

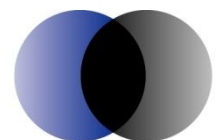
**Confidential**

# **Victorian Electricity Distribution Price Review**

Review of electricity sales and  
customer numbers forecasts  
Final report

Prepared for the Australian Energy Regulator

**21 April 2010**



**ACIL Tasman**

Economics Policy Strategy

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## Executive summary

In November 2009, the five Victorian electricity distribution businesses (collectively “the distribution businesses”) submitted their regulatory proposals for the 2011 to 2015 regulatory control period to the Australian Energy Regulator (“AER”). The proposals included forecasts of demand, customer numbers and energy sales for the region served by each of the distribution businesses.

The AER engaged ACIL Tasman to review the forecasts. This report provides the results of ACIL Tasman’s review of the forecasts of energy sales and customer numbers. Views relating to the maximum demand forecasts are contained in a separate report.

An excerpt of ACIL Tasman’s terms of reference relevant to the review of energy forecasts is at Appendix A below. To summarise, the AER tasked ACIL Tasman to review the energy sales and customer numbers forecasts produced by each of the distribution businesses. In reviewing these forecasts, the AER sought ACIL Tasman’s advice as to whether the forecasting methodologies the distribution businesses applied are robust, represent good electricity industry practice and therefore produce realistic forecasts energy sales and customer numbers.

The distribution business’s forecasts were summarised in a template spreadsheet that was prepared by the AER and appended to Regulatory Information Notices served on each business in October 2009. In addition to this template, ACIL Tasman had regard to forecasts that each business had commissioned from the National Institute of Economic and Industry Research (NIEIR) that were contained in a series of reports, one for each business, entitled “*Electricity sales and customer number projections for the (each distribution business’s) region to 2019 Class and network tariff groups*” (the energy reports). ACIL Tasman’s understanding of the distribution business’s energy sales and customer numbers forecasts was augmented by a series of meetings and subsequent correspondence with each distribution business and NIEIR.

### Best practice electricity sales forecasting

As is described in the report, ACIL Tasman considers that a best practice energy sales and customer numbers forecasting methodology is one that is transparent and repeatable, takes account of all the relevant explanatory variables (or drivers) and is based on a logical, coherent model. In preparing forecasts, steps should be taken to minimise the impact of bias. Models should be validated using both in and out of sample techniques and other diagnostic tests.

Where there is reason to expect that electricity sales and/ or customer numbers will be influenced by changes in policy or other issues not amenable to being reflected in the primary forecasting methodology, ACIL Tasman considers it appropriate to make adjustments to forecasts based on the likely effects of these policies. In this situation, models used to estimate the impact of the policy or other influences should also meet these standards, i.e. the models should be transparent and repeatable, should take account of relevant drivers, should not be susceptible to bias and where possible should be tested and validated appropriately.

## Review of forecasts

### Underlying drivers

Energy sales forecasts in particular, and customer numbers forecasts to a lesser extent, are strongly influenced by forecasts of economic and population growth. As is discussed below, ACIL Tasman regards the population growth estimates upon which these forecasts are based as unreasonably low. ACIL Tasman recommends that the AER consider substituting these forecasts with the 'B series' (or moderate series) of population growth forecasts prepared by the Australian Bureau of statistics.

Similarly, ACIL Tasman is concerned about the economic growth forecasts upon which the energy and customer numbers forecasts are based. ACIL Tasman notes that these forecasts of economic growth were prepared in 2009, when expectations concerning Australia's recovery from the financial crisis were lower than they are today. In addition the forecasts include a second slowdown late in the forecast period which is not consistent with current expectations. ACIL Tasman recommends that the AER consider substituting the current set of economic growth forecasts for a set prepared in 2010.

### Policy impacts

In recent years a number of policies have been proposed by both the Victorian and Commonwealth Governments that would be expected to influence electricity demand. Generally speaking these are policies designed to reduce energy usage and greenhouse gas emissions. As such, they are, typically, concerned primarily with reducing energy sales rather than maximum demand, although it is likely that they will at least have some modest effect on demand.

As is discussed in more detail in section 5 below, there is now significant uncertainty about whether several of the relevant policies will go ahead. Notably, the Victorian Government has placed a moratorium on the application of time of use electricity tariffs, the Carbon Pollution Reduction Scheme legislation was defeated in the Senate in December 2009 and the

Commonwealth insulation rebate scheme now appears to have largely been abandoned.

ACIL Tasman recommends that the AER disregard the forecast impact of the following policies:

- Advanced metering infrastructure
- Insulation rebate scheme (from early 2010)
- One watt standby

Further, ACIL Tasman recommends that the forecast impact of the lighting MEPS be reduced.

A summary of the impacts of these adjustments on the energy sales forecasts on a business by business basis is shown in Table 1 below.

Table 1 **Summary of distribution businesses original and adjusted energy sales forecasts**

Year	2011	2012	2013	2014	2015
<b>CitiPower</b>					
Original forecast (GWh)	6031	6046	5945	5828	5836
Adjusted forecast (GWh)	6127	6221	6191	6110	6129
Percentage change (%)	1.6%	2.9%	4.1%	4.8%	5.0%
<b>PowerCor</b>					
Original forecast (GWh)	10700	10644	10465	10307	10290
Adjusted forecast (GWh)	10870	10951	10899	10805	10807
Percentage change (%)	1.6%	2.9%	4.1%	4.8%	5.0%
<b>Jemena</b>					
Original forecast (GWh)	4246	4201	4105	4024	4011
Adjusted forecast (GWh)	4322	4339	4300	4248	4243
Percentage change (%)	1.8%	3.3%	4.8%	5.6%	5.8%
<b>United Energy</b>					
Original forecast (GWh)	7793	7734	7592	7478	7486
Adjusted forecast (GWh)	7956	8030	8010	7958	7984
Percentage change (%)	2.1%	3.8%	5.5%	6.4%	6.6%
<b>SP Ausnet</b>					
Original forecast (GWh)	7858	7817	7693	7629	7700
Adjusted forecast (GWh)	8012	8096	8087	8081	8168
Percentage change (%)	2.0%	3.6%	5.1%	5.9%	6.1%

Data source: NIEIR, Electricity and customer numbers report to 5 distribution businesses, ACIL Tasman calculations

# 1 Introduction

In November 2009, the five Victorian distribution businesses (collectively “the distribution businesses”) submitted their regulatory proposals for the 2011 to 2015 regulatory control period to the Australian Energy Regulator (“AER”). The proposals included forecasts of demand, customer numbers and energy sales for the region served by each of the distribution businesses.

The AER engaged ACIL Tasman to review the forecasts. This report provides the results of ACIL Tasman’s review of the forecasts of customer numbers and electricity sales. Views relating to the maximum demand forecasts are contained in a separate report.

Section 2 sets out a number of elements that ACIL Tasman regards as critical to best practice electricity sales forecasting.

Each of the businesses engaged the National Institute for Economic and Industry Research (NIEIR) to prepare system level forecasts. Section 3 describes the approach the methodology that was used and discusses it in light of the best practice requirements set out in section 2.

A key element of NIEIR’s system level forecast is the economic and other drivers upon which it is based. Section 3.4 discusses these drivers and compares them to similar forecasts published by the Victorian Government and the Australian Energy Market Operator (AEMO).

There are a number of energy efficiency and greenhouse policies being pursued by both the Commonwealth and Victorian governments that will impact maximum demand over the next regulatory period. Section 5 discusses the way that each of these was accounted for in NIEIR’s forecasting methodology.

Sections 7 to 11 discuss the forecasting methodology and results put forward by each of the five distribution businesses. Conclusions in relation to each business’s forecast are presented in each of these sections and are brought together in section 12.

## 2 Best practice electricity sales forecasting

The following sections provide a set of attributes by which a best practice electricity sales forecast would be expected to be characterised.

### 2.1 Incorporate key drivers

Any energy forecasting methodology should incorporate the key drivers of energy use either directly or indirectly. This includes demographic, economic, weather and appliance installation and usage drivers.

This could potentially include:

- Economic growth
- Population growth
- Growth in the number of households
- Weather drivers
- Growth in the number of air conditioning systems
- Growth in the number of heating systems
- Growth in the number and density of other appliances

The behaviour of key drivers in the future may be quite different than that exposed by recent history, particular for a five year medium term forecast. Hence by explicitly incorporating the key drivers in the forecasting methodology, rather than using simple linear trends based on history, the forecast can more accurately reflect the likely medium term key driver behaviour. Where the forecasts of the underlying drivers are expected to follow a similar pattern to that observed historically, then future energy sales would also be expected to conform to a historical time trend.

### 2.2 Incorporate policy impacts

Econometric modelling techniques can be used to establish relationships between energy sales and the underlying drivers based on historical behaviour. However, in the case of policy initiatives which will be introduced during the forecast period, econometric techniques are not useful as there is no history available. This means that estimates of policy impacts on energy sales need to be calculated separately and then applied as adjustments to the base forecasts.

The impacts of new policy initiatives can be estimated by analysing the impact of similar policies introduced in other jurisdictions, both within Australia and internationally, by considering the results from organised scientific trials on a

subset of the population to be affected by the new policies, or through a first principles analysis of the likely impact.

The latter approach is likely to have the greatest uncertainty as it is necessary to make assumptions about consumer behaviour in the absence of any empirical evidence. However careful consideration also needs to be given to the fact that policy initiatives in other jurisdictions may not be suitable comparators due to differing characteristics between the jurisdictions or because of variations between the policy initiatives themselves. The use of organised scientific trials to assess policy impacts is also hampered by potential problems of sample selection bias and gaming of the results by trial participants.

### **2.3 Transparency and repeatability through effective documentation**

Credible forecasts rely on the forecasting process being transparent, easily understood and well documented.

Documentation should set out and describe clearly the data inputs used in the process, the sources from which the data are obtained, the length of time series used, and details of how the data used in the methodology are adjusted and transformed before use.

The functional form of any specified models also should be clearly described, including:

- The variables used in the model
- The number of years of data, the reliability of the data and the number of missing data points (if any) used in the estimation process
- The estimated coefficients from the model used to derive the forecasts
- Details of the forecast assumptions used to generate the forecasts

The process should clearly describe the methods used to validate and select the model. Any judgements applied throughout the process should also be documented and justified. Any further adjustments made to the forecast following application of the forecast methodology should also be documented and justified.

The methodology should be systematic so that any a third party that follows a series of prescribed steps will be able to replicate the results of the forecasting methodology.

As a general rule, the documentation should:

- Be clear and concise
- Have clearly defined and outlined processes



- Specify all data requirements and sources

## 2.4 Model validation

Models derived and used as part of any forecasting process need to be validated and tested. This is done in a number of ways;

- Assessment of the statistical significance of explanatory variables
- Goodness of fit
- In sample forecasting performance of the model against actual data
- Diagnostic checking of the model residuals
- Out of sample forecast performance

## 2.5 Accuracy and unbiasedness

A key aspect of any forecasting methodology is that it should meet minimum accuracy requirements. All models will include errors by nature of the fact that they are an approximation of the real world and these errors will limit the model's accuracy. In order to assess the model accuracy, its forecasting performance should be assessed using both in-sample and out of sample tests.

An unbiased forecast is one which does not consistently over or under-predict the actual outcomes the methodology is trying to forecast. In and out of sample testing and residual analysis should provide a good indication of any model bias. The results of these tests should be provided to demonstrate lack of bias in the forecasting model.

### **3 NIEIR's approach to forecasting electricity sales**

NIEIR's approach to forecasting energy sales is multi-stage. Firstly, it disaggregates total sales into residential and business sales. NIEIR has stated that this is in order to treat sales on different tariffs appropriately.

Secondly, it estimates these two categories of sales separately and aggregates them for each distribution business.

Thirdly, it estimates the impact of a number of government policy measures on energy sales and adjusts the initial estimate accordingly.

For the most part, the methodology used in preparing these forecasts is similar to that which NIEIR used in preparing forecasts for VENCORP for the 2009 VAPR. In relation to some of the policy impacts estimated at step 3, NIEIR stated that its access to data improved after it had completed the VAPR forecasting and as a result, some of the estimated policy impacts are different than those described in the 2009 VAPR.

NIEIR uses a common forecasting methodology for estimating energy sales for each distribution business, although the data that feeds into the methodology is, obviously, different in each case.

The sections that follow contain a description of each of the above steps. These sections are based in part on five reports that NIEIR prepared, one for each distribution business (the energy reports). These reports are substantially the same as one another. The detail that each report provides on the forecasting methodology that is used is very limited.

In order to supplement the reports, the AER and ACIL Tasman held meetings with NIEIR and the distribution businesses in relation to the forecasts and forecasting methodology. In advance of the discussions, NIEIR made it clear that it considers the models and modelling process used in preparing these forecasts to be commercially confidential as they contain a significant amount of intellectual property.

The distribution businesses declined to provide more than a general and high level description of how their forecasts had been prepared on the basis of the confidential and proprietary nature of the NIEIR modelling. Hence while some additional information was provided during the meetings, the overall level of information provided did not meet the transparency and repeatability requirements set out in Section 2. This is reflected in the descriptions below.

Actions in the descriptions attributed by ACIL Tasman to NIEIR are based on the reports and statements made by NIEIR representatives during meetings with ACIL Tasman and AER staff. ACIL Tasman was not able to independently verify that the forecasting methodology as stated was applied in developing the forecasts that were presented because of the limited information provided.

### 3.1 Business sales

To produce forecasts of electricity sales to business customers, NIEIR stated that it first created a description of the industry structure of each distribution region.

For customers that use more than 160MWh of electricity in a year, NIEIR determined the ASIC coding of each customer in each distribution region.

For medium customers, a sample of medium customers was taken (in Powercor's region) and then total energy sales to medium customers were allocated to industry codes in the same proportion as was observed in that sample.

The allocation was performed at the one digit level for non-manufacturing industries and to the two digit level for manufacturing. The result of this process was a dataset showing economic activity, as at a point in time, by industry grouping in each distribution region. This is part of a broader categorisation that NIEIR does for this and other work. As part of the categorisation, NIEIR stated that it ensures that the regional data reconciles to the Victorian and national levels.

At this stage in the process, NIEIR stated that it has a 'picture' of the economic structure of each distribution region. It also prepared a growth forecast for each industry sector which it used to project activity forward in each region.

To convert these forward projections of economic activity in each region into energy sales forecasts requires a measure of the energy intensity of each industry. In some cases this was reached by estimating a model of approximately the following form<sup>1</sup>:

$$\Delta Q_{it} = q_{0i} + q_{1i} * p_{it} + q_{2i} * \Delta Y_{it}$$

where:

*i* the ASIC classification of electricity customers

*t* year

*Q* total energy sales in industry *i* in year *t*

*p<sub>it</sub>* the price of electricity in industry *i* in year *t*

*Y<sub>it</sub>* economic activity in industry *i* in year *t*

*q<sub>0i</sub>*, *q<sub>1i</sub>* & *q<sub>2i</sub>* are estimated coefficients

NIEIR stated that in some cases, the results of this model were not (statistically) reliable, or did not make logical sense. In these cases, NIEIR takes the energy intensity estimate from ABARE data. It should be noted that NIEIR did not explicitly provide information on which industry classes were modelled in the results, which industry classes were substituted nor the analysis and explicit reasons for rejecting the modelled approach in each case. However, the general approach of exercising judgement to disregard illogical coefficient estimates could be sound as long as such judgement is consistent with theory.

It is noteworthy that the industry code modelling was performed on a small subset and extrapolated across all distribution businesses. ACIL Tasman understands that this extrapolation was based on a sample of businesses taken in Powercor's distribution region. This assumes that the industries within the Powercor region are representative of industries across the other four distribution regions. Based on NIEIR's description, Powercor's region holds more than half of the State's agricultural industry and almost a third of the mining industry while the finance, business services, communication and public administration sectors are under-represented.<sup>2</sup> Neither NIEIR's reports nor information provided at the meetings includes analysis of the extent to which this affects the forecasts. In particular, no conclusion can be reached as

<sup>1</sup> The presentation of the model is simplified to show the impact of the energy intensity term. In practice, NIEIR's model takes account of a number of other matters, such as the cross price elasticity between different fuels and time lag effects of energy price changes.

<sup>2</sup> NIEIR, "Electricity sales and customer numbers forecasts for the Powercor Australia region to 2019", November 2009, pp. 24-25

to whether the disaggregated approach represents an improvement over a more aggregated approach which does not attempt to take different industry structure into account.

Hence energy sales projections are driven by growth projections which are produced for each industry code, taking into account electricity prices that each industry faces. Therefore, for example, the projection of energy use in the textile, clothing and footwear industry would be based on estimates of  $q_{0TCF}$ ,  $q_{1TCF}$  &  $q_{2TCF}$  for that industry and projections of growth ( $\Delta Y$ ) and electricity prices faced by that industry. NIEIR produces separate growth projections, energy intensity coefficients and thus energy sales forecasts for each industry. These forecasts are aggregated together in line with the proportion of energy sales by industry in each distribution region to produce estimates of total business electricity sales for each distribution business.

## 3.2 Residential sales

Residential sales were disaggregated between hot water and general sales, which were estimated separately.

### 3.2.1 General residential sales to existing customers

In terms of energy sales to residential customers NIEIR's models express residential sales as a function of real income per capita, real and relative prices and weather conditions. Energy forecasts are made based on forward projections of these drivers. The real income per capita forecast is drawn from NIEIR's model, so it differs by distribution region. Electricity prices are based on Treasury modelling of the CPRS-5 scenario and NIEIR's assumption that, but for the impact of the CPRS, which would be passed on by retailers, retail prices would remain constant in real terms.

The forecasts are explicitly adjusted to account for increasing penetration of air conditioners in Victoria and the decline in non-electric water heaters, but not for changes in penetration of other appliances.

### 3.2.2 Electricity sales to new customers

Given the regional monopoly nature of distribution businesses there is no scope for churn between businesses so the only source of new (residential) customers is newly constructed dwellings.

NIEIR's approach to forecasting electricity sales to residential customers is essentially to determine the average energy use by household and multiply that usage by the number of new dwellings expected. The number of new households is drawn from NIEIR's construction model, which is discussed in section 6 below.

### 3.2.3 Hot water sales

It is government policy around the country to phase out electric resistance hot water heaters. As existing heaters fail the policy is that they will be replaced with an alternative that uses less energy. In most cases this is likely to be a gas or solar boosted appliance, so electricity use by water heaters could fall substantially.

This policy is the main driver of change in hot water sales, which are otherwise projected to remain constant. This is consistent with the fact that no new electric resistance water heaters are to be expected.

NIEIR advised ACIL Tasman and the AER that, to model the decline in hot water sales, it assumed that 6.7% of existing electric resistance water heaters would be replaced each year, consistent with an average appliance life of approximately 15 years. As water heaters fail in the model their electricity use is cut to 7% of what it was. Thus, in effect, NIEIR reduces hot water sales by approximately 6.2% each year. This accounts for the fact that most water heaters are likely to be replaced with either gas or solar alternatives, with a relatively small proportion of electric heat pumps and electric boosted solar appliances being rolled out.

