Attachment 4.2

Benchmarking Australian Gas Networks' South Australian Business Operating and Capital Costs Using Partial Indicators

A report by Economic Insights

2016/17 to 2020/21 Access Arrangement Information

Australian Gas Networks

Benchmarking Australian Gas Networks' South Australian Business Operating and Capital Costs Using Partial Performance Indicators

Report prepared for
Australian Gas Networks Limited

21 May 2015

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EXECUTIVE SUMMARY

This report discusses the efficiency performance of Australian Gas Networks' (AGN) South Australian gas distribution business over the period 1999–2013 within a group of 11 Australian GDBs and 2 New Zealand GDBs. The report has been prepared for Australian Gas Networks, South Australia (AGN SA) as an input to the forthcoming review of its access arrangement for 2016–2021.

A set of partial performance indicators is presented to compare the opex and capital input efficiency of the businesses against one another. These indicators have the advantage of being relatively easy to construct and understand. However, care needs to be exercised in interpreting the results, as individual partial performance indicator results may give a misleading impression of overall efficiency. To gain an indication of overall relative performance, the partial indicators need to be considered together and jointly with key operating environment indicators.

If a GDB is ranked poorly for most indicators then this may warrant further investigation as to whether that GDB was operating inefficiently. Conversely, if a GDB is ranked highly for most indicators then this may be taken to suggest that it is performing at levels consistent with industry best practice. If a GDB performs well on some indicators but poorly on others then the GDB's performance is harder to assess as it may be making trade–offs between different types of inputs (eg opex and capital) and more detailed analysis may be required.

It is also desirable to have regard to more holistic measures of efficiency, such as total factor productivity (TFP) analysis, and methods of measuring efficiency which can control for differences in scale and other operating environment differences.

Background

This report presents partial performance indicators analogous to those published by the Australian Energy Regulator for electricity distribution businesses (AER 2014). The partial productivity performance indicators presented in this report complement the holistic productivity measures presented in the accompanying Economic Insights (2015) report.

The Australian and New Zealand GDBs included in the study are:

- ActewAGL (ACT)
- AGN Albury (NSW)
- AGN Queensland
- AGN South Australia
- AGN Victoria
- AGN Wagga (NSW)
- Allgas Energy (Queensland)
- ATCO Gas Australia (Western Australia)
- AusNet Services (Victoria)

- Jemena Gas Networks (NSW)
- Multinet (Victoria)
- Powerco (New Zealand), and
- Vector (New Zealand).

For each of these GDBs, the study presents operating environment factors and partial performance indicators. The operating environment indicators we present are:

- Energy delivered (TJ), number of customers and network kilometres
- Customer density (customers per kilometre)
- Energy density per kilometre (TJ per kilometre), and
- Energy density per customer (TJ per customer).

The partial performance indicators we present are:

- Opex per customer relative to customer density
- Asset cost per customer relative to customer density
- Total cost per customer relative to customer density.

This set of performance indicators establishes the relative performance of the GDBs across major facets of their businesses while identifying key operating environment differences. They provide an opportunity to examine the priorities and trade–offs of the various GDBs – for example, comparing operating expenditure (opex) and capital input indicators together allows trade–offs between opex and capital use to be recognised.

The data used in this study have been sourced from documents in the public domain to the maximum extent possible including Access Arrangement Information (AAI) filings, regulators' final review reports and GDB Annual Reports. We have used the latest available historic information wherever possible but in a limited number of cases the data represent forecasts as presented in the regulatory proceedings rather than historic information reported after the event. Because public domain data for AGN SA, AGN Qld and JGN is now relatively dated, we use survey–based data from Economic Insights (2015) for these GDBs.

While every effort has been made to make the publicly available data used in this study as consistent as possible, the limitations of currently available public domain data need to be recognised.

Key findings

AGN SA's operating environment characteristics can be summarised as follows:

- it is mid-sized — the sixth largest in the sample in terms of customer numbers and gas deliveries and the seventh largest in terms of network length
- it has above average customer density per km main — the fifth highest in the sample
- it has comparatively low energy density per customer — well below average and the second lowest in the sample

- it has below-average energy density per km of mains, with a middle ranking in the sample reflecting a relatively mild climate in South Australia.

AGN SA is a mid-sized GDB that does not enjoy, to the same degree, the economies of scale attained by JGN, the Victorian GDBs and ATCO WA. For this reason, it should not be expected to outperform larger utilities. It also has an especially low energy density per customer. Nevertheless, comparisons of total cost per customer suggest that AGN SA's cost per customer is closely comparable to its peers, such as the three Victorian GDBs and JGN, which all have comparatively high customer density.

Comparisons of opex per customer and asset cost per customer indicate that AGN SA appears to equal or outperform its peers in relation to opex per customer but tends to have somewhat higher assets per customer when compared to the peer firms mentioned that have relatively high customer density. It is apparent from these results that AGN SA tends to use a somewhat different mix of inputs when compared to its peers. It appears to have a higher degree of capital-intensiveness than the average GDB.

The partial indicators analysis presented in this report does not enable influences such as scale economies or different mixes of inputs to be controlled for in a rigorous fashion. This means that care needs to be taken when drawing inferences. Based on these indicators and recognising the nature of their networks, AGN SA performed at around average levels. It has performed particularly well in regard to achieving low levels of opex per customer and below-average levels of capex per customer.

Some of the indicator growth rates observed in the first half of the period in the immediate aftermath of reform and ownership changes have slowed in the second half of the period as cost reductions become progressively harder to achieve after these initial gains were made. This trend is, broadly speaking, quite common among the GDBs in the sample (see Appendix C), perhaps reflecting the likelihood that many of the potential efficiency gains at the start of the period were already achieved mid-way through the period.

1 INTRODUCTION

1.1 Terms of reference

Australian Gas Networks Limited (AGN) (formerly Envestra Pty Ltd) has commissioned Economic Insights Pty Ltd ('Economic Insights') to provide advice on productivity measurement and benchmarking in relation to its South Australian gas distribution business (AGN SA). The advice is provided in two reports detailing:

a) Analysis of AGN SA's total factor productivity (TFP) and partial factor productivity (PFP) trends over time, and a comparative analysis of its relative productivity levels and relative productivity growth rates using multilateral TFP and comparing performance against major Victorian and New South Wales (NSW) gas distribution businesses (GDBs), and against AGN's Queensland gas distribution business.

b) Partial indicator comparisons between a set of 11 Australian and 2 New Zealand GDBs using public domain data.

This report addresses item (b). This entails presenting partial performance indicators analogous to those published by the Australian Energy Regulator for electricity distribution businesses (AER 2014).

A copy of the letter of retainer for the study is presented in Attachment A.

1.2 Outline of the Report

Section 2 presents data on the business operating environment characteristics that influence the performance of GDBs differently. Section 3 provides a summary comparison of partial performance indicators relating to costs per customer.

1.3 Economic Insights' experience and consultants' qualifications

Economic Insights has been operating in Australia for 20 years as an economic consulting firm specialising in infrastructure regulation. Economic Insights provides strategic policy advice and rigorous quantitative research to industry and government. Economic Insights' experience and expertise covers a wide range of economic and industry analysis topics including:

- infrastructure regulation
- productivity measurement
- benchmarking of firm and industry performance
- infrastructure pricing issues, and
- analysis of competitive neutrality issues.

This report has been prepared by Michael Cunningham who is an Associate of Economic Insights. A summary CV for Michael is presented in Attachment B. Michael Cunningham has read the Federal Court Guidelines for Expert Witnesses and this report has been prepared in

accordance with the Guidelines. A declaration to this effect is presented in Attachment C to the report.

2 OPERATING ENVIRONMENT INDICATORS

This section describes the key characteristics for the 13 GDBs included in this study, covering the years 1999 to 2013. A summary overview of each of the GDBs included in this study is available at Attachment A.

The dataset on which this analysis is based is described in Appendix B. Data for the full 15 year period are available for 9 of the Australian GDBs. Data for ATCO WA are available from 2000 onwards while data for Allgas Queensland are available from 2001 onwards. There are fewer comparable observations for the New Zealand GDBs due to merger and restructuring activity. Powerco's composition has been relatively stable from 2004 onwards, and only this period has been included. Data for Vector are available from 2002 onwards, however more confidence can be placed on the Vector data from 2006 onwards (the earlier data being affected by mergers).

