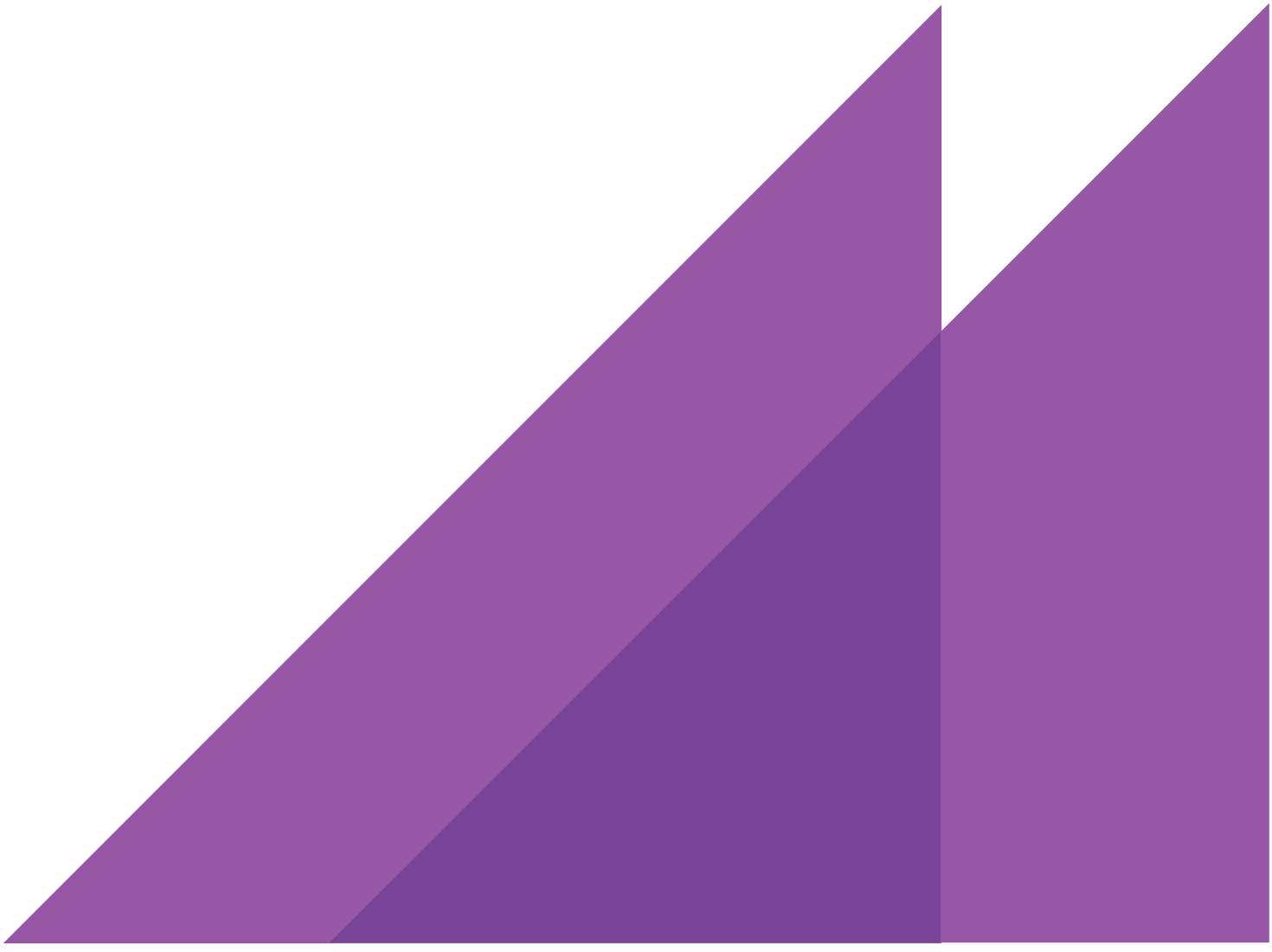
ACIL ALLEN CONSULTING

A REPORT TO
JEMENA ELECTRICITY NETWORKS
14 DECEMBER 2015

CUSTOMER NUMBERS FORECASTS

UPDATED FOLLOWING THE AER'S PRELIMINARY DECISION



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EXECUTIVE SUMMARY

Jemena Electricity Networks (JEN) is an electricity Distribution Network Service Provider (DNSP). It distributes electricity to over 300,000 customers throughout the north-west of Melbourne.

As with all electricity DNSPs in the National Electricity Market, JEN is subject to economic regulation administered by the Australian Energy Regulator (AER) under the National Electricity Rules (NER). JEN's current regulatory period will end on 31 December 2015.

JEN submitted its regulatory proposal for the next five-year period on 30 April 2015 including, among other things, forecasts of customer numbers.

In September 2015, ACIL Allen was engaged to update some of the earlier forecasts, specifically, customer numbers and system maximum demand. The updated customer numbers forecasts are provided in this report and in a spreadsheet that accompanies it. The methodology used here is the same as that described in our report of December 2014 and, as such, the two reports should be read in conjunction.

Revised forecasts

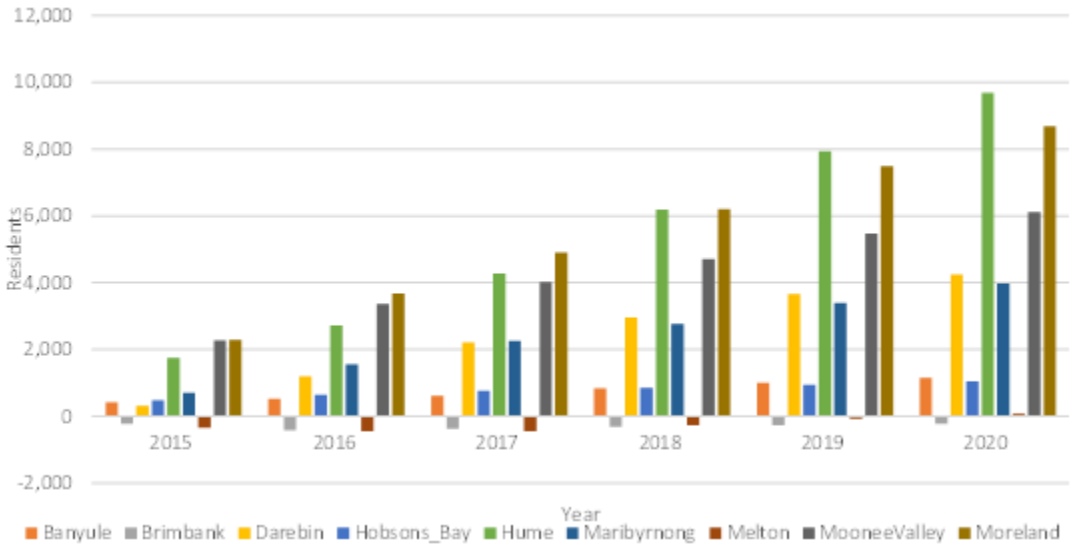
The key input to our methodology for forecasting customer JEN's numbers was a projection of household formation in JEN's region. This was based on a projection of population growth in JEN's region based on projections published at the Local Government Area (LGA) level by the Victorian Government.

Since our original report the Victorian Government has updated its population growth forecasts. Among other things it has increased its forecast rate of population growth in most of the Local Government Areas in which JEN has customers.

These changes in the population growth forecasts are the key reason for the difference between our updated forecasts of JEN's customer numbers and those in our earlier report.

The changes are illustrated in **Figure ES 1**, which shows the how the number of residents forecast to be in JEN's part of each LGA in its region differed in the 2015 forecasts form those published in 2012. For example, the figure shows that the Victorian Government's updated forecast is that the Hume, Moreland and Moonee Valley LGAs will grow faster than expected in 2012. These LGAs are substantially in JEN's region (Hume is entirely within it). Therefore, these updates flow directly to JEN's forecast customer numbers. In contrast, there is an increased forecast in the population of the Banyule LGA, but only about half of that LGA is in JEN's region, so the update to the customer numbers forecast is smaller (as is the population of the Banyule LGA).

FIGURE ES 1 DIFFERENCES IN POPULATION FORECASTS IN JEN REGION – BY LGA



SOURCE: ACIL ALLEN ANALYSIS OF DELWP DATA

Table ES 1 provides a summary of our revised forecasts and, for reference, reproduces the original forecasts from the earlier report. **Figure ES 2** provides the same comparison.