This is consistent with historical statistics set out in NIEIR's report that show that the majority (about two thirds) of Victorian households use gas to heat water. The statistics also show that gas boosted solar is overtaking electricity boosted solar.

The impact of the phase out of electric resistance water heaters on the electricity sales forecasts is discussed in more detail in section 5.9 below.

## 3.3 Public lighting

NIEIR's forecasts of public lighting are based on infrastructure construction forecasts. These forecasts were reduced in line with information provided by the distribution businesses concerning the replacement of street lamps with energy efficient (T5) lamps.

### 3.4 NIEIR's forecasting approach- Conclusions

While the lack of detailed information makes it difficult to draw conclusions about NIEIR's methodology, ACIL Tasman considers that, it has a number of features that are a necessary and desirable part of any energy sales forecasting process.

These are:

- Nears models of electricity sales incorporate the key underlying drivers, both economic, demographic and weather related
- The approach is based on econometric techniques which aim to establish a relationship between electricity sales and its underlying drivers based on historical data. These estimated relationships are then used as the basis for projecting forward.
- NIEIR recognises that there are certain policy impacts that are not able to be captured within the estimated econometric relationships and so estimates these impacts outside the basic econometric framework and makes adjustments to the original forecasts accordingly.

While ACIL Tasman has differences of view with regard to some of the forecast input assumptions and has not been given access to any detail regarding Nears proprietary models, Nears approach to forecasting electricity sales is considered to be generally sound.

## 4 Drivers

Similarly to maximum demand, electricity sales are driven largely by changes in population and economic growth. Population growth, and the related growth in dwellings, is the main driver of residential sales. Non-residential sales are mainly driven by growth in economic product, in this case estimated at the regional level.

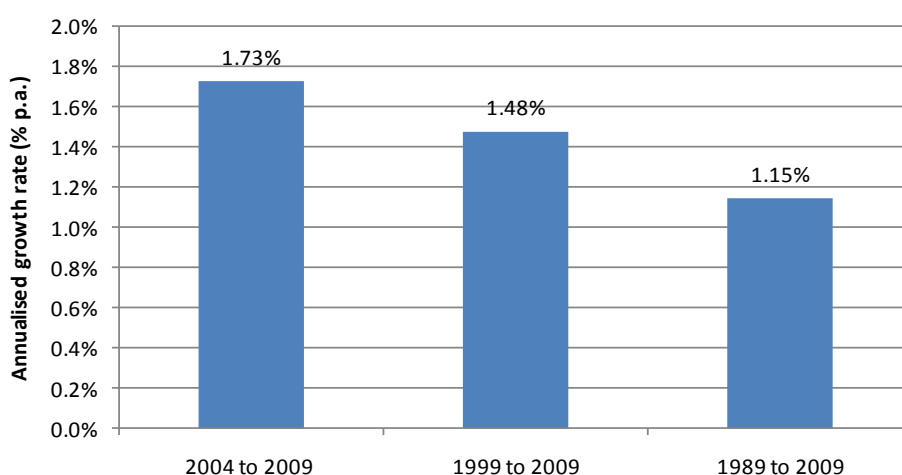
### 4.1 Population growth

Population growth is important to electricity customer sales because it drives household formation and hence domestic customer numbers for the distribution businesses.

Figure 1 shows the historical rate of population growth for Victoria over three distinct time periods, 2004 to 2009, 1999 to 2009 and 1989 to 2009.

The figure shows that in the 5 years to June 2009, the Victorian population grew at a rate of 1.73% p.a. This growth has been quite rapid compared to that observed over longer time horizons, with annualised growth over the last 10 years of 1.48% p.a. and over a 20 year time horizon of 1.15% p.a. This is consistent with higher birth rates and increased migration within Australia in recent years.

Figure 1 **Victorian population growth, 2004 ~ 09, 1999 ~ 09, 1989 ~ 09, % p.a.**



Data source: ABS, 3101.0 Australian Demographic Statistics

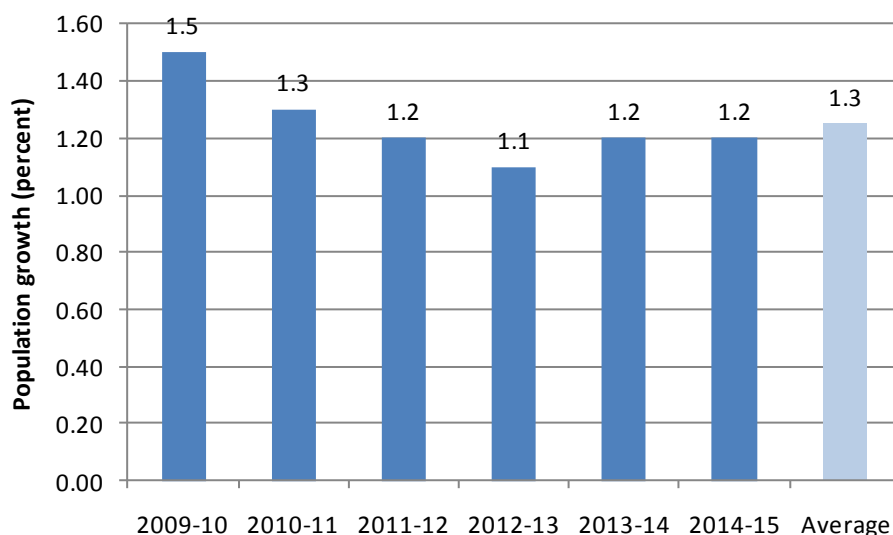


NIEIR points out that the main drivers of Victoria’s population growth in the last 5 years have been a strong natural increase, large gains from overseas migration and relatively few interstate migration losses.<sup>3</sup>

#### 4.1.1 NIEIR’s population projections

NIEIR has projected a slowdown in Victorian population growth in the next regulatory period. In the six years from June 2009-10 to 2014-15, NIEIR projects an average rate of population growth for Victoria of 1.2%% p.a. over the regulatory period. This is compared to an average growth rate between 2004 and 2009 of 1.73% p.a.

Figure 2 **NIEIR projected Victorian population growth rate, 2009-10 to 2014-15**



Data source: NIEIR, Electricity sales and customer numbers reports prepared for distribution businesses

NIEIR's projections are relatively conservative compared to those obtained from other sources. Table 2 compares NIEIR’s population projections against those sourced from the Victorian Treasury and the ABS.

<sup>3</sup> NIEIR, energy reports, p.22

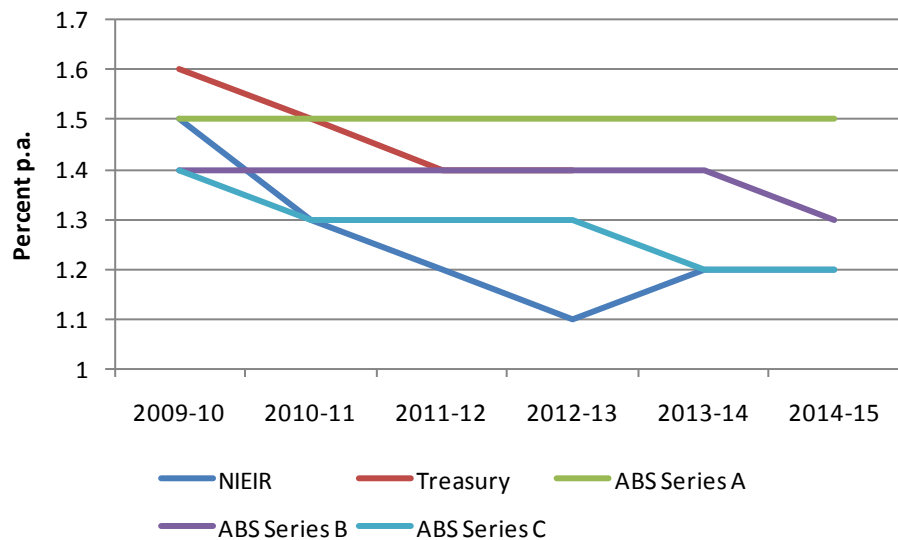
Table 2 **Population growth projections from various sources, 2009-10 to 2014-15**

Population forecasts	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	Average
NIEIR	1.5	1.3	1.2	1.1	1.2	1.2	1.2
Treasury	1.6	1.5	1.4	1.4	NA	NA	1.5
ABS Series A	1.5	1.5	1.5	1.5	1.5	1.5	1.5
ABS Series B	1.4	1.4	1.4	1.4	1.4	1.3	1.4
ABS Series C	1.4	1.3	1.3	1.3	1.2	1.2	1.3

*Data source:* ABS, 3220.0 Population Projections, Australia 2006 to 2101, Victorian Treasury, Victorian Budget Papers 2009-10, NIEIR, Electricity sales and customer numbers reports prepared for distribution businesses.

The table shows that NIEIR’s forecasts most closely resemble the ABS's Series C population projections which are the most pessimistic of the ABS scenarios. NIEIR’s population growth forecasts are also lower than those produced by the Victorian Treasury although the Treasury forecasts do not extend beyond 2012-13. The data in the table are shown graphically in Figure 3.

Figure 3 **Population growth projections from various sources, 2009-10 to 2014-15**



*Data source:* ABS, 3220.0 Population Projections, Australia 2006 to 2101, Victorian Treasury, Victorian Budget Papers 2009-10, NIEIR, Electricity sales and customer numbers reports prepared for distribution businesses.

The population growth rate assumed by NIEIR assumes that population growth in the next 5 years will revert to levels that more closely resemble long run behaviour. This forecast is equivalent to the most pessimistic ABS forecast and ACIL Tasman considers it to be unreasonably pessimistic, particularly in light of recent growth. It is unlikely that birth rates will change significantly over such a short time frame and hence the NIEIR forecasts would imply significantly lower migration rates over the period. As unemployment appears

to have peaked below 6% in the current cycle, it is unlikely that migration rates would be slowed.

#### 4.1.2 Population growth – impact

For the reasons set out above, ACIL Tasman considers that the distribution businesses' population growth expectations are unreasonably pessimistic and that these should be replaced with the ABS B series forecasts. ACIL Tasman does not have sufficient information about the energy forecasting models that were used to make a definitive statement as to the impact this will have on energy sales forecasts. Table 3 below provides an approximation of the likely impact.

The estimates in Table 3 are based on the three sets of historical energy consumption data supplied to the AER<sup>4</sup> and population data from the ABS. From these, a series of estimates of energy use per capita was produced. Total energy use (including non-residential use) was projected forward using the ABS' series B population forecast and the average of these energy use per capita estimates, which was 6.81 MWh per person. This produced the total energy row in Table 3, which was then apportioned to each business based on population share.

Table 3 **Approximate impact on electricity sales forecasts of change in population forecast**

(GWh)	Pop. share	2010	2011	2012	2013	2014	2015
SP AusNet	24%	124	245	429	724	995	1,126
CitiPower	12%	61	119	209	353	485	549
Powercor	29%	148	293	512	865	1,189	1,344
United	23%	120	237	414	700	963	1,088
Jemena	12%	60	117	205	347	477	540
total	100%	513	1,011	1,769	2,990	4,109	4,647

*Data source:* NIEIR, Electricity sales and customer numbers reports to distribution businesses table 6.2, Victorian distribution businesses, RIN templates, tables 5 and 8 and ABS 3222.0 "Population Projections, Australia, 2006 to 2101", Table 5

It should be noted that there are a number of shortcomings in this estimation. Firstly, the absence of weather corrected data means that this estimate is not prepared consistently with any particular assumption as to the future weather. Averaging energy use per capita over a number of years limits this impact, but

<sup>4</sup> These sets are one set taken from NIEIR's reports to each of the distribution businesses and two sets taken from the distribution businesses' RIN templates, being Tables 5 and 8 in the RIN template. These RIN tables were intended to contain raw and weather normalised data respectively although some businesses appear to have provided the same data (understood to be raw data) in both tables.

does not address it entirely. Secondly, if Victoria is becoming more energy efficient (on a per capita basis) this effect is obscured by the averaging of per capita energy use over time.

Thirdly, this approach assumes that any increase in population will occur in proportion to existing population shares. In fact, it is more likely that population will grow faster in some regions than others, so residential energy use will not necessarily grow in constant proportion. However, it is also to be expected that non-residential energy use would grow in relation to population. This would not necessarily happen in the same region where the population growth occurred. Hence ACIL Tasman considers that the approach taken here is a reasonable approximation of the impact.

Finally, this adjustment takes no account of the change in economic output that would be expected to accompany increased population. This is discussed in the next section.

These shortcomings would be addressed by preparing a fresh set of energy forecasts using NIEIR's model and the ABS B series population forecasts.

## 4.2 Economic Growth

Electricity sales are driven to a significant extent by economic growth. In the residential sector economic growth drives increases in disposable income which in turn leads to additional demand for and use of appliances and comfort in the home. Economic growth is also a driver of population growth which helps to contribute to customer number growth over time.

Commercial and industrial electricity use is also driven by economic growth. Increases in industrial output and commercial activity are expected to lead to higher electricity sales over time.

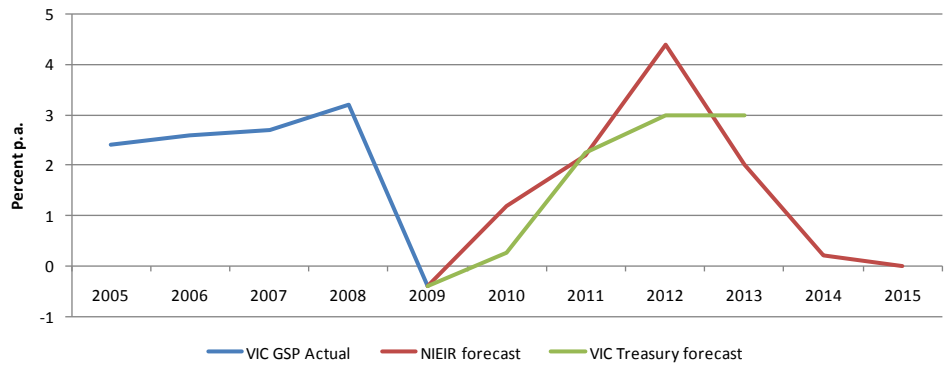
A sound forecast of economic growth is essential in forecasting electricity sales on a distribution network. Further, significant changes in economic growth in Victoria will have important implications for growth in the use of electricity.

The forecasts NIEIR prepared are based on its own projections of economic growth for the region supplied by each distribution business. These are created by disaggregating NIEIR's Victorian GSP projections to the regional level. The key drivers are discussed in relation to each of the five businesses in sections 7 to 11 below.

It is informative to compare NIEIR's forecasts of economic growth with forecasts published by other organisations. Figure 4 shows the rate of growth in Victorian GSP from 2005 to 2009 and the GSP forecasts from NIEIR

covering 2010 to 2015. As a basis of comparison, Victorian Treasury's forecasts of GSP growth to 2013 are also presented.

**Figure 4 NIEIR and treasury Victorian GSP growth forecasts, 2010 to 2015**



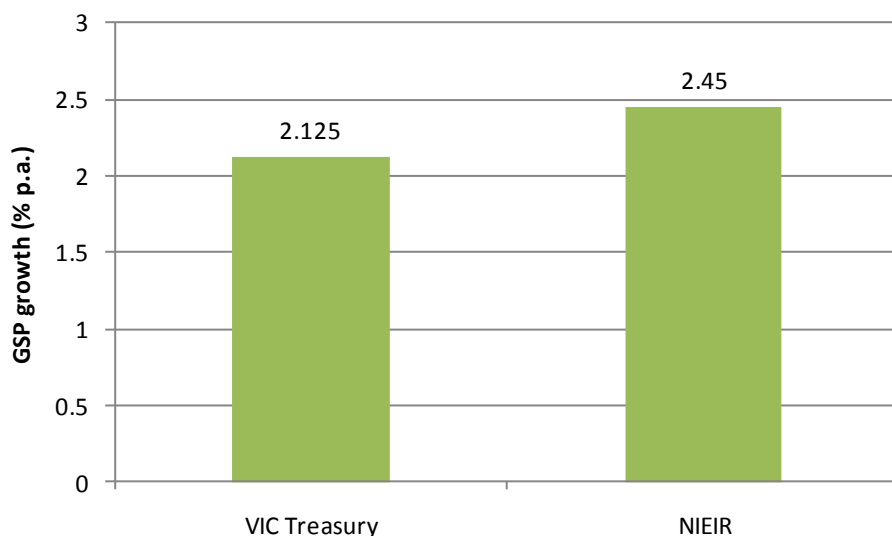
*Data source:* NIEIR, Electricity sales and customer numbers reports prepared for the five distribution businesses, Victorian Treasury, Victorian Budget 2009-10, Budget Paper Number 2, Strategy and Outlook.

The figure shows the effects of the pronounced economic slowdown affecting Victoria in 2009. NIEIR expects Victorian economic growth to be lower in the next regulatory period compared to the period between 2005 and 2009. Between 2005 and 2009 Victorian GSP growth has averaged 2.1% p.a. By comparison, NIEIR expects GSP growth to average 1.8% between 2011 and 2015.

Figure 5 compares NIEIR's average growth forecast against the Victorian Treasury's over the period in which common forecasts are available.

The figure shows that between 2009-10 and 2012-13 NIEIR projects an average rate of economic growth for Victoria of 2.5% p.a. compared with 2.1% for the Treasury. While this presents the impression that NIEIR's forecasts are more optimistic, the comparison does not take account of the last two years of the NIEIR forecast in which NIEIR is forecasting a rate of GSP growth close to zero in both years.

Figure 5 **Average Victorian GSP growth, 2009-10 to 2012-13**

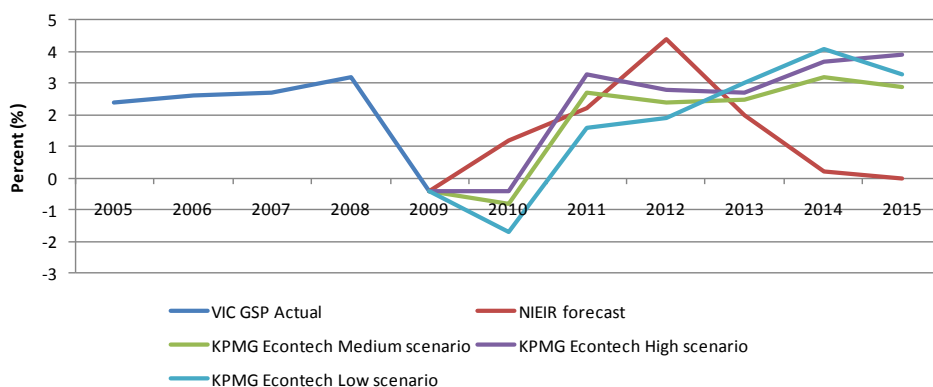


Data source: NIEIR, Electricity sales and customer numbers reports prepared for the five distribution businesses, Victorian Treasury, Victorian Budget 2009-10, Budget Paper Number 2, Strategy and Outlook.

