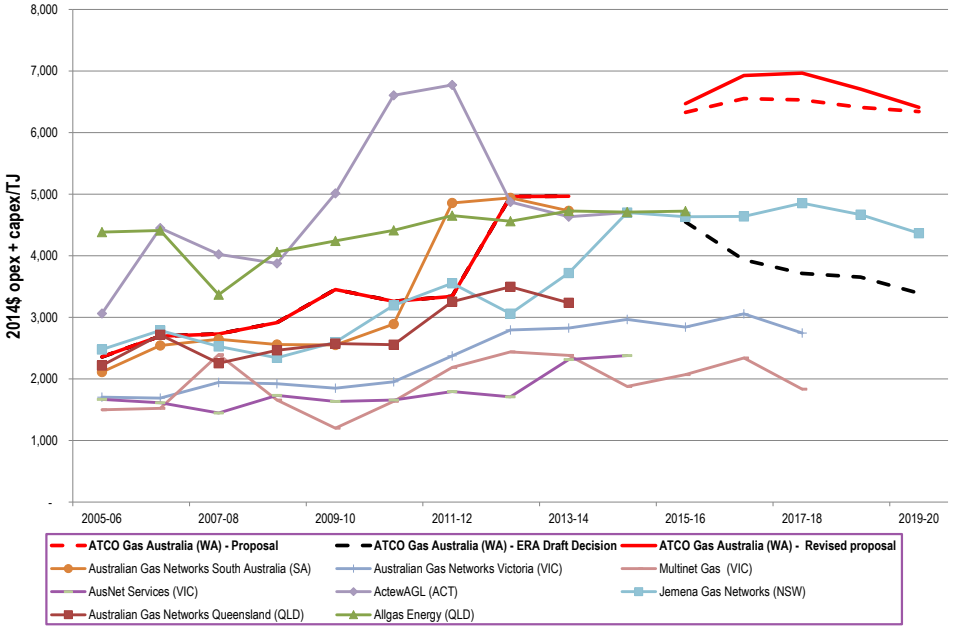
— by 2019 ATCO Gas would be 28 per cent below the 2013-14 sample average under ATCO Gas' revised proposal

— by 2019 ATCO Gas would be 56 per cent below the 2013-14 industry average under the ERA draft decision.

Figure 15 shows opex + capex per TJ for each of the nine gas distributors over the period from 2005-06 to 2019-20. Over the AA4 period, the figure shows ATCO Gas' opex + capex

per TJ under its original proposal, the ERA's draft decision and ATCO Gas' revised proposal.

Figure 15 **Opex + capex per TJ**



Note: Expenditure in $Sept 2014. ATCO Gas data to 2013-14 are actuals.

As discussed throughout the report, under each partial indicator estimated on a per TJ basis ATCO Gas will compare quite differently to the other gas distributors due to its low energy density. The significant difference between ATCO Gas and the other gas distributors in terms of their energy density means that this measure is likely to be less useful in a partial performance indicator context.

The opex + capex per TJ indicator shows that:

- ATCO Gas historically ranged between 1 per cent below and 33 per cent above the sample average (between 2005-06 and 2013-14)
- by 2019 ATCO Gas would be 72 per cent above the 2013-14 sample average under ATCO Gas' revised proposal
- ATCO Gas' energy density will continue to decline over the AA4 period. This means that ATCO Gas would be expected to incur higher totex (opex + capex) than the distributors, all of which have higher energy densities (all else being equal). Although ATCO Gas faces this operating environment disadvantage, the ERA draft decision would reduce ATCO Gas' 2019 totex per TJ to 9 per cent below the 2013-14 sample average.

In summary, the superior partial efficiency measures – opex + capex per km and opex + capex per customer – both indicate that ATCO Gas is cost efficient, but may reach unsustainably low levels of expenditure under the ERA draft decision.

5.5 Conclusions

The efficiency analysis undertaken within this study is by its nature partial as individual cost categories are assessed relative to single outputs. In addition, the measures do not fully account for potential explanators of cost differences between the firms in the sample. This means that the efficiency measures do not provide a comprehensive picture of overall efficiency performance and the performance of individual firms may appear better or worse than they would if the measures accounted for these other explanators.

However, strengthening the insights from the analysis, a significant proportion of the gas distributors' costs are measured and compared, the costs have been normalised against a range of relevant output measures and assessed in conjunction with the most significant operating environment indicators of customer and energy density. This means that partial analysis presented in this report can provide useful insights into ATCO Gas' relative cost efficiency.

For the reasons outlined in the paper, it is considered that the indicators that show expenditure on a per km and a per customer basis are the most meaningful measures of partial cost efficiency when comparing ATCO Gas to the other Australian gas distributors.

Based on the results of the analysis, the opex and capex performance indicators for ATCO Gas suggest that they have efficient costs relative to the sample of Australian gas distributors, both over historical periods and over the AA4 period. For the AA4 period, this conclusion holds for ATCO Gas' original proposal and revised proposal.

ATCO Gas is not offered a cost advantage over other distributors by the most important operating environment drivers of differences in cost, i.e. by its energy density or customer density. Its low energy density would, all else being equal, be expected to place ATCO Gas at a cost disadvantage. In this circumstance, the low level of ATCO Gas' normalised opex and capex expenditures raises the question whether its expenditure has fallen to levels that are below what would be required to sustainably deliver required services over the long term.

The ERA draft decision will reduce unit opex and capex expenditure levels even lower, taking the opex and capex indicators to levels that are well below the 2013-14 sample average and the combined unit expenditure below the levels of the other Australian gas distributors. For example:

- 2019 opex per km to 37 per cent below the current (2013-14) sample average, widening the already considerable gap of 31 per cent between the industry average performance in Australia and ATCO Gas
- 2019 opex per customer to 41 per cent below the 2013-14 industry average, extending further the already significant current gap of 39 per cent between ATCO Gas' opex per customer and the industry average
- 2019 capex per km to 68 per cent below the current (2013-14) sample average, widening the current gap of 40 per cent between the industry average performance in Australia and ATCO Gas
- 2019 capex per customer to 67 per cent below the 2013-14 industry average, extending further the current gap of 41 per cent between ATCO Gas' opex per customer and the industry average
- 2019 opex + capex per km to 56 per cent below the current (2013-14) sample average, widening the current gap of 36 per cent between the industry average performance in Australia and ATCO Gas

— 2019 opex + capex per customer to 56 per cent below the 2013-14 industry average, extending further the current gap of 40 per cent between ATCO Gas' opex per customer and the industry average.

In this circumstance, it would be prudent for the ERA to verify whether the expenditure proposals contained within its Draft Decision require ATCO Gas to achieve cost levels that are insufficient to provide their required levels of service over the long term. Reducing costs below sustainable levels could impose higher costs on consumers e.g. if assets are allowed to deteriorate and quality of service to consumers suffers. This verification could usefully involve more sophisticated approaches to account for operating environment differences in any benchmarking relied on by the ERA, as the AER is proposing.