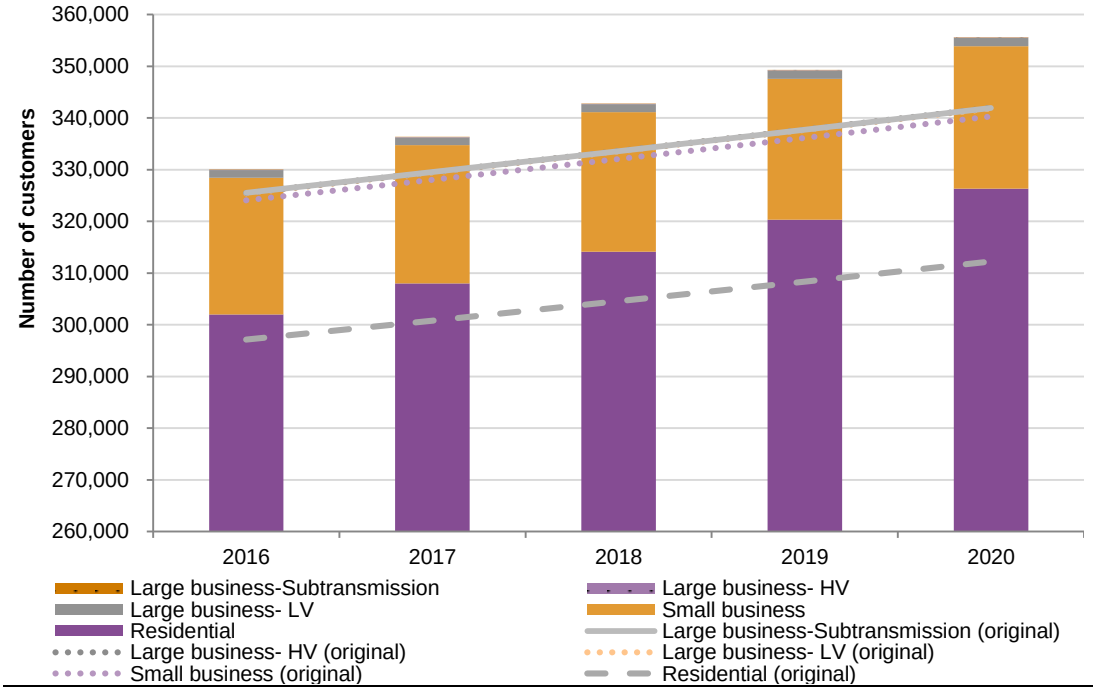
As is shown, the update leads to an increase in the forecast customer numbers throughout the period, mainly in the residential customer class.

TABLE ES 1 FORECAST CUSTOMER NUMBERS BY TARIFF CLASS, 2016 TO 2020

	2016	2017	2018	2019	2020	CAGR
Updated (December 2015)						
Residential	301,983	307,992	314,136	320,319	326,354	1.96%
Small business	26,486	26,741	27,000	27,261	27,524	0.97%
Large business- LV	1,434	1,483	1,533	1,585	1,640	3.40%
Large business- HV	76	76	76	76	76	0.00%
Large business-ST	3	3	3	3	3	0.00%
Total	329,983	336,295	342,749	349,244	355,597	1.89%
Original (December 2014)						
Residential	297,134	300,815	304,556	308,357	312,220	1.25%
Small business	26,881	27,167	27,455	27,747	28,041	1.06%
Large business- LV	1,423	1,469	1,516	1,565	1,616	3.23%
Large business- HV	78	77	77	77	77	-0.32%
Large business-ST	3	3	3	3	3	0.00%
Total	325,519	329,531	333,607	337,749	341,957	1.24%

SOURCE: ACIL ALLEN CONSULTING

FIGURE ES 2 JEN CUSTOMER NUMBERS FORECASTS – ORIGINAL AND UPDATED



SOURCE: ACIL ALLEN CONSULTING

The AER's preliminary decision

On Thursday, October 29 2015 the AER published its preliminary decision in relation to JEN's proposal.

The AER accepted our forecasts of non-residential customers. However, it replaced our residential forecast, and therefore total customer numbers, with its own.

The AER pointed out that our methodology makes the assumption that there is a one to one relationship between households and customers. That is, we assume that every new household in JEN's area is an electricity customer.

The AER challenged this assumption, suggesting that the presence of apartment blocks configured as embedded networks (i.e. one customer with many dwellings) causes it to break down.

Therefore, the AER conducted its own analysis of the historical growth in customer numbers in JEN's region and found that the historical growth rate was substantially lower than our forecast, though the population growth was not much different in forecast than in history.

Given this difference the AER substituted forecasts based on the historical growth rate for those we had prepared. This resulted in a substantial difference in forecast customer numbers in JEN's region.

We have identified four problems with the AER's substitute forecasts:

1. the reason the AER identified to 'break the link' between household formation and customer numbers is too small to justify any change at all, let alone a change of the size the AER made
2. the historical data the AER used were not the same as those which underpinned our forecasts. If the same data are used, the basis for the concern, which is a difference between historical and forecast growth rates, is reduced substantially
3. the AER's substitution is based on population growth forecasts which are not the most recent available and, as such, is not now consistent with the AER's principles for best practice forecasting
4. the AER's decision is inconsistent with the forecasts the AER approved for the gas network that operates in the same part of Melbourne.

For these reasons we remain of the view that the forecasts in our earlier report were reasonable when they were produced and that the forecasts in this report are reasonable now.

C O N T E N T S

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FIGURES

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1 INTRODUCTION

Jemena Electricity Networks (JEN) is an electricity Distribution Network Service Provider (DNSP). It distributes electricity to over 300,000 customers throughout the north-west of Melbourne. As with all electricity DNSPs in the National Electricity Market (NEM), JEN is subject to economic regulation administered by the Australian Energy Regulator (AER) under the National Electricity Rules (NER). JEN's current regulatory period will end on 31 December 2015.

JEN submitted its regulatory proposal for the next five-year period on 30 April 2015. Among many other things, JEN's proposal included forecasts of maximum demand, energy consumption and customer numbers.

In 2014 JEN engaged ACIL Allen Consulting (ACIL Allen) to assist it in preparing its submission to the AER in relation to consumption and demand forecasting. Reports and spreadsheet models containing ACIL Allen's forecasts of demand, consumption and customer numbers accompanied JEN's proposal and are on the AER's website.

In September 2015 ACIL Allen was engaged to update some of the earlier forecasts, specifically, customer numbers and system maximum demand. The updated customer numbers forecasts are provided in this report and in spreadsheets that accompany it. This report should be read in conjunction with our earlier report relating to forecasts of energy consumption and customer numbers.

JEN has five classes of customer:

- residential
- small business
- large business low voltage (LV)
- large business high voltage (HV)
- large business subtransmission (ST).

In its preliminary decision, the AER accepted our forecasts in the four non residential customer classes. However, it decided to replace our forecasts of residential customer numbers with its own.

This report is structured as follows.

Chapter 2 presents the historical and forecast customer numbers.

Chapter 3 recaps the forecasting methodology used for each class of customer, which has not changed and summarises historical and projected drivers, which have been changed.

Chapter 4 addresses the concerns the AER raised in the preliminary decision.

This report and the forecasts presented herein were prepared by Jeremy Tustin, Jim Diamantopoulos and Tim Weterings. Jeremy, Jim and Tim have extensive expertise in and experience in econometric modelling and demand forecasting. Our curricula vitae are provided in Appendix A. The opinions set out in this report are based on our expertise and experience.

The terms of reference for this report are provided in Appendix B.

In preparing this report we have been provided with a copy of the Federal Court practice note CM7, entitled Expert Witnesses in Proceedings in the Federal Court of Australia (the CM7 Guidelines). We have read and understood the CM7 Guidelines and have complied with them in preparing this report. We confirm that we have made all inquiries that we believe are desirable and appropriate, and that no matters of significance that we regard as relevant have, to our knowledge, been withheld.