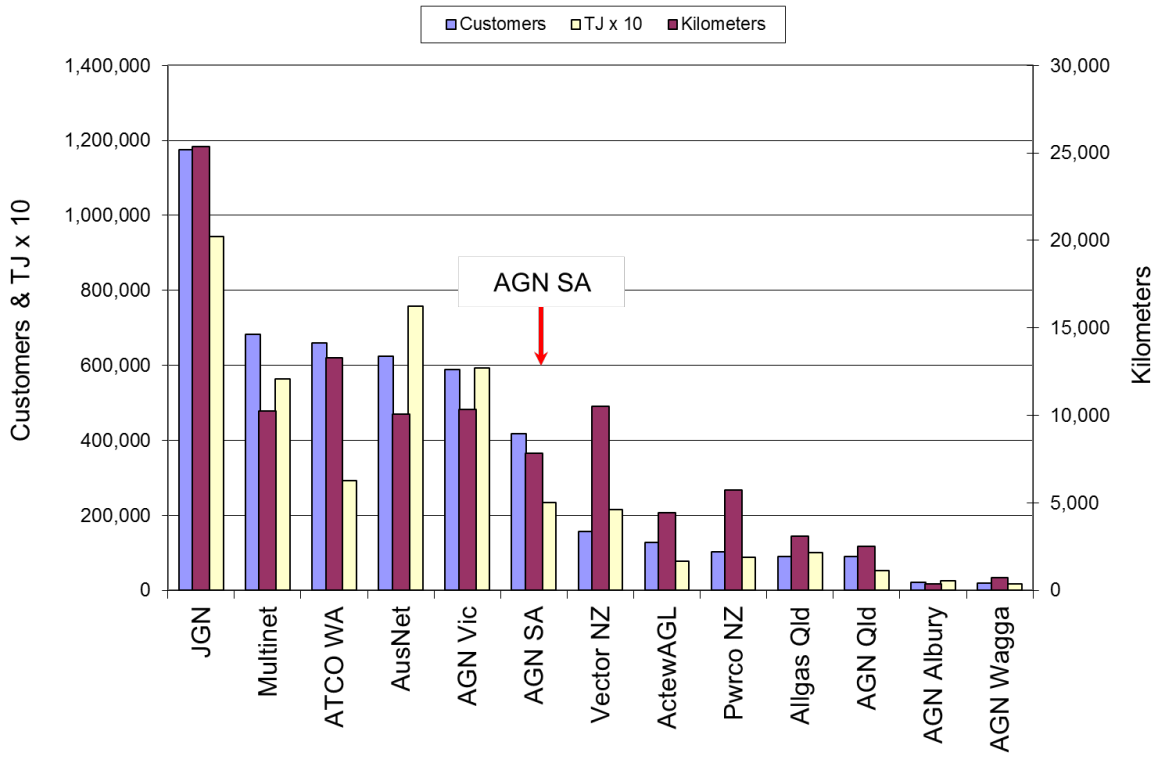
The 13 Australasian distribution businesses operate in varying environments with often substantial differences in network size, amount of throughput, demand growth, number and type of customers, and the mix of rural, urban and CBD customers. The operating environment indicators presented in this section are:

- Energy delivered (TJ), number of customers and network kilometres (Figure 2.1)
- Customer density (customers per kilometre) (Figure 2.2)
- Energy density per kilometre (TJ per kilometre) (Figure 2.3)
- Energy density per customer (TJ per customer) (Figure 2.4).

In Figure 2.1, GDBs are ranked in terms of size in 2013, and the position of AGN SA is emphasised with an arrow. AGN-SA is the sixth largest GDB in the sample in terms of both customer numbers and gas throughput, and the seventh largest GDB in terms of network length. This means it is towards the middle of the sample, together with Vector NZ, in terms of size.

Jemena's NSW distribution network is by far the largest of the 13 included GDBs, and the three Victorian GDBs occupy either the second to fourth or second to fifth positions in terms of the three key measures of size — throughput, customer numbers and network length (Figure 2.1 and Table 2.1). Multinet is the largest of the Victorian GDBs in terms of customers while AusNet is the largest in terms of gas deliveries, while the three Victorian GDBs have very similar network lengths to each other. ATCO WA is the third largest GDB in the sample in terms of customer numbers and network length, but the fifth largest in terms of gas throughput. Vector NZ is the larger of the two New Zealand GDBs in the sample. It has a larger network length than AGN SA, and comparable to each of the three Victorian GDBs. It has similar gas throughput to AGN SA but considerably fewer customers. Several comparatively small GDBs are included in the database, namely: ActewAGL, Powerco (NZ), Allgas (Queensland), AGN Queensland, AGN Albury and AGN Wagga Wagga.

Figure 2.1: **Key features of the operating environment, 2013**

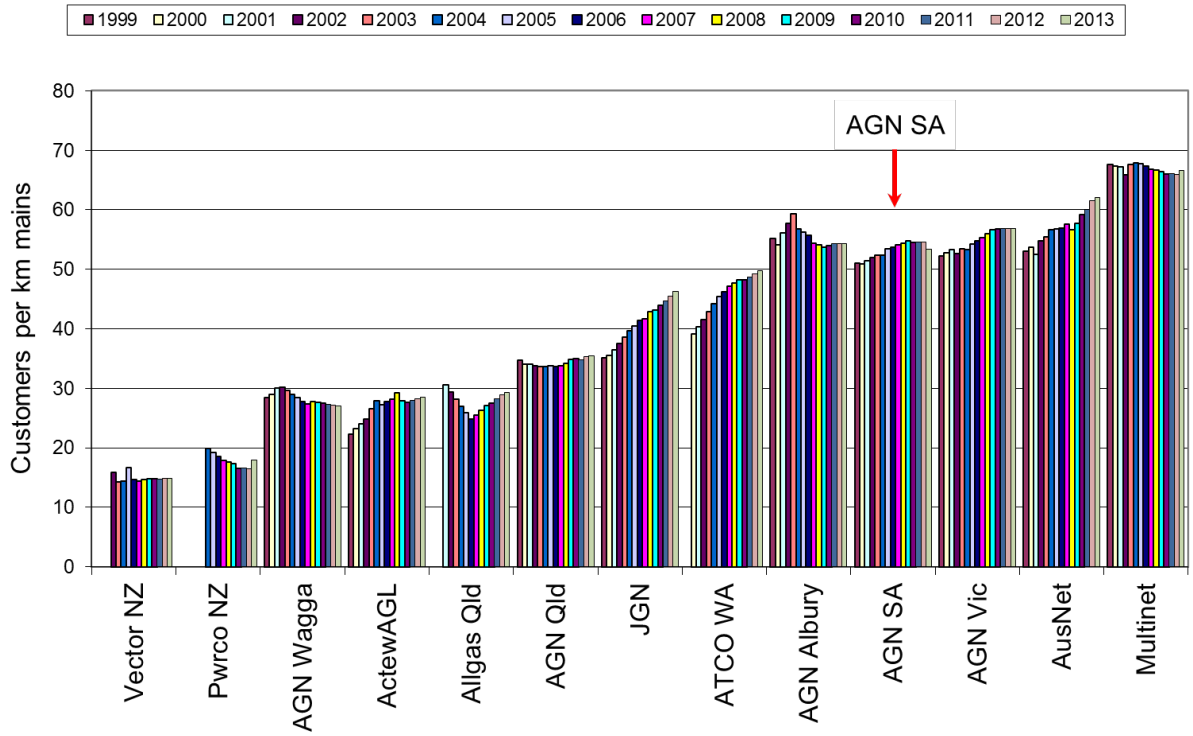


Source: Economic Insights gas utility database

Two key operating environment characteristics which influence energy distribution business productivity levels and costs are customer density, measured by the number of customers per kilometre (km) of mains, and energy density measured by the energy throughput (ie, TJ) per customer. A GDB with lower customer density will require more pipeline length to reach its customers than will a GDB with higher customer density but the same consumption per customer. This would make the lower density distributor appear less efficient unless the differing densities are allowed for. Being able to deliver more energy to each customer means that a GDB will usually require less inputs to deliver a given volume of gas as it will require less pipelines than a less energy-dense GDB would need to deliver the same total volume. The secondary energy density measure of throughput per km is also relevant. These density measures for all companies in the sample for all available years are presented in Figures 2.2 to 2.4.

