AusNet Gas Services Pty Ltd

Gas Access Arrangement Review 2018–2022

Appendix 7B: Benchmarking the Victorian Gas Distribution Businesses' Operating and Capital Costs Using Partial Productivity Indicators

Submitted: 16 December 2016

Benchmarking the Victorian Gas Distribution Businesses' Operating and Capital Costs Using Partial Productivity Indicators

Report prepared for

AusNet Services

Australian Gas Networks Limited, and

Multinet Gas

15 June 2016

Michael Cunningham

Economic Insights Pty Ltd
10 By Street, Eden,
NSW 2551, Australia
Ph +61 2 6496 4005
WEB www.economicinsights.com.au
ABN 52 060 723 631

CONTENTS

EXECUTIVE SUMMARY

This report discusses the efficiency performance of the three Victorian gas distribution businesses – AusNet Services ('AusNet'), Australian Gas Networks' Victorian operations ('AGN Vic') and Multinet Gas ('Multinet') – over the period 1999–2015 within a group of 11 Australian and two New Zealand gas distribution businesses (GDBs). The report has been prepared for the three Victorian GDBs as an input to the forthcoming reviews of each of their access arrangements for the period 2018–2022.

A set of partial performance indicators is presented to compare the opex and capital input efficiency of the thirteen 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 (2016) 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 for most of the GDBs included in this study has been sourced from documents in the public domain. The exceptions are AGN SA, AGN Vic, AusNet, Jemena and Multinet, for which the primary data source is information provided in response to common detailed data surveys, covering key output and input value, price and quantity information for the calendar years 1998 to 2015 (or 2014 in the case of Jemena). Using survey data where available assists to ensure greater data accuracy.

The public domain data used for the other GDBs is sourced mainly from 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. 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

The operating environment characteristics of the three Victorian GDBs are similar and can be summarised as follows:

- After Jemena in NSW (the largest GDB in the sample), they are among the largest in terms of customer numbers and gas deliveries and network length. Only ATCO is of comparable size.

- They have the highest customer density per km mains of all the GDBs in the sample. Other GDBs with relatively high customer density include AGN Albury, AGN SA, ATCO and Jemena.
- Their energy density per customer is about average. Those with higher or comparable energy density include Vector, AGN Albury, Allgas, Powerco and Jemena.
- They have comparatively high levels of energy density per km of mains, with only AGN Albury's being higher.

The Victorian GDBs therefore have a substantial degree of economies of scale. Even so, their opex per customer and asset cost per customer are amongst the lowest of those for GDBs of comparable scale. Similarly, comparisons of total cost per customer suggest that the Victorian GDBs are comparable to the most efficient peers, and hence amongst the most efficient of the GDBs in the sample.

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, the Victorian GDBs appear to have performed at better than average levels, achieving comparatively low levels of opex per customer, asset cost per customer and hence total cost per customer.

Some of the indicators, such as opex per customer, have improved less strongly over the last five years (shown in Table 2) compared to the whole sample period (shown in Table 1). Some of the cost reductions achieved 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.

1 INTRODUCTION

1.1 Terms of reference

Three Australian gas distribution businesses (GDBs), AusNet Services ('AusNet'), Australian Gas Networks Limited ('AGN') and Multinet Gas ('Multinet') have commissioned Economic Insights Pty Ltd ('Economic Insights') to provide advice on productivity measurement and benchmarking of their Victorian gas distribution network operations. The advice provided in this report presents partial indicator comparisons between a set of 11 Australian and two New Zealand GDBs using a combination of public domain and survey–based data. These partial performance indicators are analogous to those published by the Australian Energy Regulator for electricity distribution businesses (AER 2014). This report updates a similar study carried out for AGN in 2015 for its South Australian gas distribution business access arrangement review (Economic Insights 2015).

1.2 Outline of the Report

Section 2 presents data on the business operating environment characteristics that influence the observed performance of GDBs. 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 over 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 was prepared by Michael Cunningham, who is an Associate of Economic Insights. His summary CV is presented in Attachment A. 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 B 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 2015. A summary overview of each of the GDBs included in this study is available at Appendix A. The performance indicators discussed below are summarised in Tables 2.1, 2.2 and 2.3 at the end of this section.

The dataset on which this analysis is based is described in Appendix B. Data for the full 15 year period are available for 7 of the Australian GDBs. Data for ATCO in WA are available from 2000 onwards while data for Allgas and AGN Queensland are available from 2001 onwards. Jemena's data is available from 1999 to 2014.

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 2005 onwards, the earlier data being affected by mergers.