2 HISTORY AND UPDATED FORECASTS – CUSTOMER NUMBERS

This chapter provides a summary of historical customer numbers in JEN's region in section 2.1. It then provides the updated forecasts in section 2.2

2.1 Historical customer numbers in JEN's region

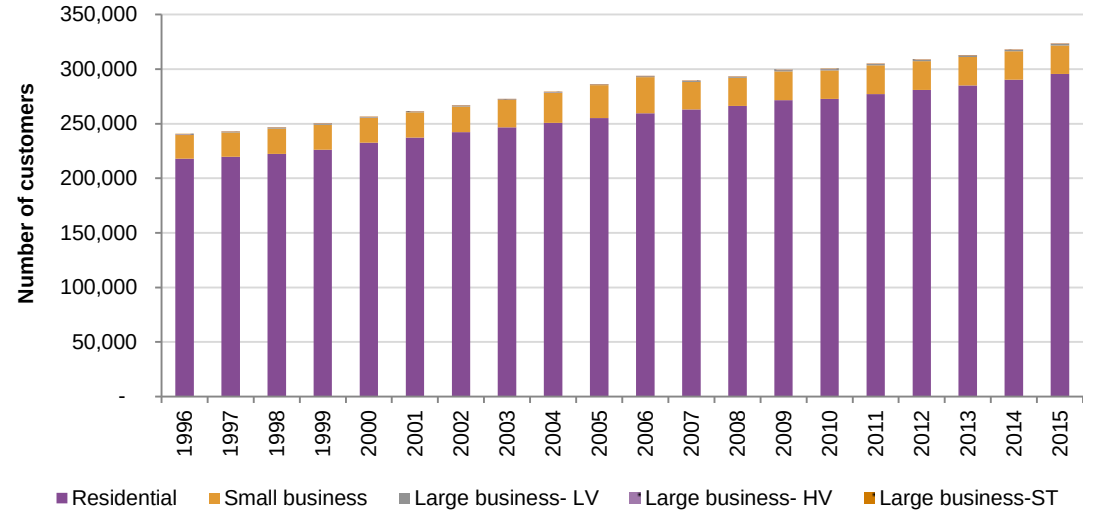
Figure 2.1 shows the number of customers supplied by the JEN distribution network between 1996 and 2014.[1]

JEN has experienced a steady increase in customer numbers over time. From 1996 to 2014, growth in customer numbers has averaged 1.56 per cent per annum.

In 2014, JEN had 317,762 customers. Of these, 290,358 were residential, 25,983 were small business, 1,343 were large LV, 76 were large HV, and 3 were large ST customers.[2] Historical data for the last ten years are shown in **Table 2.1**.

[1] There are very small changes to the historical data in this report and those used in the original report. The changes occur in 2010, 2011 and 2013. They were made by JEN during a routine reconciliation of data. They are inconsequential to the forecasts.
[2] As discussed in chapter 4 these data were taken (by JEN) from the data source used to prepare RIN A.

FIGURE 2.1 TOTAL CUSTOMER NUMBERS BY TARIFF CLASS, 1996 TO 2014



SOURCE: JEN

TABLE 2.1 HISTORICAL CUSTOMER NUMBERS BY TARIFF CLASS, 1996 TO 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Residential	255,058	259,458	263,090	266,427	271,496	272,788	277,168	280,974	285,074	290,358	295,608
Small business	30,188	33,274	25,140	25,748	26,460	26,216	26,451	26,418	26,096	25,983	26,236
Large business- LV	769	793	909	964	1,060	1,118	1,191	1,275	1,316	1,343	1,388
Large business- HV	80	77	75	79	78	80	82	79	79	76	76
Large business-ST	4	4	4	4	4	4	4	4	3	3	3
Total	286,099	293,606	289,218	293,222	299,097	300,206	304,897	308,750	312,569	317,762	323,311

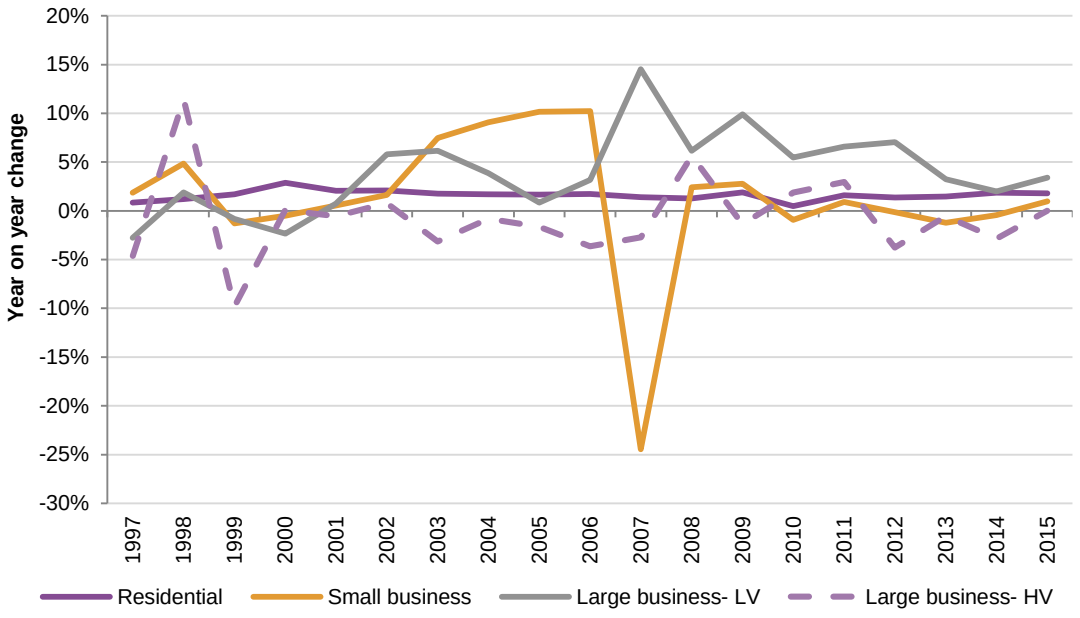
SOURCE: JEN

Figure 2.2 shows year on year changes in customer numbers by tariff class from 1997 to 2013. There is significant growth in small business customers from 2003 to 2006, followed by a sharp decline of 25 per cent. This is accounted for in the forecasting process with the use of indicator variables from 2004 to 2006.

Otherwise, growth appears relatively stable over the period. The exception is a decline in large customers, which must be considered in the context that the total number of these customers is small, so the growth rates are calculated from a low base.

The number of large ST customers was so small that the growth rate is not meaningful, so it is omitted from the figure.

FIGURE 2.2 YEAR ON YEAR CHANGE IN CUSTOMER NUMBERS BY TARIFF CLASS, 1997 TO 2014



SOURCE: ACIL ALLEN ANALYSIS OF JEN DATA

TABLE 2.2 YEAR ON YEAR CHANGE IN CUSTOMER NUMBERS BY TARIFF CLASS, 2005 TO 2015

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Residential	1.66%	1.72%	1.40%	1.27%	1.90%	0.48%	1.61%	1.37%	1.46%	1.85%	1.81%
Small business	10.15%	10.22%	-24.45%	2.42%	2.76%	-0.92%	0.90%	-0.13%	-1.22%	-0.44%	0.98%
Large business- LV	0.84%	3.18%	14.54%	6.15%	9.90%	5.46%	6.58%	7.03%	3.23%	2.00%	3.39%
Large business- HV	-1.64%	-3.64%	-2.70%	5.66%	-1.37%	1.87%	2.96%	-3.77%	-0.54%	-2.85%	0.00%
Large business-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-18.84%	-7.59%	0.00%
Total	2.49%	2.62%	-1.49%	1.38%	2.00%	0.37%	1.56%	1.26%	1.24%	1.66%	1.75%

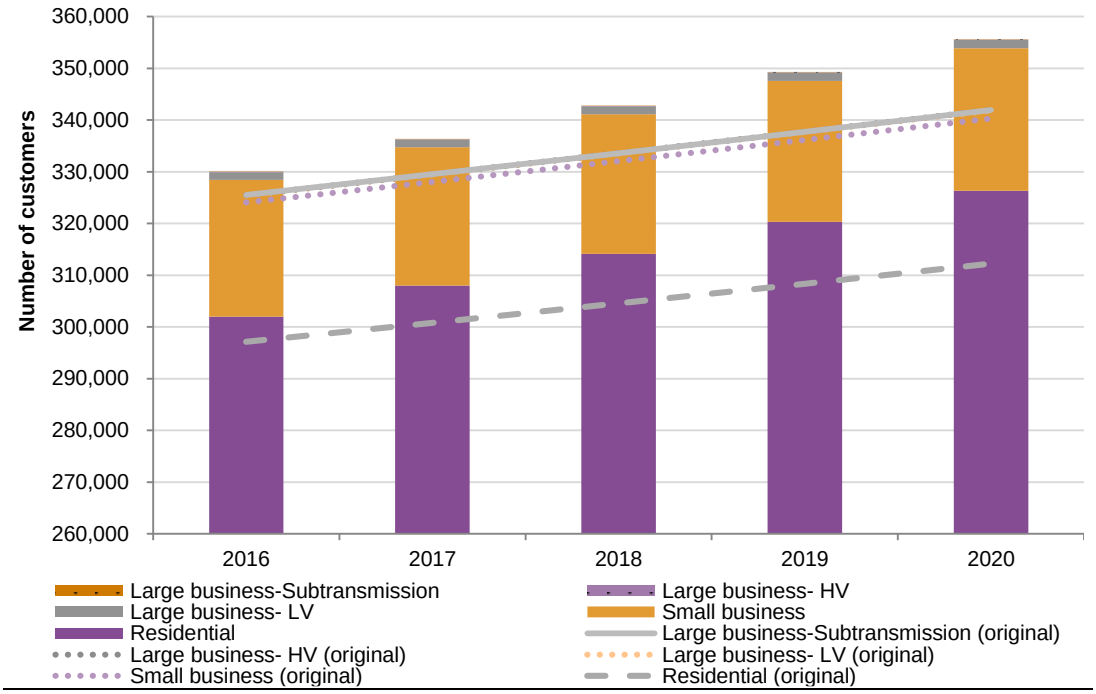
SOURCE: ACIL ALLEN ANALYSIS OF JEN DATA

2.2 Updated forecasts of customer numbers

Figure 2.3 and **Table 2.3** show the updated customer numbers forecasts by tariff class. For reference, our original forecasts from December 2014 are also shown.