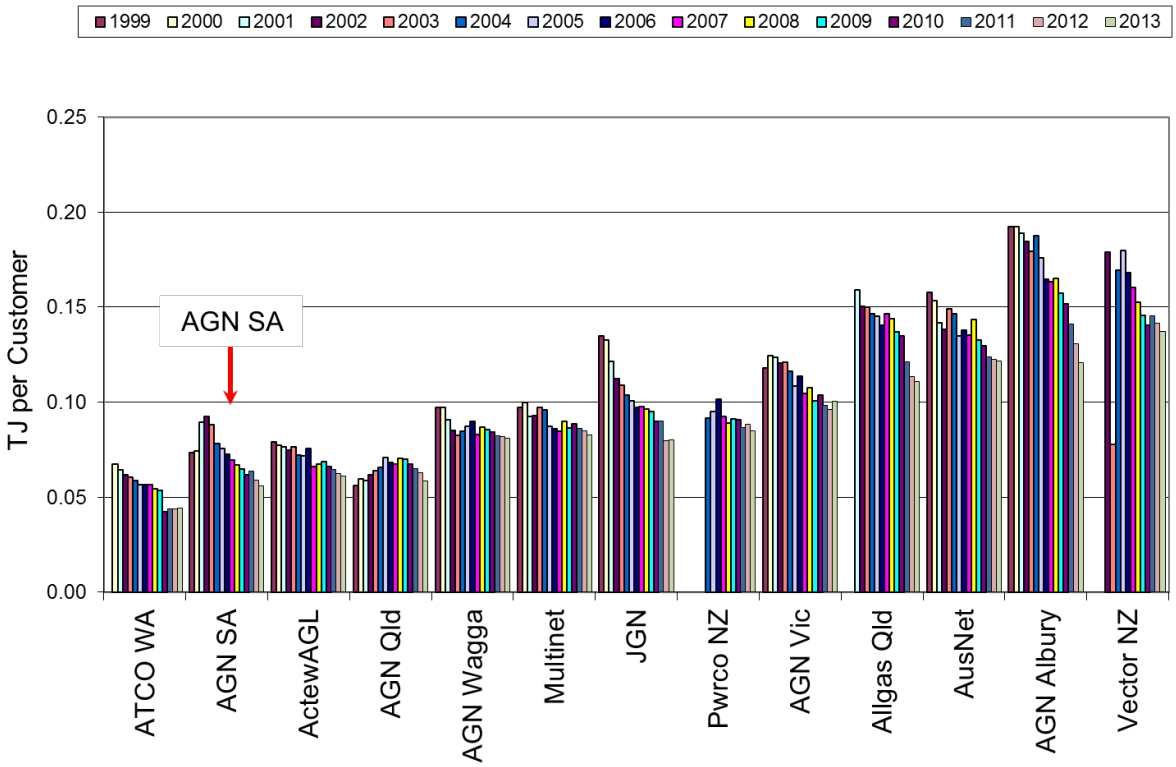
AGN-SA had an average customer density of 54 customers per km in the period 2009-2013, which is greater than the average for all GDBs in the sample of 41 customers per km in the same period (Figure 2.2 and Table 2.1). The utilities with the highest customer density are Multinet, with 66 customers per km, and AusNet and AGN-VIC with 60 and 57 customers per km respectively in the period 2009-2013. AGN-SA's customer density has generally increased over the sample period, but there was a marginal decline in 2013.

Figure 2.2: **Customer density, 1999–2013**



Source: Economic Insights gas utility database

Figure 2.3: **Energy density per customer, 1999–2013**

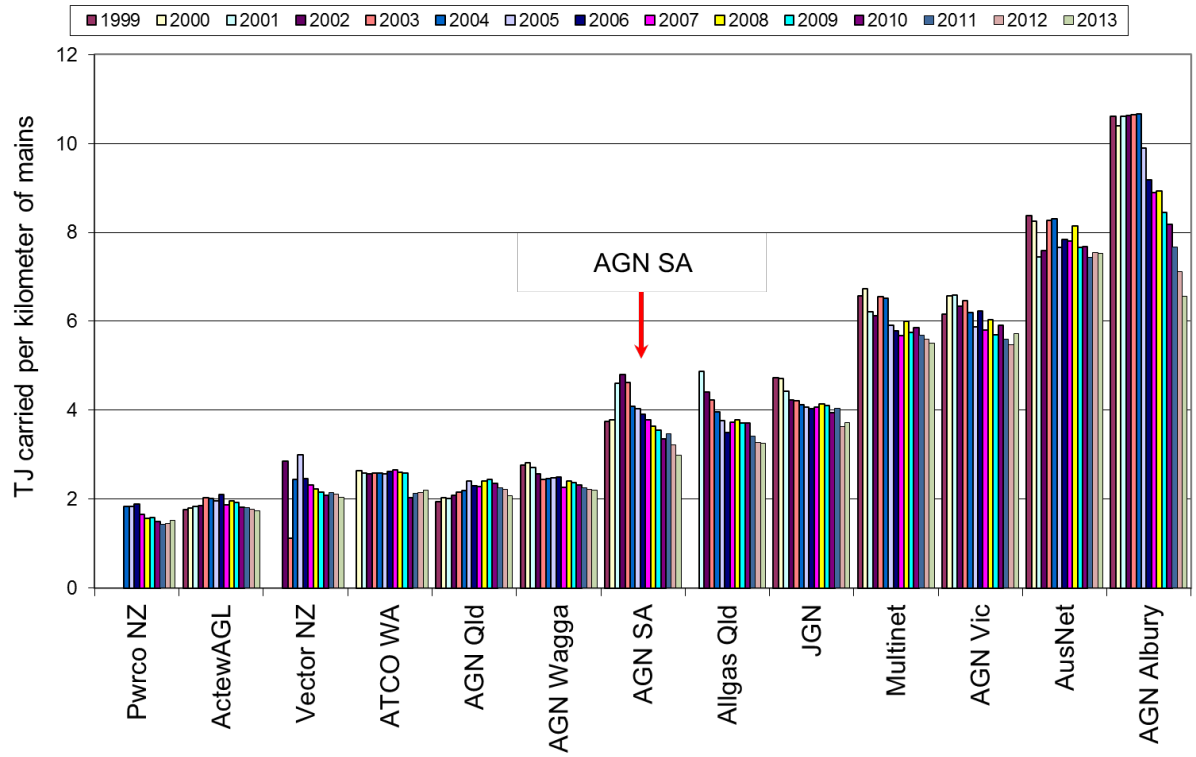


Source: Economic Insights gas utility database

AGN-SA has a comparatively low energy density per customer (Figure 3 and Table 1). On average over the period 1999-2013 it was the second lowest in the sample at 61 gigajoules (GJ) per customer (ie, 0.061 TJ per customer) compared to the sample average of 93 GJ per customer over the same period. Only ATCO WA was lower, with an average of 46 GJ per customer. Among the other larger GDBs in the sample, those with below average energy density include JGN (87 GJ per customer) and Multinet (86 GJ per customer) and those with above-average energy density include AGN-Vic (100 GJ per customer) and AusNet (126 GJ per customer). Some of the smaller GDBs in the sample have comparatively high energy densities per customer due to a comparatively high concentration of large industrial customers compared to domestic customers.

The energy density per customer of most GDBs in the sample has generally fallen over the period. This may be due to a combination of decreased gas demand by energy-intensive industries and residential energy efficiency improvements.

Figure 2.4: **Energy density per kilometre, 1999–2013**



Source: Economic Insights gas utility database

Over the period 2009-2013, AGN-SA's average network energy density of AGN-SA was 3.3 TJ per km, below the average for all GDBs of 3.8 TJ per km over the same period (Figure 2.4 and Table 2.1). The three Victorian GDBs are among those with comparatively high network energy densities, given their high customer densities and generally mid–range energy densities per customer. The industrial customer–oriented AGN-Albury is the other GDB with a high energy density per kilometre.