Further comparison can be made between the economic growth forecasts generated by NIEIR and those provided by KPMG Econtech in the VENCorp Victorian Annual Planning Report of 2009.

Figure 6 compares NIEIR’s economic growth forecasts with the forecasts applied by KPMG Econtech in the VENCorp Annual planning report published in 2009.

Figure 6 **NIEIR economic growth forecasts versus KPMG Econtech**



Data source: NIEIR Electricity sales and customer numbers reports prepared for five distribution businesses and VENCorp annual planning report 2009

The charts show a deviation between the NIEIR and KPMG Econtech forecasts, with NIEIR projecting a higher rate of economic growth for Victoria in 2010 and 2012 compared to the medium scenario of KPMG Econtech. In 2014 and 2015, NIEIR's forecasts of Victorian GSP growth diverge substantially from those provided by KPMG Econtech. NIEIR’s projections

of GSP growth of 0.2% and 0.0% in 2014 and 2015 contrast sharply with KPMG Econtech's medium scenario forecast growth rates of 3.2% and 2.9%. This difference is partly compensated for by NIEIR projecting a more pronounced business cycle with substantially higher growth rate in 2010 and 2012 compared the KPMG Econtech's medium scenario.

Over the entire forecast period from 2010 to 2015, NIEIR's average growth rate of 1.7% is 0.5 percentage points below the KPMG Econtech medium scenario, which averages 2.2% per annum over the same period.

Based on the NIEIR forecasts of Victorian population and economic growth, it would be expected that electricity sales forecasts would exhibit some degree of slowdown relative to that observed over the last 5 years; which have been characterised by stronger population and economic growth.

ACIL Tasman notes that the Assistant Governor (Economic) of the Reserve Bank of Australia recently expressed the view that Australia's economic performance in 2009 was significantly better than was expected one year ago.<sup>5</sup> We highlight NIEIR's advice that the economic forecasts underpinning the current set of demand forecasts were prepared in the second half of 2009. ACIL Tasman considers it likely, or at least possible, that, if these forecasts were constructed again today that they would be somewhat different. In light of the fact that NIEIR's forecasts are the lowest of the three discussed here, it may be worthwhile to explore the impact of using more up to date input economic growth forecasts.

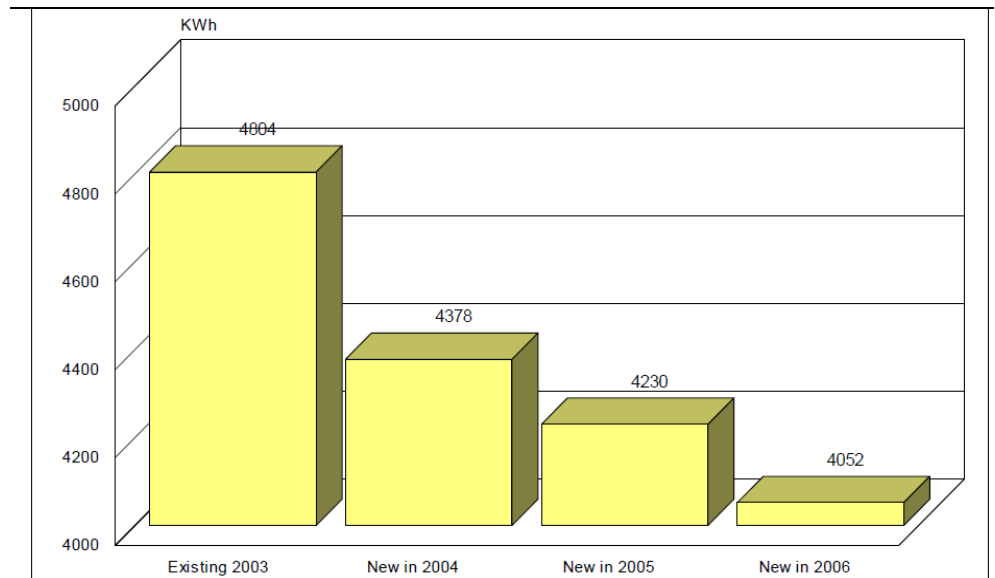
### 4.3 Average energy use by household

In terms of electricity use on a per household basis, NIEIR has observed that the average energy use by dwelling varies depending on the 'vintage' of the dwelling. In CitiPower's region (alone), this variation is steadily downwards, i.e. CitiPower customers that were new in 2004 use less energy than customers who were connected in 2003. New customers in 2005 use less electricity than 2004 customers and 2006 customers use less electricity again. This is shown in Figure 7 below.

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<sup>5</sup> "The Current Economic Landscape" speech by Mr Philip Lowe, Assistant Governor (Economic), Reserve Bank of Australia, available online at <http://www.rba.gov.au/speeches/2010/sp-ag-180210.html>

Figure 7 **Average residential electricity use by dwelling vintage - CitiPower**



Source: NIEIR, "Electricity sales and customer number projections for the CitiPower region to 2019", November 2009, p34

Based on this observation, there is an argument in favour of taking this decline into account in forecasting electricity sales. It could be argued that the volume of electricity sold to new customers will be less, on average, than the volume sold to existing customers. In turn, this could reflect decreasing dwelling size or a reduction in the average number of occupants. It could also reflect improvements in the energy efficiency of dwellings.

However, unlike the CitiPower case, the energy use of dwellings by vintage in other distribution regions does not show a clear decline.<sup>6</sup> For this reason, and partly due to data issues, NIEIR did not take this factor into account in preparing its electricity sales forecasts.

Given the number of new customers it projects will be connected in each distribution business's region, NIEIR's methodology makes the assumption that (on average) new dwellings will use the same amount of energy as existing dwellings (on average).

## 4.4 Weather

As is the case with maximum demand, weather is a key driver of electricity sales, mainly due to electricity demand to power space heaters and coolers. Maximum demand forecasting makes no attempt to forecast the weather conditions that will occur in any given year but seeks to estimate the level to

<sup>6</sup> The charts showing the relationships are set out in NIEIRs' energy reports to each business.



which demand would rise if the weather conditions are at a certain level (usually the 50 POE level). This approach is necessary because it is impossible to predict the weather in a way that would be necessary to make a forecast of *actual* maximum demand, which would essentially require a forecast of the weather conditions on the hottest day of each year in the forecast period.

In this respect, NIEIR's energy forecasting methodology takes a different approach to its approach to forecasting maximum demand because it contains, in a sense, an estimate of future weather conditions.

The forecast of electricity sales is based on the number of cooling and heating degree days (CDD and HDD respectively) that are expected to occur in each of the forecast years. This approach takes account of the fact that, as the average daily temperature moves away from a central level, either heating or cooling will increase (colder or hotter).

NIEIR's methodology takes the relationship between the number of HDD and CDD that occur each month into account in explaining historical energy consumption. In forecasting energy sales NIEIR uses these responsiveness estimates together with an estimate of the number of HDD and CDD over the forecast period.

NIEIR's methodology for predicting the number of HDD and CDD that will occur over the forecast period amounts to an assumption that there is a linear trend in the number of HDD and CDD that will occur in any given month of the year. NIEIR's forecasting approach is to increase the number of HDD and CDD in any given month of the year by an amount that is the same for each year in the forecast period, but that varies across months (i.e. January always grows at a given rate, but this is a different rate than February etc). The growth rates are taken from trend analysis over 50 years of data, therefore 50 observations of each month.

NIEIR states that this approach is consistent with the view that temperatures are warming at an observable rate and that this will continue to happen over the forecast period. This could be explained in part by climate change and in part by the urban heat island effect. NIEIR has not provided its estimates of the rate of change of HDD and CDD.

## 5 Policy impacts

The forecasts prepared by the process described above are not the final forecasts put forward by the distribution businesses in the regulatory process. As is mentioned briefly in NIEIR's reports, the methodology described above does not take account of policy changes other than to the extent that they are reflected in either the forward price or the historical data. They are, in a sense, 'policy free' forecasts. Hence NIEIR argues that they need to be adjusted to take account of a number of policy interventions that are planned (or were planned at the time the forecasts were prepared). In general terms these are interventions that are intended to reduce energy use, and therefore greenhouse gas emissions.

NIEIR estimated the effect of the policy measures separately and subtracted the effects from the results. The amounts subtracted due to each policy implementation are shown in Table 4 and Table 5 below. A discussion of the estimated effects in relation to each identified policy then follows.

Most of these policy initiatives do not have any historical precedents. For this reason, it is very difficult to estimate their effect with confidence, in particular to the extent that they rely on individual customers making significant behavioural changes. ACIL Tasman considers that it is appropriate to take a conservative approach to estimating the impact these policies will have on individual behaviour.



Table 4 **Cumulative impacts on residential energy sales due to policy changes – all Victoria (GWh)**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
MEPs – lighting	110.8	221.5	332.3	443.0	509.5	531.6	553.8	575.9	598.1	609.1	609.1
Standby power	0.0	0.0	24.9	74.5	124.2	155.4	167.6	176.9	183.9	190.9	196.9
Insulation	22.3	66.8	111.3	133.5	133.5	133.5	133.5	133.5	133.5	133.5	133.5
Photovoltaics	9.8	17.6	21.6	25.7	29.4	32.2	34.3	35.7	36.9	38.0	38.8
VEET	13.5	31.5	49.5	67.5	85.5	108.0	121.5	121.5	121.5	121.5	121.5
Hot water <sup>1</sup>	0.0	0.0	23.1	44.7	65.1	84.1	101.6	117.6	132.4	146.2	159.2
MEPS – air conditioners	0.0	2.0	6.0	10.6	15.8	20.3	24.3	29.1	34.2	39.3	44.4
6 Star building standards	0.0	0.0	0.0	1.4	4.2	6.7	9.2	11.9	14.6	17.4	20.4
AMI	0.0	0.0	99.0	349.8	627.0	772.2	792.0	792.0	792.0	792.0	792.0
Total	156.4	339.4	667.6	1150.8	1594.2	1844.1	1937.9	1994.2	2047.3	2088.1	2116.0

<sup>1</sup> This excludes the impact of the water heater phase out in SP AusNet's distribution region, for which estimates have not been provided.

Data source: Table 6.2 of NIEIR's Electricity sales and customer numbers report to each business aggregated across businesses and totalled across years

Table 5 **Cumulative impacts on commercial energy sales due to policy changes – all Victoria (GWh)**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
MEPs – lighting	45.2	90.4	135.5	180.7	207.8	216.8	225.9	234.9	244.0	248.5	248.5
Standby power	0.0	0.0	2.5	7.6	12.7	17.8	22.8	27.9	30.6	30.9	31.1
Hot water (off-peak)	5.6	16.8	28.0	39.2	50.4	61.6	72.8	84.0	95.2	106.4	117.6
MEPS – air conditioners	0.0	0.9	2.5	4.5	6.8	8.7	10.4	12.4	14.6	16.8	19.0
AMI	0.0	0.0	27.8	98.3	176.1	216.9	222.5	222.5	222.5	222.5	222.5
Electric cars (off-peak)	-3.4	-10.2	-17.0	-23.8	-30.7	-37.5	-44.3	-51.1	-57.9	-64.7	-71.6
Total	47.4	98.0	179.6	306.6	423.4	484.7	510.4	530.9	549.2	560.6	567.5

Data source: Table 6.5 of NIEIR's Electricity sales and customer numbers report to each business aggregated across businesses and totalled across years

## 5.1 Carbon Pollution Reduction Scheme

Unlike the other policy measures discussed below, the CPRS is incorporated in the ‘policy free’ forecasts because the forward electricity prices in the forecasts were based on the CPRS-5 scenario.<sup>7</sup>

Since NIEIR’s reports were completed, there have been numerous developments in climate change policy which were not apparent at the time of writing the report, but which now make the CPRS implementation less certain. As is discussed in ACIL Tasman’s report regarding maximum demand, it seems reasonable to assume that, notwithstanding Commonwealth Government policy, the CPRS will not commence on 1 July 2011, which is the basis on which the current set of forecasts were prepared.

However, ACIL Tasman regards it as likely that either the CPRS or an alternative greenhouse emissions reduction policy will be introduced sometime during the forecast period and that this will cause electricity sales to be somewhat lower than they would otherwise have been. Further, it would appear likely that any greenhouse emissions reduction policy that is introduced will, assuming it has comparable emissions reduction targets to the CPRS, cause the price of electricity to increase at least to some extent towards the levels expected under the CPRS and possibly higher.

If this assumption turns out to be incorrect there will be implications for the electricity sales forecasts. Generally speaking:

- the longer that the CPRS is delayed and/ or
  - the more that electricity price rises due to greenhouse policy are reduced relative to the modelled CPRS -5 levels,
- the more the energy sales forecasts discussed here will be an underestimate.

Therefore, if the CPRS actually commences on 1 July 2012, energy sales are likely to be greater than estimated here. Similarly, if further steps are taken to limit the extent to which the CPRS causes electricity prices to increase, energy sales would be higher than forecast.

It is not possible to be certain about what will happen in terms of greenhouse emissions reduction policy during the coming regulatory period. Accordingly, notwithstanding that the businesses have probably forecast maximum demand based on an incorrect assumption concerning the CPRS to 2015, ACIL Tasman does not consider it possible to provide a more accurate assumption. Given this uncertainty, ACIL Tasman has accepted the assumption made by

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<sup>7</sup> The other exception is the phase out of electric resistance water heaters, which is also dealt with in the base model.

each of the businesses that, in line with Government policy, the CPRS will commence on 1 July 2011 and follow the CPRS-5 trajectory. ACIL Tasman notes, though, that this will tend to bias the energy sales forecast downwards.

## 5.2 Mandatory Energy Performance Standards - lighting

Australian Governments have recently introduced a new minimum energy performance standard (MEPS) for lighting. The MEPS requires that lights are no less efficient than 15 lumens per watt (compared to approximately 7 lumens per watt for traditional tungsten filament incandescent lamps).

NIEIR forecasts the impact of the lighting MEPS using the same dwelling stock estimates used elsewhere in the model. To these estimates it applied an average number of light fittings per dwelling, a usage rate and an average watt input, none of which are specified in the energy reports. Based on meetings with NIEIR and the distribution businesses, ACIL Tasman understands that the distribution business's estimate of the impact of the MEPS is based on a set of assumptions including that:

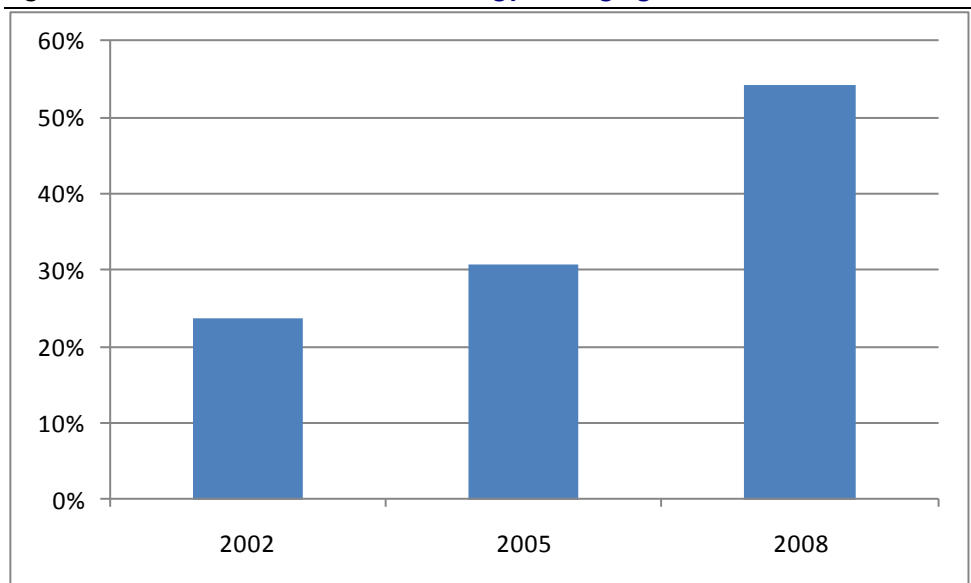
- 95% of dwellings in Victoria would be occupied at any given time
- Each dwelling will have, by the beginning of the regulatory period, 6 'eligible' lamps<sup>8</sup> remaining
- The average 'eligible' lamp is a 75W incandescent globe
- The average replacement globe will draw 15W
- All eligible globes will be replaced during the regulatory period.

The reports say that the methodology also allowed for the fact that there is significant anecdotal evidence to indicate that households have moved ahead of the MEPS and introduced energy efficient lamps already. To the extent that this has happened, the historical data, at least since 2007 when the MEPS was first announced, would be lower due to the changeover to efficient lights, thus reducing the extent to which energy use will fall after the policy took effect officially. Figure 8 is based on ABS data and shows this trend.

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<sup>8</sup> A lamp is 'eligible' if it has a low efficiency globe in place at the beginning of the regulatory period and there is no technical reason why that globe could not be replaced with a high efficiency lamp

Figure 8 **Victorian homes with energy saving lights**



Note: Includes people's own perception of energy saving lights e.g. low voltage halogen etc.

Data source: Australian Bureau of Statistics<sup>9</sup>

Based on this methodology, the distribution businesses estimated that, in each year of the regulatory period, the lighting MEPS would cause energy sales to be reduced below the base forecast by the amounts set out in Table 6.

Table 6 **Estimated impact of lighting MEPS on residential energy sales (GWh)**

	2011	2012	2013	2014	2015	2016
CitiPower	38.37	51.16	58.84	61.4	63.96	66.52
SP AusNet	80.91	107.88	124.06	129.45	134.84	140.23
Powercor	88.8	118.4	136.16	142.08	148	153.92
Jemena	40.35	53.8	61.87	64.56	67.25	69.94
United	83.82	111.76	128.53	134.12	139.71	145.3
Victoria total	332.25	443	509.46	531.61	553.76	575.91

Data source: NIEIR, Electricity sales and customer numbers reports to the five distribution businesses, table 6.2

A point of comparison for these estimates can be drawn from the Commonwealth Government's Final Regulatory Impact Statement on this MEPS, which was published in May 2009.<sup>10</sup> In making this comparison, it should be borne in mind that NIEIR's estimates were prepared on a different basis to those commissioned by the Commonwealth Government.

<sup>9</sup> Australian Bureau of Statistics, "Environmental issues: energy use and conservation, 4602.2.55.001", March 2008

<sup>10</sup> Equipment Energy Efficiency, "Regulatory Impact Statement for Decision - Proposed MEPS for incandescent lamps, compact fluorescent lamps and voltage converters", 2009, available at , accessed 4/3/2010.

At the time the Commonwealth Government's modelling was conducted, tungsten filament lamps were widely available for sale and the MEPS had not yet been announced. Accordingly, the task at that time was to estimate the total impact of the MEPS. In other words, that modelling represents an estimate of the impact of replacing all non-compliant lamps in Australia with MEPS-compliant lamps (bearing in mind the time this will take and other factors).