Appendix A Benchmarks

Table A1 **Customers per mains km**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	44.26	45.04	45.58	46.45	47.51	48.78	49.59	49.90	49.80		50.13	50.35	50.55	50.61	50.76
ATCO Gas Australia (WA) - ERA Draft Decision	44.26	45.04	45.58	46.45	47.51	48.78	49.59	49.90	49.80		49.49	49.00	48.34	47.57	46.92
ATCO Gas Australia (WA) - Revised proposal	44.26	45.04	45.58	46.45	47.51	48.78	49.59	49.90	49.80		50.63	50.67	50.97	51.04	51.09
Australian Gas Networks South Australia (SA)	49.05	49.32	49.46	49.74	51.77	52.23	52.81	53.39	53.73						
Australian Gas Networks Victoria (VIC)	57.86	58.05	57.15	56.54	56.69	57.14	56.13	57.49	56.91	57.59					
Multinet Gas (VIC)	67.82	67.70	67.41	66.26	66.47	65.55	64.74	67.15	68.38						
AusNet Services (VIC)	56.38	56.81	57.06	56.90	56.90	58.28	58.43	61.35	61.15	61.01					
ActewAGL (ACT)	27.78	28.18	29.22	27.87	27.66	27.87	28.73	29.24							
Jemena Gas Networks (NSW)	41.56	42.22	42.80	43.38	44.48	45.90	47.05	47.62	47.89						
Australian Gas Networks Queensland (QLD)	31.41	31.61	31.91	32.55	32.77	32.76	33.13	33.39	34.10						
Allgas Energy (QLD)	26.80	29.33	28.84	28.43	27.81	28.68	26.89	27.85	28.52	29.13	29.60				

Table A2 **TJ per mains km**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	2.68	2.55	2.48	2.22	2.18	2.11	2.06	1.99	1.94		1.98	1.97	1.98	1.99	2.01
ATCO Gas Australia (WA) - ERA Draft Decision	2.68	2.55	2.48	2.22	2.18	2.11	2.06	1.99	1.94		1.98	1.96	1.96	1.96	1.97
ATCO Gas Australia (WA) - Revised proposal	2.68	2.55	2.48	2.22	2.18	2.11	2.06	1.99	1.94		1.92	1.86	1.85	1.84	1.85
Australian Gas Networks South Australia (SA)	4.99	4.80	4.68	4.61	4.57	4.65	4.27	4.24	4.18						
Australian Gas Networks Victoria (VIC)	6.27	6.60	5.99	6.09	5.70	5.94	5.52	5.42	5.26	5.07					
Multinet Gas (VIC)	6.24	6.48	5.81	5.97	5.73	5.82	5.57	5.69	5.62						
AusNet Services (VIC)	8.06	7.37	7.74	7.47	7.77	7.32	7.30	7.07	7.09	6.39					
ActewAGL (ACT)	2.10	1.87	1.97	1.92	1.82	1.79	1.79	1.78							
Jemena Gas Networks (NSW)	4.05	4.16	4.09	4.17	4.07	4.10	3.74	3.83	3.55						
Australian Gas Networks Queensland (QLD)	6.15	6.56	6.64	6.57	6.16	6.38	6.23	6.08	5.70						
Allgas Energy (QLD)	4.17	4.00	3.99	3.74	3.56	3.33	3.05	3.09	3.09	3.09	3.07				

Table A3 **TJ per customer**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.04		0.04	0.04	0.04	0.04	0.04
ATCO Gas Australia (WA) - ERA Draft Decision	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.04		0.04	0.04	0.04	0.04	0.04
ATCO Gas Australia (WA) - Revised proposal	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.04		0.04	0.04	0.04	0.04	0.04
Australian Gas Networks South Australia (SA)	0.10	0.10	0.09	0.09	0.09	0.09	0.08	0.08	0.08						
Australian Gas Networks Victoria (VIC)	0.11	0.11	0.10	0.11	0.10	0.10	0.10	0.09	0.09	0.09	0.08	0.08	0.08		
Multinet Gas (VIC)	0.09	0.10	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08		
AusNet Services (VIC)	0.14	0.13	0.14	0.13	0.14	0.13	0.12	0.12	0.12	0.10					
ActewAGL (ACT)	0.08	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06					
Jemena Gas Networks (NSW)	0.10	0.10	0.10	0.10	0.09	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.06	0.06	0.06
Australian Gas Networks Queensland (QLD)	0.20	0.21	0.21	0.20	0.19	0.19	0.19	0.18	0.17						
Allgas Energy (QLD)	0.16	0.14	0.14	0.13	0.13	0.12	0.11	0.11	0.11	0.11	0.10				

Table A4 **Operating expenditure per mains km**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	3,695	3,760	3,602	3,269	3,707	3,610	3,853	3,798	4,218		4,881	4,818	4,840	4,880	4,887
ATCO Gas Australia (WA) - ERA Draft Decision	3,695	3,760	3,602	3,269	3,707	3,610	3,853	3,798	4,218		4,022	3,944	3,875	3,867	3,818
ATCO Gas Australia (WA) - Revised proposal	3,695	3,760	3,602	3,269	3,707	3,610	3,853	3,798	4,218		4,751	4,701	4,711	4,750	4,816
Australian Gas Networks South Australia (SA)	6,046	6,758	6,509	6,364	6,591	6,788	7,049	6,859	6,694						
Australian Gas Networks Victoria (VIC)	5,312	5,118	5,248	5,545	5,514	5,529	5,560	5,515	6,096	6,231					
Multinet Gas (VIC)	5,240	5,295	5,307	5,763	5,479	5,549	5,852	5,958	5,947						
AusNet Services (VIC)	5,745	5,327	4,936	5,028	4,880	4,306	4,575	4,641	6,184	5,227					
ActewAGL (ACT)	3,977	4,689	5,218	4,930	5,011	5,136	5,627	5,692							
Jemena Gas Networks (NSW)	5,321	5,386	5,317	5,124	5,267	5,599	5,659	6,047	5,783						
Australian Gas Networks Queensland (QLD)	6,286	7,565	7,448	7,857	8,044	7,965	8,222	8,232	8,000						
Allgas Energy (QLD)	3,961	5,940	5,436	5,347	5,563	5,716	5,572	5,648	5,694	5,724	5,694				

Table A5 **Operating expenditure per customer**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	83	83	79	70	78	74	78	76	85		97	96	96	96	96
ATCO Gas Australia (WA) - ERA Draft Decision	83	83	79	70	78	74	78	76	85		81	80	80	81	81
ATCO Gas Australia (WA) - Revised proposal	83	83	79	70	78	74	78	76	85		94	93	92	93	94
Australian Gas Networks South Australia (SA)	123	137	132	128	127	130	133	128	125	123	118				
Australian Gas Networks Victoria (VIC)	92	88	92	98	97	97	99	96	107	108	108	107	107		
Multinet Gas (VIC)	77	78	79	87	82	85	90	89	87	95	97	96	97		
AusNet Services (VIC)	102	94	87	88	86	74	78	76	101	86	90	78	80		
ActewAGL (ACT)	143	166	179	177	181	184	196	195	188	186					
Jemena Gas Networks (NSW)	128	128	124	118	118	122	120	127	121	114	110	107	106	107	104
Australian Gas Networks Queensland (QLD)	200	239	233	241	245	243	248	247	235	229	222				
Allgas Energy (QLD)	148	203	189	188	200	199	207	203	200	197	192				