Network energy densities have tended to decline over much of the sample period, especially over the five year period ending 2013, during which energy density declined for all GDBs included in the analysis. The general increases in customer density have been more than offset by the more pronounced decrease in energy density per customer, resulting, in most cases, in declines in energy throughput per km of mains.

3 PARTIAL PERFORMANCE INDICATORS

The AER has said the following in relation to electricity distribution, which applies equally to gas distribution:

> *We consider that the most significant output of distributors is customer numbers. The number of customers on a distributor's network will drive the demand on that network. Also, the comparison of inputs per customer is an intuitive measure that reflects the relative efficiency of distributors (AER 2014 p.23).*

This section presents information on the inputs per customer of GDBs compared to their network customer densities. By expressing inputs in per customer values and plotting them against network density, we seek to control for differences in the size and customer densities of GDBs.

The inputs we present information on include real opex, real asset costs, and total costs (the sum of real opex and real asset costs). All of the input, output and customer density measures presented in this section are averages over the five year period ending 2013. The partial performance indicators we present are:

- Opex per customer relative to customer density (Figure 3.1)
- Asset cost per customer relative to customer density (Figure 3.2)
- Total cost per customer relative to customer density (Figure 3.3).

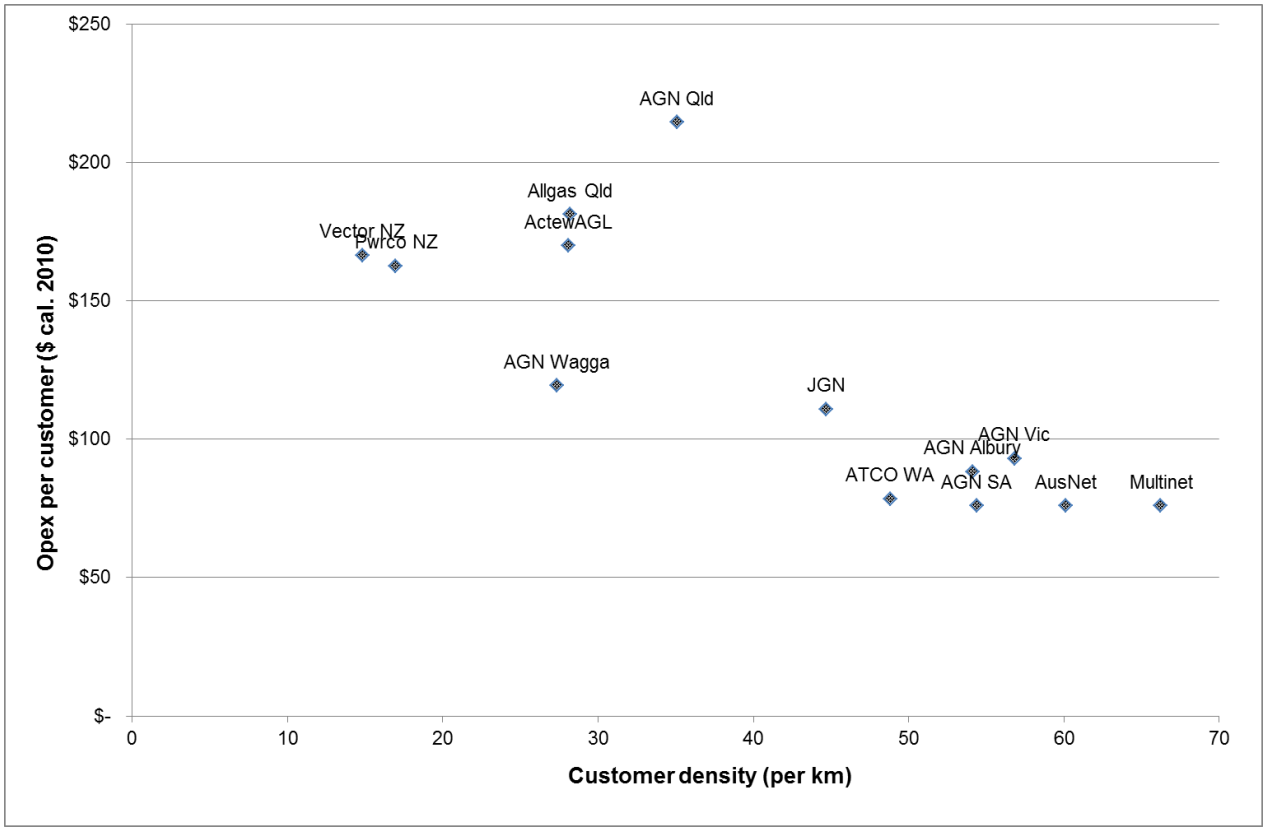
3.1 Opex per customer

Figure 3.1 plots opex per customer against one of its important drivers, customer density. GDBs with lower customer density, such as Vector, Powerco, AGN Wagga, Allgas Qld, ActewAGL and AGN Qld, generally have higher opex per customer than the GDBs with comparatively higher customer density. Those with the highest opex per customer include AGN Qld, Allgas Qld and ActewAGL, with opex per customer for the period 2009 to 2013 averaging $214, $181 and $170 respectively.

GDBs with relatively higher customer density tend to have comparatively low opex per customer. AGN SA is among the GDBs with comparatively high customer density, and its average opex per customer of $76 over the period 2009 to 2013 is equal to the lowest in the sample.

The comparison tends to suggest that AGN SA's use of opex inputs is likely to be among the more efficient of the GDBs in the sample. That said, a comparison of this kind does not control for other drivers of opex costs that may be relevant, and only qualified conclusions can be drawn from it.

Figure 3.1: **Opex per customer relative to customer density (avg. 2009–2013)**



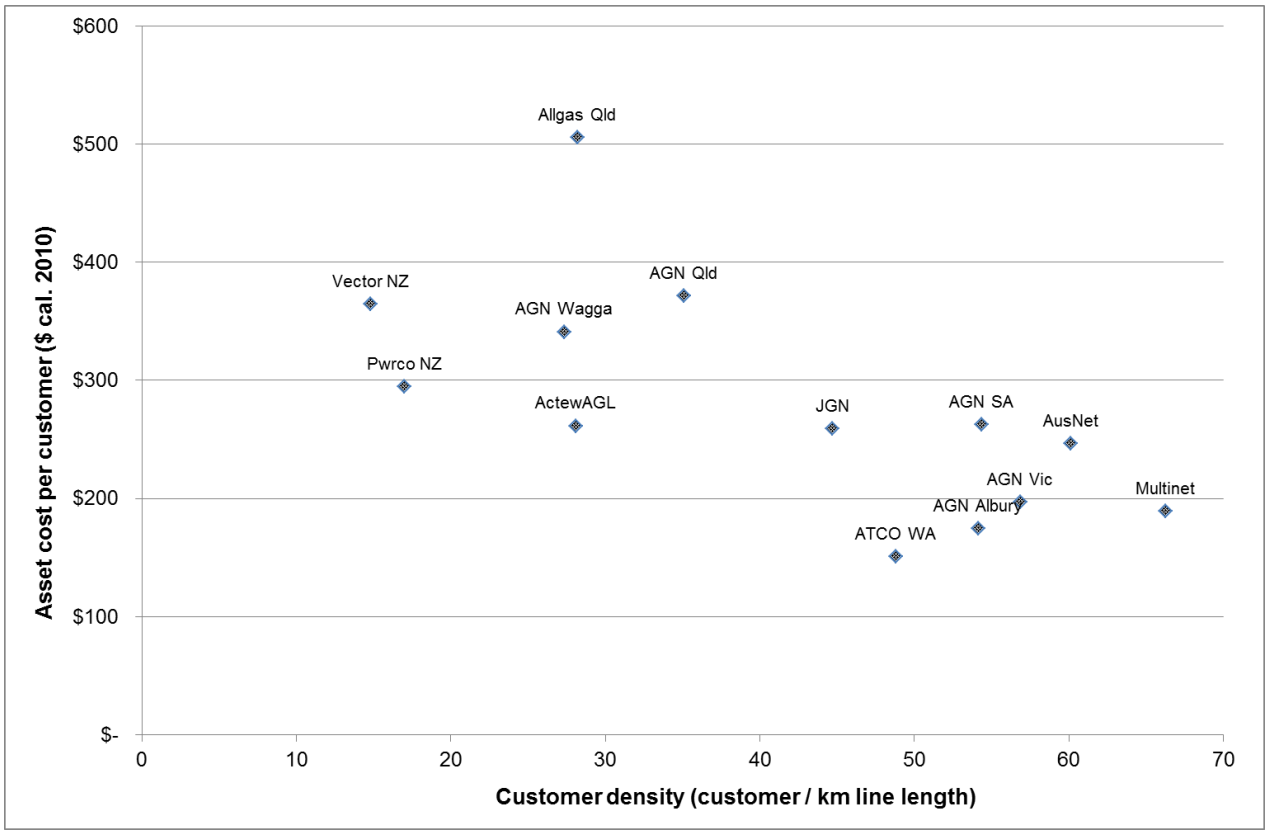
Source: Economic Insights gas utility database.