This is not the same as the task that is required in the current context or that NIEIR undertook on behalf of the distribution businesses. The extent to which Australians have 'moved ahead of the MEPS' and installed energy efficient lamps in their homes should automatically be reflected in NIEIR's modelling of energy use, which is based on the observed actual energy use. Hence the task for the distribution businesses was to estimate the residual impact of the MEPS, i.e. how much *more* would the MEPS cause lighting energy use to decline during the regulatory period. Therefore it is to be expected that the distribution business's estimates of the impact of MEPS should be less than that contained in the RIS.

The Commonwealth Government's modelling is published on only an aggregated basis, with residential, commercial and industrial impacts rolled together. This does not lend itself to a direct comparison, so a reconstruction is necessary.

In estimating the impact of the MEPS on residential consumers, the Commonwealth Government estimated that, in 2005, the average Australian home used 684 kWh of electricity for lighting (annually). It also estimated that, if the 2005 lighting task was met entirely by MEPS compliant lamps (i.e. if the MEPS was introduced overnight), energy sales would reduce by 32.5%, thus, with the MEPS in full force, the average Australian home would use 222kWh less electricity for lighting than they would otherwise have used. Based on the ABS estimated number of households in Victoria

The implications of this estimate for residential electricity use are summarised in Table 7 below.

Table 7 **Comparison of lighting MEPS impact on residential electricity sales (GWh)**

	2011	2012	2013	2014	2015	2016
Projected number of households in Victoria (,000 households) <sup>1</sup>	2122	2155	2190	2225	2261	2297
Lighting energy use if no MEPS (GWh)	1451	1474	1498	1522	1546	1571
Lighting use with MEPS (GWh)	980	995	1011	1027	1044	1060
Reduction due to MEPS compliance (GWh)	472	479	487	495	503	511
Distribution business's forecast (aggregated GWh)	333	443	509	531	554	576
Difference (GWh)	-139	-36	23	37	51	65

*Data source:* NIEIR Electricity sales and customer numbers reports, ABS, Commonwealth Government and ACIL Tasman analysis

In its 2009 publication “Australian Demographic statistics”, the ABS estimated the number of households in Victoria at 2,088,114.<sup>11</sup> Using this as a starting point, Row 1 in Table 7 applies NIEIR’s estimated rate of dwelling growth rate of 1.5 per cent<sup>12</sup> to create a forward projection of the number of households in Victoria.<sup>13</sup> Rows 2 to 4 show estimates of Victorian residential lighting energy use based on the figures set out in the RIS.<sup>14</sup> Row 5 shows the aggregate distribution business savings based on the NIEIR projections. As the RIS figures are based on the assumption of an overnight introduction of the MEPS, it is only really the 2016 figures that are comparable, as NIEIR’s methodology allows for a transition until that time.

In 2016, the aggregate reduction in energy use estimated by the distribution businesses is almost 13% larger than the Commonwealth Government’s estimate (576 GWh compared to 511GWh). While the available detail concerning both sets of modelling is limited, ACIL Tasman notes that NIEIR’s methodology is based on an assumption that all lamp replacements due to the MEPS achieve an eighty per cent efficiency improvement. This is due to NIEIR’s assumption that the average ‘replacement’ is a 75W incandescent globe being replaced by a 15W compact fluorescent lamp. By contrast, the

<sup>11</sup> Australian Bureau of Statistics, “Australian Demographic statistics”, June 2009, available at: [http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/FB52766C453652E1CA25768000196B47/\\$File/31010\\_jun%202009.pdf](http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/FB52766C453652E1CA25768000196B47/$File/31010_jun%202009.pdf), accessed 24 March 2010.

<sup>12</sup> This rate is discussed in the various energy reports although it is only stated in the report to United.

<sup>13</sup> Note that the historical rate of growth in the ABS series is approximately 1.5%, about 10% slower than NIEIR’s forecast.

<sup>14</sup> i.e. 684 and 462 kWh per household before and after the RIS is introduced



Commonwealth Government took the possibility of tungsten halogen globes into account, with correspondingly smaller efficiency gains as a result.<sup>15</sup>

In summary, the distribution businesses have accepted that behaviour has moved ahead of policy to some extent whereas the Commonwealth Government RIS estimated total policy implementation impacts on energy use. Notwithstanding this, the distribution business estimates are more than 10% higher than the estimates relied upon by the Commonwealth Government in choosing to implement the MEPS in the first place. This suggests that the distribution businesses are likely to have overestimated the savings attributable to the lighting MEPS, at least relative to the Commonwealth Government's estimates.

In estimating the likely impact of the MEPS, the Commonwealth Government conducted modelling at a detailed level, taking the number of different types of lights installed in the average Australian home and distinguishing between different types of light. The estimated impact of the MEPS was on detailed lighting matrices for both residential and non-residential use. From these matrices, the Commonwealth Government made judgements as to the likely impact the MEPS would have on the amount of electricity used for lighting. This is a more detailed approach than NIEIR appears to have taken, based on richer, more detailed data. In light of this, ACIL Tasman recommends that, as a minimum, the impact of the lighting MEPS be constrained to no more than the impact estimated by the Commonwealth Government (noting that this remains likely to overstate of the impact as it does not take account of the tendency to 'move ahead' of the policy).

### 5.3 Mandatory Energy Performance Standards - air conditioning

NIEIR's stated forecast of the impact that the air conditioner MEPS will have on maximum demand is set out in Table 8.

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<sup>15</sup> The Commonwealth Government's RIS is based on what it describes as a 'residential lighting matrix that distinguishes between a number of different types of lamp such as reflector vs. non-reflector, switch circuit vs. dimmer circuit etc. Each category has a different assumption regarding the split of replacement globes between the available options. For further detail see appendix D to the RIS.

Table 8 **Estimated cumulative impact of air-conditioning MEPS on summer maximum demand (GWh)**

Impact (GWh)	2011	2012	2013	2014	2015
Residential sector	6.0	10.6	15.8	20.3	24.3
Commercial sector	2.5	4.5	6.8	8.7	10.4
Total	8.5	15.1	22.6	29.0	34.7

*Data source:* NIEIR maximum demand reports to the businesses

The distribution businesses have provided no information as to how this estimate was prepared although, as is discussed below, ACIL Tasman understands that NIEIR projects that air conditioning sales will grow at 4% per annum over the next regulatory period. The information that is available to ACIL Tasman is insufficient to reach a conclusion as to whether the forecast is reasonable or otherwise. However, in the broader context of this review, the forecast impact is not sufficiently large to warrant a more detailed analysis.

## 5.4 Standby power

The energy reports refer to a 1 watt standby target, the impacts of which are estimated using an approach based on the number of appliances, the average standby power of each and a number of other parameters. The appliances that are considered, and therefore those to which the distribution businesses have applied this target, are:

- Television
- Video player
- DVD player
- Microwave
- Stereo system
- Surround sound system
- Desktop computer
- Laptop/notebook computer
- Printer/scanner/fax
- Games console
- Washing machine

The forecast impact of the one watt standby target put forward in the current set of forecasts is shown in Table 9:

Table 9 **Annual incremental energy savings due to one watt standby target (GWh)**

Incremental impact - Victoria	2009	2010	2011	2012	2013	2014	2015	2016
Residential	0	0	24.85	49.69	49.69	31.18	12.19	9.34
Commercial	0	0	2.53	5.72	7.01	8.29	9.58	10.87

*Data source:* NIEIR Electricity sales and customer numbers reports to distribution businesses, tables 6.2 and 6.5 aggregated

ACIL Tasman notes that this is significantly lower than the estimates upon which VENCorp (now AEMO) relied in its 2009 Victorian Annual Planning Report. VENCorp reported that NIEIR estimated the impact of this target to start around 50GWh in 2011/12 increasing to 200GWh in 2018/19.<sup>16</sup>

ACIL Tasman understands that the estimates NIEIR provided to VENCorp were, in NIEIR's view, unreasonably high. ACIL Tasman understands that NIEIR now regards the underlying estimates for the VENCorp forecasts, which were prepared and provided to NIEIR by an independent party, as unreasonably high in terms of the number of appliances with standby mode in Victorian homes. The current set of forecasts, which NIEIR considers superior, was prepared independently of those provided to VENCorp.

ACIL Tasman is not aware of a single, comprehensive committed policy, of either the Commonwealth or Victorian Government, to introduce a mandatory requirement of this type. When this issue was discussed with the distribution businesses and NIEIR, they referred to a statement on the International Energy Agency's website that Australia has a one watt standby target<sup>17</sup>, but were otherwise unable to refer ACIL Tasman to an Australian policy of this kind.

ACIL Tasman is aware that there have been numerous attempts by various Governments to reduce the power used by domestic appliances operating in standby mode. A discussion of the history of a number of attempted and intended policies that contain one watt standby elements is set out on the energy rating website.<sup>18</sup> As is discussed on that website, there are MEPS either in place or under consideration for a number of the appliances listed above, some of which include standby power elements. For example:

- There is a MEPS for televisions in place at present. It has been foreshadowed that this will shift to 'tier 2' in 2012. Basically televisions

<sup>16</sup> "Victorian Annual Planning Report 2009" VENCorp, 2009, available at: <http://www.aemo.com.au/planning/v400-0017.pdf>

<sup>17</sup> See International Energy Agency, "Summary of Standby Power Regulatory Policies", available at <https://www.iea.org/subjectqueries/standby.asp>, accessed 11 March 2010.

<sup>18</sup> See <http://www.energyrating.gov.au/standby.html> and <http://www.energyrating.gov.au/standby-background.html>, both accessed 6 March 2010

can now only be sold if they meet at least 1-star. This does not control the standby power use directly, although clearly this is part of the star rating process (and it must be measured to comply with the standard).<sup>19</sup>

- There is a MEPS for set top boxes in place already. These can meet either a 1 or 2 watt standby requirement. If standby power usage is between 1 and 2 watts then the on mode power usage restriction is more stringent than that which applies to units with standby power of less than 1 watt.<sup>20</sup>
- There is a MEPS for external power supplies which requires that their standby mode power usage is below 0.75W (0.5W for supplies with lower power output)<sup>21</sup>

Given that it is unclear what policy is being modelled here, ACIL Tasman recommends that the electricity sales reduction attributed to this target should be disregarded. This view is strengthened by the fact that a number of MEPS with one watt standby components are already in place and are thus already influencing the data that feeds NIEIR's electricity sales model, which raises the risk of double counting if the current estimates are included as well.

## 5.5 Insulation target

On 19 February 2010, several months after the distribution businesses submitted their regulatory proposals, the Commonwealth Government discontinued its insulation rebate scheme. Prior to this, the Government's objective had been to see insulation installed in up to 1.9 million homes by 2011. Retaining this objective, in March 2010 the Government had announced its intention to repackage the earlier insulation scheme as a new household renewable energy bonus scheme with an insulation component that would come into operation by 1 June 2010.

NIEIR's energy forecasts were prepared on the basis of a rebate of up to \$1200 for home insulation. To estimate the energy savings that would result from this, NIEIR drew on ABS data showing that approximately three quarters of Victorian householders reported having insulation in their homes while another 19 per cent did not know whether or not their home was insulated. It estimated that insulating a home would reduce electricity use for heating and

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<sup>19</sup> The process is described in "Regulatory Impact Statement: Proposed Minimum Energy Performance Standards and Labelling for Televisions" Energy Efficient Equipment, 2009 available at: <http://www.energyrating.gov.au/library/pubs/200916-decision-ris-tvs.pdf>.

<sup>20</sup> See <http://www.energyrating.gov.au/stb2.html>

<sup>21</sup> See <http://www.energyrating.gov.au/eps2.html>

cooling by 35%. To take account of non-compliant installation and the rebound effect<sup>22</sup>, NIEIR discounted this impact by approximately 30%.

Based on these parameters, NIEIR estimated that the Commonwealth insulation target would cause electricity sales to fall below where they would otherwise have been by the amounts shown in Table 10 below.

Table 10 **Estimated impact on energy sales of Commonwealth insulation target (GWh)**

Year	2009	2010	2011	2012	2013	2014	2015
CitiPower	2.57	7.71	12.85	15.42	15.42	15.42	15.42
SP AusNet	5.42	16.26	27.1	32.52	32.52	32.52	32.52
Powercor	5.95	17.85	29.75	35.7	35.7	35.7	35.7
Jemena	2.7	8.1	13.5	16.2	16.2	16.2	16.2
United	5.62	16.85	28.08	33.7	33.7	33.7	33.7
Total	22.26	66.77	111.28	133.54	133.54	133.54	133.54

Data source: NIEIR, Electricity sales and customer numbers reports, table 6.2

As a point of comparison, the Sustainable Energy Authority of Victoria (SEAV) has estimated that insulating a home can save between 45 and 55 per cent of heating and cooling energy.<sup>23</sup> SEAV has also stated that energy used for heating and cooling accounts for almost 60% of the energy Victorians use, although a significant portion of this is gas rather than electricity.

The Department for Environment, Water, Heritage and the Arts published estimates of the total electricity used for heating and air conditioning in Victorian homes along with the number of homes. These data suggest that 1,305 GWh of electricity is used in Victoria for heating and air conditioning. Based on this data, ACIL Tasman calculates that NIEIR's insulation rebate impact is consistent with approximately 10% of Victorian homes (slightly over 215,000) being insulated as a result of the Commonwealth program, which is also consistent with what might be expected on a population share basis.

ACIL Tasman considers that the uncertainty surrounding this policy is such that there is a very real possibility either that it will not go ahead or that the Government's desire to improve the energy efficiency of Australian homes will manifest itself in a different way, excluding insulation.

ACIL Tasman regards this is distinct from the issue of a broader carbon emissions reduction policy, which is supported in concept by both the government and the federal opposition, although the particular means of

<sup>22</sup> Rebound occurs when, having installed insulation, the householder chooses to increase comfort levels rather than take all of the saving in the form of reduced energy bills.

<sup>23</sup> [http://www.sustainability.vic.gov.au/resources/documents/Insulation\\_benefits.pdf](http://www.sustainability.vic.gov.au/resources/documents/Insulation_benefits.pdf)

achieving it (i.e. the CPRS) is not. In considering this issue, ACIL Tasman is not aware that the opposition parties have made any commitment that they will support an amended insulation rebate scheme or that they would choose this path to improving the energy efficiency of Australian homes (either in opposition or in government). Further, ACIL Tasman notes that the widespread reporting of the injuries and loss of property linked with this policy may cause people to be more reluctant to install insulation in their homes than they were to begin with. The high degree of uncertainty around the future of subsidised insulation suggests that it should be excluded from the forecasts.

## 5.6 Photovoltaics

This review is being conducted at a time when, for a number of reasons, solar panels are very popular with Australian householders. A review of the advertisements encouraging Victorians to install solar panels on their roofs indicates that Victorians, or at least those who market products to them, see solar panels as providing benefit in terms of energy security, cost reduction and avoiding greenhouse gas emissions. The Victorian Government has chosen to encourage the uptake of solar panels by offering a premium ‘feed-in’ tariff to households who install them. This tariff guarantees Victorians who install solar panels and export the electricity they generate to the grid a guaranteed minimum of 60c/kWh for that electricity (equivalent to \$600/MWh).

In addition to the premium solar feed-in tariff, Victorians (and other Australians) who install solar panels can participate in the expanded Renewable Energy Target (RET) scheme by creating and selling Renewable Energy Certificates (RECs). These go some way to offset the upfront cost of the solar panel.

During the course of this review, the Commonwealth Government announced that it was adjusting the RET scheme. In terms of solar panels, the effect was that the risk of REC price variability was reduced as householders will now be paid a fixed amount per REC.

The take up of solar panels is potentially significant for distribution businesses. To the extent that electricity is generated and used at the same location within a residence, it reduces the amount of electricity that each business will be required to transfer on its network. Where electricity generated is exported to the network, it becomes part of the total energy transported by the network. As distribution charges are based on electricity transferred to each billing meter, the energy to be transported by the distribution business includes the portion eligible for the feed in tariff, namely the quantity exported from each house with an installed solar panel.

Based on the policy frameworks as they existed at the time the forecasts were prepared, the distribution businesses expect that solar panels will be installed in Victoria in coming years at the rates shown in Table 11, although neither NIEIR, nor the distribution businesses, have provided any information as to the basis for this expectation. Given this rate of installation, NIEIR and the distribution business expect that the impact on electricity sales will be as set out in Table 11.

Table 11 **Take-up and impact of solar panels in Victoria**

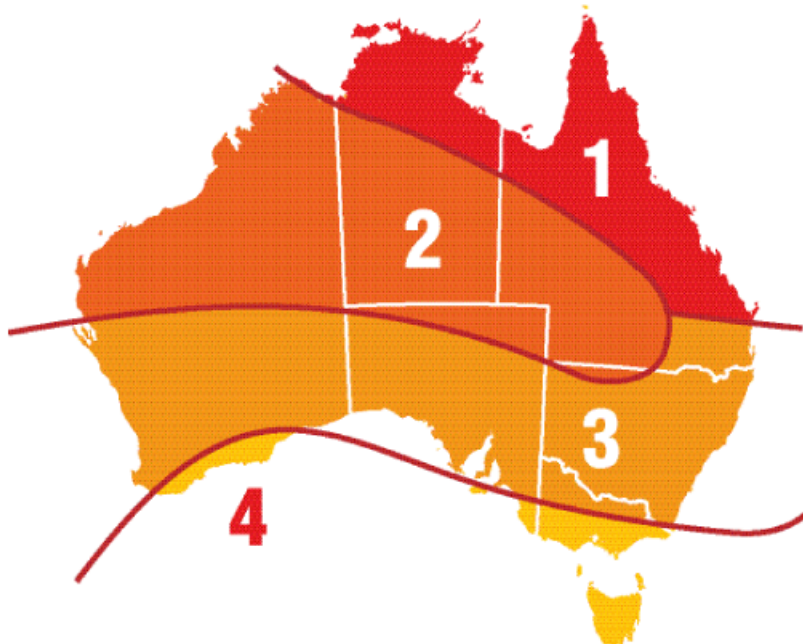
Year (fin year ending June)	2009	2010	2011	2012	2013	2014	2015
Annual panels installed (Vic)	10000	14000	5000	5000	5000	4000	3000
CitiPower (GWh)	1.13	2.03	2.5	2.97	3.39	3.72	3.96
SP AusNet (GWh)	2.38	4.27	5.26	6.25	7.14	7.84	8.34
Powercor (GWh)	2.62	4.69	5.78	6.87	7.85	8.61	9.16
Jemena (GWh)	1.19	2.13	2.63	3.13	3.58	3.93	4.18
United (GWh)	2.47	4.43	5.46	6.49	7.42	8.14	8.65
<b>total (GWh)</b>	<b>9.79</b>	<b>17.55</b>	<b>21.63</b>	<b>25.71</b>	<b>29.38</b>	<b>32.24</b>	<b>34.29</b>

Data source: NIEIR, Electricity sales and customer numbers reports to the distribution businesses, table 6.14

NIEIR's report contains a table indicating that its forecasts assume that solar panels in Victoria will generate 1.2 MWh per annum for each kW of installed capacity. This is consistent with the factor used by ORER for zone 4<sup>24</sup>, which includes about half of Victoria but most of the population (see Figure 9 below). The same table shows NIEIR calculations indicating that, of this 1200 kWh, 680kWh will be used in the home.