Table A6 **Operating expenditure per TJ**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	1,378	1,476	1,450	1,473	1,704	1,713	1,873	1,905	2,178		2,464	2,451	2,450	2,453	2,432
ATCO Gas Australia (WA) - ERA Draft Decision	1,378	1,476	1,450	1,473	1,704	1,713	1,873	1,905	2,178		2,034	2,013	1,979	1,975	1,942
ATCO Gas Australia (WA) - Revised proposal	1,378	1,476	1,450	1,473	1,704	1,713	1,873	1,905	2,178		2,472	2,524	2,553	2,578	2,608
Australian Gas Networks South Australia (SA)	1,212	1,408	1,392	1,380	1,441	1,459	1,652	1,617	1,601						
Australian Gas Networks Victoria (VIC)	847	775	876	910	967	931	1,007	1,018	1,160	1,229	1,280	1,327	1,371		
Multinet Gas (VIC)	840	818	913	966	956	954	1,050	1,047	1,058	1,174	1,226	1,224	1,245		
AusNet Services (VIC)	713	723	637	673	628	589	627	657	872	817					
ActewAGL (ACT)	1,895	2,511	2,654	2,574	2,747	2,862	3,142	3,194	3,129	3,127					
Jemena Gas Networks (NSW)	1,314	1,296	1,300	1,228	1,293	1,367	1,515	1,579	1,628	1,723	1,733	1,745	1,777	1,850	1,855
Australian Gas Networks Queensland (QLD)	1,023	1,153	1,122	1,196	1,305	1,249	1,320	1,353	1,404						
Allgas Energy (QLD)	951	1,486	1,363	1,429	1,564	1,717	1,828	1,831	1,843	1,855	1,856				

Table A7 **Operating expenditure as a percentage of RAB**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	5.09%	5.26%	5.15%	4.72%	5.29%	5.04%	5.37%	5.11%	5.60%		6.27%	5.71%	5.54%	5.45%	5.32%
ATCO Gas Australia (WA) - ERA Draft Decision	5.09%	5.26%	5.15%	4.72%	5.29%	5.04%	5.37%	5.11%	5.60%		5.40%	5.17%	5.14%	5.22%	5.28%
ATCO Gas Australia (WA) - Revised proposal	5.09%	5.26%	5.15%	4.72%	5.29%	5.04%	5.37%	5.11%	5.60%		6.21%	5.63%	5.44%	5.36%	5.34%
Australian Gas Networks South Australia (SA)	4.36%	4.92%	4.75%	4.60%	4.65%	4.77%	4.65%	4.31%	4.06%	3.87%	4.14%				
Australian Gas Networks Victoria (VIC)	4.61%	4.48%	4.67%	4.86%	4.90%	4.92%	5.02%	4.84%	5.18%	5.13%	5.08%	5.01%	5.03%		
Multinet Gas (VIC)	4.59%	4.72%	4.72%	5.03%	4.98%	5.22%	5.57%	5.40%	5.27%	5.86%	6.13%	6.07%	7.15%		
AusNet Services (VIC)	4.56%	4.23%	3.95%	3.82%	3.76%	3.29%	3.51%	3.51%	4.55%	3.80%	3.95%	3.46%	4.06%		
ActewAGL (ACT)	4.90%	5.73%	6.61%	6.53%	6.81%	6.72%	7.00%	7.14%	7.10%	7.21%					
Jemena Gas Networks (NSW)	4.98%	4.92%	4.98%	4.73%	4.89%	5.14%	4.95%	5.34%	5.09%	4.73%	4.53%	4.43%	4.37%	4.46%	4.40%
Australian Gas Networks Queensland (QLD)	5.35%	6.10%	5.90%	6.07%	6.19%	6.08%	5.97%	5.74%	5.38%	5.19%	5.62%				
Allgas Energy (QLD)	2.54%	3.76%	3.55%	3.50%	3.69%	3.67%	3.82%	3.77%	3.73%	3.70%	3.66%				

Table A8 **Capital expenditure per mains km**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	2,629	3,103	3,181	3,198	3,803	3,260	3,019	6,095	5,399		7,651	8,062	8,062	7,865	7,855
ATCO Gas Australia (WA) - ERA Draft Decision	2,629	3,103	3,181	3,198	3,803	3,260	3,019	6,095	5,399		4,976	3,763	3,395	3,285	2,845
ATCO Gas Australia (WA) - Revised proposal	2,629	3,103	3,181	3,198	3,803	3,260	3,019	6,095	5,399		7,682	8,198	8,144	7,606	7,021
Australian Gas Networks South Australia (SA)	4,480	5,447	5,852	5,428	5,073	6,667	13,679	14,085	13,073						
Australian Gas Networks Victoria (VIC)	5,370	6,019	6,389	6,166	5,030	6,060	7,555	9,623	8,753	8,807					
Multinet Gas (VIC)	4,103	4,559	8,619	4,118	1,396	3,966	6,330	7,912	7,442						
AusNet Services (VIC)	7,692	6,556	6,264	7,906	7,812	7,825	8,527	7,435	10,231	9,985					
ActewAGL (ACT)	2,451	3,617	2,689	2,491	4,133	6,715	6,503	2,993							
Jemena Gas Networks (NSW)	4,715	6,195	5,016	4,655	5,313	7,478	7,616	5,666	7,421						
Australian Gas Networks Queensland (QLD)	7,351	10,252	7,524	8,334	7,818	8,344	12,053	13,029	10,436						
Allgas Energy (QLD)	14,300	11,678	7,997	9,849	9,521	8,977	8,607	8,424	8,906	8,805	8,801				

Table A9 **Capital expenditure per customer**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	59	69	70	69	80	67	61	122	108		153	160	159	155	155
ATCO Gas Australia (WA) - ERA Draft Decision	59	69	70	69	80	67	61	122	108		101	77	70	69	61
ATCO Gas Australia (WA) - Revised proposal	59	69	70	69	80	67	61	122	108		152	162	160	149	137
Australian Gas Networks South Australia (SA)	91	110	118	109	98	128	259	264	243	247	231				
Australian Gas Networks Victoria (VIC)	93	104	112	109	89	106	135	167	154	153	131	140	107		
Multinet Gas (VIC)	60	67	128	62	21	61	98	118	109	57	67	87	46		
AusNet Services (VIC)	136	115	110	139	137	134	146	121	167	164	157	137	120		
ActewAGL (ACT)	88	128	92	89	149	241	226	102	90	94					
Jemena Gas Networks (NSW)	113	147	117	107	119	163	162	119	155	197	184	177	183	162	141
Australian Gas Networks Queensland (QLD)	234	324	236	256	239	255	364	390	306	288	289				
Allgas Energy (QLD)	534	398	277	346	342	313	320	302	312	302	297				