3.2 Capital assets cost per customer

The efficiency of the use of capital inputs is indicated by asset cost per customer, which is based on actual returns to capital rather than a measure based on the opportunity cost of capital and depreciation cost, as used by the AER, because insufficient information is available from public sources to derive a measure based on the latter approach (AER 2013).

Figure 3.2 plots asset cost per customer against customer density, where asset cost is measured by the actual return to capital including depreciation. The chart shows that GDBs with lower customer density tend to have higher asset cost per customer than the GDBs with higher customer density. AGN SA's average asset cost per customer over the 2009-2013 period was $262, which is similar to the sample average of $278, but is among the highest for the GDBs with relatively higher network densities. ATCO WA had the lowest asset cost per customer, averaging $151 for the same period. AGN SA's capital cost per customer is similar to that of AusNet and JGN. However, this comparison is influenced among other things by asset age, original network asset valuations, and various factors not controlled-for which influence the quantity of assets per customer, and hence asset cost per customer. Thus, only qualified conclusions can be drawn from this chart.

Figure 3.2: **Asset cost per customer relative to customer density (avg. 2009–2013)**



Source: Economic Insights gas utility database. Asset cost is defined as real revenue minus real opex.

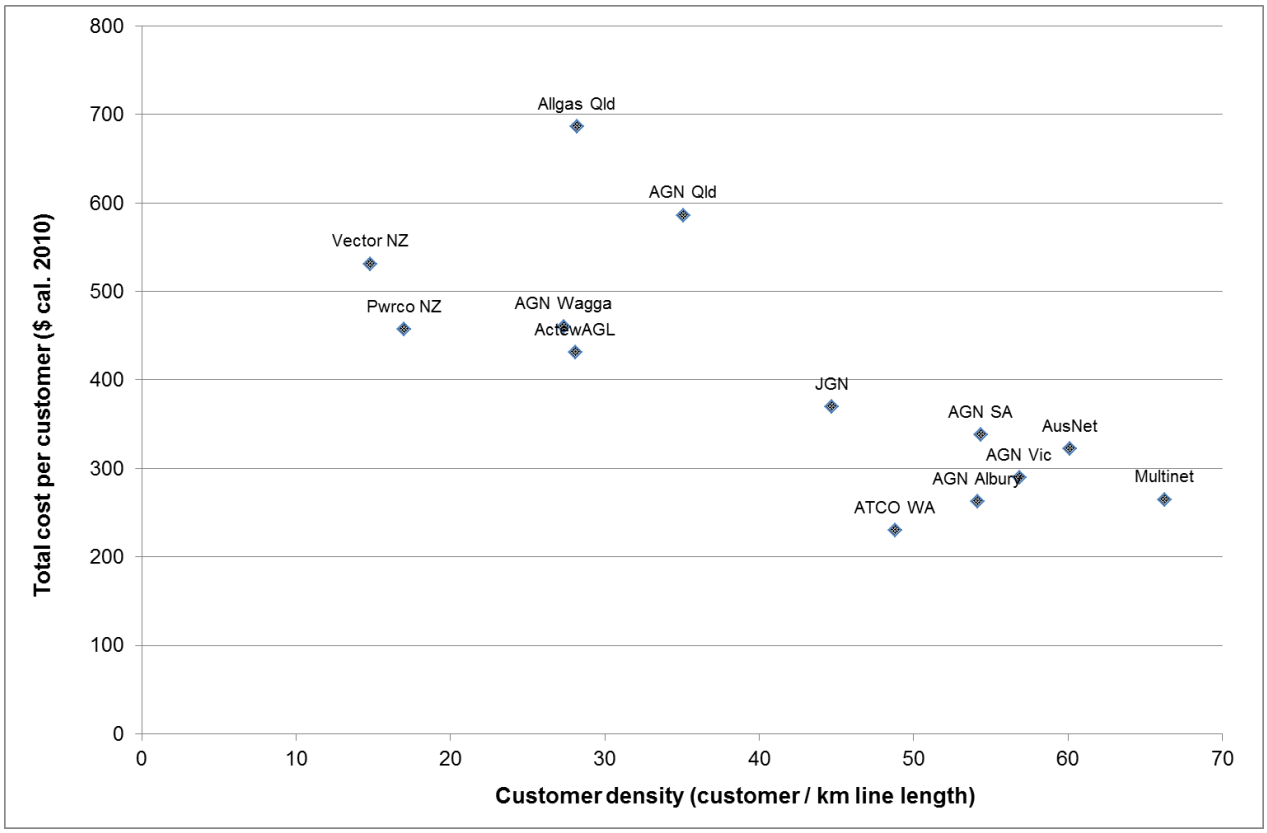
3.3 Overall cost efficiency

Figure 3.3 plots total cost per customer against customer density, where total cost is the sum of opex and asset cost shown in Figures 3.1 and 3.2 respectively. This chart shows the very clear relationship between cost per customer and customer density.

AGN SA's average cost per customer of $338 in the period 2009-2013, was similar to most other GDBs that have relatively high customer density, including JGN ($370), AusNet ($323) and AGN Vic ($290). Multinet has the highest customer density and its average cost per customer was $265 in the same period. AGN Albury and ATCO WA appear to have atypically low total costs per customer, and if this is caused by unique factors, they may not provide a good basis for comparison.

When the clear relationship between cost per customer and customer density is taken into account, and given the differences in individual GDB customer densities, AGN SA's total cost per customer appears to be closely comparable to those of JGN, AusNet, AGN Vic and Multinet. Once again, caution is needed in relation to drawing strong conclusions for these comparisons alone.

Figure 3.3: **Total cost per customer relative to customer density (avg. 2009–2013)**



Source: Economic Insights gas utility database

3.4 Summary

AGN SA's operating environment characteristics can be summarised as follows:

- it is mid-sized — the sixth largest in the sample in terms of customer numbers and gas deliveries and the seventh largest in terms of network length
- it has the fifth highest customer density per km main in the sample
- it has comparatively low energy density per customer — well below average and the second lowest in the sample
- it has below-average energy density per km of mains, with a middle ranking in the sample reflecting a relatively mild climate in South Australia.

AGN SA is a mid-sized GDB that does not enjoy, to the same degree, the economies of scale attained by JGN, the Victorian GDBs and ATCO WA. For this reason, it should not be expected to outperform larger utilities. It also has an especially low energy density per customer. Nevertheless, comparisons of total cost per customer suggest that AGN SA's cost per customer is closely comparable to its peers, such as the three Victorian GDBs and JGN, which all have comparatively high customer density.

Comparisons of opex per customer and asset cost per customer indicate that AGN SA appears to equal of outperform its peers in relation to opex per customer but tends to have

somewhat higher assets per customer when compared to the peer firms mentioned that have relatively high customer density. It is apparent from these results that AGN SA tends to use a somewhat different mix of inputs when compared to its peers. It appears to have a higher degree of capital-intensiveness than the average GDB.