The updated forecasts are for increased growth residential in customer numbers. This is driven by updates to the population forecasts published by the Victorian Government in the intervening period. Details are provided in chapter 3.

FIGURE 2.3 FORECAST CUSTOMER NUMBERS BY TARIFF CLASS, 2016 TO 2020



SOURCE: ACIL ALLEN CONSULTING

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	2016	2017	2018	2019	2020	CAGR
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Residential	297,134	300,815	304,556	308,357	312,220	1.25%
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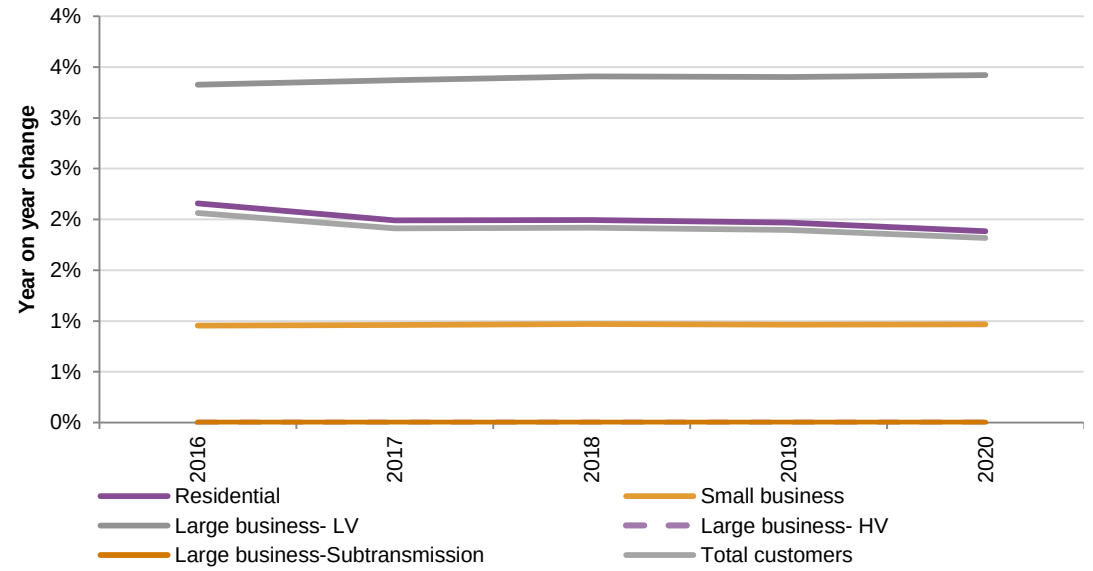
Large business- LV	1,423	1,469	1,516	1,565	1,616	3.23%
Large business- HV	78	77	77	77	77	-0.32%
Large business-ST	3	3	3	3	3	0.00%
Total	325,519	329,531	333,607	337,749	341,957	1.24%
Change (2015 - 2014)						
Residential	4,849	7,177	9,580	11,961	14,134	0.71%
Small business	-430	-461	-490	-521	-552	-0.09%
Large business- LV	46	49	52	55	59	0.09%
Large business- HV	-2	-2	-2	-2	-2	0.00%
Large business-ST	-	-	-	-	-	0.00%
Total	4,464	6,763	9,141	11,494	13,639	0.65%

SOURCE: ACIL ALLEN ANALYSIS OF JEN DATA

FIGURE 2.4 JEN CUSTOMER NUMBERS – FORECAST YEAR ON YEAR GROWTH RATES 2016 TO 2020



SOURCE: ACIL ALLEN CONSULTING

TABLE 2.4 JEN CUSTOMER NUMBERS FORECAST GROWTH RATES, YEAR ON YEAR AND REGULATORY PERIOD

	2016	2017	2018	2019	2020	Reg. period
Residential	2.16%	1.99%	2.00%	1.97%	1.88%	1.96%
Small business	0.95%	0.96%	0.97%	0.96%	0.97%	0.97%
Large business- LV	3.33%	3.37%	3.41%	3.40%	3.42%	3.40%
Large business- HV	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Large business-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total customers	2.06%	1.91%	1.92%	1.89%	1.82%	1.89%

SOURCE: ACIL ALLEN CONSULTING

3 METHODOLOGY AND DRIVERS – HISTORICAL AND PROJECTED

This chapter sets out the methodologies used to produce forecasts and the inputs to those methodologies.

The methodologies used in this report are the same as those used to produce the original forecasts. Therefore, different methodologies were used for each class of customer.

Section 3.1 relates to residential customers and section 3.2 relates to non-residential customers.

Unlike the methodologies, the forecast drivers were changed for this report. The details are discussed in sections 3.1.2 (residential) and 3.2.2 (non-residential) below. Broadly, the driver of the residential forecasts was updated to make use of the most recent available information while the driver of the non-residential forecasts was changed to ensure consistency between these forecasts and JEN's maximum demand forecasts.

3.1 Residential customer numbers

3.1.1 Residential customer numbers - methodology

Forecasts of residential customer numbers were generated using the following inputs:

- population growth by Local Government Area (LGA)
- number of individuals per household
- the proportion of each LGA that falls within JEN's distribution region.

These inputs were used to construct a series of yearly growth rates for the number of households in each LGA in which JEN has customers. The method used to construct these growth rates was as follows.

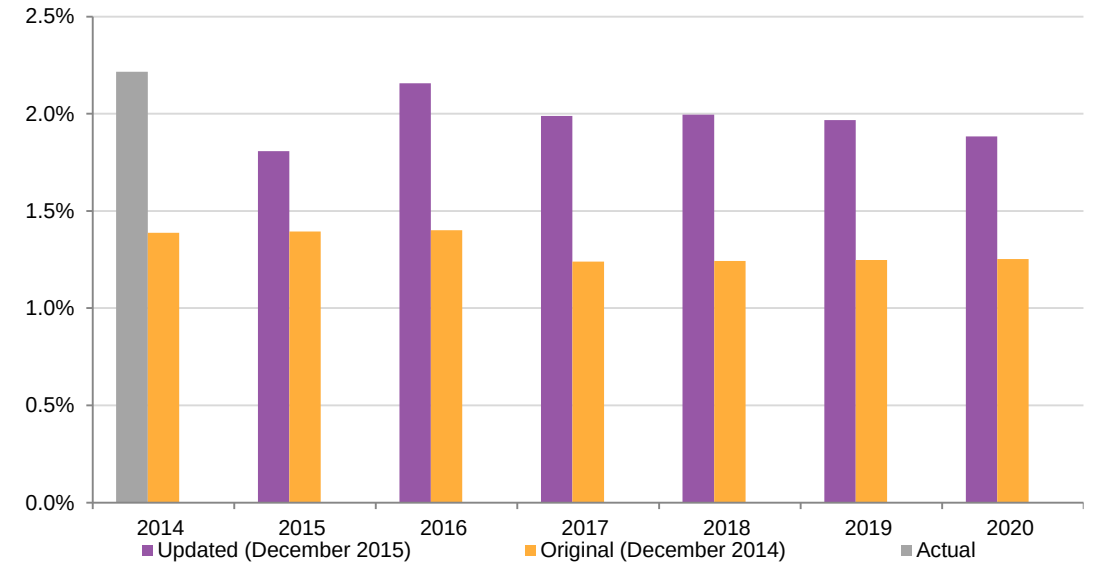
1. **Forecast the population of each LGA:** This was done using the LGA specific growth rates discussed in section 3.1.2
2. **Convert population to the number of households:** The population forecasts for each LGA were divided by the average number of individuals per household in that LGA.
3. **Estimate the number of households that are within JEN's distribution region:** This was done using the proportion of area of each LGA within JEN's region. For example, only 12 per cent of households in the Melton LGA were counted towards total JEN households, but 100 per cent of households within the Hume LGA were counted in this figure.
4. **Calculate the yearly growth in households within the JEN region:** This included only the households in JEN's region calculated within step 3.