Table A10 **Capital expenditure per TJ**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	980	1,218	1,281	1,441	1,748	1,547	1,468	3,056	2,788		3,863	4,101	4,081	3,954	3,909
ATCO Gas Australia (WA) - ERA Draft Decision	980	1,218	1,281	1,441	1,748	1,547	1,468	3,056	2,788		2,516	1,920	1,734	1,677	1,447
ATCO Gas Australia (WA) - Revised proposal	980	1,218	1,281	1,441	1,748	1,547	1,468	3,056	2,788		3,998	4,402	4,413	4,128	3,802
Australian Gas Networks South Australia (SA)	898	1,135	1,251	1,177	1,109	1,433	3,205	3,321	3,128						
Australian Gas Networks Victoria (VIC)	797	966	1,012	1,058	832	1,053	1,370	1,776	1,665	1,737	1,560	1,730	1,373		
Multinet Gas (VIC)	658	704	1,482	690	243	682	1,136	1,390	1,324	704	844	1,115	588		
AusNet Services (VIC)	954	890	809	1,058	1,006	1,069	1,168	1,052	1,442	1,562					
ActewAGL (ACT)	1,168	1,937	1,368	1,301	2,265	3,742	3,631	1,679	1,504	1,574					
Jemena Gas Networks (NSW)	1,164	1,490	1,226	1,115	1,304	1,826	2,039	1,479	2,089	2,977	2,901	2,893	3,078	2,816	2,510
Australian Gas Networks Queensland (QLD)	1,196	1,563	1,133	1,269	1,269	1,308	1,935	2,142	1,831						
Allgas Energy (QLD)	3,433	2,922	2,005	2,632	2,676	2,696	2,824	2,731	2,883	2,854	2,869				

Table A11 **Capital expenditure as a percentage of RAB**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	3.62%	4.34%	4.55%	4.62%	5.43%	4.55%	4.21%	8.19%	7.16%		9.82%	9.56%	9.23%	8.78%	8.55%
ATCO Gas Australia (WA) - ERA Draft Decision	3.62%	4.34%	4.55%	4.62%	5.43%	4.55%	4.21%	8.19%	7.16%		6.68%	4.93%	4.50%	4.43%	3.93%
ATCO Gas Australia (WA) - Revised proposal	3.62%	4.34%	4.55%	4.62%	5.43%	4.55%	4.21%	8.19%	7.16%		10.05%	9.81%	9.40%	8.58%	7.79%
Australian Gas Networks South Australia (SA)	3.23%	3.97%	4.27%	3.92%	3.58%	4.69%	9.02%	8.85%	7.94%	7.79%	8.09%				
Australian Gas Networks Victoria (VIC)	4.66%	5.26%	5.68%	5.40%	4.47%	5.40%	6.82%	8.44%	7.44%	7.25%	6.19%	6.54%	5.04%		
Multinet Gas (VIC)	3.59%	4.07%	7.67%	3.59%	1.27%	3.73%	6.02%	7.18%	6.59%	3.51%	4.22%	5.53%	3.38%		
AusNet Services (VIC)	6.11%	5.20%	5.01%	6.01%	6.01%	5.97%	6.55%	5.61%	7.53%	7.27%	6.93%	6.06%	6.09%		
ActewAGL (ACT)	3.02%	4.42%	3.40%	3.30%	5.62%	8.79%	8.09%	3.76%	3.41%	3.63%					
Jemena Gas Networks (NSW)	4.41%	5.66%	4.70%	4.30%	4.93%	6.87%	6.67%	5.01%	6.53%	8.17%	7.59%	7.34%	7.57%	6.78%	5.96%
Australian Gas Networks Queensland (QLD)	6.26%	8.26%	5.96%	6.44%	6.02%	6.36%	8.76%	9.09%	7.02%	6.51%	7.32%				
Allgas Energy (QLD)	9.17%	7.40%	5.22%	6.44%	6.32%	5.77%	5.91%	5.63%	5.84%	5.70%	5.65%				

Table A12 **Operating + capital expenditure per mains km**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	6,324	6,864	6,783	6,468	7,510	6,871	6,873	9,892	9,618		12,532	12,880	12,903	12,744	12,741
ATCO Gas Australia (WA) - ERA Draft Decision	6,324	6,864	6,783	6,468	7,510	6,871	6,873	9,892	9,618		8,998	7,707	7,270	7,153	6,663
ATCO Gas Australia (WA) - Revised proposal	6,324	6,864	6,783	6,468	7,510	6,871	6,873	9,892	9,618		12,432	12,899	12,855	12,357	11,836
Australian Gas Networks South Australia (SA)	10,527	12,205	12,361	11,792	11,664	13,454	20,729	20,944	19,767						
Australian Gas Networks Victoria (VIC)	10,683	11,137	11,637	11,712	10,544	11,589	13,114	15,138	14,849	15,038					
Multinet Gas (VIC)	9,343	9,854	13,926	9,881	6,874	9,515	12,182	13,870	13,389						
AusNet Services (VIC)	13,437	11,883	11,200	12,933	12,692	12,131	13,102	12,076	16,415	15,212					
ActewAGL (ACT)	6,427	8,307	7,907	7,421	9,144	11,851	12,130	8,685							
Jemena Gas Networks (NSW)	10,037	11,582	10,333	9,780	10,579	13,078	13,275	11,713	13,203						
Australian Gas Networks Queensland (QLD)	13,636	17,817	14,971	16,191	15,861	16,309	20,275	21,261	18,436						
Allgas Energy (QLD)	18,261	17,618	13,433	15,196	15,084	14,693	14,180	14,072	14,600	14,529	14,495				

Table A13 **Operating + capital expenditure per customer**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	143	152	149	139	158	141	139	198	193		250	256	255	252	251
ATCO Gas Australia (WA) - ERA Draft Decision	143	152	149	139	158	141	139	198	193		182	157	150	150	142
ATCO Gas Australia (WA) - Revised proposal	143	152	149	139	158	141	139	198	193		246	255	252	242	232
Australian Gas Networks South Australia (SA)	215	247	250	237	225	258	392	392	368	369	349				
Australian Gas Networks Victoria (VIC)	185	192	204	207	186	203	234	263	261	261	239	248	214		
Multinet Gas (VIC)	138	146	207	149	103	145	188	207	196	151	164	183	142		
AusNet Services (VIC)	238	209	196	227	223	208	224	197	268	249	247	215	201		
ActewAGL (ACT)	231	295	271	266	331	425	422	297	279	280					
Jemena Gas Networks (NSW)	241	274	241	225	238	285	282	246	276	311	294	285	288	269	245
Australian Gas Networks Queensland (QLD)	434	564	469	497	484	498	612	637	541	517	511				
Allgas Energy (QLD)	681	601	466	535	542	512	527	505	512	499	490				