The partial indicators analysis presented in this report does not enable influences such as scale economies or different mixes of inputs to be controlled for in a rigorous fashion. This means that care needs to be taken when drawing inferences. Based on these indicators and recognising the nature of their networks, AGN SA performed at around average levels. It has performed particularly well in regard to achieving low levels of opex per customer and below-average levels of capex per customer.

Some of the indicator growth rates observed in the first half of the period in the immediate aftermath of reform and ownership changes have slowed in the second half of the period as cost reductions become progressively harder to achieve after these initial gains were made. This trend is, broadly speaking, quite common among the GDBs in the sample (shown in Table 2.2), perhaps reflecting the likelihood that many of the potential efficiency gains at the start of the period were already achieved mid-way through the period.

APPENDIX A: GAS DISTRIBUTION BUSINESSES INCLUDED IN THE STUDY

The database formed for the study includes 11 Australian GDBs and 2 New Zealand GDBs. A brief summary of the operations of the included GDBs follows.

Australian GDBs

ActewAGL, Australian Capital Territory

ActewAGL is the distribution business supplying gas and electricity in the Australian Capital Territory (ACT).[1] The total population of the ACT in 2013 was 383,000. Gas is distributed to a predominantly residential customer base with Canberra the largest market. Outside the ACT ActewAGL supplies gas to Queenbeyan and Bungendore in NSW. There are few industrial users of any significance in its supply area. Canberra covers a large geographical area and the majority of urban development is low density. Moreover, gas distribution in residential areas utilises a dual mains configuration with mains on both sides of a street, rather than a single sided system with longer cross-road service connection. For these reasons it is a low density distribution network when measured in terms of customers per kilometre of main.

In 2013 ActewAGL supplied 127,071 customers with 7,744 TJ of gas from a distribution network of around 4,448 kilometres of mains.

Allgas Energy Pty Ltd (Allgas), Queensland

Allgas is owned by Marubeni Corporation, RREEF and the APA Group. It supplies gas to consumers in several areas in and around Brisbane and to several Queensland regional areas. The Allgas distribution system is separated into three operating regions. These are:

- the Brisbane region (south of the Brisbane river to the Albert River);
- the Western region (including Toowoomba and Oakey); and,
- the South Coast region (including the Gold Coast, and Tweed Heads in NSW).

About 59 per cent of the network is located in Brisbane, 19 per cent in the Western region and the remaining 22 per cent on the South Coast and Tweed Heads.

Queensland's mild to hot climate means that residential and commercial heating demand is low. Residential demand for gas is mainly for hot water systems and cooking. In June 2011 southeast Queensland's population was around 3,178,000. More than 70 per cent of Allgas' gas demand is from around 100 large demand class customers.

In 2013 Allgas supplied 90,281 customers with 10,001 TJ of gas from a distribution network of 3,076 kilometres of mains.

[1] ActewAGL includes an energy retailing partnership and an energy distribution partnership. Only the latter is relevant to this study, which is owned jointly by ACTEW Corporation and Jemena Networks (ACT) Pty Ltd.

AGN Albury, NSW

AGN Albury operates in the large regional centre on the border of NSW and Victoria often referred to as Albury–Wodonga. In 2011 the population of the twin cities was estimated to be 82,083.[2]

In 2013 AGN Albury supplied its 20,601 customers with 2,492 TJ of gas from a distribution network of 380 kilometres of mains.

AGN Queensland, Queensland

AGN Queensland is an operating division of Australian Gas Networks Limited, which is owned by the Cheung Kong Consortium. AGN Queensland's distribution network can be divided into two regions:

- the Brisbane region (including Ipswich and suburbs north of the Brisbane river); and
- the Northern region (serving Rockhampton, Gladstone and Bundaberg).

The network consists of 2,509 kilometre of low, medium, high and transmission pressure mains. Assets used to service the Brisbane region comprise 88 per cent of the network with the balance of 12 per cent attributable to the Northern region.

AGN Queensland is subject to similar climatic influences on residential gas demand as Allgas. Customer numbers are greater than those for Allgas but regulated volumes are smaller. However, AGN has a number of unregulated industrial customers with very large volumes that are not reflected in the data used in this study. In 2013 there were 88,811 customers consuming 5,191 TJ of gas.

AGN SA, South Australia

AGN SA's distribution network services: greater Adelaide; to the north-east of Adelaide, the Barossa Valley, Riverland and Mildura in Victoria; to the north, Peterborough, Port Pirie and Whyalla; and in the east and south-east regions, Murray Bridge and Mt Gambier. Adelaide's population in 2011 was 1.23 million. As with Melbourne, Adelaide's winter climate is conducive to relatively high residential gas demand for heating.

In 2013, AGN SA supplied 417,198 customers with 23,282 TJ of gas from a distribution network of 7,811 kilometres of mains. The Adelaide network makes up 93 per cent of the total network length.

AGN Victoria, Victoria

AGN Victoria serves parts of the greater Melbourne metropolitan area (population of 4.25 million in 2012) including the northern suburbs, the Mornington Peninsula and Pakenham/Cranbourne. AGN Victoria also supplies the north central Victorian area (including Seymour, Wodonga, Wangaratta, Shepparton-Mooropna and Echuca among others). It also supplies rural townships and cities in the Gippsland region (including

[2] Australian Bureau of Statistics, 2011 Census Community Profiles, Cat. No. 2001.0.

Bunyip, Drouin, Warragul, Traralgon, Morwell and Sale among others), and a number of outlying towns in East Gippsland such as Bairnsdale and Paynesville (which are in the new Eastern Zone). The Distribution System is divided into four Zones – North, Central, Murray Valley and Eastern.

Melbourne's gas market is well established and cool to mild climatic conditions result in high residential gas consumption for heating, cooking and hot water systems. A relatively high concentration of industry also supports industrial gas demand provided that prices are competitive with other sources of energy supply. In 2012 there were 553,604 residential customers and 23,200 non–residential customers.

In 2013, AGN Victoria supplied its 589,214 customers with 59,268 TJ of gas from a distribution network of 10,353 kilometres of mains.

AGN Wagga Wagga, NSW

AGN (formerly Envestra) took over gas supply from the NSW Government's Country Energy from October 2010. It supplies gas to the city of Wagga Wagga (estimated population of 63,500 in 2010) in southern regional NSW.

In 2013 there were 19,554 residential and non–residential customers. AGN supplied these customers with 1,588 TJ of gas from a distribution network of 723 kilometres of mains. In April 2014 the NSW Energy Minister, the Honourable Anthony Roberts, determined coverage of the Wagga Wagga gas distribution network be revoked. Economic regulation of the network by the AER therefore ceased at that time.

ATCO Gas Australia, Western Australia

ATCO acquired the network previously operated by WA Gas Networks (WAGN) in July 2011. ATCO Gas Australia is the principal GDB for Western Australian businesses and households. It operates the gas distribution system in the mid-west and south-west of Western Australia, including the greater Perth Metropolitan region (including Busselton and Bunbury), Geraldton, Kalgoorlie and the Albany region, each with separate gas distribution networks (Albany is supplied with reticulated LPG).

In 2013, ATCO supplied 660,288 customers with 29,131 TJ of gas from a distribution network of 13,275 kilometres of mains.

AusNet Services, Victoria

AusNet's Victorian gas distribution business was formerly TXU networks, which was formerly Westar (Assets) Pty Ltd, and is now part of AusNet Services, an ASX-listed business. The AusNet gas distribution business delivers gas to over 600,000 customers across a geographically diverse region spanning the western half of Victoria, including the Western part of Melbourne, from the Hume highway in metropolitan Melbourne west to the South Australian border and from the southern coast to Horsham and just north of Bendigo. Its supply area includes the major Victorian regional centres of Geelong, Ballarat and Bendigo, and many other cities and towns in western Victoria.

In 2013, AusNet supplied its 624,143 customers with 75,829 TJ of gas from a distribution network of 10,062 kilometres of mains.