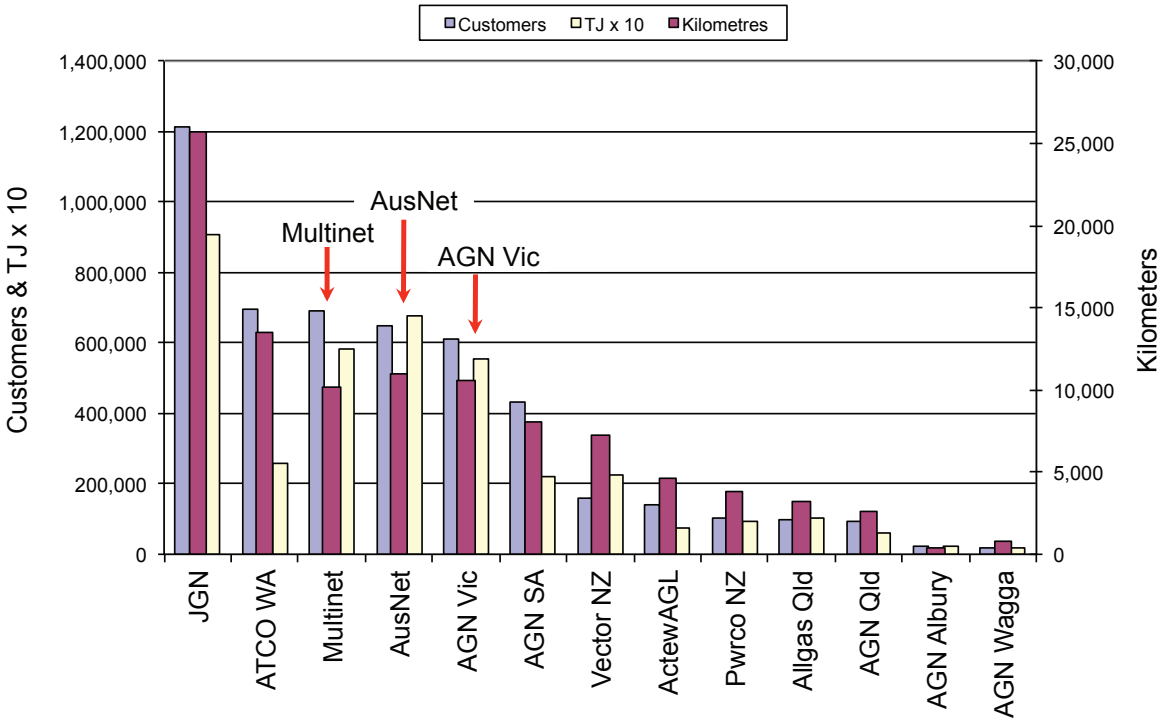
The 13 Australasian distribution businesses operate in varying environments often with substantial differences in network size, amount of throughput, demand growth, number and type of customers, and the mix of rural, urban and CBD customers. The operating environment indicators presented in this section 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 number of customers in 2015, and the positions of each of the three Victorian GDBs is emphasised with an arrow. In terms of customer numbers, Multinet, AusNet and AGN Vic are respectively the third, fourth and fifth largest GDBs in the sample. In terms of gas throughput, AusNet, Multinet and AGN Vic are respectively the second, third and fourth largest. In terms of network length, AusNet, AGN Vic and Multinet are respectively the third, fourth and fifth largest GDBs in the sample. This means that while they are smaller than JGN, together with ATCO in WA they are among the largest GDBs in the sample. Multinet is the largest of the Victorian GDBs in terms of customers, AusNet is the largest in terms of gas deliveries, and the three Victorian GDBs have very similar network lengths to each other.

Among the other GDBs, JGN in NSW is by far the largest. ATCO in WA is the second largest GDB in the sample in terms of customer numbers and network length, but is the fifth largest in terms of gas throughput. AGN SA and Vector in NZ are middle-sized GDBs in the sample. Vector NZ is the larger of the two New Zealand GDBs included. 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, 2015***



* Jemena Gas Networks data is for 2014.

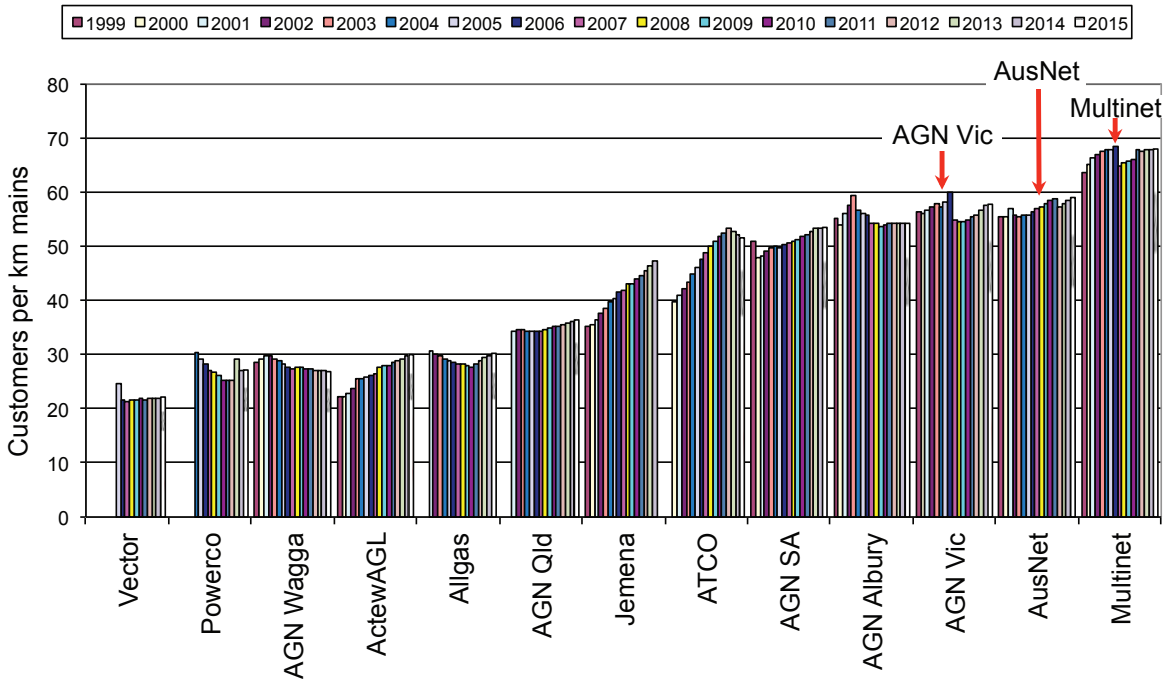
Source: Economic Insights gas utility database

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.

The three Victorian GDBs have the highest customer densities in the sample in 2015. The highest are Multinet, with 68 customers per km, and AusNet and AGN Vic with 58 and 57 customers per km, respectively, in 2015. These have generally been static or increased only slightly over the period from 1999 to 2015.