Table A14 **Operating + capital expenditure per TJ**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	2,358	2,694	2,731	2,915	3,452	3,260	3,341	4,961	4,966		6,327	6,552	6,530	6,407	6,342
ATCO Gas Australia (WA) - ERA Draft Decision	2,358	2,694	2,731	2,915	3,452	3,260	3,341	4,961	4,966		4,550	3,932	3,713	3,652	3,389
ATCO Gas Australia (WA) - Revised proposal	2,358	2,694	2,731	2,915	3,452	3,260	3,341	4,961	4,966		6,470	6,925	6,966	6,706	6,409
Australian Gas Networks South Australia (SA)	2,110	2,543	2,643	2,557	2,551	2,891	4,857	4,939	4,729						
Australian Gas Networks Victoria (VIC)	1,703	1,687	1,943	1,922	1,849	1,952	2,374	2,793	2,825	2,967	2,840	3,057	2,744		
Multinet Gas (VIC)	1,498	1,522	2,395	1,656	1,199	1,636	2,186	2,437	2,382	1,878	2,070	2,339	1,833		
AusNet Services (VIC)	1,667	1,612	1,446	1,731	1,634	1,658	1,795	1,709	2,314	2,379					
ActewAGL (ACT)	3,063	4,448	4,022	3,875	5,012	6,604	6,773	4,873	4,633	4,701					
Jemena Gas Networks (NSW)	2,478	2,786	2,526	2,343	2,597	3,193	3,553	3,059	3,718	4,700	4,634	4,638	4,855	4,667	4,365
Australian Gas Networks Queensland (QLD)	2,218	2,716	2,255	2,465	2,574	2,556	3,255	3,495	3,235						
Allgas Energy (QLD)	4,384	4,409	3,368	4,061	4,240	4,413	4,653	4,561	4,727	4,709	4,725				

Table A15 **Operating + capital expenditure as a percentage of RAB**

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
ATCO Gas Australia (WA) - Proposal	8.7%	9.6%	9.7%	9.3%	10.7%	9.6%	9.6%	13.3%	12.8%		16.1%	15.3%	14.8%	14.2%	13.9%
ATCO Gas Australia (WA) - ERA Draft Decision	8.7%	9.6%	9.7%	9.3%	10.7%	9.6%	9.6%	13.3%	12.8%		12.1%	10.1%	9.6%	9.7%	9.2%
ATCO Gas Australia (WA) - Revised proposal	8.7%	9.6%	9.7%	9.3%	10.7%	9.6%	9.6%	13.3%	12.8%		16.3%	15.4%	14.8%	13.9%	13.1%
Australian Gas Networks South Australia (SA)	7.6%	8.9%	9.0%	8.5%	8.2%	9.5%	13.7%	13.2%	12.0%	11.7%	12.2%				
Australian Gas Networks Victoria (VIC)	9.3%	9.7%	10.3%	10.3%	9.4%	10.3%	11.8%	13.3%	12.6%	12.4%	11.3%	11.6%	10.1%		
Multinet Gas (VIC)	8.2%	8.8%	12.4%	8.6%	6.2%	9.0%	11.6%	12.6%	11.9%	9.4%	10.3%	11.6%	10.5%		
AusNet Services (VIC)	10.7%	9.4%	9.0%	9.8%	9.8%	9.3%	10.1%	9.1%	12.1%	11.1%	10.9%	9.5%	10.2%		
ActewAGL (ACT)	7.9%	10.1%	10.0%	9.8%	12.4%	15.5%	15.1%	10.9%	10.5%	10.8%					
Jemena Gas Networks (NSW)	9.4%	10.6%	9.7%	9.0%	9.8%	12.0%	11.6%	10.3%	11.6%	12.9%	12.1%	11.8%	11.9%	11.2%	10.4%
Australian Gas Networks Queensland (QLD)	11.6%	14.4%	11.9%	12.5%	12.2%	12.4%	14.7%	14.8%	12.4%	11.7%	12.9%				
Allgas Energy (QLD)	11.7%	11.2%	8.8%	9.9%	10.0%	9.4%	9.7%	9.4%	9.6%	9.4%	9.3%				

Appendix B Terms of reference

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LAWYERS

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Our Ref: B1299
Doc ID: 66204208.1

30 October 2014

Ms Deirdre Rose
Principal
Acil Allen Consulting Pty Ltd
Level 9
60 Collins Street
MELBOURNE VIC 3000

Dear Ms Rose

ATCO Gas Australia Pty Ltd - ERA Price Determination

We act for ATCO Gas Australia Pty Ltd (**ATCO Gas**) in relation to the Economic Regulation Authority's (**ERA**) review of the Gas Access Arrangement for ATCO Gas under the National Gas Law and Rules for the period July 2014 to December 2019.

As you are aware, on 14 October 2014 the ERA published its Draft Decision on ATCO Gas Access Arrangement Review Proposal. ATCO Gas wishes to engage you to prepare an expert report in connection with the ERA's Draft Decision.

This letter sets out the matters which ATCO Gas wishes you to address in your report and the requirements with which the report must comply.

Terms of Reference

Legal Framework

A fundamental aspect of the Access Arrangement review and the Draft Decision is the ERA's assessment of the efficiency of proposed expenditure.

In this context the following provisions of the National Gas Rules are of note:

Under Rule 79 to be Conforming Capital Expenditure, capital expenditure must, amongst other things:

> "*be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services;*.

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Rule 91(1) provides:

> "*Operating expenditure must be such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of delivering pipeline services.*"

Rule 74 provides:

> *"(1) Information in the nature of a forecast or estimate must be supported by a statement of the basis of the forecast or estimate.*
>
> *(2) A forecast or estimate:*
>
> *(a) must be arrived at on a reasonable basis; and*
>
> *(b) must represent the best forecast or estimate possible in the circumstances."*

Rule 75 provides:

> *"Information in the nature of an extrapolation or inference must be supported by the primary information on which the extrapolation or inference is based."*

Capital expenditure is defined as:

> "*costs and expenditure of a capital nature incurred to provide, or in providing, pipeline services.*"

Operating expenditure is defined as:

> "*operating, maintenance and other costs and expenditure of a non-capital nature incurred in providing pipeline services and includes expenditure incurred in increasing long-term demand for pipeline services and otherwise developing the market for pipeline services.*"

Opinion

Your report is prepared in the context of assessing whether ATCO Gas is an efficient operator.

In March 2014 you prepared a report which was submitted to the ERA titled: "*Gas Distribution Benchmarking Partial Productivity Measures*".

ATCO Gas wishes to engage you to prepare an expert report which:

1. updates the analysis in your March 2014 Report to include additional and updated actual data insofar as it is available; and

2. considers ATCO Gas' operating expenditure forecasts and the growth expectations on which the forecasts are based and undertake a benchmarking analysis of those forecasts against the expenditure proposals of other Australian gas distributors covering the same time period as ATCO Gas' access arrangement period.