Figure 3.1 shows the growth rates from step 4. Those growth rates were applied to JEN's customer numbers from 2014 onwards to generate projections of residential customers within JEN's region.

Those regional estimates were summed to produce the projection of customer numbers shown in **Table 2.3**.

Figure 3.1 also shows the growth rates that underlay the original forecasts in December 2014, which were notably lower. As discussed below, the difference is due to a notable increase in the Victorian Government's forecasts for the relevant regions.

FIGURE 3.1 PROJECTED RESIDENTIAL HOUSEHOLD GROWTH RATES FOR THE JEN DISTRIBUTION NETWORK



SOURCE: ACIL ALLEN CONSULTING

3.1.2 Residential customer numbers – input drivers

As discussed above, the key driver of the residential customer numbers forecast is a population forecast.

On this occasion we used forecasts published by the Victorian Government Department of Environment, Land, Water and Planning in '*Victorian in Future 2015*' (VIF2015). [3] In the earlier forecasts we used forecasts from the same source published in 2012.[4]

VIF 2015 is described as "the official state government projection of population and households" covering "Local Government Areas [for] the period to 2031." A key characteristic of the VIF 2015 population projections is that, in Greater Melbourne, growth is forecast be stronger in the so called 'growth corridors', some of which are in JEN's region. Therefore, the population in JEN's region is forecast to grow more quickly that the forecast in other parts of Greater Melbourne. It is also forecast to grow more quickly than has been the case historically.

As is shown in **Table 3.1** the Victorian Government's forecast of population growth in the JGA's JEN serves increased between VIF 2012 and VIF 2015. Together, these factors lead to the increased forecast growth rates shown in **Figure 3.1** and, therefore, to the increased projection in customer numbers.

[3] http://www.dtpli.vic.gov.au/data-and-research/population/census-2011/victoria-in-future-2015
[4] When VIF 2012 was published the Department was known as the Department of Planning and Community Development. The name of the department changed, but it was still the relevant Victorian Government department.

TABLE 3.1 CHANGING VICTORIAN GOVERNMENT FORECASTS OF POPULATION IN JEN'S REGION

	2015	2016	2017	2018	2019	2020
Original (Vic. Gov. 2012 forecast)	687270	697312	706266	715369	724624	734034
Revised (Vic. Gov. 2015 forecast)	694993	710157	724537	739343	754216	768784
Change	7723	12844	18271	23975	29593	34750

SOURCE: ACILALLEN ANALYSIS OF VICTORIA IN FUTURE 2012 AND 2015

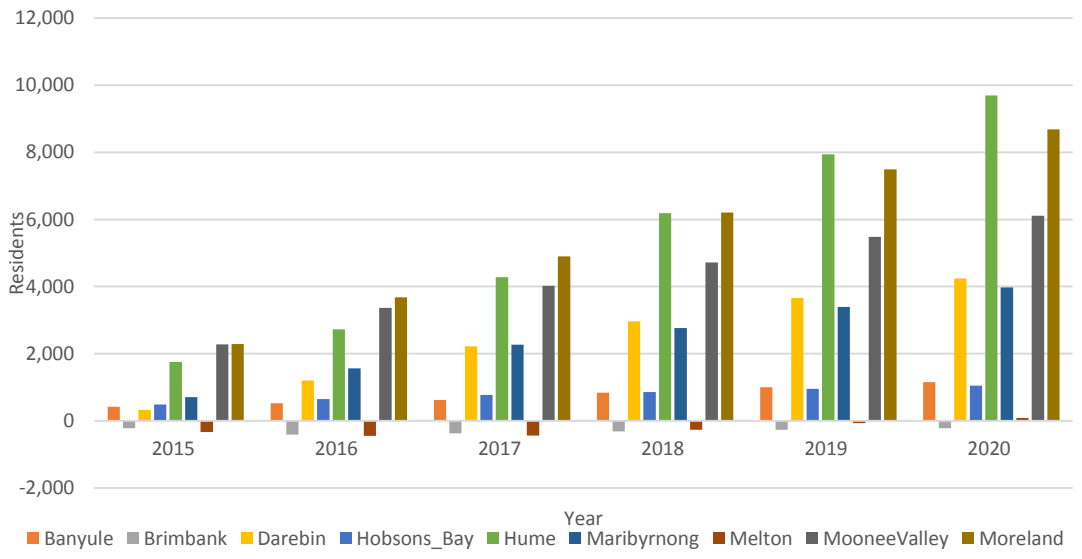
The difference between the two forecasts is illustrated at the LGA level in **Figure 3.2**. It should be noted that the figure shows the difference in projected population rates in (all of) each LGA in which JEN has customers. However, many of these LGAs are also served by other DSNPs.

For example, the figure shows that the Victorian Government's updated forecast is that the Hume, Moreland and Moonee Valley LGAs will grow faster than expected in 2012. These LGAs are substantially in JEN's region (Hume is entirely within it). Therefore, these updates flow directly to JEN's forecast customer numbers. In contrast, there is an increased forecast in the population of the Banyule LGA, but only about half of that LGA is in JEN's region, so the update to the customer numbers forecast is smaller (as is the population of the Banyule LGA).

As noted at step 3 above, the relationship between these population forecasts and JEN's customer numbers took account of the proportion of each LGA served by JEN's network.

While there are exceptions in some LGAs, the overwhelming effect of the update to the Victorian Government population forecasts is to increase them. Given this, it is not surprising that the customer numbers forecasts increase as well.

FIGURE 3.2 DIFFERENCES IN POPULATION FORECASTS FOR LGAS IN JEN REGION



Source: ACIL Allen analysis of Victorian Government data

3.2 Non-residential customer numbers

3.2.1 Non-residential customer number forecasts

The four classes of non-residential customer were forecast independently as described in our earlier report. Broadly, the number of small business and Large LV customers were forecast using regression

models which fit customer numbers to gross state product (GSP). As discussed in the next section, the updated forecasts in this report are based on GSP forecasts published by AEMO, whereas the earlier forecasts were based on Victorian Government GSP forecasts. While the two GSP forecasts are similar, they are not entirely the same, so neither are the customer numbers forecasts, which are shown in **Figure 2.3** and **Table 2.3**.

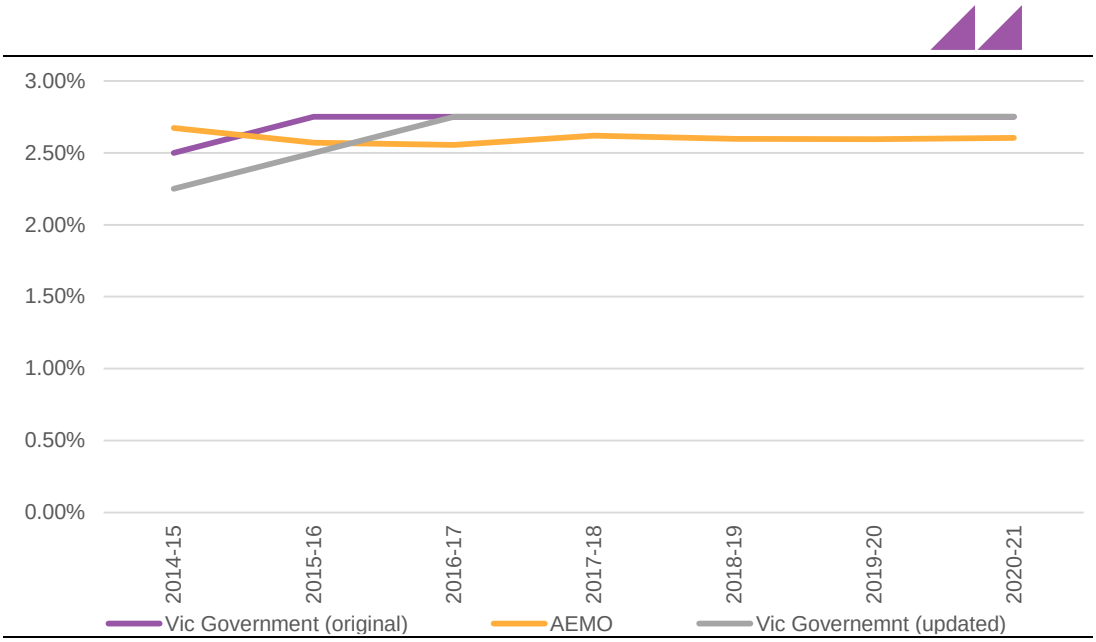
In contrast, the number of Large LV and Large ST customers were not forecast econometrically but simply by making adjustments for known (anticipated) closures, such as the anticipated closure of the Ford manufacturing plant. No changes were made to these forecasts for this update.