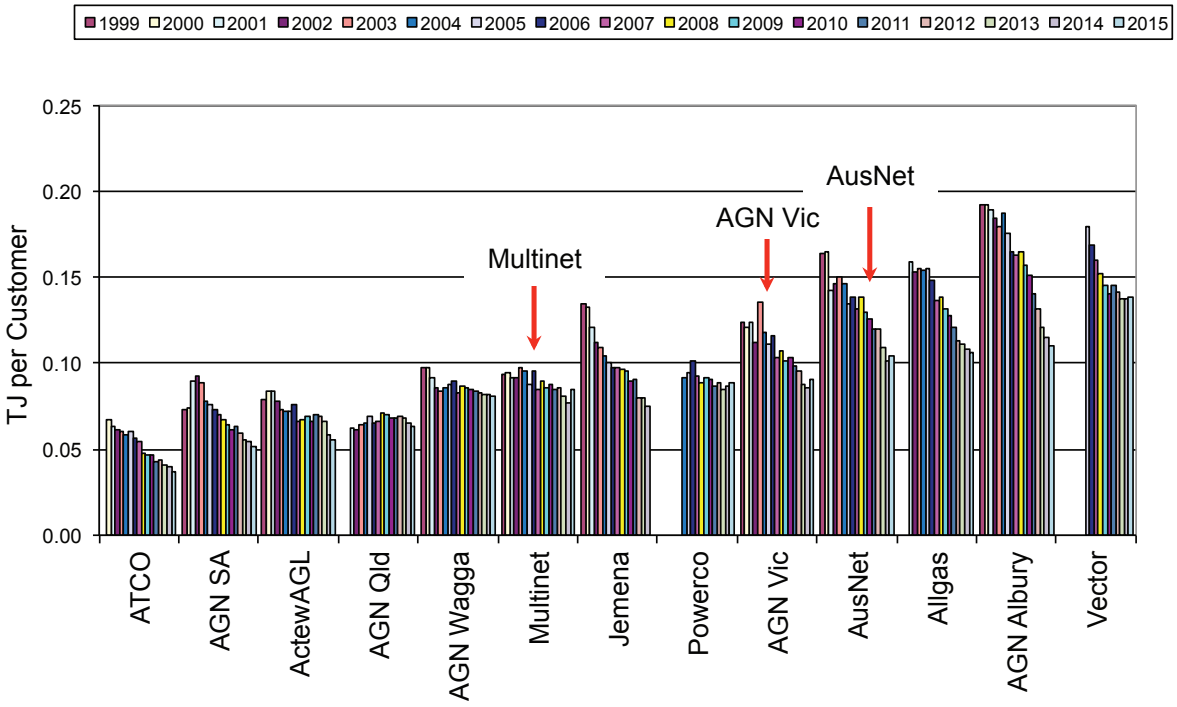
Other GDBs with comparatively high customer densities are AGN Albury (54 customers per km), AGN SA (53) and ATCO (52). Jemena's customer density in 2014 was 46 customers per km of network. Customer densities for Jemena and ATCO have increased strongly over the sample period.

Figure 2.2: **Customer density, 1999–2015**



Source: Economic Insights gas utility database

Figure 2.3: **Energy density per customer, 1999–2015**

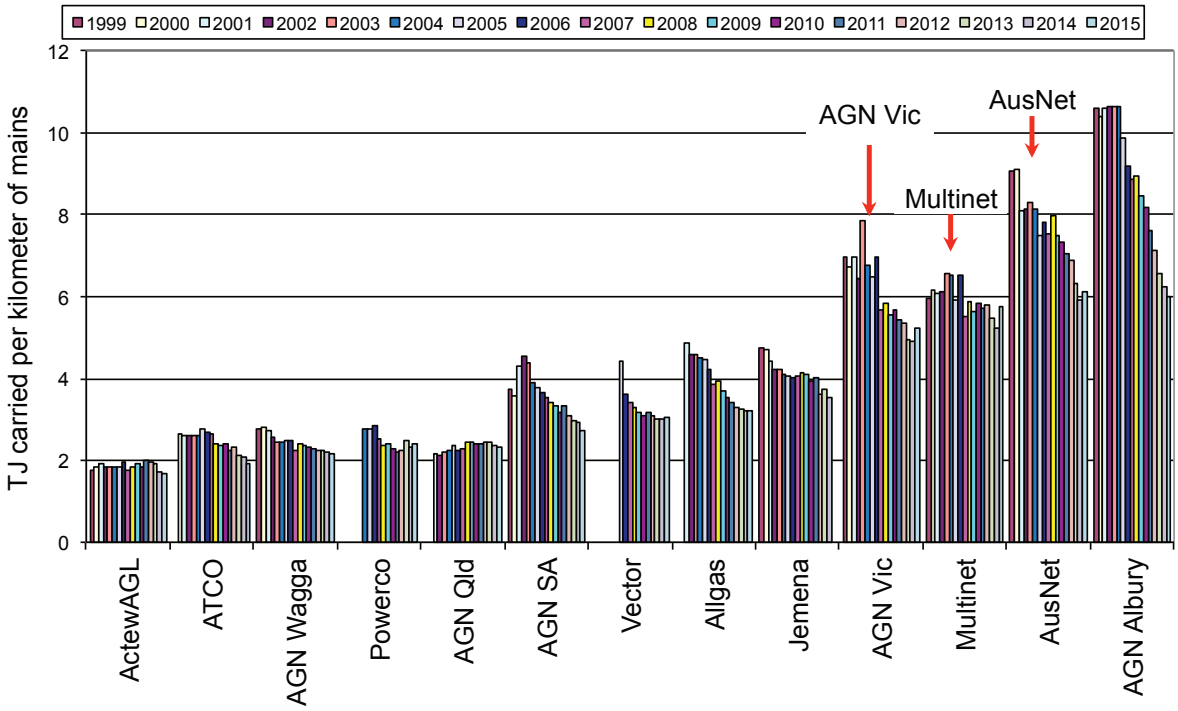


Source: Economic Insights gas utility database

The three Victorian GDBs have average levels of energy density per customer (Figure 2.3 and Table 2.1). In 2015, AGN Vic' s average energy use per customer was 91 GJ, Multinet's was 83 GJ and AusNet's was 111 GJ. The highest energy densities in the sample were AGN Qld, AGN Albury and Vector. Those comparable to the Victorian GDBs included Jemena (83 GJ per customer on average), Powerco (87) and AGN Wagga (82).