ATCO Gas also requests you address the following in your report:

(a) the basis on which data was sourced and the extent to which that data can be considered robust and appropriate to use for the benchmarking analysis;

(b) the methodology used to ensure comparability of data between the analysed businesses;

(c) the uses which can be made of a benchmarking analysis and any strengths and weaknesses of that analysis;

(d) your view, as an expert, as to whether benchmarking is a useful mechanism for assessing the efficiency of a business;

(e) how ATCO Gas performs relative to the benchmarks.

It is intended that your report will be submitted by ATCO Gas to the ERA with its response to the Draft Decision. The report may be provided by the ERA to its own advisers. The report must be expressed so that it may be relied upon both by ATCO Gas and by the ERA.

The ERA may ask queries in respect of the report and you will be required to assist in answering these queries. The ERA may choose to interview you and if so, you will be required to participate in any such interviews.

The report will be reviewed by ATCO Gas' legal advisers and will be used by them to provide legal advice as to its respective rights and obligations under the National Gas Law and National Gas Rules.

If ATCO Gas was to challenge any decision ultimately made by the ERA, that appeal will be made to the Australian Competition Tribunal and your report will be considered by the Tribunal. ATCO Gas may also seek review by a court and the report would be subject to consideration by such court. You should therefore be conscious that the report may be used in the resolution of a dispute between the ERA and ATCO Gas Due to this, the report will need to comply with the Federal Court requirements for expert reports, which are outlined below.

Timeframe

ATCO Gas's response to the Draft Decision must be submitted by **25 November 2014.** Your report will need to be finalised by 18 November 2014.

Compliance with the Code of Conduct for Expert Witnesses

Attached is a copy of the Federal Court's Practice Note CM 7, entitled "*Expert Witnesses in Proceedings in the Federal Court of Australia*", which comprises the guidelines for expert witnesses in the Federal Court of Australia (**Expert Witness Guidelines**).

Please read and familiarise yourself with the Expert Witness Guidelines and comply with them at all times in the course of your engagement by ATCO Gas.

In particular, your report should contain a statement at the beginning of the report to the effect that the author of the report has read, understood and complied with the Expert Witness Guidelines.

Your report must also:

1 contain particulars of the training, study or experience by which the expert has acquired specialised knowledge;

2 identify the questions that the expert has been asked to address;

3 set out separately each of the factual findings or assumptions on which the expert's opinion is based;

4 set out each of the expert's opinions separately from the factual findings or assumptions;

5 set out the reasons for each of the expert's opinions; and

6 otherwise comply with the Expert Witness Guidelines.

The expert is also required to state that each of the expert's opinions is wholly or substantially based on the expert's specialised knowledge.

It is also a requirement that the report be signed by the expert and include a declaration that "*[the expert] has made all the inquiries that [the expert] believes are desirable and appropriate and that no matters of significance that [the expert] regards as relevant have, to [the expert's] knowledge, been withheld from the report*".

Please also attach a copy of these terms of reference to the report.

Terms of Engagement

Your contract for the provision of the report will be directly with ATCO Gas. You should forward ATCO Gas any terms you propose govern that contract as well as your fee proposal.

Please sign a counterpart of this letter and return it to us to confirm your acceptance of the engagement.

Yours faithfully

Johnson Winter & Slattery

Enc: Federal Court of Australia Practice Note CM 7, "Expert Witnesses in Proceedings in the Federal Court of Australia"

Deirdre Rose

Signed and acknowledged by Deirdre Rose

Date 31/10/2014

Doc ID: A8059 - 66204208.1

Appendix C CV Deirdre Rose

Deirdre is a Principal at ACIL Allen in Melbourne with over 16 years of economic consulting experience at leading consulting firms including her own practice Ilex Consulting, Ernst & Young, Frontier Economics and London Economics.

Deirdre has undertaken productivity and efficiency benchmarking of a range of industries and government services over a period of close to 20 years, including benchmarking of electricity distribution businesses and water supply businesses. Deirdre was initially trained while a research economist at NSW Treasury by leading international academics in economic performance benchmarking techniques (including Total Factor Productivity (index number) and Data Envelopment Analysis).

Deirdre brings a strong background in applied micro-economics and modelling skills such as in electricity market modelling, cost benefit analysis and business case development.

Deirdre has also provided wide-ranging analytical and advisory support to regulated firms across a range of industries. This has been in the context of regulatory determinations advising on elements of the building blocks and broader support relevant to the operations and investments of the regulated firms. Deirdre has also advised governments and regulators on economic regulatory frameworks.

Deirdre has a degree in administration and economics from Griffith University.

Economic benchmarking experience

- *ATCO Gas:* Preparation of an expert witness report providing partial productivity measures of ATCO Gas against a sample of Australian gas distributors (March 2014)
- *Victorian diary sector:* While the Chief Economist of the Victorian Department of Primary Industries oversighted a study to measure the productivity and efficiency of the Victorian dairy industry. (2012)
- *Victorian water business:* Led a TFP study for a large metropolitan Victorian water business to assess their productivity over time using index number techniques. (2008)
- *Review of Energy Reform Implementation Group (ERIG) analysis of electricity network performance:* Provided an electricity network business with a critique of the productivity measures included in the ERIG discussion papers on energy market reforms released in November 2006. (2006)
- *Sydney Water:* Assisted in undertaking a TFP study for Sydney Water to assess their productivity over time using index number techniques. This was done in the context of their periodic price review process with IPART. This analysis was able to change the negative view of the businesses' productivity performance to a more positive stance, with an understanding that significant investments had increased costs but had commensurately significantly improved Sydney Water's required quality of service particularly in terms of wastewater quality. (2005)
- *Victorian distribution pricing review:* Regulatory advice to TXU Networks during the 2001 Victorian electricity distribution pricing review on benchmarking analysis. (2000)
- *NSW electricity distribution:* Led the team (including Professor Tim Coelli) that undertook a detailed benchmarking study for the Independent Pricing and Regulatory Tribunal (IPART). The study used a range of economic benchmarking techniques including partial indicators, Data Envelopment Analysis, Stochastic Frontier Analysis and index number techniques. The results of the study were used to help determine the regulated price

paths of the NSW electricity distributors for the five-year period from July 1999. (1998, 1999)