<sup>24</sup> In fact ORER's factor is 1.185.

Figure 9 **Map of REC zones for photovoltaic cells**



Source: <http://www.ecosmart.com.au/RECs.html>, accessed 10 March 2010

A point of comparison with the assumed rate of take up is available from the Department for Water, Heritage and the Arts (DEWHA), which publishes data concerning the number and capacity of solar panels for which it grants rebates under the Solar Homes and Communities program and its predecessors.<sup>25</sup>

Table 12 **Solar panels installed in Victoria, 2001/02 to present**

financial year	past installs (# systems)
2000	429
2001	267
2003	250
2004	240
2005	257
2006	295
2007	684
2008	1617
2009	11864
2010	2853
Total	18756

Data source: DEWHA

<sup>25</sup> The data is available from <http://www.environment.gov.au/sustainability/renewable/pv/history.html>



The data in Table 12 suggest that the distribution businesses have slightly underestimated the number of solar panels installed in Victoria in 2009. While the forward estimates beyond 2010 are significantly above the experience prior to 2008/09, the policy environment is likely to be substantially different as well. Accordingly, ACIL Tasman does not regard the distribution business's estimated number of solar panels, or their impact on energy sales, as unreasonable.

## 5.7 Residential building standards – 5 and 6 star

New homes built in Victoria are required to meet a 5 star energy efficiency standard and there is some suggestion that COAG may move to increase this to a 6 star minimum performance standard. For the purposes of forecasting maximum demand, the businesses have assumed that this change will happen in 2012 and have estimated a modest reduction in electricity sales as a result.

This measure would only be relevant for newly constructed homes and is thus limited to a very small portion of overall electricity sales. Its estimated impact is well within a reasonable degree of forecast accuracy. It also needs to be considered in the context of trends for larger homes which, while more energy efficient, may nonetheless be large enough to have increasing, rather than decreasing, demand for electricity.

## 5.8 VEET

The Victorian Energy Efficiency Target, VEET, is a white certificate energy efficiency trading scheme. It places an obligation on energy retailers (electricity and gas) to deliver a certain quantity of energy efficiency improvements in the community. They satisfy this obligation by surrendering Victorian Energy Efficiency Certificates, which are created when one of the 'prescribed activities' is carried out in a Victorian home.

There are currently six categories of prescribed activity, namely:<sup>26</sup>

1. "Water heating - decommissioning of low efficiency water heating products and the installation of high efficiency water heating products. This category also includes the installation of solar pre-heaters or solar retrofit kits.
2. Space heating - decommissioning of low efficiency ducted heating products and the installation of high efficiency ducted heating products, and the installation of high efficiency space heating products.

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<sup>26</sup> Essential Services Commission,  
<http://www.esc.vic.gov.au/public/VEET/Prescribed+Activities.htm>

3. Space conditioning - installation of insulation, thermally efficient windows and weather sealing products.
4. Lighting – installation of low energy lamps.
5. Shower rose - decommissioning of non-low flow shower rose and the installation of low flow shower rose.
6. Refrigerators/freezers – purchase of high efficiency refrigerator or freezer (refrigerator purchase) and destruction of pre-1996 refrigerator or freezer (refrigerator destruction)”

Many of these activities overlap with other policies considered separately in preparing the current set of energy forecasts. For example, the lighting requirements are similar to the lighting MEPS and the water heating activity is similar to the phase out of electric resistance water heaters.

The distribution businesses have not provided sufficient information concerning how the VEET impacts were estimated to enable ACIL Tasman to reach a conclusion as to whether these estimates are reasonable. ACIL Tasman notes that, due to the overlap between the prescribed activities and other policy measures, the distribution business’s forecasts of the impact of VEET have been weighted down substantially to a level where they are modest.

Table 13 **VEET estimates in energy terms (GWh) and as a percentage of ‘policy free’ forecasts – all cumulative**

Year	2011	2012	2013	2014	2015
CitiPower	5.72	7.8	9.88	12.48	14.04
	0.42%	0.56%	0.70%	0.88%	0.98%
Jemena	13.23	18.04	22.85	28.86	32.47
	0.46%	0.61%	0.77%	0.96%	1.07%
Powercor	13.23	18.04	22.85	28.86	32.47
	0.36%	0.50%	0.63%	0.81%	0.92%
SP AusNet	12.05	16.43	20.81	26.29	29.58
	0.35%	0.48%	0.61%	0.78%	0.87%
United	12.49	17.03	21.57	27.25	30.66
	0.41%	0.56%	0.71%	0.89%	1.00%
Total	56.72	77.34	97.96	123.74	139.22

Data source: NIEIR, Electricity sales and customer numbers reports to the distribution businesses, tables 6.2 and 7.1

## 5.9 Hot water standards

Water heating is the second largest energy user in Australian households, accounting for about 23% of total use in the average Australian house and a

similar amount in Victorian houses.<sup>27</sup> In July 2009 the Council of Australian Governments agreed to implement a national process to phase out electric resistance water heaters from 2010.<sup>28</sup>

This will have two impacts on electricity distributors:

1. Given the widespread availability of gas in Victoria, it is likely that, as the existing stock of electric resistance water heaters fail, they will be replaced with gas alternatives. In some cases these will be solar boosted, but in any event the majority of water heaters installed over the coming regulatory period are likely to use no electricity.
2. In some cases electric water heaters will still be used including:
  - in areas where gas is unavailable,
  - where the user chooses a solar boosted electric system
  - where the specifics of the application prevent non-electric options from being used.

However, in these cases, the efficiency of the typical electric water heater will be significantly higher than has previously been the case with the result that electricity sales will fall.

To account for this policy, NIEIR's methodology reduces electricity sales each year in an amount based on its understanding of the number of electric resistance water heaters in place and their effective life (6.7% per annum, consistent with a 15 year life). Where electricity is 'removed' from the model for this reason, only 7% of the original volume is retained, to account residual electricity usage by the replacement heaters. In effect, this amounts to removing 6.2% of the electricity used for water heating every year.

The result of this process is that the distribution business's energy forecasts are lower than they would have been without the policy by the amounts shown in Table 14 below.

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<sup>27</sup> Department of Primary Industries, <http://www.new.dpi.vic.gov.au/energy/energy-policy/energy-efficiency/water-heaters>, accessed 26 March 2010.

<sup>28</sup> This was one of the actions in the National Partnership Agreement on Energy Efficiency, which COAG signed at its 27<sup>th</sup> meeting on 2 July 2009 in Darwin, see [http://www.coag.gov.au/coag\\_meeting\\_outcomes/2009-07-02/index.cfm#tabs](http://www.coag.gov.au/coag_meeting_outcomes/2009-07-02/index.cfm#tabs).

Table 14 **Estimated impacts of hot water heater phase out on electricity sales by distribution region (GWh)**

	2011	2012	2013	2014	2015
<b>Residential</b>					
CitiPower	1.0	2.1	2.9	3.7	4.4
SP AusNet	0.0	0.0	0.0	0.0	0.0
Powercor	12.7	24.5	35.5	45.8	55.4
Jemena	2.1	4.0	6.0	7.9	9.7
United	7.3	14.1	20.6	26.7	32.2
Sub total	23.1	44.7	65.1	84.1	101.6
<b>Commercial</b>					
CitiPower	4.3	6.0	7.7	9.4	11.1
SP AusNet	6.4	8.9	11.4	14.0	16.5
Powercor	8.9	12.5	16.0	19.6	23.1
Jemena	3.5	4.9	6.3	7.7	9.0
United	5.0	7.0	9.0	11.0	13.0
Sub total	28.0	39.2	50.4	61.6	72.8
<b>Total energy</b>					
CitiPower	5.3	8.0	10.6	13.1	15.5
SP AusNet	6.4	8.9	11.4	14.0	16.5
Powercor	21.6	36.9	51.5	65.4	78.5
Jemena	5.6	8.9	12.3	15.6	18.7
United	12.3	21.1	29.6	37.7	45.2
total	51.1	83.9	115.5	145.7	174.4

Data source: NIEIR Electricity sales and customer numbers reports, tables 6.2 and 6.5

ACIL Tasman notes that, in the 2009 VAPR, VENCORP reported NIEIR as having estimated the impact of hot water standards to be around 115 GWh in 2010/11 rising to 1010 GWh by 2018/19. This is quite a different forecast to that which the distribution businesses provided through the RIN templates.<sup>29</sup> In discussions with NIEIR, ACIL Tasman was told that this reflected limitations in the data available at the time NIEIR prepared the forecasts for VENCORP and that NIEIR regards the forecasts the distribution businesses have put forward as being superior to those prepared for VENCORP.

Subsequently, ACIL Tasman was told that the information the distribution businesses provided (and that was, in turn, provided to each of them by NIEIR) did not actually reflect the forecast impact of this policy. Specifically, tables 6.2 to 6.7 in NIEIR's reports to the businesses purport to set out the impact that NIEIR estimates that each policy will have on total energy sales in

<sup>29</sup> "Victorian Annual Planning Report 2009" VENCORP, 2009, available at: <http://www.aemo.com.au/planning/v400-0017.pdf>

the residential and commercial sectors and on summer and winter peak demand in both of these sectors.

The report to SP AusNet is unique in that it indicates that the phase out of electric resistance water heaters will have no impact on energy sales in SP AusNet's region. ACIL Tasman sought clarification of this issue from SP AusNet and was advised that the numbers in table 6.2 purporting to relate to the phase out of electric resistance water heaters do not reflect NIEIR's estimate of the impact of this policy on total energy sales for any of the distribution businesses.

NIEIR then advised that this particular row of table 6.2 should be read as zero for each of the distribution businesses in terms of incremental impacts on the energy sales forecasts because as a function of the NIEIR model the policy impact was built into the base forecast.

NIEIR however did not provide any description of how the numbers in table 6.2 were calculated or what they represent. It was not made clear whether this retraction of the figures in table 6.2 is applicable to the estimate of the impact of this policy on total commercial energy sales (which is presented in a different table in the reports).

By applying the methodology that NIEIR described in reverse and 'backing out' from the numbers in table 6.2, the estimated impact of the hot water phase out (that has now been withdrawn) implies that, before the policy was introduced, the total residential use of electricity for water heating in the residential sector in the four distribution regions of Victoria other than SP AusNet's distribution region was approximately 330GWh per annum.<sup>30</sup>

The Department for Environment, Water, Heritage and the Arts reports that the total electricity used for residential water heating in Victoria in 2009 was 1750 GWh. This is approximately 3 MWh when averaged across the number of households estimated to have electric water heating.<sup>31</sup> This is roughly consistent with modelling conducted by Energy Consult for Sustainability Victoria in 2009, which estimated electricity use for water heating at approximately between 2.7 MWh and 4.9 MWh per annum.<sup>32</sup> It is also

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<sup>30</sup> This is calculated by taking the annual change in the residential impact (i.e. the differences between columns in the residential sub-total row) and dividing by 6.2% (i.e. the rate at which NIEIR advised ACIL Tasman that its forecast of hot water electricity use declines). The average of these values is 328 GWh.

<sup>31</sup> DEWHA estimates this at 27.4% for 2009

<sup>32</sup> The estimates were: small users (approx 120l/day) 2,767 kWh for continuous and 3,113 kWh for off peak; medium users (approx 200l/day) 4,410 kWh continuous, 4,745 off peak and 4,864 dual element.

consistent with ACIL Tasman's experience in modelling hot water system usage being a little less than 3 MWh per annum on average.

The substantial difference between these two figures (i.e. 330 and 1750 GWh per annum) is consistent with NIEIR's advice that the hot water row in table 6.2 does not reflect the likely impact of this policy.

In light of this, ACIL Tasman cannot comment on the reasonableness or otherwise of the distribution business's estimates of the impact of the phase out of electric resistance water heaters.

## 5.10 Advanced Metering Infrastructure

The Ministerial Council on Energy has committed considerable effort in recent years to analysing the potential benefit of introducing advanced metering infrastructure, or 'smart meters'. The Victorian Government committed to rolling out smart meters across the State, starting in 2009 and finishing in 2013. Each distribution business has its own rollout plan.

On Monday, 22 March 2010, towards the end of ACIL Tasman's review of the electricity sales forecasts, the Victorian Government announced a moratorium on the smart meter roll out. At the time of writing, there was limited detail concerning the Government's plans for the roll out. It appears most likely that the meters themselves will continue to be installed, perhaps on a delayed timeframe, but that time of use tariffs will not be permitted until a later stage. From an energy forecasting point of view it is the tariffs, not the meters themselves, that are relevant so, for these purposes, the moratorium amounts to a delay in the impact of smart meters.

The basis for introducing smart meters is that they will increase the (economic) efficiency of electricity consumption by allowing consumers to be charged tariffs that reflect the cost of supplying electricity on a time of use basis. While the economic theory that underpins this is relatively uncontroversial, there are a number of reasons why time of use meters have not been adopted in Australia to date. These include equity concerns and questions over the net benefit of changing to smart meters given that the existing stock of meters, while otherwise functional, is not capable of supporting time of use tariffs.

The next section (5.10.1) reviews previous studies that have been conducted into the impact of smart meters and time variable tariffs are likely to have on electricity sales. This is followed by a discussion (5.10.2) of the impact that the businesses (other than SP AusNet) estimate that the smart meter rollout will have on their electricity sales. Next, ACIL Tasman provides an assessment of these estimates in section 5.10.3. We separately discuss the impact of smart

meters in relation to SP AusNet's forecasts in section 5.10.4. Section 5.10.5 provides a recommended way forward for the AER.

References to “the distribution businesses” in relation to the impact of AMI should be read to exclude SP AusNet, which performed its own estimates on a different methodology and which ACIL Tasman evaluated separately.

### 5.10.1 Advanced Metering Infrastructure – past studies

By comparison to a traditional ‘anytime’ tariff, a typical time of use tariff structure would be higher during the afternoon and early evening, when peaks in demand occur, and lower at other times. Generally speaking, this tariff structure would be expected to induce two effects, namely load reduction and load shifting. Load reduction would be driven by the price elasticity of demand for electricity at peak times, whereas load shifting is driven by the cross price elasticity of demand for electricity between peak and off peak times.

While a detailed review of this literature is beyond the scope of the current project, it is worth making some general observations about the studies that have been conducted and their results.

#### The relevance of trials

Before turning to a discussion of the structure and results of individual trials, it is worth making a few comments about the shortcomings of trial based studies. In a paper reviewing a number of Australian trials on behalf of the Consumer Utilities Action Centre, Dr Chris Riedy from the Institute for Sustainable Futures at the University of Technology, Sydney, made the following comments, applicable to all the trials of interval metering that have been conducted in Australia:

First, the trials are voluntary and there are no penalties for opting out of the trial. Second, participants often receive incentive payments that offset any increases in bills. Third, some trials have excluded customers with payment difficulties so that there is no risk that these customers will experience an increase in hardship. Fourth, meters and associated equipment (including in-house displays) are provided at no cost to the customer. Finally, tariffs seem to have been set so that most customers will experience only small increases in bills even if they do not change their behaviour.<sup>33</sup>

In Riedy's view, these are appropriate characteristics of trials. While this may be the case, it should be noted that trials with these characteristics are likely to yield different results than would be expected in the ‘real world’.

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<sup>33</sup> Riedy, C. “Interval Meter Technology Trials and Pricing Experiments”, p.vi available at <http://www.isf.uts.edu.au/publications/riedy2006intervalmeters.pdf>, accessed 29 March 2010

The ‘real world’ contains a proportion of people who see little or no net benefit in reducing their energy use. Whenever a trial is conducted using volunteers as subjects, it is unlikely that volunteers will include representatives from this group of energy users. In trials which are ‘opt out’, it is more likely that this group will take that option. Trials are unlikely to reflect the impact of an environmental policy on these people.

Hence trials of this kind tend to exaggerate the incentives applying to subjects, because trial participants are more inclined to try to reduce their energy use regardless of the trial and even more likely to do so when given the assistance that comes with the trial itself.

### AMI studies – nomenclature

The tariff structures that have been studied and trialled can be broken into two groups, namely critical peak price (CPP) trials and time of use tariff (TOU) trials.

A typical CPP trial is based on the idea that a small number of critical peak events will occur each year. The number varies from study to study, but typically there are not permitted to be more than about ten. When a critical peak event is anticipated, consumers are told that the critical peak price will apply. This is typically much higher than the ‘anytime’ price. Again, the scale varies from study to study, but a multiple of five or ten times is not uncommon. Affected customers are typically informed of the CPP event the day before it will occur, usually by SMS or email although in some cases there may also be telephone calls.

By contrast to a CPP structure, a TOU tariff applies every day (or perhaps every working day). There are typically two or three components to the tariff, peak, shoulder and off peak and the typical variation in tariff from peak to off peak is less than three times. There is usually a different peak timeframe in summer than winter and, in some cases, a different set of tariffs as well.

### Country Energy Critical Peak Pricing trial

Country Energy’s trial commenced in December 2004 and ran for 18 months.<sup>34</sup> Smart meters and in-home displays were installed in the homes of about 200 participants in Queanbeyan and Jerrabomberra. Tariff levels were as follows:

- **Off Peak:** 0.0703 cents/kWh
- **Shoulder:** 0.127 cents/kWh

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<sup>34</sup> Faruqui et al, “The impact of informational feedback on energy consumption – a survey of the experimental evidence”, Energy Volume 35, Issue 4, April 2010, Pages 1598-1608



- **Peak:** 0.1887 cents/kWh
- **Critical Peak:** 0.3774 cents/kWh

Critical peak events could only be called with at least two hours notice and could not be called more than 12 times per year. They were called when the load on the network was reaching maximum capacity or when NEM prices were high. Energy Futures Australia reports that Country Energy's experience was that energy consumption reduced during the peak periods but increased again afterwards. On one day, the peak in demand occurred later in the evening than normal, outside the critical peak period.

In terms of the impact on energy consumption in total, Faruqui et al cite private communications with Country Energy and say that that customers in the trial experienced median energy savings of 8% over a twelve month period.<sup>35</sup> Riedy<sup>36</sup> cites an article the Business Review Weekly by Searle on an unspecified date in 2006 entitled "Getting Smart" BRW as saying that participants in the trial reduced their energy usage by 5% on average.

### Energy Australia study

Energy Australia's strategic pricing study was conducted in New South Wales in 2006-07. 750 residential and 550 business customers took part. All of these had a smart meter, some with an in-house display. A public report of the results of this study is understood to be under development, although ACIL Tasman is not aware that it is yet available. The published information that is available regarding Energy Australia's review is relatively limited.

The study was set up with a control group (without a smart meter) and the following treatment groups<sup>37,38</sup>:

1. A group with a smart meter but no time of use tariff (i.e. information only)
2. A group on seasonal TOU tariffs
3. A group on medium (\$1/kWh) critical peak pricing tariffs (referred to in the study as Dynamic Peak Pricing or DPP)<sup>39</sup>

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<sup>35</sup> Ibid.