3.2.2 Non-residential customer numbers – input drivers

As discussed above, the key input to forecasting non-residential customer numbers, other than Large LV and Large ST, was projected GSP. In the original report we used forecasts from the Victorian Government. However, in its review of our maximum demand forecasts for JEN the AER "anticipate(s) that [JEN] will submit an updated demand forecast that includes the most recent demand data and takes onto account AEMO's most recent forecasts."[5] In our view the most appropriate way to take account of AEMO's forecasts is to adopt their inputs, in particular their forecasts of GSP. Therefore, the updated maximum demand forecasts are now based on AEMO forecasts. For consistency we have made the same change here.

The GSP projection is shown in **Figure 3.3**. For reference, the forecast used in the original report is also shown along with an updated GSP forecast from the Victorian Government. The figure shows that AEMO's GSP projection is consistently below the Victorian Government's projection. Therefore the revision to the forecast number of non-residential customers is downward.

FIGURE 3.3 ORIGINAL AND UPDATED GSP FORECASTS



SOURCE: ACIL ALLEN CONSULTING

[5] Preliminary decision, attachment 6, p.6-101

4 THE PRELIMINARY DECISION – CUSTOMER NUMBERS

In the preliminary decision the AER accepted our forecasts of non residential customer numbers. However, it decided to replace our forecasts of residential customer numbers with its own.

In its review of the forecast of residential customer numbers the AER noted, correctly, that we assume a one to one relationship between residential customer numbers and households. That is, we assume that each new household will be a new electricity customer.

The AER did not accept this assumption. Instead it suggested that households in apartment blocks will connect to the grid as embedded networks. If this accounts for a substantial number of JEN's residential customers or if it was to account for a different proportion of them in future than in the past, our 'one to one' assumption would be flawed.

Given this, the AER analysed historical customer numbers data and reached the view that residential customer numbers grew at approximately 0.78 per cent per annum over the period from 2007 to 2013. It omitted the data for 2006 from this analysis on the basis that it appeared to be an outlier.

The AER then appears to have become concerned about the difference between 0.78 per cent per annum historical growth and forecast growth of 1.28 per cent per annum. It sought justification for an acceleration in customer numbers growth of this magnitude.

The AER looked for that justification in population growth forecasts, noting that

the Victorian Department of Planning and Community Development… forecast the total population in the local government areas that Jemena serves will grow by 2.0 per cent per year on average between 2015 and 2020. This is the same growth rate as over the period 2007 to 2014.

Given that population growth in the regulatory period would be the same as it had been in the historical period the AER found no justification for the apparent acceleration in growth. Therefore, the AER substituted our forecast of residential customer numbers with its own, which was constructed by extending historical growth at 0.78 per cent per annum.

We do not consider this to be an appropriate revision in this case. There are four problems:

1. the reason for 'breaking' the link between the number of households and the number of customers does not stand up to scrutiny
2. the AER did not analyse the same historical data that were provided to us
3. the AER has not made use of the most up to date population forecasts available
4. this decision is inconsistent with the AER's recent decision concerning gas customers in the same area.

We were provided with a spreadsheet showing the AER's calculations. That spreadsheet contained a table entitled 'proposed forecasts' which appears to summarise JEN's forecasts as per its initial regulatory proposal. However, these values are not the same as JEN's original forecasts, which match

the summary in the preliminary decision itself. We do not know the source of the values in the spreadsheet or what significance was given to them.

We discuss the above four issues in turn below. Their impact on the forecast of customer numbers is summarised in **Table 4.1**, which shows our forecasts (original and updated) and the AER's as well as the differences between them.

TABLE 4.1 SUMMARY OF ALTERNATIVE CUSTOMER NUMBERS FORECASTS

	2015	2016	2017	2018	2019	2020
JEN original forecasts						
ACIL Allen/ preliminary decision	293,028	297,134	300,815	304,556	308,357	312,220
AER - spreadsheet	289,437	293,543	297,225	300,967	304,769	308,633
Difference	*-3,590*	*-3,591*	*-3,590*	*-3,589*	*-3,588*	*-3,587*
AER preliminary decision						
AER - preliminary decision	288,065	290,313	292,579	294,863	297,164	299,483
Difference (from ACIL Allen forecast)	*-4,963*	*-6,820*	*-8,236*	*-9,693*	*-11,193*	*-12,737*
Updated forecasts						
ACIL Allen (updated)	295,608	301,983	307,992	314,136	320,319	326,354
Difference (from preliminary decision)	*7,543*	*11,670*	*15,413*	*19,274*	*23,155*	*26,871*

SOURCE: ACIL ALLEN CONSULTING

In our view, the problems are sufficiently large to mean that the AER's substitute forecasts are not a reasonable reflection of the likely number of residential customers JEN will be asked to supply over the regulatory period. Further, they do not satisfy the AER's principles for demand forecasting as set out in the Better Regulation materials.

In our view the substitute forecasts should be set aside and replaced with the forecasts provided in **Table 2.3**.

4.1 No reason to 'break the link'

The AER's concern with JEN's forecasts is based on its view that our 'one to one' assumption is flawed. In particular, the AER does not accept that every new household in JEN's distribution region will be a new electricity customer because some will be in apartment buildings that are configured as embedded networks.

We did not consider the possibility of apartment building embedded networks of residential customers in our original forecasts. However, since the preliminary decision we have made inquiries with JEN to test the notion that a significant number of its residential customers are configured in this way.

Based on those inquiries, we understand that 78 of JENs 317,762 customers are embedded networks. We also understand that between 60 and 120 apartments join JEN's network as embedded networks each year. In the first 10 months of 2015 one apartment building connected as an embedded network.

There are between one and five thousand new residential customers connected to JEN's network each year. Therefore, the 60 or so 'embedded residential customers' who join the network each year represent approximately two per cent of new connections to JEN's network.

We do not see this as sufficient reason to 'break the link' between the number of new households in JEN's region and the number of new connections. There are simply not enough customers in this

category to genuinely challenge the 'one to one' assumption. At most, it could perhaps be substituted with a 'one to 0.98' assumption.

Further, even if this was sufficient reason to modify the 'one to one' assumption, the change the AER has made is much too large.

On our estimate, the number of households in JEN's region grew at about 1.8 per cent per annum from 2007 to 2014. Over this time, the AER says that the number of residential customers grew at 0.78 per cent per annum, which is less than half.

The very small number of embedded residential customers in JEN's region cannot possibly account for such a large discrepancy between historical population growth and growth in customer numbers as calculated by the AER. Rather than supporting the modification, this suggests that the two datasets are not consistent with one another. This is discussed further in relation to the next problem, which is that the data the AER analysed were not the data that underpinned our forecasts.

4.2 Difference in historical data

The upper pane of **Table 4.2** is a reproduction of the AER's analysis of JEN's historical residential customer numbers. When **Table 4.2** is compared to **Table 2.1** and/ or the spreadsheet that accompanied our earlier report, it shows that the historical data the AER analysed are different from those that underpin our analysis. We understand the difference to be that the AER analysed from the economic benchmarking RIN whereas the data we were given come from the annual RINs.

In the lower pane of **Table 4.2** we have replicated the AER's analysis using the same data provided to us. This shows that, while the difference between the two historical datasets is not large, it is important.