- *Queensland electricity supply industry:* Supervised and undertook benchmarking studies of the generation, retail and network businesses in Queensland. The network sector studies were used to establish appropriate X factors as part of the revenue caps for the transmission and distribution businesses in Queensland. The retail sector study was used in setting allowed revenues in relation to non-contestable customers. (1998)
- *West Australia electricity supply industry:* Benchmarked the economic performance of the West Australian firms in the generation, transmission and distribution sector against international firms using DEA. This was done as part of a broader study of options for reforming the electricity supply industry in Western Australia. (1998)
- *Water and Sewerage Companies, England and Wales:* Member of advisory teams to water companies subject to take over bids which were referred to the Monopolies and Mergers Commission (MMC) during 1996. Worked on projects to assess the relative efficiency of firms in the UK water sector (using DEA and Total Factor Productivity (TFP) analysis), to examine the structure of the water sector, and to provide general advice on likely economic and regulatory consequences of further mergers in the UK water sector. Appeared before hearings of the MMC to report on the results of the efficiency studies. During this six month period in the UK, I presented to a number of water companies on economic benchmarking techniques. (1996)
- *Government owned businesses and budget sector agencies:* At NSW Treasury applied efficiency measurement tools to measure and assess the performance of government owned businesses and budget sector agencies (including electricity distributors, correctional centres, rail and ferry services). Developed considerable expertise in using TFP or index number techniques and Data Envelopment Analysis (DEA) to measure and benchmark public sector performance. Received training in the use of economic benchmarking techniques from leading academics including Knox Lovell, Hal Fried, Tim Coelli and Suthathip Yaisawarng. (1994, 1995)

Appendix D References

ACCC and AER, 2012, *Benchmarking Opex and Capex in Energy Networks*, Working Paper no.6, May

ACIL Tasman, 2012a, *Review of Demand Forecasts for Envestra Victoria, Victorian Gas Access Arrangement Review for the period 2013 – 2017, Final Report*, Prepared for the Australian Energy Regulator, August

— 2012b, *Review of Demand Forecasts for SP AusNet, Victorian Gas Access Arrangement Review for the period 2013 – 2017, Final Report*, Prepared for the Australian Energy Regulator, August

ActewAGL, *Annual Report 2012-13*

— *Annual Report 2011-12*

— *Annual Report 2010-11*

— 2010, *Access Arrangement Information for the ACT, Queanbeyan and Palerang Gas Distribution Network, 1 July 2010 – 30 June 2015, Amended by Order of the Australian Competition Tribunal made on 23 September 2010,* April

— 2009a, *ActewAGL Gas Network Performance Benchmark Study, FY2000 – FY2008*, Prepared by Darrall Cutting, May

— 2009b, *Access Arrangement Information for the ACT, Queanbeyan and Palerang Gas Distribution Network*, June

— 2004, *Access Arrangement Information for ActewAGL Gas Distribution System in ACT and Greater Queanbeyan*, November

— 2003, *Access Arrangement Information for ActewAGL Distribution System in ACT, Queanbeyan and Yarrowlumla*, December

AER, 2014, *Victorian Gas Distribution Business Comparative Performance Report 2012*, February

— 2013a*, Better Regulation, Explanatory Statement, Expenditure Forecast Assessment Guideline*, November

— 2013b, *Victorian Gas Distribution Business Comparative Performance Report 2009–2011*, March

— 2013c, *Access arrangement final decision, Envestra Ltd 2013–17, Part 2: Attachments*, March

— 2013d, *Multinet Gas (DB No. 1) Pty Ltd, Multinet Gas (DB No. 2) Pty Ltd, 2013–17 Access arrangement, Opening capital base, Decision, Pursuant to Orders of the Australian Competition Tribunal in Application by Multinet Gas (DB No. 1) Pty Ltd (No 2) [2013] ACompT 6,* October

— 2013e, *Access arrangement final decision, Multinet Gas (DB No. 1) Pty Ltd Multinet Gas (DB No. 2) Pty Ltd 2013–17, Part 2: Attachments*, March

— 2013f, *Access arrangement final decision, SPI Networks (Gas) Pty Ltd 2013–17, Part 2: Attachments*, March

— 2012a, *Access Arrangement draft decision Multinet Gas (DB No.1) Pty Ltd Multinet Gas (DB No.2) Pty Ltd 2013–17 Part 2 Attachments*, September

— 2012b, *Access Arrangement draft decision* SPI Networks (Gas) Pty Ltd *2013–17 Part 2 Attachments*, September

— 2011a, *Envestra Ltd Access arrangement proposal for the Qld gas network 1 July 2011 – 30 June 2016, Final Decision*, June

— 2011b, APT Allgas *Access arrangement proposal for the Qld gas network 1 July 2011 – 30 June 2016, Final Decision*, June

— 2011c, *Envestra Ltd Access arrangement proposal for the SA gas network 1 July 2011 – 30 June 2016, Final Decision*, June

— 2011d, *Envestra Ltd Access arrangement proposal for the Qld gas network, 1 July 2011 – 30 June 2016, Draft Decision*, February

— 2010a, *Victorian Gas Distribution Business Comparative Performance Report 2008*, May

— 2010b, *Access arrangement proposal ACT, Queanbeyan and Palerang gas distribution Network 1 July 2010–30 June 2015*, Final decision–Public, March

AGL Gas Networks, 2005, *Access Arrangement for NSW Network*, June

AlintaGas Networks, 2005, *Access Arrangement Information For the Mid-West and South-West Gas Distribution Systems*, Amended AAI dated 29 July 2005

APA Group, *Annual Review 2010*

— *Annual Report 2009*

APT Allgas Energy, 2011, *Access Arrangement Information, Effective 01 July 2011 – 30 June 2016, Amended by order of the Australian Competition Tribunal, 10 February 2012*, June

— 2010a, *Load Forecast, Effective 01 July 2011 – 30 June 2016*, 1 November

— 2010b, *Access Arrangement Information, Effective 01 July 2011 – 30 June 2016*, September

— *Access Arrangement Submission, Effective 01 July 2011 – 30 June 2016*

— 2006, *Access Arrangement Information for the Queensland Network*, 7 June

— 2001, *Access Arrangement Information for the Queensland Network*, 12 November

ATCO Gas Australia, 2012, *Access Arrangement Information for the Mid-West and South-West Gas Distribution Systems*, 28 June

Centre for International Economics, 2012, *Gas demand forecasting, SPAusNet, 2013-17*, January

Coelli, T. et al, 2005, *An Introduction to Efficiency and Productivity Analysis, Second Edition*, Springer, New York

Core Energy Group, 2012, *Demand, Energy and Customer Forecasts*, Envestra Limited – Gas Access Arrangement Review, Victoria and Albury Networks (2013 to 2017), March

Diversified Utility and Energy Trusts (DUET) Group, 2008, *Multinet Gas Access Arrangement Review, Final ESC Decision*, Presentation, 7 March

— *Annual Report 2007*

— *Annual Report 2006*

— *Annual Report 2005*

— *Annual Report 2004*

Economic Insights, 2014, *Relative Opex Efficiency and Forecast Opex Productivity Growth of Jemena Gas Networks*, Report prepared for Jemena Gas Networks, 14 April

— 2012a, *Benchmarking the Victorian Gas Distribution Businesses' Operating and Capital Costs Using Partial Productivity Indicators*, Report prepared for Envestra Victoria, Multinet and SP AusNet, 26 March

— 2012b, *The Total Factor Productivity Performance of Victoria's Gas Distribution Industry*, Report prepared for Envestra Victoria, Multinet and SP AusNet, 26 March

— 2010, *The Productivity Performance of Envestra's South Australian and Queensland Gas Distribution Systems*, Report prepared for Envestra Ltd, 30 September