<sup>36</sup> Riedy, op cit, p. 16

<sup>37</sup> Sustainability First, "International Smart Meter Trials selected case studies smart tariffs and customer stimuli", May 2008, available at <http://www.sustainabilityfirst.org.uk/publications.htm>, accessed 24 March 2010.

<sup>38</sup> Energy Market Consulting associates, "Smart Meter Consumer Impact: Initial Analysis a report to the Ministerial Council on Energy standing committee of officials", April 2009, available online at [http://www.ret.gov.au/Documents/mce/emr/smart\\_meters/default.html](http://www.ret.gov.au/Documents/mce/emr/smart_meters/default.html), accessed 15 March 2010.

<sup>39</sup> EMC<sup>a</sup> describes this as the low dynamic peak price tariff

4. A group on a high (\$2/kWh) critical peak pricing tariffs with an in-house display
5. A group on a high (\$2/kWh) critical peak pricing tariffs without an in-house display

The \$2/kWh DPP high tariff is one of the highest multiples set in any CPP tariff worldwide.<sup>40</sup>

In terms of the results, EMC<sup>a</sup> and Sustainability First report that there was a significant reduction in energy consumption of between 5% and 7% on DPP days, which represents conservation, not load shifting. This is consistent with the report by Sustainability First, which refers to savings of between 5.5% and 7.8%. NIEIR's energy reports to the business refer to the savings observed in this study as being between 6% and 8%, which is also consistent.

By contrast, Faruqui and George report that the reduction in dynamic peak consumption by customers on DPP high rates and DPP medium rates was 24 and 20 per cent respectively.

It is critically important to note that, at most, Energy Australia's trial enables it to call up to 12 critical peak events per year, no more than four times per month and no more than once per day.<sup>41</sup> Given this, while energy reductions are of the order of six to eight per cent during critical peak events, it does not follow that this is the amount by which electricity sales will be reduced throughout the year. On the contrary, using these metrics, at most the annual energy reductions would be expected to be much less than one percent.

#### **AMI study – Integral Energy**

Integral Energy conducted a study in Western Sydney beginning on 1 August 2006 and running for at least two years.<sup>42</sup> In the trial, more than 900 residential customers, who are understood to have been volunteers, had interval meters installed. These customers were priced into one of three treatment groups and were given either a seasonal time of use tariff, or a dynamic peak price. Of the customers subject to a Dynamic peak price, some had in home displays while others did not.

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<sup>40</sup> Energy Futures Australia, "Advanced metering for energy supply in Australia", report prepared for the Total Environment Centre, available at <http://www.tec.org.au/reports-and-submissions/393-reports-and-submissions>, accessed 29 March 2010.

<sup>41</sup> Riedy, C. op cit, p.21.

<sup>42</sup> Nominally the trial ended after two years although most customers opted to stay on the 'treatment' tariffs.

The seasonal TOU tariff was such that peak time prices were approximately triple off peak prices. Peak prices applied from 1:00pm until 8:00pm in the summer months and from 5:00pm to 7:00pm in the winter months.

The dynamic peak price was around fifteen to twenty times the off peak price and was applied on a small number of days with advance warning given either the morning of the peak day or the night before. Customers on the dynamic peak price model also paid a higher price for energy consumed between 1:00pm and 8:00pm on working days.

All customers were given access to an online mechanism to monitor their energy usage.

In terms of the results, the time of use tariff group used more energy in the last 18 months of the trial than the control group. Specifically, the STOU group used 2.7% more energy in peak times and 3.7% more in total. Integral has noted that this group started out using 6% more energy than the control group, which implies that their energy use actually fell during the trial.<sup>43</sup> This observation stresses the importance of controlling for sample selection bias in conducting trials, as is discussed in section 2 above and in further detail below. The evidence suggests that the CPP trials were effective in reducing peak demand, as is seen by the following charts.

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<sup>43</sup> EMC<sup>a</sup> op cit, p.31



Figure 10 **Integral energy preliminary trial results - average load profiles for control and treatment groups for 11 January 2007<sup>44</sup>**

### Hot Summer Day

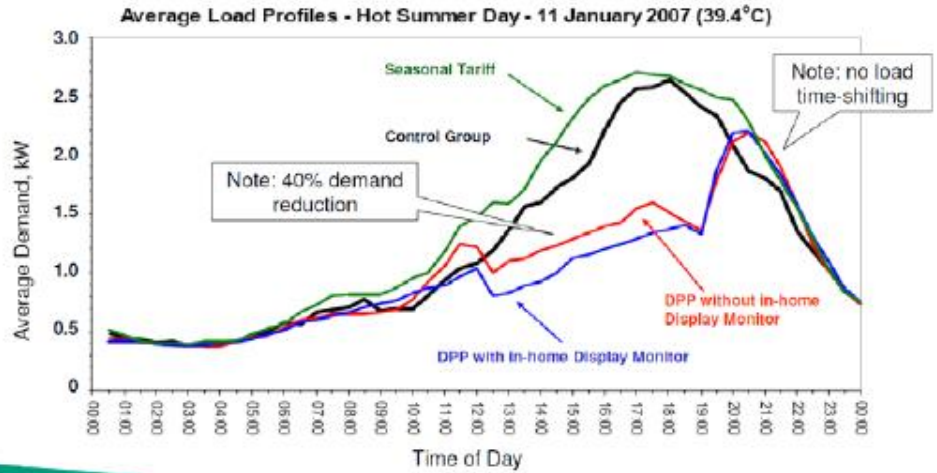


Figure 11 **Integral energy preliminary trial results - average load profiles for control and treatment groups for three consecutive days in December 2008<sup>45</sup>**

### 3 days in a row

29<sup>th</sup> 32.0 deg C  
30<sup>th</sup> 33.7 deg C  
31<sup>st</sup> 33.7 deg C

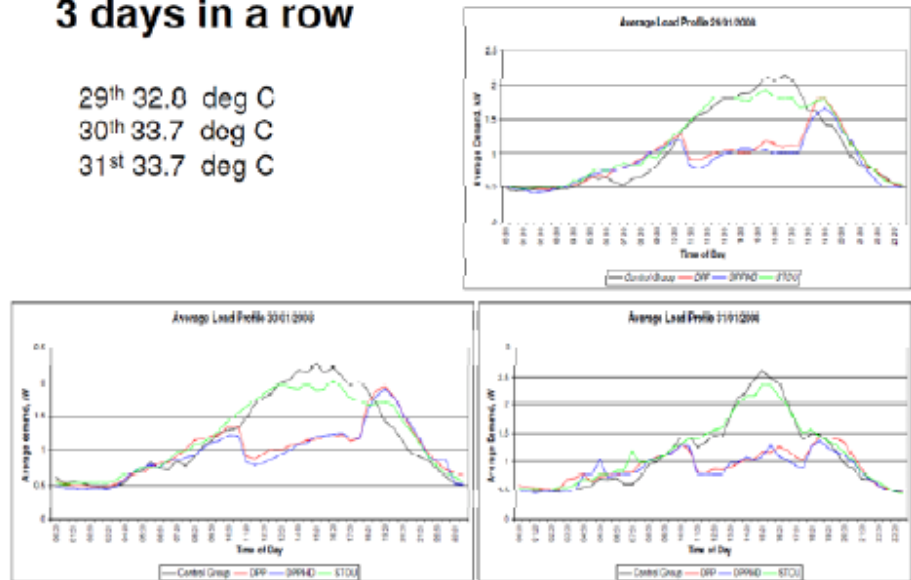


Figure 10 and Figure 11 show the impact that a CPP tariff structure can have on energy consumption at times of peak demand. In the first case, the data relates to a single day in January 2007. Even more interesting is the result over

<sup>44</sup> EMC<sup>a</sup>, op cit, p29

<sup>45</sup> EMC<sup>a</sup>, op cit, p30

a sustained period of three days shown in Figure 11. While these trial results are subject to the shortcomings discussed above, they provide some evidence that it is possible to achieve demand reductions by implementing CPP tariff structures. However, given the limit on the number of CPP events that may be called each year (in this case, as in Energy Australia's case, no more than 12 each year), the trial does not suggest that this type of reduction in energy consumption could be sustained for a whole year.

### Other studies

A number of other studies into the potential impact of time of use and CPP tariff structures have been conducted going as far back as the 1970s, with a resurgence following the Californian power crisis of 2000/01.<sup>46</sup> A brief comparison of a number of these studies is set out in appendix B below. A more detailed consideration is provided in a number of papers authored by Ahmad Faruqui of the Brattle Group, in particular Faruqui et al, 2008.

A number of observations can be distilled from these studies. Key among these are the observations that:

- Demand for electricity is inelastic in the short run
- There is some evidence to support a 'fatigue' effect
- Demand by business customers is less elastic than demand by residential customers
- CPP tariffs initiate a larger response than TOU tariffs.

As a general proposition, the studies have tended to agree that demand for electricity is relatively inelastic in the short term. This reflects a number of factors, notably that it takes time for appliances to reach the end of their useful lives and be replaced and that the increases associated with time of use tariffs are typically not large enough to warrant abandoning appliances before this time. There is also likely to be learning delays, exacerbated by the time delay between when the consumer makes their consumption (i.e. when they operate the appliance in question) and when they receive their electricity bill.

Another characteristic that emerged from some trials, in particular those with TOU tariff structures, was that changes were temporary. The most stark example of this was observed in the Californian state wide pricing trial, where the TOU group demonstrated a reduction in peak period energy use of almost 6%, which then fell almost to zero in the second year.<sup>47</sup> This suggests that, once the initial novelty of the time of use tariff has worn off, or once the

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<sup>46</sup> Faruqui, A. and S. Sergici, "Household response to dynamic pricing of electricity a survey of seventeen pricing experiments", 10 January 2009.

<sup>47</sup> Faruqui, A. and Sergici, S. *ibid*, p15

customer notices that the increases in their electricity bill are not as dramatic as they feared they might be, their interest in reducing energy during higher price periods wanes.

A third characteristic that emerged from a number of studies is that business demand is less elastic than domestic demand. In many cases, the estimates of business demand were not distinguishable from zero. This is contrary to the general principle usually applied in Australia, that residential customers have lower elasticities.

The final key characteristic is that CPP tariffs generate a much larger response than TOU tariffs. While this result emerged from practically all studies that compared the two, this issue was summarised most directly by Energy Futures Australia, which said that:

A tentative conclusion from the results of CPP trials carried out in several countries is that a price differential of about 10 times between the critical peak price and the off-peak price is required to achieve significant and firm peak load reductions.<sup>48</sup>

#### **5.10.2 AMI - distribution business's estimated impact on electricity sales**

With the exception of SP AusNet, the distribution businesses put forward estimates of the impact of the AMI rollout that were prepared on the same basis.<sup>49</sup> The energy reports state that, when the AMI rollout is complete, Victoria's energy consumption will be 8 per cent less than it would otherwise have been.<sup>50</sup> This estimate is based on a judgement based review of a number of studies and trials that have been conducted in Australia and overseas. In particular, the judgement is based on NIEIR's observation that this was the result in the Energy Australia study, which it considers to be "the most relevant and local study".

The result is that the distribution businesses propose that the impact of AMI metering on total energy sales will be as set out in Table 15 below.

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<sup>48</sup> Energy Futures Australia report for the Total Environment Centre, available at <http://www.tec.org.au/reports-and-submissions/393-reports-and-submissions>, accessed 29 March 2010.

<sup>49</sup> All reference to the distribution businesses in relation to smart meters should be taken to exclude SP AusNet.

<sup>50</sup> In analysing the business's regulatory proposals and NIEIR's reports, ACIL Tasman has been unable to replicate the 8 per cent figure. From the analysis that has been possible, it appears more likely that, contrary to a literal interpretation of the energy reports, the estimates are based on an 8% reduction in electricity sales to customers who will receive a smart meter, i.e. any customer whose consumption is greater than 160 MWh per annum is excluded.

Table 15 **Estimated impact of AMI rollout on energy sales by distribution region**

	2011	2012	2013	2014	2015	2016
<b>Residential</b>						
CitiPower	11.4	40.4	72.4	89.2	91.5	91.5
Powercor	26.5	93.5	167.6	206.4	211.7	211.7
Jemena	12.0	42.5	76.1	93.8	96.2	96.2
United	25.0	88.3	158.2	194.8	199.8	199.8
sub-total	74.9	264.6	474.3	584.2	599.2	599.2
<b>Commercial</b>						
CitiPower	7.0	24.9	44.6	54.9	56.3	56.3
Powercor	6.2	21.8	39.1	48.2	49.4	49.4
Jemena	2.7	9.4	16.8	20.7	21.2	21.2
United	6.5	22.8	40.9	50.3	51.6	51.6
sub-total	22.3	78.9	141.3	174.1	178.5	178.5
<b>total</b>	<b>97.2</b>	<b>343.5</b>	<b>615.7</b>	<b>758.3</b>	<b>777.7</b>	<b>777.7</b>

Data source: NIEIR, Electricity sales and customer numbers reports, tables 6.2 and 6.5 aggregated

In terms of total electricity residential sales for each business, the estimated impact of the AMI rollout is as set out in Table 16.

Table 16 **Estimated AMI impact as a percentage of total residential electricity sales forecasts**

Year	2011	2012	2013	2014	2015
CitiPower	0.89%	3.21%	5.91%	7.40%	7.52%
Powercor	0.77%	2.82%	5.31%	6.79%	7.11%
Jemena	0.97%	3.54%	6.56%	8.19%	8.36%
United	0.88%	3.22%	6.00%	7.56%	7.77%

Data source: NIEIR, Electricity sales and customer numbers reports, cumulative sum of table 7.2 compared to residential sales forecast from table 7.1

In terms of commercial sales, the picture is different, as is shown in Table 17 below.

Table 17 **Impact of AMI rollout on commercial sales by distribution region**

Year		2011	2012	2013	2014	2015
CitiPower	(7.1)	0.2%	0.5%	1.0%	1.2%	1.3%
	(RIN)	0.4%	1.4%	2.5%	3.2%	3.3%
Powercor	(7.1)	0.1%	0.3%	0.5%	0.6%	0.6%
	(RIN)	0.4%	1.2%	2.2%	2.7%	2.7%
Jemena	(7.1)	0.2%	0.8%	1.4%	1.7%	1.8%
	(RIN)	0.2%	0.8%	1.4%	1.8%	1.8%
United	(7.1)	0.2%	0.8%	1.5%	1.7%	1.8%
	(RIN)	0.5%	1.7%	3.2%	4.0%	4.1%

Data source: NIEIR, Electricity sales and customer numbers reports, cumulative sum of table 7.2 compared to residential sales forecast from table 7.1

Table 17 shows the estimated impact of the AMI rollout on commercial sales as a percentage of the business's forecast of sales volume to small customers (i.e. <160 MWh)<sup>51</sup> and as a percentage of NIEIR's forecast of medium commercial sales.<sup>52</sup> ACIL Tasman notes that these totals do not reconcile to 8%, which is a discrepancy that has not been accounted for entirely. It will be due, in part, to the fact that SP AusNet is not included in these summaries.

### 5.10.3 Estimated AMI impact on electricity sales - assessment

For the purposes of this discussion it is helpful to think of an electricity bill as consisting of the following three components:

- An energy component, equal to about half of the total bill which includes the retailers gross margin
- A distribution network component, equal to about 40% of the total bill
- A transmission network component, equal to the remainder of the bill (about 10%)<sup>53</sup>.

From its discussions with the distribution businesses other than SP AusNet, ACIL Tasman understands that none of them have any intention of proposing a CPP tariff structure for the distribution component of retail electricity bills.

<sup>51</sup> i.e. the data set out in RIN template 6.3 for each business.

<sup>52</sup> Note that these totals are not the always same, although ACIL Tasman has not attempted to account for the difference. While ACIL Tasman has not been provided with the PTRM spreadsheets populated by each business, to the extent that it has been privy to material relating to the PTRM this has been consistent with the NIEIR report data, not the data in the RIN template.

<sup>53</sup> The three share of bill estimates are presented for illustrative purposes only and are not intended to be precise. ACIL Tasman understands that these are approximately representative of the average structure of retail electricity bills, although individual bills would vary due to a wide range of factors.



However, it is not unreasonable to assume that the energy component of the bill may begin to reflect some of the variability of the electricity wholesale price.<sup>54</sup> However any form of TOU pricing offered by retailers will be subject to competitive forces and will need to offer tangible savings to the end user to be accepted. In addition, the fact that this accounts for only half of the total bill means that any impact will be muted, i.e. any given increase in the energy component would cause the retail bill to increase by half of that amount.

For these reasons, and also bearing in mind recent controversy in the Victorian media surrounding SP AusNet's proposed time of use tariff, ACIL Tasman does not consider it likely that customers who receive AMI meters under the rollout will be offered tariffs resembling those studied in the CPP trials during the regulatory period. Rather, ACIL Tasman considers it more likely that (After the moratorium is lifted) tariffs will resemble the TOU tariffs examined in the studies.<sup>55</sup>

Given that tariffs are unlikely to resemble CPP tariffs during the coming regulatory period, ACIL Tasman considers that the distribution business's estimated 8% reduction is substantially overstated. This figure is consistent with Energy Australia's observed reduction in energy sales on a relatively small number of critical peak days in response to CPP tariffs of one or two dollars per kWh. Even if CPP tariffs are introduced at this level, it would not follow that total energy sales throughout the year should be reduced by this amount. Further, in considering Energy Australia's observation that most of the reduction it observed was due to reduced air conditioning use, this estimate is inconsistent with the business's estimate that AMI's impact on maximum demand will be negligible.

#### **5.10.4 Advanced Metering Infrastructure – SP AusNet**

Unlike the other distribution businesses, SP AusNet prepared a forecast of the likely impact a time of use tariff would have on energy sales to its customers from the bottom up.

SP AusNet's approach is based on the net system load profile (NSLP) for each of its tariff classes, which gives an average of the share of total usage that happens at various times of the day. Starting from the NSLP, SP AusNet applied a cross price elasticity of demand (between peak and off-peak) usage as well as an own price elasticity of demand at peak and shoulder times to calculate the extent to which customers would shift load away from peak and

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<sup>54</sup> Note that this component is determined by electricity retailers who now operate in an unregulated environment, at least in Victoria.

<sup>55</sup> In discussions with the AER and ACIL Tasman connected to this review NIEIR indicated that it had made a similar assumption in its modeling.

shoulder times and the extent to which they would reduce consumption in response to price increases. To account for the fact that customers will respond to retail prices rather than distribution tariffs as such, SP AusNet discounted the elasticity effects to 40% of the calculated effect.

As a general proposition, ACIL Tasman regards this methodology as sound. However, the accuracy of the results this approach will yield is limited by the accuracy of the elasticity estimates used in the model itself. One way that the model could be improved would be to calibrate it (i.e. generate the elasticity estimates) using data collected in a trial of the proposed tariffs. In practice, though, this data is not available. Accordingly, SP AusNet carried out a review of previous studies.