Energy use per customer has generally declined over the period from 1999 to 2015. Among the Victorian GDBs, the energy densities of AGN Vic and AusNet have declined most strongly. The declines in energy density per customer experienced by most GDBs in the sample 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, 1999–2015**



Source: Economic Insights gas utility database

The three Victorian GDBs have comparatively high network energy density per kilometre (Figure 2.4 and Table 2.1). Only AGN Albury has a higher network energy density. Among the Victorian GDBs, AusNet had 6.5 TJ per km main in 2015, Multinet, had 5.2 TJ per km and AGN Vic had 5.2 TJ per km in the same year. These are well above the average over the whole sample of 3.7 TJ per km.

Network energy density has generally declined for most GDBs over much of the sample period, especially over the five-year period ending 2015 during which it declined for all but one of the GDBs included in the analysis (Figure 2.2). AusNet has seen significant declines in this measure, but Multinet's network energy density has been comparatively static.

Table 2.1: **Operating and performance indicators, Australian and New Zealand GDBs, average 2011-2015***

Company	Year/ Period	TJ	Cust.	Km	Cust/ km	TJ/ km	TJ/ cust	Opex/ TJ	Opex/ cust	Opex/ km
AGN Albury	2011-15*	2,344	21,254	392	54	6.71	0.124	753	92	5,003
AGN Vic	2011-15*	55,608	613,324	10,618	57	5.18	0.091	999	91	5,171
Multinet	2011-15*	58,233	689,278	10,141	68	5.60	0.083	1,080	89	6,043
AusNet	2011-15*	67,552	650,515	11,023	58	6.46	0.111	680	75	4,378
AGN SA	2011-15*	22,055	430,221	8,043	53	3.01	0.057	2,125	120	6,371
AGN Qld	2011-15*	5,996	94,321	2,591	36	2.39	0.067	3,568	238	8,532
Allgas Qld	2011-15*	10,216	96,432	3,189	29	3.28	0.112	1,695	189	5,547
AGN Wagga	2011-15*	1,630	20,134	750	27	2.23	0.082	1,443	119	3,214
JGN	2010-14*	90,622	1,211,793	25,693	46	3.77	0.083	1,238	102	4,651
ActewAGL	2011-15*	7,700	138,879	4,630	29	1.86	0.064	2,778	176	5,150
ATCO WA	2011-15*	25,806	696,139	13,500	52	2.14	0.041	1,789	73	3,800
Pwrco NZ	2011-15*	9,169	103,869	3,825	27	2.33	0.087	1,629	142	3,780
Vector NZ	2011-15*	22,402	161,748	7,298	22	3.08	0.140	846	119	2,611
Average		29,179	379,070	7,823	43	3.69	0.088	1,587	125	4,942

Company	Year/ Period	Capex/ TJ	Capex/ cust	Capex/ km	Assets/ TJ	Assets/ cust	Assets/ km	Asset cost/ cust	Total cost/ cust
AGN Albury	2011-15*	424	52	2,804	13,043	1,603	87,083	166	258
AGN Vic	2011-15*	1,740	158	8,977	20,754	1,891	107,169	196	287
Multinet	2011-15*	918	76	5,157	18,774	1,548	104,939	158	247
AusNet	2011-15*	1,171	129	7,546	17,616	1,942	113,254	207	282
AGN SA	2011-15*	3,065	170	9,043	47,800	2,695	142,871	303	423
AGN Qld	2011-15*	4,438	296	10,637	58,823	3,918	140,579	374	611
Allgas Qld	2011-15*	2,542	284	8,325	44,372	4,955	145,211	466	655
AGN Wagga	2011-15*	2,609	215	5,817	41,221	3,391	91,773	389	507
JGN	2010-14*	1,494	123	5,610	27,066	2,235	101,672	269	371
ActewAGL	2011-15*	1,959	122	3,578	35,908	2,277	66,499	260	436
ATCO WA	2011-15*	2,238	89	4,679	33,606	1,364	71,476	140	213
Pwrco NZ	2011-15*	1,126	98	2,607	35,964	3,126	83,644	301	443
Vector NZ	2011-15*	988	138	3,039	20,507	2,870	63,056	372	491
Average		1,901	150	5,986	31,958	2,601	101,479	277	402

Note: TJ is terajoules, km is kilometres, cust is customers, opex/unit is opex per unit of a comprehensive output index, assets is the regulatory value of fixed assets. All costs in 2010 dollars. * Average for period 2011- 2015 except that 2015 data is reported for TJ, Cust and Km.

Table 2.2: **Operating and performance indicators, average annual growth rate since earliest year**

Company	Year/ Period	TJ	Cust.	Km	Cust/ km	TJ/ km	TJ/ cust	Opex/ TJ	Opex/ cust	Opex/ km
AGN Albury	2015/1999	-1.4	2.1	2.2	-0.1	-3.5	-3.4	2.9	-0.6	-0.7
AGN Vic	2015/1998	0.5	2.5	2.4	0.2	-1.8	-2.0	-2.0	-4.0	-3.8
Multinet	2015/1998	0.0	1.1	0.5	0.5	-0.5	-1.0	-0.4	-1.5	-1.0
AusNet	2015/1998	-0.2	2.7	2.1	0.6	-2.3	-2.8	-1.5	-4.3	-3.7
AGN SA	2015/1999	-0.4	1.8	1.5	0.3	-1.9	-2.2	0.7	-1.6	-1.3
AGN Qld	2015/2001	2.2	2.0	1.6	0.4	0.5	0.1	0.2	0.3	0.7
Allgas Qld	2015/2001	0.5	3.4	3.5	-0.1	-2.9	-2.9	3.4	0.5	0.4
AGN Wagga	2015/1999	0.8	2.0	2.4	-0.4	-1.5	-1.1	-0.6	-1.8	-2.1
JGN	2014/1999	-0.8	3.2	1.2	2.0	-1.9	-3.9	-2.4	-6.2	-4.3
ActewAGL	2015/1999	1.6	3.8	1.9	1.9	-0.4	-2.2	0.9	-1.3	0.6
ATCO WA	2015/2000	-0.5	3.5	1.7	1.8	-2.2	-3.9	1.1	-2.8	-1.1
Pwrco NZ	2015/2004	-0.6	-0.3	0.7	-1.0	-1.3	-0.3	-1.4	-1.7	-2.7
Vector NZ	2015/2005	-0.6	2.0	3.1	-1.0	-3.6	-2.6	-5.8	-8.2	-9.1
Average		0.1	2.3	1.9	0.4	-1.8	-2.2	-0.4	-2.5	-2.2