— 2009, *The Productivity Performance of Jemena Gas Networks' NSW Gas Distribution System*, Report prepared for Jemena Gas Networks (NSW) Ltd, 18 August

Economic Regulation Authority Western Australia, 2011, *Final decision on WA Gas Networks Pty Ltd proposed revised access arrangement for the Mid-West and South-West Gas Distribution Systems*, 28 February

Economics and Industry Standing Committee, 2011, *Inquiry into Domestic Gas Prices*, Report No. 6, 24 March

Energy Consulting Group, 2006, *Envestra Limited Capital and Operating Expenditure Review For Essential Services Commission of South Australia*, 26 March

— 2004, *Review of AGLGN Gas Access Arrangement For Independent Pricing and Regulatory Tribunal*, 30 August

Envestra, 2013, *Victorian Access Arrangement Information*, *Envestra's Victorian Gas Distribution Network, 1 January 2013 – 31 December 2017*, April

— 2012, *Victorian Access Arrangement Information*, 30 March

— 2012b, *Access Arrangement Information, Envestra's Queensland Gas Distribution Network, 1 July 2011 – 30 June 2016,* Amended by order of the Australian Competition Tribunal, 10 February

— 2011a, *Access Arrangement Information Envestra's South Australian Gas Distribution Network, 8 July 2011 – 30 June 2016*, July

— 2011b, *Queensland Access Arrangement Information, Public Version*, As revised on 23 March

— 2011c, *South Australian Access Arrangement Information, Public Version*, As revised on 23 March

— 2010a, *Queensland Access Arrangement Information, Public Version*, 1 October

— 2010b, *South Australian Access Arrangement Information, Public Version*, 1 October

— 2009, *Access Arrangement for Victorian Distribution System, Part A – Principal Arrangements, With revisions drafted and approved by the Essential Services Commission of Victoria under section 2.42 of the National Third Party Access Code for Natural Gas Pipeline Systems for the Access Arrangement Period commencing 2 June 2008 and varied by order of the Essential Services Commission Appeal Panel under sections 38 and 39 of the Gas Pipelines Access (Victoria) Law dated 11 November 2008*, March

— 2006, *Amended Access Arrangement Information for Envestra's South Australian Network*, 24 July

— 2005, *Access Arrangement Information for Envestra's South Australian Network*, September

ESC, 2008a, *Gas Access Arrangement Review 2008-2012, Final Decision – Public Version*, 7 March

— 2008b, *Gas Access Arrangements 2008-2012, Further Final Decision and Approval of Commission's Amended Revisions to Access Arrangement, Multinet,* 19 May

— 2008c, *Gas Access Arrangements 2008-2012, Further Final Decision and Approval of Commission's Amended Revisions to Access Arrangement, SP AusNet,* 19 May

ESCOSA, 2006a, *Proposed Revisions to the Access Arrangement for the South Australian Gas Distribution System, Further Final Decision*, October

— 2006b, *Proposed Revisions to the Access Arrangement for the South Australian Gas Distribution System, Final Decision*, June

— 2006c, *Proposed Revisions to the Access Arrangement for the South Australian Gas Distribution System, Draft Decision*, March

Independent Competition and Regulatory Commission, 2004a, *Access arrangement for ActewAGL gas distribution system in the ACT and Greater Queanbeyan, Final Approval*, November

— 2004b, *Review of access arrangement for ActewAGL natural gas system in ACT, Queanbeyan and Yarrowlumla*, July

Independent Pricing and Regulatory Tribunal, 2005, *Revised Access Arrangement for AGL Gas Networks, Final Decision*, April

— 2004, *Revised Access Arrangement for AGL Gas Networks, Draft Decision*, December

Jemena Gas Networks, 2014, *2015-20 Access Arrangement Information*, 30 June

Jemena Gas Networks (NSW) Ltd, 2009, *Access Arrangement Information*, 25 August

Marchment Hill Consulting, 2012, *Multinet Gas International Gas Benchmarking*, Final Results, January

Marksman Consulting Services, 2010, *Gas Distributor Benchmarking Report Envestra South Australia and Queensland*, 28 September

Meyrick and Associates, 2004, *Comparative Benchmarking of Gas Networks in Australia and New Zealand, Public Version*, Report prepared for Commerce Commission, 14 May

Multinet Gas, 2013, *Access Arrangement Information, Multinet Gas (DB No 1) and Multinet Gas (DB No 2) Gas Distribution Network, 1 January 2013 – 31 December 2017, Amended to take account of orders from the Australian Competition Tribunal*, October

— 2012a, *Gas Access Arrangement Review January 2013-December 2017 Revised Proposal and Response to Draft Decision*, 9 November

— 2012b, *Gas Access Arrangement Review January 2013-December 2017 Access Arrangement Information,* 30 March

National Institute of Economic and Industry Research, 2011, *Natural gas forecasts and customer number forecasts for the Multinet distribution region to 2021*, A report for Multinet, December

— 2010a, *Natural gas forecasts for the Queensland Envestra distribution regions to 2020*, A report for Envestra, September

— 2010b, *Natural gas forecasts for the Envestra South Australian distribution region to 2019-20*, A report for Envestra, September

NSW Department of Water and Energy, 2009, *NSW Gas Networks Performance report 2007-08*

NSW Trade & Investment, *New South Wales 2011-2012 Gas Networks Performance Report*

Parsons Brinckerhoff, 2010, *Allgas CAPEX and OPEX Review*, October

— 2003, *Review of AGL Gas Networks Capital and Operating Expenditure*, December

Queensland Competition Authority, 2006a, *Revised Access Arrangement for Gas Distribution Networks: Envestra, Final Decision*, May

— 2006b, *Revised Access Arrangement for Gas Distribution Networks: Allgas Energy, Final Decision*, May

SP AusNet, 2014, *Business Review 2014*

— SP AusNet, 2014b, *2013/14 Full Year Results Release and Investor Presentation*, 15 May

— 2013, *Business Review 2013*

— SP AusNet, 2012, *2013-2017 Gas Access Arrangement Review, Access Arrangement Information*, 30 March

— 2010, *SP AusNet 2009/10 Full-Year Results Release and Investor Presentation, ASX & SGX-ST Release*, 12 May

— 2009, *Business Review 2009*, June

— *Annual Report 2007*

— 2006, *SP AusNet 2009/10 Full-Year Results for Period Ended 31 March 2006, ASX Release*, 5 June

— *Annual Report 2006*

The Brattle Group, 2008, *Use of Total Factor Productivity Analysis in Network Regulation, Case Studies of Regulatory Practice*, October, Belgium

WIK-Consult, 2011, *Cost Benchmarking in Energy Regulation in European Countries, Final Report*, Study for the Australian Energy Regulator, December, Bad Honnef

Wilson Cook & Co, 2010, *Review of Expenditure of Queensland & South Australian Gas Distributors: Envestra Ltd (Queensland)*, December

WorleyParsons, 2007, *Review of Envestra Gas Access Arrangement for Victoria*, March