After conducting an assessment of overseas studies, SP AusNet reached the view that there is no correct or common 'point estimate' in relation to the impact that these tariffs will have on the amount of energy that customers consume. This was further complicated by the significant change in both price level and structure proposed by SP AusNet, which limits the ability to translate the results from other jurisdictions to SP AusNet.

SP AusNet's reading of the literature is that it commonly indicates that the elasticity of demand ranges between -0.2 to -0.5. Examples to which SP AusNet referred include:

- The NIEIR 2007 report, which estimates a price elasticity of -0.25 for residential customers, -0.35 for commercial customers and -0.38 for industrial customers<sup>56</sup>;
- The Monash University report into the price elasticity of electricity demand in South Australia and Victoria, which, at a summary level, suggests an elasticity of demand during the summer period at 4pm of -0.355<sup>57</sup>; and
- A study by Faruqui and George, which examined the price elasticity associated with coincident peak demand, not just peak period energy consumption. This study determined a value of -0.28 of peak demand based on Time of Use prices applied across 100,000 customers<sup>58</sup>.

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<sup>56</sup> NIEIR, "The own price elasticity of demand for electricity in NEM regions" June 2007

<sup>57</sup> Fan, S. and Hyndman, J. "The price elasticity of electricity demand in South Australia and Victoria", – Table 10, page 36, available at [http://www.esipc.sa.gov.au/webdata/resources/files/Price\\_Elasticity.pdf](http://www.esipc.sa.gov.au/webdata/resources/files/Price_Elasticity.pdf), accessed 22 March 2010.

<sup>58</sup> Faruqui, A & George, S 2002, "The value of dynamic pricing in mass markets", *The Electricity Journal*, July, p. 48.

Having regard to these studies, SP AusNet's modelling includes the following elasticity of demand estimates:

- Own-price elasticity of peak summer, shoulder and winter peak demand of -0.15;
- Cross-price elasticity demand between 0.005 to 0.1; and
- Own-price elasticity of off-peak demand of zero.

ACIL Tasman's review of the relevant literature raises some questions about the appropriateness of these estimates.

First, from a theoretical point of view, it is important to remember that SP AusNet is proposing quite a substantial change in the level of tariffs, i.e. the peak time tariff will increase, and the off peak tariff will decrease, by a significant amount in percentage terms. This is relevant in that the way the elasticities SP AusNet has relied upon are reported is a measure of the change (in percentage terms) in quantity demanded in response to a one per cent change in price. While it is mathematically possible for the elasticity of demand to be constant across a wide range of price changes, this is not the typical case and a number of studies and end use models have suggested that the price elasticity of demand for electricity is non linear.<sup>59</sup> In cases where the quantum of the price change is small, this factor is relatively unimportant as the inaccuracy it causes is likely to be 'drowned out' by other inaccuracies inherent in estimating elasticity. However, in this case, the scale of the proposed changes in tariff is significant and hence the assumption of constant elasticity is questionable.

Second, (as discussed above) the price elasticity of demand for electricity (and indeed many other products) is a function of time. In the short run, consumers are only able to respond to pricing changes with their existing capital stock. In the case of business customers, this means that plant changes are not possible even if, for example, it would be profitable to switch from one fuel to another, this cannot be done. For domestic customers the capital stock in question is generally household appliances such as space heaters and coolers and other equipment that, when replaced, could reduce energy use. This is particularly relevant in relation to the first set of estimates to which SP AusNet refers, namely those drawn from NIEIR's work. These are clearly estimates of the long run price elasticity of demand. Of particular note, NIEIR's estimates suggest that business customers would reduce demand more (in percentage terms) than residential customers if faced with the same (percentage) price

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<sup>59</sup> See NIEIR, "*The own price elasticity of demand for electricity in NEM regions*", 2007, although the studies to which NIEIR refers here are not cited.

increase. This is contrary to the short run elasticity estimates provided in the various TOU studies that ACIL Tasman has reviewed.

It is always difficult to define the length of the long run. ACIL Tasman notes that NIEIR's report suggests that it could be as much as 10 to 20 years for domestic customers, given the life of some appliances. NIEIR's report says that the estimate of -0.35 should be discounted in circumstances where the forecast horizon is short.<sup>60</sup>

The next of SP AusNet's references is to a report prepared for the electricity Supply Industry Planning Council by the business forecasting unit of Monash University.<sup>61</sup> The authors of this report reviewed ten previous studies, including the NIEIR study discussed above, and summarised the estimates of residential elasticity of demand that had been made. Of the remaining nine studies, 7 estimated residential elasticity, either together with commercial or separately. Of these seven, four found residential elasticity estimates of around -0.3<sup>62</sup>, while the remaining three found lower estimates.<sup>63</sup> The remaining two studies only estimated elasticities for industrial or commercial customers, which were typically lower than the residential estimates.

The third of SP AusNet's references is to a brief review paper by Faruqui and George. That article refers to a number of studies, including one specifically cited by SP AusNet, which was conducted by the Salt River Project<sup>64</sup> in Arizona in the 1980s. In that case more than 100,000 of the Salt River Project's customers participated in a voluntary rate program. A Master's candidate at the University of Arizona conducted an (unpublished) study of that case and found that the elasticity of peak demand with respect to the price of electricity at peak times was -0.28.<sup>65</sup> It is unclear what use should be made of this study given that it was focussed on estimating a different parameter than that under consideration here.

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<sup>60</sup> NIEIR, 2007 op cit p4

<sup>61</sup> Fan, S. and Hyndman, R. "The price elasticity of electricity demand in South Australia and Victoria" available at [http://www.esipc.sa.gov.au/webdata/resources/files/Price\\_Elasticity.pdf](http://www.esipc.sa.gov.au/webdata/resources/files/Price_Elasticity.pdf), accessed 26 March 2010.

<sup>62</sup> These were Phillipini (1999), Beenstock et al. (1999) King and Chatterjee (2003) and Reiss (2005). See Fan, S and Hyndman for references.

<sup>63</sup> These studies, and the corresponding elasticity estimates, were (Bohi and Zimmerman (1984) - -0.2, King and Shatrawka (1994) - 0.1 to 0.2 (Inter day substitution) and Faruqui and George (2005) - -0.09

<sup>64</sup> Salt River project is an electricity utility in Arizona.

<sup>65</sup> Faruqui, A. and S. George "The Value of Dynamic Pricing in Mass Markets", The Electricity Journal, July, pp. 45 - 55

In terms of load shifting, a number of studies have estimated the elasticity of substitution, which appears to be analogous to what SP AusNet describes as the cross price elasticity of demand. In a study which compiled data from five experiments conducted in the USA, Caves et al reported a range of elasticity estimates from 0.05 to 0.25. This study should be interpreted with care, though, as it was published in 1984 when the nature of household electricity use was quite different to today.

In summary, there is significant reason to be cautious in relation to the elasticity estimates to which SP AusNet refers. Presumably for these reasons, SP AusNet used values of elasticity of demand that are about half the values estimated in the studies to which it refers, although these studies had higher estimates than others.

#### **5.10.5 Advanced metering infrastructure – recommendation**

On Monday, 22 March 2010, the Premier of Victoria announced that there will be a moratorium on the rollout of AMI meters. While the available information on the moratorium is limited, ACIL Tasman takes this to mean that regardless of whether the meters themselves continue to be installed, Victorians will not be presented with either time of use or CPP tariffs until the moratorium is lifted. Prior to this moratorium, the rollout timetable was such that there was only about one full year in the coming regulatory period when all smart meters would be in place.

In light of the uncertainty raised by the moratorium, and the fact that ACIL Tasman does not regard the distribution business's estimate of the impact the AMI rollout will have on energy sales as reasonable, ACIL Tasman recommends that the AER reject any reduction in the electricity sales forecasts due to this policy intervention with a view to making any necessary adjustments as and when the future of AMI meters becomes clearer.

The implications of this recommendation for each business's energy sales forecast is summarised in a table in each of sections 7 to 11 below.

### **5.11 Electric cars**

The distribution businesses have each put forward an estimate of the amount by which off peak energy will increase due to the uptake of electric cars. The estimates, which are set out in Table 18 below, are for a small increase in off-peak energy sales. They are based on what NIEIR describes in its reports as “a possible scenario” rather than a forecast or prediction of what is expected to occur. The scenario is that 1,800 electric cars will be in use in Victoria in 2010, growing to 10,300 by the end of the regulatory period. ACIL Tasman notes that there has been some discussion of electric cars in the media and that there

is a chance that some may be introduced to Victoria in the next few years. This said, there is no particular reason to expect that the possible scenario NIEIR discusses will occur.

While it may not be unreasonable to expect some electric cars to be introduced to Victoria over the regulatory period, ACIL Tasman does not consider that the scenario put forward here has sufficient basis to be regarded as a reasonable prediction of the likely demands on the distribution businesses. However, this is an extremely uncertain area and the estimates are so small as to be within reasonable forecast error. Given this, ACIL Tasman does not consider them to be unreasonable.

Table 18 **Estimated impact of increased uptake of electric cars (GWh)**

Year	2010	2011	2012	2013	2014	2015
CitiPower	-2.0	-2.7	-3.5	-4.3	-5.1	-5.1
SP AusNet	-4.15	-5.81	-7.47	-9.13	-10.79	-10.79
Powercor	-4.55	-6.37	-8.19	-10.01	-11.83	-11.83
Jemena	-2.07	-2.9	-3.73	-4.56	-5.39	-5.39
United	-4.3	-6.02	-7.74	-9.46	-11.18	-11.183
<b>Total</b>	<b>-10.2</b>	<b>-17.0</b>	<b>-23.8</b>	<b>-30.7</b>	<b>-37.5</b>	<b>44.3</b>

Data source: NIEIR, Electricity sales and customer numbers reports, table 6.5

## 6 Customer numbers

NIEIR takes new customer estimates from its construction industry model, which estimates changes in the dwelling stock. On the basis that it is commercially confidential, NIEIR was reluctant to describe the construction industry model in detail. The description of the basis of these forecasts was limited to the following:

“Residential customer number forecasts for each distribution region are driven by dwelling stock forecasts.

At the State level, dwelling stock forecasts are an output from NIEIR’s detailed construction industry models. The model covers residential building, non-residential building and engineering construction. The residential component covers approvals, commencements, completions and the building stock by type of dwelling. Detailed construction forecasts are currently prepared for a number of national companies and State Government departments.

In the Victorian regional model, State forecasts of the dwelling stock are disaggregated into Local Government Area forecasts for Melbourne and Statistical Division forecasts for the rest of Victoria. Population growth is the key driver at the regional level.

Non-residential customer number projections are a derivative of the historical growth in energy consumption for each class or network tariff, historical customer growth and average usage by class or network tariff.”<sup>66</sup>

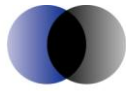
ACIL Tasman understands from the energy reports that the model covers residential and non-residential building and engineering construction and that the residential component of the model covers approvals, commencements, completions and the building stock by type of dwelling. NIEIR uses this model to prepare detailed construction forecasts for a number of private companies and State governments.

ACIL Tasman notes, in particular, the statement above that population growth is the key driver (of customer numbers) at the regional level. As is discussed in section 4.1 of this report and in the corresponding section of ACIL Tasman’s maximum demand report, ACIL Tasman considers that the population growth and economic growth forecasts upon which the various forecasts the distribution businesses have presented are likely to be too low. This would be expected to apply downward pressure to the customer numbers forecasts.

ACIL Tasman has been provided with insufficient information to reach a conclusion as to the reasonableness or otherwise of the customer numbers

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<sup>66</sup> NIEIR, energy report to each distribution business, approximately p.35 in each report.



forecasts. Given that the population growth forecasts that was driving the customer numbers forecast is lower than the observed growth in recent years, it would be reasonable to expect that customer numbers forecast would also grow more slowly compared with recent years. However, as is discussed in the sections below, the forecasts that have been provided appear to be approximately consistent with historical trends, so this expectation is not borne out.

ACIL Tasman has recommended that the energy sales forecasts should be re-estimated with more reasonable population forecasts. This would be expected to include revised customer number forecasts as a key input to energy sales. However, given the apparent lack of relationship between population growth and customer numbers growth, ACIL Tasman would not expect to see a substantial change in the customer numbers forecast even if they were re-estimated.



## 7 CitiPower

### 7.1 Description of CitiPower network

Figure 12 **Map of the CitiPower region**



CitiPower’s network is approximately 157 square kilometres in size and covers central Melbourne and inner suburbs. It accounts for approximately 12% of Victoria’s population and dwelling stock, with a slightly lower occupancy rate (persons per household) than average.<sup>67</sup>

CitiPower’s area accounts for almost 30% of Victoria’s total gross state product including a dominant share of ‘white collar’ industries such as finance, property and business services, communication and public administration. Manufacturing, on the other hand, is relatively small in CitiPower’s area.

Gross Regional Product in CitiPower’s area will grow, according to NIEIR’s forecast, at 1.4% per annum over the forecast period. By contrast to the population growth estimates where Melbourne is forecast to outperform CitiPower’s area, Melbourne’s GRP is forecast to grow at 0.5%, lagging the rest of CitiPower’s area where forecasts range from 0.9 to 3.1% per annum.

<sup>67</sup> NIEIR states that CitiPower’s area includes 11.8% of the Victorian population and 12.3% of dwelling stock.

## 7.2 CitiPower customer numbers

Total energy sales can be decomposed into energy use per customer and the number of customer numbers.

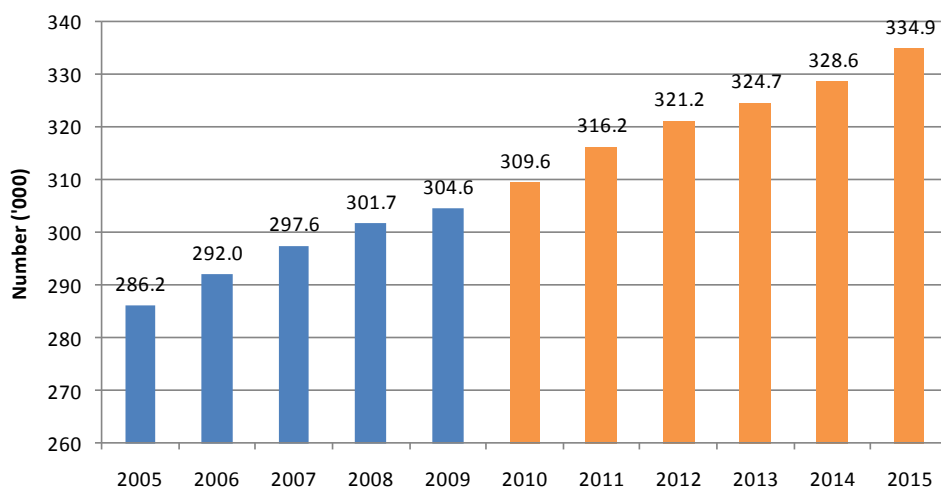
For residential customers, customer numbers is equivalent to the number of dwellings supplied. This, together with the average energy use per dwelling, is the key driver of electricity sales to residential customers.

### 7.2.1 Total Customer numbers

Customer number growth in the CitiPower network is projected to increase broadly in line with the rate of growth experienced in the historical period.

Figure 13 shows that total customer numbers in the CitiPower region are projected to increase from 309.6 thousand in 2010 to 334.9 thousand in the last year of the regulatory period. This represents a rate of growth of 1.6% per annum. This is approximately the same as the rate of growth over the period from 2005 to 2009 (see Table 19).

Figure 13 **CitiPower network total customer numbers, historical and forecast**



Data source: NIEIR, Electricity sales and customer numbers report to CitiPower, Table 7.2

Table 19 **Growth in CitiPower customer numbers, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	1.57%	1.43%	1.90%
Commercial	3.78%	3.45%	0.08%
Industrial	-2.51%	-2.69%	-2.21%
Total customer numbers	1.78%	1.57%	1.59%

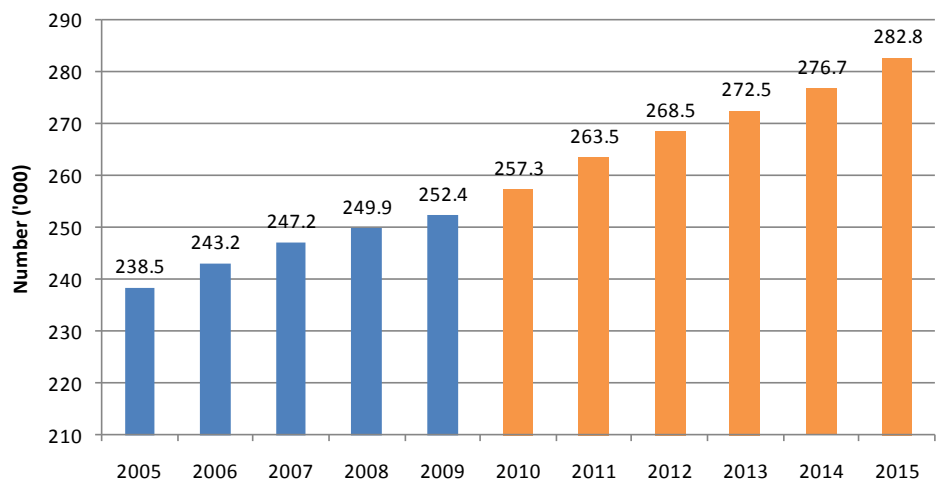
Data source: Calculations based on NIEIR, Electricity sales and customer numbers report to CitiPower, Table 7.2

### 7.2.2 Customer numbers by sector

On a sector by sector basis, growth in residential customer numbers is projected to accelerate to an average growth rate of 1.9% per annum over the regulatory period compared to a rate of growth of 1.6% per annum in the years between 2005 and 2008 and compared to a Victorian average of 1.5% per annum.<sup>68</sup>

The continued strong growth in residential customer numbers is largely the result of a continuation of the trend towards city living within high rise apartment developments. As is discussed below, this is somewhat in conflict with CitiPower’s estimate that population growth in its area will be 0.9% per annum over the next regulatory period, 0.3 percentage points below NIEIR’s forecast of the Victorian average. CitiPower’s estimates that annual dwelling growth in its area will be 1.7 per cent, slightly above the Victorian average.