TABLE 4.2 REPLICATING THE AER'S ANALYSIS OF HISTORICAL CUSTOMER NUMBERS

	2006	2007	2008	2009	2010	2011	2012	2013	2014
Analysis of economic benchmarking RIN data									
Residential customer numbers	257,927	270,637	272,464	273,637	275,568	275,510	278,085	282,529	285,834
Annual growth		4.81%	0.67%	0.43%	0.70%	-0.02%	0.93%	1.59%	1.16%
Average change – 2007 to 2014									0.78%
Average change 2006 to 2014 [a]									1.28%
Analysis of annual RIN data									
Residential customer numbers	259,458	263,090	266,427	271,496	272,788	277,168	280,974	285,074	290,358
Annual growth		1.39%	1.26%	1.88%	0.47%	1.59%	1.36%	1.45%	1.84%
Average change – 2007 to 2014									1.41%
Average change 2006 to 2014									1.41%
Household numbers									
Annual growth		2.07%	2.13%	2.38%	1.58%	1.26%	1.54%	1.94%	2.22%

[a] *this average was not calculated or mentioned by the AER.*

Note: the annual percentage changes in this table were calculated using the AER's method of the difference in natural logarithms. This is a different approach than we used in ***TABLE 2.2****, so the percentages do not match. However, the difference is immaterial for present purposes.*

SOURCE: ACIL ALLEN AND AER ANALYSIS

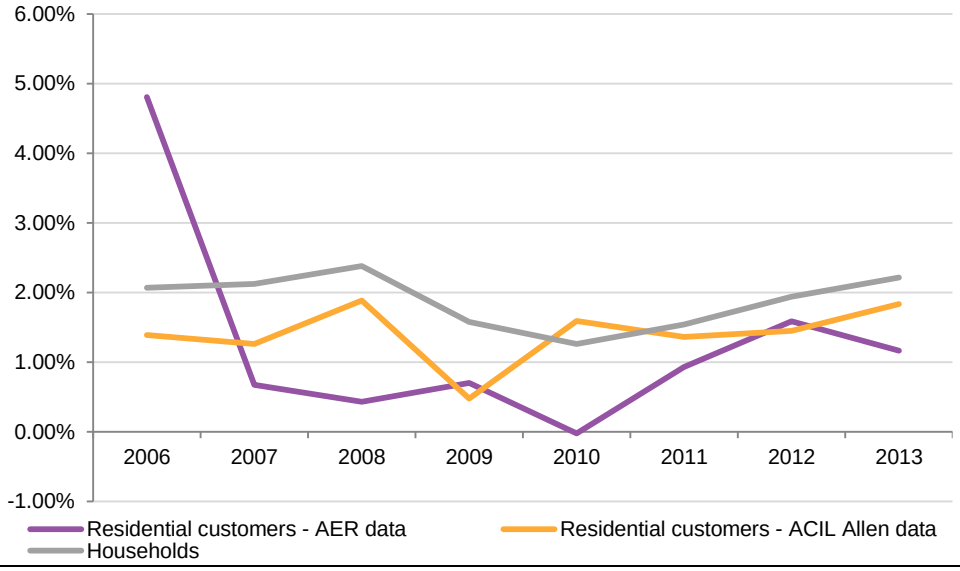
The lower pane of **Table 4.2** shows that if the AER had analysed the data in our forecasting model it would have seen historical growth of 1.18 per cent per annum and compared this to forecast growth of 1.27 per cent per annum. Thus it would have seen approximately a seven per cent acceleration in growth.

Further, in the RIN B data, the 2006 data point appears to be an outlier so the AER omitted it. However, in the RIN A data this data point does not appear to be an outlier. If that data point is included in an analysis of RIN A data the 'gap' between historical and forecast growth rates narrows to less than five per cent.

This raises a question – "which of the two datasets is a better reflection of historical customer numbers?"

We cannot be entirely firm on this, but the economic benchmarking data do not appear to be reliable. The first thing to note about the data the AER analysed is that, as shown in **Figure 4.1** below, they do not correspond with population growth. The figure shows that population growth was quite steady through the period, with little variation from year to year. In contrast, the data the AER analysed show substantially different year on year changes, ranging from almost five percent to close to zero.

FIGURE 4.1 COMPARING GROWTH IN POPULATION AND RESIDENITAL CUSTOMERS – 2006 TO 2014



SOURCE: ACIL ALLEN CONSULTING

The second cause for concern with the data the AER analysed is the presence of negative growth in 2011. In our experience it is extremely uncommon for the number of residential electricity customers in a given area to decrease. Certainly we would not expect to see this in a high growth part of Melbourne.

By contrast to the data that the AER analysed we note that historical growth in the data we were provided, which is 1.2 per cent from 2007 to 2014, is closer to our estimate of household formation over the same period. It is still slower, which may reflect imperfections in our estimate of household formation, but it is substantially closer than the 0.78 per cent rate suggested by the RIN B data.

Given the submissions that were made to the effect that growth could reasonably be expected to accelerate,[6] the AER may have been comfortable with the acceleration in growth implied by our analysis. Certainly our view is that the difference between our original forecast growth rate and the historical rate suggested by the RIN A data does not justify rejecting JEN's forecasts.

[6] See, for example, the submissions from VECUA and the Consumer Challenge Panel.

4.3 Not using the most up to date information

As discussed in section 3.1.2, the Victorian Government revised its forecasts of Victoria's population in August 2015.

The sixth of the AER's principles for demand forecasting is that the most recent information available should be used.[7] Consistent with this, we note that, while the AER accepted JEN's maximum demand forecasts, it asked JEN to update these to reflect information that has become available since those forecasts were prepared.

We do not know whether the AER's analysis of the customer numbers forecast was done before or after August, when VIF 2015 was published. Assuming that they were not available to the AER in the first place, it seems reasonable that the AER would now take the revised population forecasts into account.

The significance is that the most recent forecasts available indicate that population growth in JEN's region will outstrip growth in the historical period.

Based on the method described in our earlier report we estimate that historical growth in the number of households in JEN's region from 2007 to 2014 was approximately 1.8 per cent per annum. The VIF 2015 population forecasts suggest that this will accelerate to approximately 2.0 per cent per annum, i.e. approximately a ten per cent increase in the growth rate.

In principle, we are confident that the AER would agree that the more recent population forecasts published in VIF 2015 should be accepted in lieu of the earlier forecasts they have replaced. It seems reasonable to expect that if the AER had considered those more recent forecasts it would not have seen the forecasts in our earlier report as unreasonable.

Further, in light of the more recent forecasts it is not reasonable to use historical population growth as a driver of forecasts of residential customer numbers because the more recent forecasts are for an acceleration in growth in JEN's distribution region. Therefore, the new Victorian Government population growth forecasts challenge the premise of the AER.

It follows that, *even if* the Economic benchmarking RIN data are considered superior to the annual RIN data, 0.78 per cent per annum is not the right rate at which to project growth in JEN's residential customer numbers. Rather, a rate that is *faster* than this should be used.

4.4 Inconsistency with gas network decision

JEN's electricity network overlaps substantially, though not perfectly, with the gas distribution network operated by AusNet Services (formerly SP AusNet).

In March 2013 the AER made its final decision in the corresponding regulatory process for that network. In doing so it accepted AusNet Services' (revised) proposal that the number of residential customers it would be asked to supply would grow at a rate in excess of two per cent per annum over the period from 2013 to 2017.[8]

In arriving at that decision, the AER preferred the population forecasts from Victoria in Future 2012 (the most recent available at the time) to the forecasts AusNet Services proposed initially (the update was made after AusNet Services first forecasts were prepared, so it could not be used initially). However, the AER accepted the methodology, which was the same as we have used here.[9]

We see no reason why the AER would now overturn the methodology that it has previously accepted for the corresponding part of the regulatory process of a gas network in much the same area in Victoria. Further, it is implausible that electricity customers would grow at 0.78 per cent at the same time and place as gas connections are growing at in excess of two per cent. If anything, the

[7] Australian Energy Regulator "Better Regulation, Explanatory Statement, Expenditure Forecast Assessment Guideline" November 2013
[8] The final customer numbers forecast was 607,990 in 2013 and 668,355 in 2017. This represents compound annual growth of 2.39 per cent per annum over that period.
[9] In arriving at this view the AER had regard to a review of AusNet Services forecasts that we conducted. It accepted our advice that the methodology is sound.

discretionary nature of gas as a fuel would suggest that the reverse is more likely, i.e. that growth in the number of electricity customers would outstrip that in the gas sector.

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CURRICULA VITAE

Jeremy Tustin, Principal

Bachelor of Economics University of Adelaide

Jeremy Tustin is a Principal in the Melbourne Office of ACIL Allen Consulting.

Jeremy's expertise is in economics and policy analysis specialising in market analysis and policy. He began his career working on competition and consumer protection matters with the Australian Competition and Consumer Commission. He transitioned from there to a period of research and lecturing at the University of South Australia. During that time he conducted research into the use of choice experiments and econometric analysis in consumer protection matters.