Company	Year/ Period	Capex/ TJ	Capex/ cust	Capex/ km	Assets/ TJ	Assets/ cust	Assets/ km	Asset cost/ cust	Total cost/ cust
AGN Albury	2015/1999	2.1	-1.4	-1.5	1.7	-1.8	-1.9	-2.4	-1.8
AGN Vic	2015/1998	4.3	2.3	2.5	1.7	-0.3	-0.1	0.1	-1.3
Multinet	2015/1998	0.9	-0.1	0.4	-0.1	-1.2	-0.7	-1.9	-1.7
AusNet	2015/1998	4.2	1.2	1.8	2.3	-0.6	0.0	-1.7	-2.6
AGN SA	2015/1999	7.2	4.8	5.1	2.5	0.2	0.5	3.0	1.5
AGN Qld	2015/2001	3.7	3.8	4.3	1.4	1.6	2.0	3.4	2.1
Allgas Qld	2015/2001	4.7	1.7	1.6	3.8	0.8	0.7	1.7	1.4
AGN Wagga	2015/1999	2.1	0.9	0.5	2.6	1.4	1.0	0.6	0.0
JGN	2014/1999	3.2	-1.0	1.0	1.9	-2.0	-0.1	-0.3	-2.4
ActewAGL	2015/1999	7.5	5.2	7.1	-0.3	-2.4	-0.6	-0.2	-0.6
ATCO WA	2015/2000	7.3	3.2	5.0	2.2	-1.7	0.0	-3.7	-3.3
Pwrco NZ	2015/2004	9.7	10.1	12.2	-2.5	-2.8	-3.8	-2.4	-2.2
Vector NZ	2015/2005	8.5	6.5	7.0	1.7	-0.9	-1.9	-2.3	-4.0
Average		5.0	2.9	3.6	1.5	-0.8	-0.4	-0.5	-1.2

Note: TJ is terajoules, km is kilometres, cust is customers, opex/unit is opex per unit of a comprehensive output index, assets is the regulatory value of fixed assets. All costs in 2010 dollars.

Table 2.3: **Average annual indicator growth rate since 2010**

Company	Year/ Period	TJ	Cust.	Km	Cust/ km	TJ/ km	TJ/ cust	Opex/ TJ	Opex/ cust	Opex/ km
AGN Albury	2015/2010	-4.7	1.5	1.4	0.1	-6.1	-6.2	8.3	1.6	1.7
AGN Vic	2015/2010	-0.3	2.4	1.4	1.0	-1.7	-2.6	-0.1	-2.8	-1.8
Multinet	2015/2010	-0.2	0.7	0.1	0.6	-0.3	-0.8	2.7	1.8	2.4
AusNet	2015/2010	-1.4	2.4	2.2	0.2	-3.5	-3.7	5.1	1.2	1.4
AGN SA	2015/2010	-2.0	1.7	1.0	0.7	-3.0	-3.6	4.4	0.7	1.3
AGN Qld	2015/2010	1.0	2.4	1.8	0.6	-0.7	-1.3	2.9	1.6	2.2
Allgas Qld	2015/2010	-0.5	3.3	1.6	1.7	-2.1	-3.7	4.2	0.4	2.1
AGN Wagga	2015/2010	0.7	1.5	2.0	-0.5	-1.3	-0.8	0.8	0.0	-0.5
JGN	2014/2009	-2.0	2.9	1.0	1.8	-3.0	-4.7	3.9	-1.0	0.8
ActewAGL	2015/2010	0.1	3.6	2.3	1.3	-2.1	-3.4	4.4	0.8	2.2
ATCO WA	2015/2010	-1.8	2.7	2.8	-0.1	-4.4	-4.3	1.1	-3.3	-3.4
Pwrco NZ	2015/2010	-0.2	0.3	-1.2	1.5	1.0	-0.5	-3.4	-3.9	-2.5
Vector NZ	2015/2010	1.1	1.4	1.2	0.2	-0.1	-0.3	-8.9	-9.2	-9.0
Average		-0.8	2.1	1.4	0.7	-2.1	-2.8	1.9	-0.9	-0.2

Company	Year/ Period	Capex/ TJ	Capex/ cust	Capex/ km	Assets/ TJ	Assets/ cust	Assets/ km	Asset cost/ cust	Total cost/ cust
AGN Albury	2015/2010	3.8	-2.6	-2.5	4.2	6.1	-2.1	-4.8	-2.7
AGN Vic	2015/2010	16.6	13.5	14.7	5.6	-3.4	3.8	2.0	0.6
Multinet	2015/2010	4.8	3.9	4.5	0.1	0.3	-0.2	-4.8	-2.7
AusNet	2015/2010	4.5	0.7	0.9	4.7	-1.8	1.0	-7.3	-5.4
AGN SA	2015/2010	24.0	19.5	20.4	6.3	0.0	3.2	12.8	9.0
AGN Qld	2015/2010	11.5	10.0	10.7	3.9	-2.2	3.2	7.4	5.0
Allgas Qld	2015/2010	0.4	-3.3	-1.6	3.7	2.8	1.6	5.7	4.1
AGN Wagga	2015/2010	3.8	2.9	2.5	2.3	-0.7	1.0	5.0	3.7
JGN	2014/2009	10.4	5.3	7.2	4.1	0.8	1.0	5.2	3.4
ActewAGL	2015/2010	6.8	3.1	4.5	1.4	2.5	-0.7	5.2	3.5
ATCO WA	2015/2010	11.4	6.6	6.5	6.1	2.6	1.5	-4.7	-4.1
Pwrco NZ	2015/2010	9.7	10.1	12.2	-3.4	-0.1	-2.5	0.6	-0.9
Vector NZ	2015/2010	13.3	13.0	13.2	0.3	1.5	0.2	-2.7	-4.4
Average		9.3	6.4	7.2	3.0	0.6	0.8	1.5	0.7

Note: TJ is terajoules, km is kilometres, cust is customers, opex/unit is opex per unit of a comprehensive output index, assets is the regulatory value of fixed assets. All costs in 2010 dollars.