Jemena Gas Network, NSW

JGN was formed from the sale of Alinta Ltd in 2007, Alinta itself having acquired the gas assets of AGL Gas Networks (AGLGN) in 2006. It is now co-owned by State Grid Corporation of China and Singapore Power. The JGN network provides gas to 1,174,522 customers in Sydney, Newcastle, Wollongong and the Central Coast, and over 20 country centres including those within the Central Tablelands, Central West, Southern Tablelands and Riverina regions of NSW.

Jemena has the largest distribution network and customer base of the Australian GDBs. In 2013 JGN supplied 90,877 TJ of gas from a distribution network of 23,377 kilometres of mains.

Multinet Gas, Victoria

Multinet is owned by the DUET Group, an ASX-listed energy infrastructure business. The Multinet gas distribution system covers the eastern and south–eastern suburbs of Melbourne extending over an area of approximately 1,600 square kilometres as well as comparatively recent extensions of supply to townships in the Yarra Valley and South Gippsland.

In 2013, Multinet supplied its 682,436 customers with 56,424 TJ of gas from a distribution network of 10,238 kilometres of mains.

New Zealand GDBs

The New Zealand gas distribution industry is generally less mature than Victoria's with penetration rates still increasing relatively quickly, but comparatively low customer density at present.

Powerco Limited

Powerco is based in New Plymouth (population 53,400 in 2013) and distributes gas in the central and lower North Island regions. It is a dual gas and electricity network business. Powerco's gas networks in the central North Island region include the Taranaki (including New Plymouth), Manawatu and Horowhenua (including Palmerston North, population 83,800), and Hawkes Bay networks (including Napier-Hastings, population 125,300). In the lower North Island it supplies Wellington City (population of 203,100), Hutt Valley (estimated population 141,700) and Porirua (district population of 53,100). Powerco acquired part of UnitedNetworks' gas operations in 2002 comprising the Hawkes Bay, Wellington, Horowhenua and Manawatu networks.

In 2013, Powerco supplied its 102,794 customers with 8,745 TJ of gas from a distribution network of 5,738 kilometres of mains.

Vector Ltd

Vector Ltd operates the gas distribution network in Auckland (estimated population of 1,418,000 including North Shore City, and the urban parts of Waitakere and Manukau cities) as well as other major North Island centres and 40 smaller towns and cities.

Vector acquired the remaining part of UnitedNetworks' gas operations in 2002 comprising its Auckland gas network and the National Gas Corporation's gas distribution business in 2004 and 2005. The Vector data from 2006 represent the combined operations of Vector and the former NGC Distribution. In 2013, Vector supplied 155,977 gas distribution customers with 21,400 TJ of gas from a distribution network of 10,505 kilometres of mains.

Vector also owns and operates significant transmission pipelines and power line networks throughout the North Island. It is listed on the NZ Stock Exchange, but is around 75 per cent owned by the Auckland Energy Consumer Trust.

APPENDIX B: DATABASE USED IN THE STUDY

The data used in this study have been sourced from documents in the public domain to the maximum extent possible and relate to the period 1999 to 2013. Data for most of the Australian GDBs in the study are publicly available for most of this period. However, there are fewer consistent observations publicly available for the New Zealand GDBs, reflecting the impact of mergers, asset sales and industry restructuring. As a result, Powerco (New Zealand) only has observations for 2004 onwards and Vector (New Zealand) only has observations for 2002 onwards.

The public domain data sources used for the Australian GDBs include:

- Access Arrangement Information (AAI) filings as proposed and as amended by a regulator's decision
- Regulators' final decisions, sometimes with amendment following appeal, and
- Annual Reports from the GDB or its parent firm.

The public domain data source used for the NZ GDBs is the Information Disclosure Data filings required by the Gas (Information Disclosure) Regulations 1997.

Data used includes throughput, customer numbers, distribution pipeline length, opex, capex and regulatory asset value. In a few cases missing observations were estimated based on growth rates for the variable or a related variable before and after the missing year. In a number of cases adjustments were made to ensure the data related to comparable activities and measures (eg unaccounted for gas allowances for non–Victorian GDBs have been excluded to put those GDBs on a comparable basis with Victorian reporting).

The data used for the Australian GDBs cover only the regulated activities. Data relating to large industrial users whose supply is not regulated are not included. Inclusion of this data would require access to information not generally in the public domain and has been beyond the scope and timeframe of this study.

Despite the existence of the National Gas Law and Regulations and their predecessors, the amount of detail provided by both regulators and GDBs differs and data are typically not drawn together in the one location. The transfer of regulatory responsibilities from jurisdictional regulators to the Australian Energy Regulator (AER) also tended to fragment the historic data available. Some differences remain in the coverage of distribution activities across states although this is now more consistent than in earlier years.

In some cases the regulators' final approvals have used forecast data substantially different from that presented by the GDBs in their initial AAIs. Not all jurisdictions have required the GDBs to supply revised AAIs consistent with the final approvals. We have used the final approval information, where possible, as we consider that it is the most consistent and objective source of information available. While we have used the latest available historic information wherever possible, in a limited number of cases the data

represent forecasts from regulatory decisions because actual data were not available for the more recent years.

Economic Insights (2009 p.v) noted that:

> *The extent, quality, uniformity and continuity of currently available historical regulatory data are very variable both between jurisdictions and over time. Regulatory data have to date concentrated almost exclusively on financial variables ... (and) there are significant gaps and changes in coverage over time and across jurisdictions. ... This compromises comparability across businesses, across jurisdictions and over time.*

While every effort has been made to make the publicly available data used in this study as consistent as possible, the limitations of currently available public domain data need to be recognised. These include somewhat different coverage of activities and definitions of variables reported both across jurisdictions and over time as regulators have changed reporting requirements.

The data derived from public sources relate to the time periods normally reported by each GDB, and some GDBs use calendar year reporting while others use financial year reporting, and sources varied in reporting data in nominal and real terms. All cost data were first converted to nominal terms (where necessary) using the All Groups Consumer Price Index in Australia and the equivalent in New Zealand. The nominal series were then converted to real series in 2010 dollars using the same price indexes. The New Zealand data were then converted to Australian dollars using the OECD (2014) purchasing power parity for 2010. Purchasing power parities are the rates of currency conversion that eliminate differences in international price levels and are commonly used to make comparisons of real variables between countries.

For AGN SA, AGN Qld and JGN, survey data has been used rather than the public domain data, which was not sufficiently current due to the timing of their access arrangement approval processes (since access arrangement information and regulatory decisions are key sources of the public domain data).

The measure of opex covers regulated distribution activities only and excludes all capital costs. It includes all non–capital costs allowed by the regulatory authorities, including directly employed labour costs, contracted services, materials and consumables, administration costs and overheads associated with operating and maintaining the distribution service. It excludes unaccounted for gas for all the GDBs as this is treated differently in Victoria compared to the other Australian States and excluding this item provides the best basis for like–with–like comparisons. In line with earlier studies, full retail contestability (FRC) costs are included as reported. All of the cost data are expressed in $A 2010 prices.

The estimates of capital assets are based on depreciated asset values for regulatory purposes or those calculated using the same approach as used in regulatory accounts in $A 2010.

ATTACHMENT A: LETTER OF RETAINER

Australian Gas Networks Limited
ACN 078 551 685
Level 10, 81 Flinders Street
Adelaide, South Australia 5000
Telephone +61 8 8418 1114
www.australiangasnetworks.com.au

11 May 2015

Mr Michael Cunningham
Economic Insights Pty Ltd
10 By Street
EDEN NSW 2551

Dear Mr Cunningham

Australian Gas Networks Limited South Australian Access Arrangement Review 2016/17 – 2020/21

Australian Gas Networks Limited (AGN) seeks to engage you to prepare an expert report in relation to the AER's review of the South Australian Access Arrangement.

This letter of retainer sets out the matters which AGN wish you to address in your report and the requirements with which the report must comply.

Terms of Reference

AGN wishes to engage you to prepare the following report in relation to Cost Benchmarking:

- Cost Benchmarking

  AGN wishes to engage you to prepare an expert report that compares partial productivity indicators for AGN's South Australian network against those determined for other equivalent Australian and New Zealand gas distribution network operators.