Jeremy then spent several years in Energy and Water policy in the South Australian Governments at both line and central agencies. His Government career included periods as Markets and Sustainability and Director, Retail frameworks in the Energy Division. He was also Director, Economic Regulation in the South Australian Department of Treasury and Finance.

After moving to Melbourne in 2009, Jeremy began consulting with ACIL Allen. He has since managed and contributed to a wide range of consulting projects for Government and private sector clients. Many of these have been in the energy sector.

Jeremy's projects include:

- **Electricity tariffs -** projects for the Victorian Government relating to energy tariffs. Jeremy is currently leading a team that has surveyed a sample of almost 3,000 residential customers, collecting demographic data as well as highly detailed energy consumption data. Jeremy and his team have since used those datasets to:
  - prepare algorithms to assist customers in choosing between electricity and gas retail packages
  - analyse the impact of electricity tariff reform for residential customers
- **Solar power –** since 2012 Jeremy has conducted a series of projects estimating the value of electricity exported by household solar panels for the Essential Services Commission of South Australia, the Victorian Competition and Efficiency Commission and the Essential Services Commission (Victoria). Those projects have underpinned the mandatory payment made for electricity exported to the grid from solar panels in South Australia and Victoria from 2012 to the present. They were in three stages:
  - Stage 1 – (for ESCOSA (2011) and VCEC (2012)) develop conceptual approach to valuing electricity generated by domestic solar panels and exported to the grid (the value of exported PV output)
  - Stage 2 – develop quantitative method for applying the conceptual approach developed in stage 1

- Stage 3 ((ESCOSA 2012, 2013, 2014, 2015 (ongoing)) and ESC Vic 2014, 2015) periodic updating of quantitative methodology to update the (forecast) value of exported PV output

— **Energy demand forecasting** projects in three related fields:
  - for the **Australian Energy Regulator** (2009, 2010, 2012, 2015) – review demand forecasts submitted by electricity and gas network businesses in support of regulatory proposals
  - for **energy network businesses** – prepare demand forecasting tool and/or demand forecasts for submission to the AER in support of regulatory proposals (various, ongoing)
  - for the **Australian Energy Market Operator** - develop and implement nationally consistent methods for forecasting electricity and gas demand in consultation with electricity and gas network businesses and industry stakeholders

— **Energy policy analysis**
  - a review of the Northern Territory's Electricity standards of Service Code and of the categorisation of feeders on Power and Water Corporation's network
  - a review of certain principles underpinning the Essential Services Commission of South Australia's upcoming determination of the standing contract price for gas in South Australia
  - a review of competitiveness, and barriers to increased competitiveness, in the South Australian retail energy markets.

— Other projects including
  - preparation of a paper outlining the potential for competition in the vocational education and training (VET) sector in Victoria and identifying likely pitfalls, such as 'races to the bottom' in quality. Jeremy subsequently worked closely with DEECD staff identifying market segments in the VET sector
  - participating in an ACIL Allen team preparing a forecasting tool for the
  - assisting DEECD with analysis surrounding the implementation of principles for VET in Schools including drafting and refining policy papers
  - a review of the regulatory arrangements applicable to the Western Australian plumbing industry

Jim Diamantopoulos, Consultant

Jim Diamantopoulos specialises in the application of financial, statistical and quantitative methods to solve complex problems for both the private and public sectors. At ACIL Allen, Jim carries out financial modelling, econometric modelling, including model construction, evaluation and testing, demand forecasting and efficiency benchmarking for regulated utilities. Jim has accumulated considerable expertise in the development of demand forecasting methodologies across a range of sectors, particularly in energy and water.

Jim has over 15 years of practical experience in the application of financial and econometric techniques to real world problems. Before joining ACIL Allen, Jim spent six years as a statistician with the Australian Bureau of Statistics. Prior to this he held quantitative roles for several banks.

Demand Forecasting

Jim has extensive experience in producing demand forecasts for regulated utilities in the energy and water sectors, including:

— Ongoing preparation of energy, customer numbers and maximum demand forecasts and modelling tools for several Electricity Distribution Network Service Providers (DNSPs) (2007-14)

— Development of sophisticated connection point and zone substation load demand forecasting models for Aurora Energy and SA Power Networks. The models incorporated weather correction as well as adjustments for permanent transfers, major block loads, embedded generation and demand side management initiatives

— Development of a new maximum demand and energy forecasting methodology at the connection point level for AEMO. The assignment involved all aspects of the forecasting process from model specification, development and estimation to weather normalisation

- Estimation of short and long run cost functions for several Electricity Distribution Network Service Providers (DNSPs)
- For the Australian Energy Market Commission, an analysis of the impact of the Small Scale Renewable Energy Scheme (SRES). Specifically Jim developed a non-linear econometric model of the take-up of solar PV installations by state jurisdiction, with the economic payback of installation as the main driving variable.
- Development of a comprehensive model of water demand for SA Water. The model is econometrically driven and generates water demand forecasts by sector for South Australia after estimating suitable relationships between water use and its key drivers
- In a pricing submission for the Lower Murray Urban and Rural Water Authority, Jim undertook an econometric analysis to generate forecasts of urban water demand in the Lower Murray region.

Demand model assessments and forecast reviews

In addition to his experience in demand forecasting, Jim has also been engaged on numerous occasions to review the models and forecasts of others. For example:

- A review of maximum electricity demand and energy forecasts for the Independent Market Operator (IMO) in Western Australia
- A review the energy and maximum demand forecasts of the Victorian DNSPs for the Australian Energy Regulator as part of a regulatory price review
- Multiple reviews and evaluations of forecasting methodologies on behalf of several Electricity Distribution Network Service Providers (DNSPs) (2007-2014)
- Reviewing of SA Water's water and wastewater demand forecasts and associated forecasting methodology for ESCOSA in South Australia
- VET training demand, review of forecasting methodology – Jim conducted a review of the methodology used by the Higher Education Skills Group (HESG) to forecast demand for VET places in the (then brand new) market driven model. The significance of those forecasts was that they related directly to the Government's financial exposure to make subsidy payments and, therefore, to its commitment to deliver a budget surplus

Qualifications

Jim holds a Master of Economics degree from Monash University, specialising in econometrics, a Bachelor of Economics degree with Honours, and a Graduate Diploma of Applied Finance and Investment (FINSIA).

Timothy Weterings, Consultant

Tim Weterings is a consultant in ACIL Allen's Melbourne office with significant experience in the application of econometric and statistical techniques. He has a PhD in Econometrics from Monash University and has published econometric papers in multiple international peer-reviewed academic journals. He also has several years' experience teaching econometrics and modelling techniques at the undergraduate level.

Tim has worked extensively within the energy sector. He was involved in both the development of the gas forecasting methodology for AEMO and in the later stages of the electricity forecasting advisory project. In both projects he applied his statistical expertise to recommend improvements to methodological approaches.

He has also worked with Jeremy and others to prepare demand forecasts for electricity distribution networks as part of their regulatory submission process. This has included forecasts of photovoltaic generation capacity based on a rational financial modelling approach. Tim also built models to assess the impact of time-of-use tariffs on both demand for and consumption of electricity, and forecast consumption based on a wide range of demographic and economic variables.

Tim was recently involved in the development of algorithms for the *My Power Planner* website for a Victorian Government Department. This involved econometric analysis of a significant amount of

smart meter data. This was matched to demographic data from a survey of Victorian households. Tim identified the variables that best explain both the level and shape of electricity consumption profiles. This has been used to design the website, including the website structure, the types of questions asked of website users, and the generation of consumption profiles used to recommend retail tariffs.

Using the *My Power Planner* dataset, Tim also analysed the impacts of demand-based tariffs on bills for Victorian consumers. This involve the analysis of approximately 2,300 households' consumption and demographic data, to find which households will benefit the most from the transition to demand-based tariffs. As this work was undertaken before the 2015 submission of tariff structure statements, a set of assumptions were used to inform the structure and level of tariffs.

Tim also has substantial experience applying advanced analytics and econometrics in a range of other contexts. This includes:

— *VET forecasting for the Victorian Department of Education and Training (2014):* Tim applied advanced econometric analysis to Vocational Education and Training data to quantify the impact of subsidies, the economic environment, and the policy environment on commencement levels. He also built a sophisticated model to forecast VET activity and expenditure, and to investigate the impact of a wide range of policy scenarios.

— *Analysis and reporting of Check-up Digital for the National Archives of Australia:* Tim analysed and reported on the digital capabilities of a range of Australian Government agencies. This included advanced exploratory analysis to uncover deeper insights into the way in which different agencies develop digital capabilities.

B

TERMS OF REFERENCE

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