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 2015. 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).

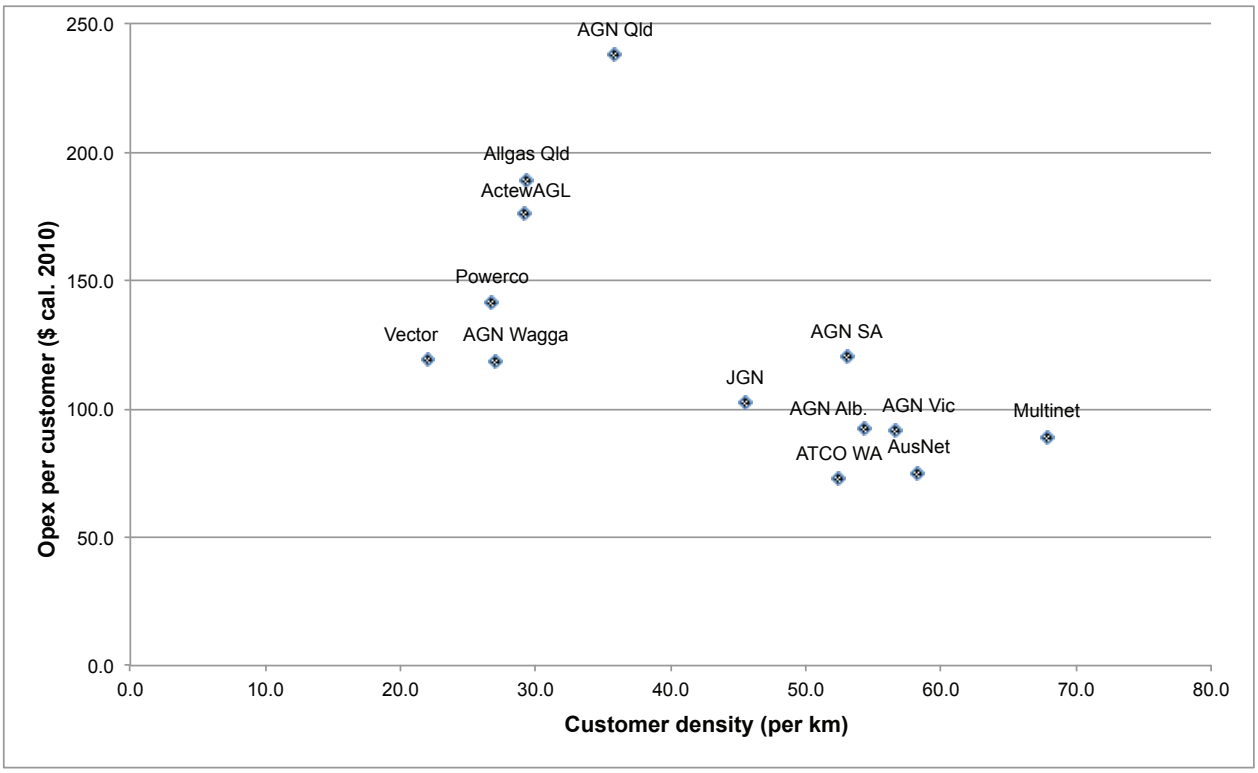
3.1 Opex per customer

Figure 3.1 plots real opex per customer against one of its important drivers, customer density. GDBs with lower customer density, such as Vector, Powerco, AGN Wagga, Allgas, 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 and ActewAGL, with opex per customer for the period 2011 to 2015 averaging $238, $189 and $176 respectively. The average opex per customer of the six GDBs with lowest customer density was $164 from 2011 to 2015.

GDBs with relatively higher customer density tend to have comparatively low opex per customer. The Victorian GDBs, together with ATCO, AGN Albury, AGN SA and Jemena are the GDBs with comparatively high customer density. The average opex per customer of AGN Vic, Multinet and AusNet over the period 2011 to 2015 was $91, $89 and $75, respectively. The average opex per customer of the seven GDBs with lowest customer density was $92 from 2011 to 2015.

The three Victorian GDBs are either at or below the average opex per customer for GDBs with relatively high customer density. This suggests that they are 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. 2011–2015)**



Source: Economic Insights gas utility database.