  In preparing those aspects of your report which relate to the making of forecasts or estimates, you should have regard to the relevant requirements of Rule 74(2) of the National Gas Rules which provides:

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

Use of Report

The report may be included in AGN's South Australian Access Arrangement proposal to the AER. The report may be provided by the AER to its own advisors. The report must be expressed so that it may be relied upon both by AGN SA and by the AER.

The AER may ask queries relating to the report and you will be required by AGN to answer these queries. The AER may choose to interview you and if so, you will be required to participate in any such interviews.

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The report will be reviewed by AGN's legal advisors and will be used by them to provide legal advice to AGN as to AGN's rights and obligations under the NGL and NGR. You will be required to work with these legal advisors and AGN's personnel to assist in the preparation of the South Australian Access Arrangement proposal and submissions in response to the preliminary and final decisions made by the AER.

If AGN chooses to challenge any decision made by the AER, that appeal will be made to the Australian Competition Tribunal and the reports will be considered by the Tribunal. AGN may also seek review by a court and the reports would be subject to consideration by such court. You should therefore be conscious that the reports may be used in the resolution of a dispute between the AER and any or all of the Distributors as to the appropriate level of AGN's distribution tariffs. Due to this, the reports will need to comply with the Federal Court requirements for expert reports, which are outlined below.

You must ensure you are available to assist AGN until such time as the Access Arrangement review and any subsequent appeal is finalised.

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 code of conduct for expert witnesses in the Federal Court of Australia.

Please read and familiarise yourself with the Code of Conduct and comply with it at all times in the course of your engagement with AGN.

In particular, your report prepared for AGN 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 Code of Conduct.

Your report must also:

a) Contain particulars of the training, study or experience by which the expert has acquired specialised knowledge;
b) Identify the questions that the expert has been asked to address;
c) Set out separately each of the factual findings or assumptions on which the expert's opinions is based;
d) Set out each of the expert's opinions separately from the factual findings or assumptions;
e) Set out the reasons for each of the expert's opinions; and
f) Otherwise comply with the Code of Conduct.

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 is signed by the expert and include a declaration that:

> *"[the expert] has made all the inquiries which [the expert] believes are desirable and appropriate and that no matters of significance which [the expert] regards as relevant have, to [the expert's] knowledge, been withheld from the report."*

AGN may request the principal author of the report to sign a statutory declaration to the effect that the Code of Conduct has been complied with. This is to ensure that the report carries maximum weight and probative value and will be suitable to rely upon in any subsequent court proceedings.

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

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Terms of Engagement

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

Please sign a counterpart of this letter and forward it to AGN to confirm your acceptance of the engagement by AGN.

Kind regards,

Peter Bucki
Manager Regulatory Strategy

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ATTACHMENT B: CURRICULUM VITAE

Michael Cunningham

Position	Associate
Business address:	28 Albert St, Brunswick East, VIC 3057
Business telephone number:	+61 3 9380 4700
Mobile:	0412 255 131
Email address	michael@economicinsights.com.au

Qualifications

Master of Commercial Law, Melbourne University

Master of Commerce (Hons), Melbourne University

Bachelor of Economics, Monash University

Key Skills and Experience

Michael Cunningham has recently become an Associate of Economic Insights following more than a decade as a senior regulatory manager with the Essential Services Commission of Victoria. Michael has extensive experience in the regulation of energy, water and transport networks and in detailed productivity analysis.

Michael recently developed Victoria's minimum feed-in tariffs for 2014, and conducted research into Victoria's energy retail market, including methods for estimating retailer margins, and research into emerging regulatory issues such as household electricity control products. He produced the ESC's analysis of the productivity of the Victorian water industry in 2012, and on secondment to the Victorian Competition and Efficiency Commission in 2011, for the Inquiry into a State-Based Reform Agenda, he was lead author of its Productivity Information Paper (Dec 2011).

Michael has led many key ESC reviews, including:

- Review of the Rail Access Regime 2009-10
- Reviews of Victorian Ports Regulation 2009 & 2004
- Reviews of Grain Handling Access Regime 2009, 2006 & 2002
- Taxi Fare Review 2007-08
- Review of Port Planning 2007
- Implementing the Victorian rail access regime 2005 & rail access arrangement approvals 2006 & 2009

- Review of the Supply of Bottled LPG in Victoria 2002.

Prior to joining the ESC, Michael was a commercial advisor at Gascor Pty Ltd for the re-determination of the natural gas price under Victoria's (then) principal gas supply contract for Gippsland gas. From 1997 to 1999, he was an Associate Analyst at Credit Suisse First Boston Australian Equities, carrying out financial analysis of Australia listed infrastructure businesses and utilities. For more than 10 years Michael was employed by Gas & Fuel Corporation Victoria (GFCV) and was responsible for developing forecasting models, operations research, project evaluation, developing management performance reporting systems and tariff design.

As Manager, Resource Strategy, he participated in contract negotiations, and carried out key analysis, relating to the supply of LNG (for the Dandenong storage facility), and participated in the development of gas transmission prices. From 1994 to 1997, he was seconded to the Gas Industry Reform Unit (GIRU) in Victoria's Treasury department and assisted with the negotiation and settlement of the Resource Rent Tax dispute between GFCV and Esso-BHP (approximately $1 billion in claims). He was a member of the negotiating team that settled a new 13-year gas supply agreement to supply 95% of Victoria's natural gas. In addition to being a member of the negotiating team, he was responsible for carrying out all of the forecasting and risk analysis of key contractual terms such as take-or-pay, maximum day quantity, quantity renomination options etc.

Recent Publications

- Journal article: 'Productivity Benchmarking the Australian Water Utilities' *Economic Papers* (June 2013)
- Conference paper: Cunningham M B & Harb, D 'Multifactor productivity at the sub-national level in Australia', 41st Australian Conference of Economists 2012
- Submissions:
  - 'Submission to MCE consultation on the separation of electricity transmission and distribution' (Nov 2011)
  - 'Submission to AEMC consultation on AER rule change request' (Dec 2011)
  - 'Submission to PC Consultation on Electricity Network Regulation' (Apr 2012)
  - 'Processes for stakeholder negotiation for electricity regulation', submission to PC (Nov 2012)
  - 'Submission to Productivity Commission Review of the National Access Regime' (Feb 2013).

Relevant Projects

- For the Essential Services Commission Victoria, developed options for feed-in tariffs for small renewable electricity generators in Victoria to apply in 2015 (2014).

- On behalf of Jemena Gas Networks, carried out productivity analysis, benchmarking and forecasting partial productivity to support its current access arrangement review (2014).
- For the Commonwealth Department of Environment, carried out (with Denis Lawrence) an economic benchmarking study of the Murray Darling Basin Authority's River Murray Operations joint venture against similar Australian rural water businesses using data envelopment analysis (2014).
- For the Essential Services Commission Victoria, carried out an econometric benchmarking study of Victorian urban water businesses against urban water businesses throughout Australia (2014).
- Assisted in preparing advice to the New Zealand Commerce Commission on international practices regarding setting regulated rates of return within a range of best estimates (2014).

ATTACHMENT C: DECLARATION

I, Michael Bradbury Cunningham, Associate of Economic Insights Pty Ltd, declare that I have read the Federal Court Guidelines for Expert Witnesses and that I have made all inquiries I believe are desirable and appropriate and that no matters of significance which I regard as relevant have, to the best of my knowledge, been withheld. The opinions expressed in this report are wholly or substantially based on my specialised knowledge.

Michael Bradbury Cunningham

21 May 2015

REFERENCES

AER 2013, 'Better Regulation: Expenditure Forecast Assessment Guideline for Electricity Distribution'.

Australian Energy Regulator (AER) 2014, 'Electricity distribution network service providers, Annual benchmarking report'.

Economic Insights 2009, 'Assessment of Data Currently Available to Support TFP-based Network Regulation', in *Report prepared by Denis Lawrence and John Kain for Australian Energy Market Commission*.

Economic Insights 2012, 'Benchmarking the Victorian Gas Distribution Businesses' Operating and Capital Costs Using Partial Productivity Indicators', in *Report prepared for Envestra Victoria, Multinet and SP AusNet*.

Organisation of Economic Cooperation and Development (OECD) 2014, *Economics: Key tables from OECD - Purchasing power parities for GDP*.