3.2 Capital assets cost per customer

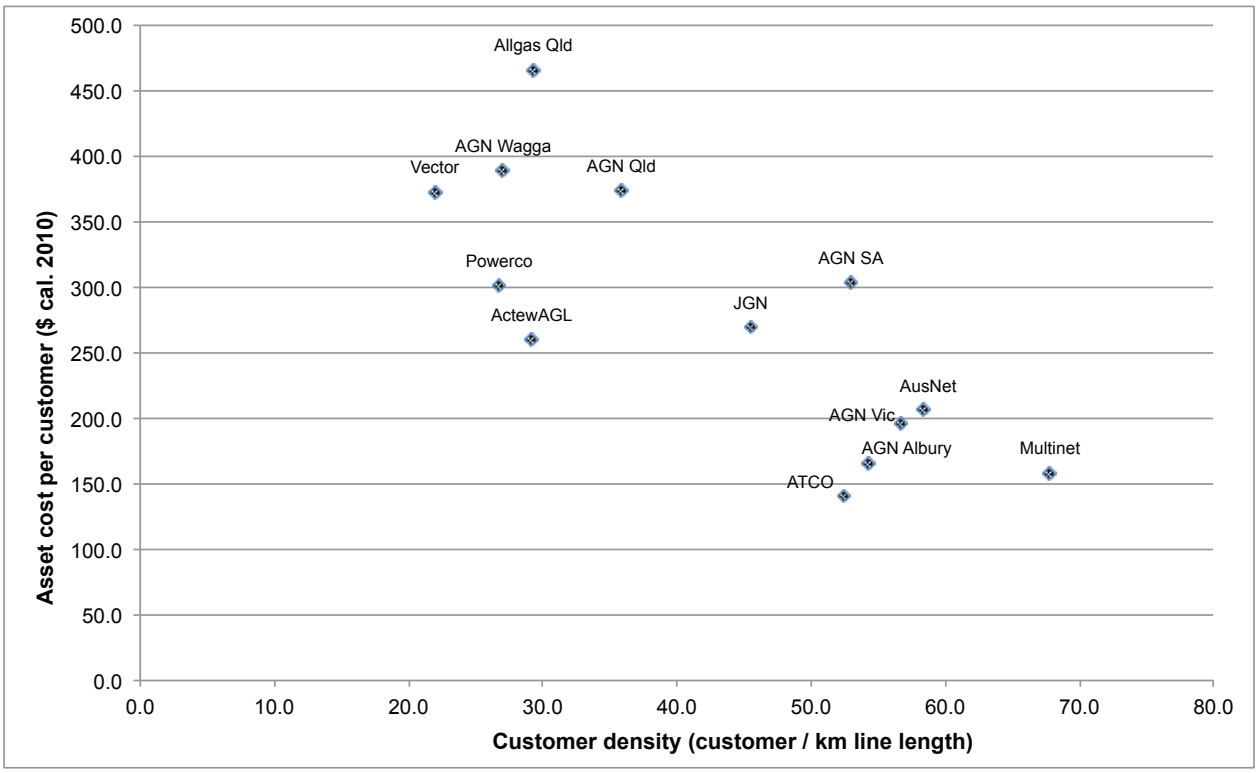
The efficiency of the use of capital inputs is indicated by asset cost per customer, which is based on actual returns to capital rather than a measure based on the opportunity cost of capital and depreciation cost, as used by the AER, because insufficient information is available from public sources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

Figure 3.2 plots the average asset cost per customer against average customer density in the period 2011 to 2015, 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. The average annual asset cost per customer of the three Victorian GDBs was $196 for AGN Vic, $158 for Multinet and $207 for AusNet. Some of the GDBs with comparatively high customer density had much higher asset cost per customer, namely Jemena (averaging $269 from 2011 to 2014) and AGN SA (averaging $303 from 2011 to 2015). Only ATCO and AGN Albury, among those with higher customer density, had comparable asset cost per customer to the Victorian GDBs. ATCOs asset cost per customer averaged $140 from 2011 to 2015 and AGN Albury's averaged $166. For the six GDBs with comparatively low customer density, namely AGN Qld, Allgas, AGN Wagga, ActewAGL, Powerco and Vector, the overall average asset cost per customer was $360 for 2011 to 2015.

These comparisons are 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. It suggests that the Victorian GDBs are amongst the more efficient in terms of asset use.

Figure 3.2: **Asset cost per customer relative to customer density (avg. 2011–2015)**



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

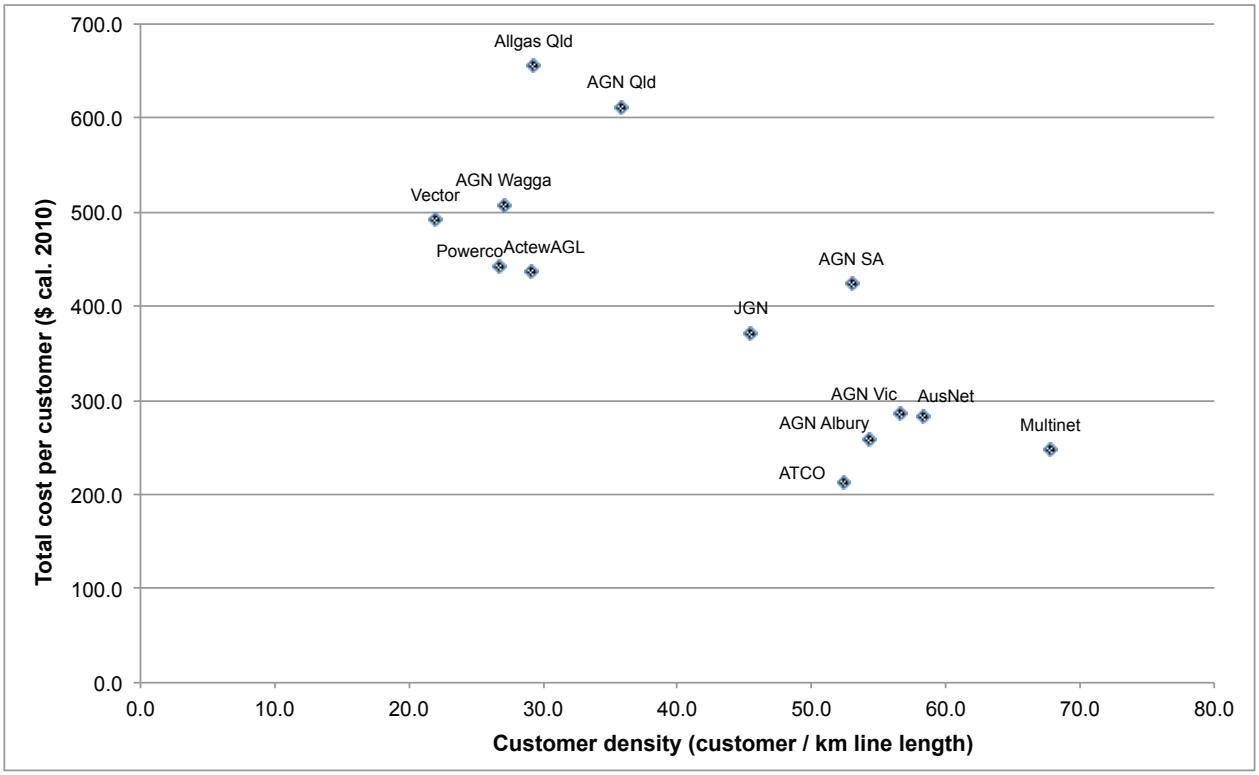
3.3 Overall cost efficiency

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. The average cost per customer of the three Victorian GDBs in the period 2011-2015, was similar to several other GDBs that have relatively high customer density. Total cost per customer of the three Victorian GDBs averaged $287 for AGN Vic, $247 for Multinet and $282 for AusNet.

The GDBs with comparable total cost per customer were AGN Albury and ATCO ($258 and $213 respectively). 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. Two of the GDBs amongst those with relatively high customer density, Jemena and AGN SA, had substantially higher total cost per customer ($371 and $424, respectively). For the six GDBs with comparatively low customer density, namely AGN Qld, Allgas, AGN Wagga, ActewAGL, Powerco and Vector, the overall average asset cost per customer was $524 for 2011 to 2015.

Once again, caution is needed in drawing strong conclusions for these comparisons alone. That said, the results tend to indicate that the Victorian GDBs are amongst the more efficient of those included in the sample.

Figure 3.3: **Total cost per customer relative to customer density (avg. 2011–2015)**



Source: Economic Insights gas utility database

3.4 Summary

The operating environment characteristics of the three Victorian GDBs are similar and can be summarised as follows:

- After Jemena in NSW (the largest GDB in the sample), they are among the largest in terms of customer numbers and gas deliveries and network length. Only ATCO is of comparable size.
- They have the highest customer density per km mains of all the GDBs in the sample. Other GDBs with relatively high customer density include AGN Albury, AGN SA, ATCO and Jemena.
- Their energy density per customer is about average. Those with higher or comparable energy density include Vector, AGN Albury, Allgas, Powerco and Jemena.
- They have comparatively high levels of energy density per km of mains, with only AGN Albury's being higher.

The Victorian GDBs therefore have a substantial degree of economies of scale. Even so, their opex per customer and asset cost per customer are amongst the lowest of those for GDBs of comparable scale. Similarly, comparisons of total cost per customer suggest that the Victorian GDBs are comparable to the most efficient peers, and hence amongst the most efficient of the GDBs in the sample.

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, the Victorian GDBs appear to have performed at better than average levels, achieving comparatively low levels of opex per customer, asset cost per customer and hence total cost per customer.

Some of the indicators, such as opex per customer, have improved less strongly over the last five years (shown in Table 2) compared to the whole sample period (shown in Table 1). Some of the cost reductions achieved 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 two 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 across-road service connection. For these reasons, it is a low-density distribution network when measured in terms of customers per kilometre of main.

In 2015 ActewAGL supplied 138,880 customers with 7,700 TJ of gas from a distribution network of around 4,630 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 2015 Allgas supplied approximately 96,400 customers with 10,200 TJ of gas from a distribution network of 3,190 kilometres of mains.

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

[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.

82,083.2

In 2013 AGN Albury supplied its 21,250 customers with 2,340 TJ of gas from a distribution network of 390 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 comprises 2,590 kilometres 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 similar to 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 2015 there were 93,300 customers consuming 6,000 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 2015, AGN SA supplied 430,220 customers with 22,050 TJ of gas from a distribution network of 8,040 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 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 2015 there were 613,320 customers using

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

55,600 TJ of gas, supplied from a distribution network of 10,600 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 2015 there were approximately 20,100 customers. AGN supplied these customers with 1,600 TJ of gas from a distribution network of 750 kilometres of mains. In April 2014 the NSW Energy Minister, the Honourable Anthony Roberts, determined that 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 2015, ATCO supplied 696,140 customers with 25,800 TJ of gas from a distribution network of 13,500 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 a number of urban centres 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 2015, AusNet supplied its 650,500 customers with 67,550 TJ of gas from a distribution network of 11,000 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 provided gas to 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 2015 it supplied 1,211,800 customers with 90,620 TJ of gas from a distribution network of 25,690 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 2015, Multinet supplied 689,280 customers with 58,230 TJ of gas from a distribution network of 10,140 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 2015, Powerco supplied 103,870 customers with 9,170 TJ of gas from a distribution network of 3,825 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 2015, Vector supplied 161,750 gas distribution customers with 22,400 TJ of gas from a distribution network of 7,300 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 and is about 75 per cent owned by the Auckland Energy Consumer Trust.

APPENDIX B: DATABASE USED IN THE STUDY

The data used for most of the GDBs included in this study have been sourced from documents in the public domain and relate to the period 1999 to 2015. The public domain data sources are described below. Data for some GDBs was sourced from surveys carried out by Economic Insights, namely for AusNet, AGN Vic, Multinet, AGN SA and JGN. This data was supplied in response to common detailed data surveys, covering key output and input value, price and quantity information over the following periods:

- calendar years from 1998 to 2015 for the Victorian GDBs
- from 1998–99 to 2014–15 for AGN SA, and
- from 1998–99 to 2013–14 in the case of JGN.

Data for most of the remaining Australian GDBs in the study are publicly available for most of the period from 1999 to 2015. However, there are fewer consistent observations publicly available for the New Zealand GDBs, reflecting the impact of mergers, asset sales and industry restructuring. The GDBs for which public domain data is used, and the periods for which data is available, include: AGN Albury (1999-2015); AGN Qld (2001-2015); Allgas (2001-2015); AGN Wagga (1999-2015); ActewAGL (1999-2015); ATCO (2000-2015); Powerco (2004-2015); and Vector (2005-2016).

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.

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.

REFERENCES

Australian Energy Regulator (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: report prepared for Envestra Victoria, Multinet and SP AusNet'.

Economic Insights 2016, 'The Productivity Performance of Victorian Gas Distribution Businesses: report prepared for AusNet Services, Australian Gas Networks Limited and Multinet Gas'.

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

ATTACHMENT A: 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 became an Associate of Economic Insights in late 2013 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 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).

In August 2011, Michael produced a substantial ESC internal research report on "Returns to Businesses in Regulatory Decision Making: What is best practice?" which examined in detail the broad range of issues relating to regulated rates of return.

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).
  - 'Options to Strengthen the Law Prohibiting Misuse of Market Power' submission to C'th Treasury (Feb 2016).

ATTACHMENT B: 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.

Michael Bradbury Cunningham

15 June 2016