Figure 14 CitiPower network residential customer numbers

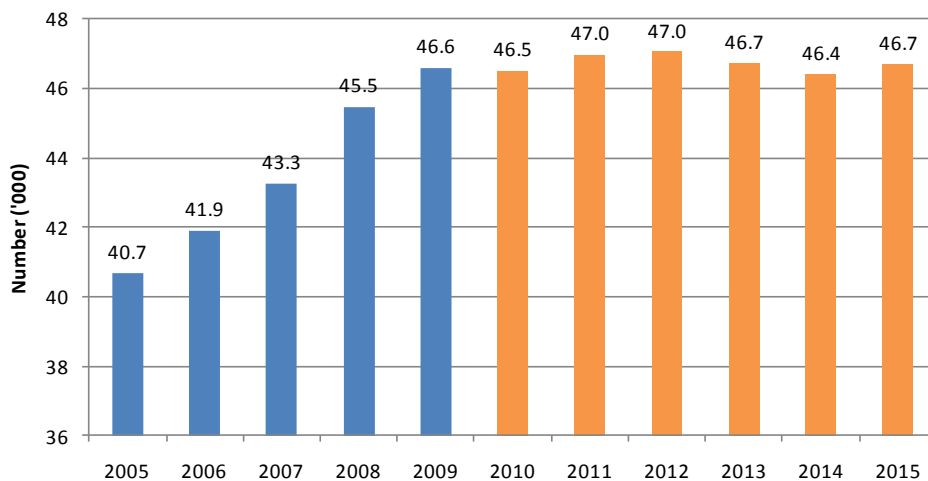


Data source: NIEIR Electricity sales and customer numbers report to CitiPower Table 7.2

The stronger growth in residential customer numbers in the CitiPower region is offset to some extent by a stabilisation in the growth of commercial customer numbers, which is forecast to slow from more than 3% per annum in the historical period to close to zero over the next regulatory period (see Figure 15).

<sup>68</sup> NIEIR, energy report to United, p28.

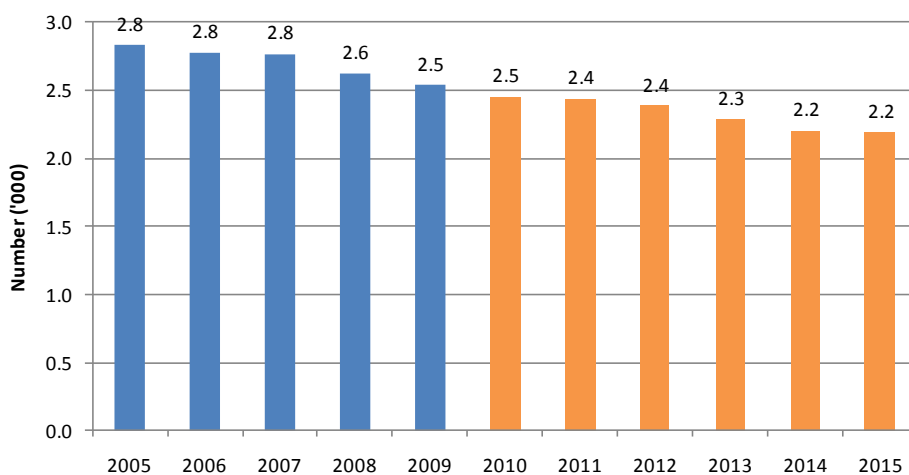
Figure 15 **CitiPower network commercial customer numbers, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to CitiPower Table 7.2

NIEIR points out that a significant portion of the manufacturing activity in CitiPower’s distribution region is in the textiles, clothing and footwear sector which has been experiencing a long rate of decline. This is expected to continue (see Figure 16). Industrial customer numbers are projected to continue declining in the next regulatory period, albeit at a slightly slower rate.

Figure 16 **CitiPower network industrial customer numbers, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to CitiPower Table 7.2

### 7.2.3 Energy intensity of residential customers

As is discussed above, CitiPower’s forecasts of residential energy sales are driven, in large part, by its forecasts of growth in the number of dwellings (customers) in its area over the regulatory period and (as discussed in section

3.2) its assumption that the energy intensity of these new dwellings will be, on average, the same as the energy intensity of existing dwellings in its area.

This implies that CitiPower's area is characterised by growth in dwellings with less than the average number of occupants, which is broadly consistent with the observation that energy use per dwelling has fallen over recent years (see Figure 17 below).

It is notable, though, that CitiPower's annual population growth estimate for Melbourne CBD is 2.2 per cent, approximately half its forecast of annual growth in dwelling stock, which is 4.5% per annum.

In presenting this estimate of growth in dwelling stock to CitiPower, NIEIR notes that this reflects apartment construction in and around the CBD. However, based on its view that apartments are currently in over supply in this area, NIEIR says that a number of these projects may be postponed, although, as ACIL Tasman understands it, no modification was made to the forecasts to take this into account.<sup>69</sup> CitiPower has advised<sup>70</sup> that it considers that:

- the population growth forecast for the Melbourne (CBD) area is too low and is likely to be a typographical error in NIEIR's report
- the dwellings forecast is correct
- the forecasts, which are driven by the dwellings forecast, are not affected by the typographical error concerning the population growth forecasts.

As is discussed above, ACIL Tasman considers that the energy and customer numbers forecasts should be re-estimated using a more reasonable population growth forecast. This would provide an opportunity for CitiPower to clarify the position concerning its expectations for population growth in the CBD and to verify its forecast of energy sales in that area.

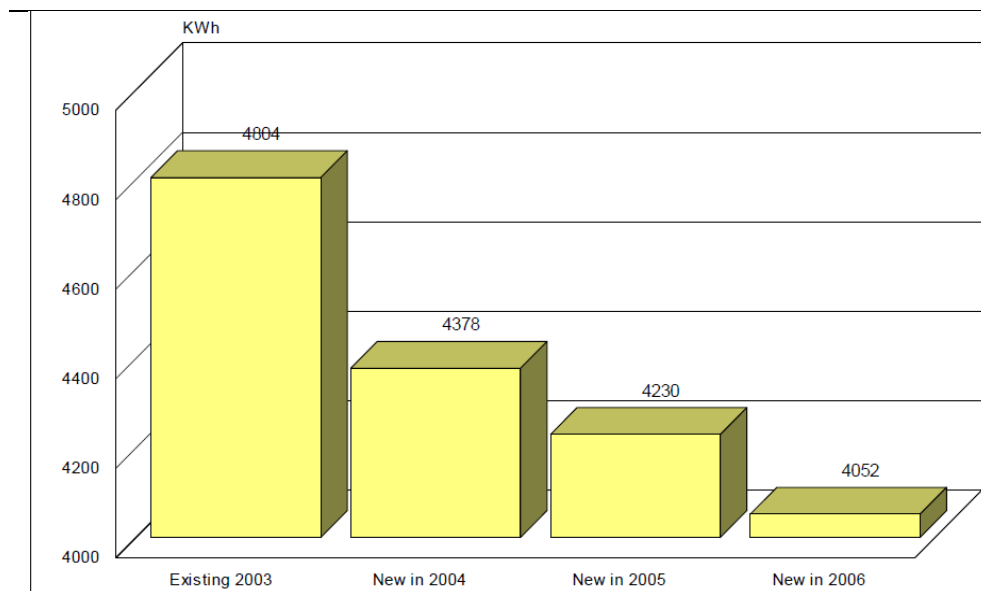
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<sup>69</sup> NIEIR, energy report to CitiPower, p28.

<sup>70</sup> CitiPower (Mr. M. Serpell), email to AER and ACIL Tasman, 22 March 2010 9:15pm.

Average electricity usage per dwelling

Figure 17 **Average residential electricity use by dwelling vintage - CitiPower**



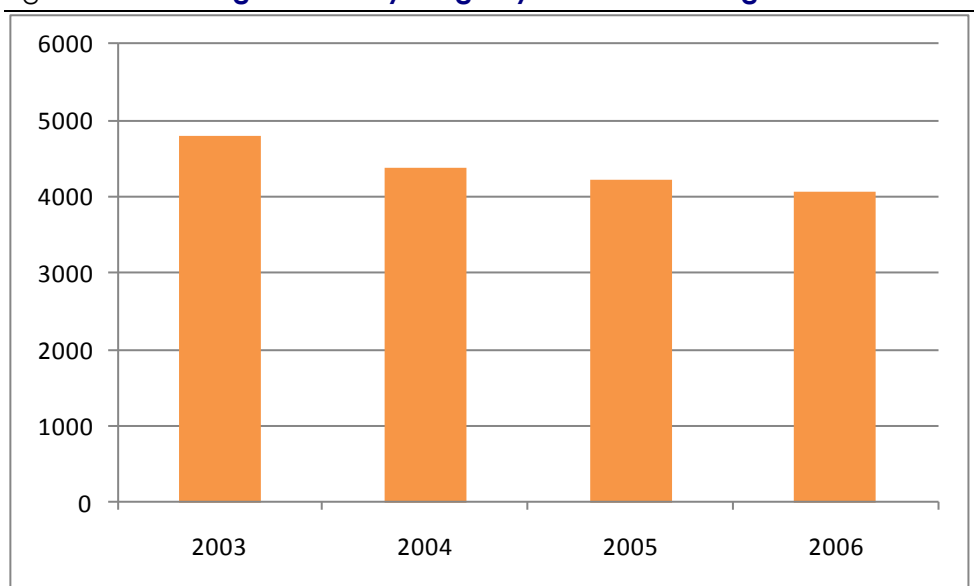
Source: NIEIR, Electricity sales and customer numbers report to CitiPower, p.34

Figure 17 shows that, for dwellings built between 2003 and 2006, the energy intensity of dwellings fell over time. In other words, newer dwellings use less energy on average than older dwellings. This would tend to support an energy forecasting approach which assumed that dwellings constructed over the regulatory period would use less energy than existing dwellings in CitiPower’s area.

However this would require a forecast of the energy intensity of these new dwellings and, given that the policy impacts are estimated externally to the central model, this would need to be a forecast of what the energy intensity of those dwellings would be without taking those policy impacts into account. The risk of double counting these impacts would be high.

Further, as the corresponding figures in sections relating to the other distribution businesses show, there is no clear trend in energy intensity of dwellings in the other distribution regions. We understand that it was for this reason that NIEIR elected not to attempt to forecast the energy intensity of dwellings that will be constructed over the regulatory period. Rather, its approach assumes that (on average) new dwellings will have the same energy intensity as existing dwellings (on average). Note that this approach takes the decline depicted in Figure 17 above into account because the energy used by these dwellings is reflected in the data that feeds into NIEIR’s model. Note also that the scale in Figure 17 tends to exaggerate the decline. Figure 18 shows the same information as Figure 17 with the y axis reset to zero.

Figure 18 **Average electricity usage by residential vintage - CitiPower**



Data source: NIEIR, Electricity sales and customer numbers report to CitiPower, p34

If this decline in energy intensity was to continue into the regulatory period, this decision would tend to bias the electricity sales forecast upwards. This said, the impact of this bias is not likely to be large given that it applies only to new residential customers, who are forecast to represent only 11% of CitiPower’s residential customers at the end of the regulatory period.

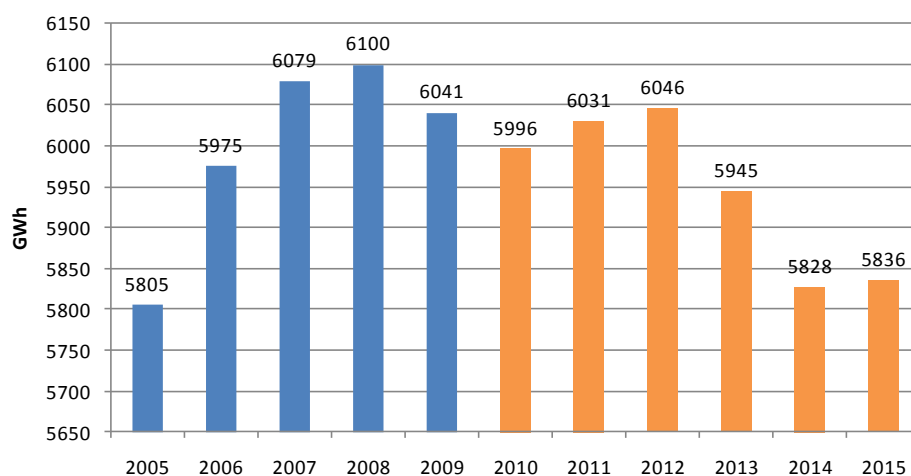
## 7.3 CitiPower energy sales

### 7.3.1 Total energy sales

As is shown in Figure 19, CitiPower forecasts total energy sales within its network to decline from 6,100 GWh in the 2008 calendar year<sup>71</sup> to 5,836 GWh by 2015, the final year of the next regulatory period. This decline represents a major departure from historical trend behaviour.

<sup>71</sup> 2008 is the last year for which complete data were available when these forecasts were prepared.

Figure 19 **CitiPower total energy sales, historical and forecast**



Data source: NIEIR, Electricity sales and customer numbers report to CitiPower, Table 7.1

Between 2005 and 2008, growth in sales was 1.7% per annum, compared to a decline of just over 0.5% per annum in the next regulatory period (see Table 20).

Table 20 **Growth in CitiPower energy sales, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	1.91%	1.21%	-1.20%
Commercial	2.69%	2.25%	-0.17%
Industrial	-5.94%	-9.09%	-2.64%
Total sales	1.66%	1.00%	-0.54%

Data source: Calculations based on NIEIR, Electricity sales and customer numbers report to CitiPower, Table 7.1

On a sector by sector basis, this overall decline is driven mostly by a reversal in the historical growth that has been observed in the residential and commercial sectors.

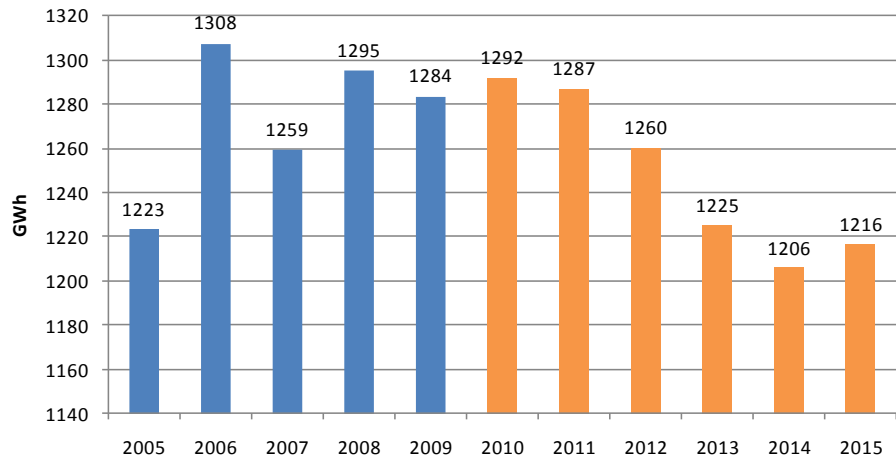
### 7.3.2 Energy sales by sector

Residential electricity sales in CitiPower’s distribution region are projected to decline by 1.2% per annum in the next regulatory period.<sup>72</sup> This is compared to a rate of growth of 1.9% per annum between 2005 and 2008.

<sup>72</sup> Note that the analysis here refers to the data as presented in NIEIR’s report to CitiPower. This is not consistent with the data CitiPower submitted in its RIN template (it is consistent in total, but not at the disaggregated level). ACIL Tasman understands that this is due to differences in the way data for the two submissions were aggregated. The data analysed here is, as ACIL Tasman understands it, consistent with CitiPower’s inputs into the Post Tax Revenue Model, which makes it more relevant for the current task. One drawback of using this data is that the historical series is shorter (the data in the RIN goes back to 2001).

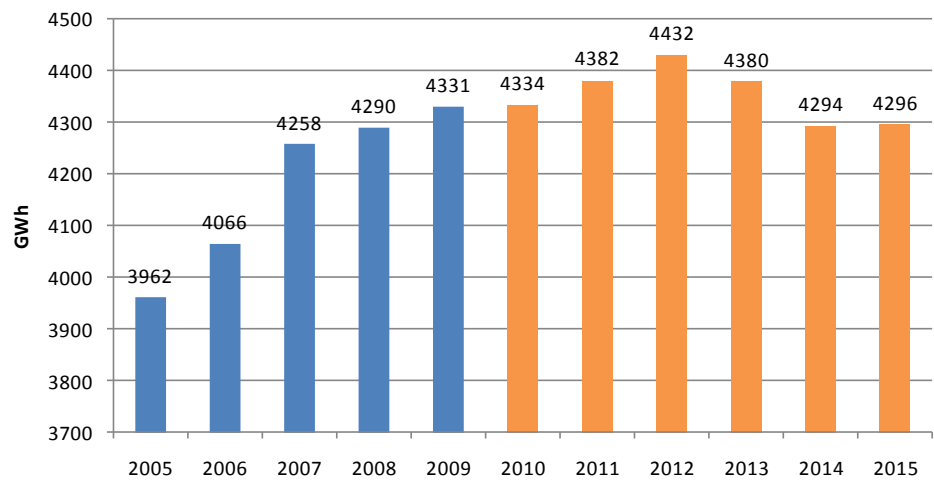


Figure 20 **CitiPower total residential sales, historical and forecast**



Data source: NIEIR, Electricity sales and customer numbers report to CitiPower, Table 7.1

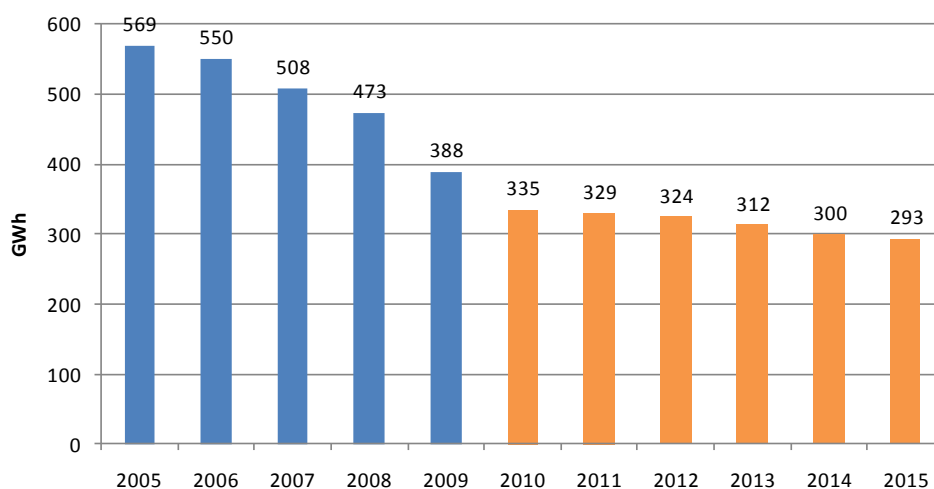
Figure 21 **CitiPower total commercial sales, historical and forecast**



Data source: NIEIR, Electricity sales and customer numbers report to CitiPower, Table 7.1

The commercial sector within the CitiPower network is projected to decline in the next regulatory period by -0.2% per annum. It is evident from Figure 21 that this represents a substantial departure from the historical behaviour of the series, which grew by 2.7% per annum between 2005 and 2008 and 2.3% per annum between 2005 and 2009.

Figure 22 **CitiPower total industrial sales, historical and forecast**



Data source: NIEIR, Electricity sales and customer numbers report to CitiPower, Table 7.1

NIEIR projects industrial energy sales to shrink in the next regulatory period by 2.6% per annum compared to a more rapid rate of decline in the historical period (see Figure 22).

### 7.3.3 Energy sales per customer

Sections 7.2 and 7.2.3 show that customer numbers and energy sales are forecast to move in opposite directions to one another. This is highlighted again in this section, which considers the average energy use on a per customer basis.

#### Total energy sales by customer

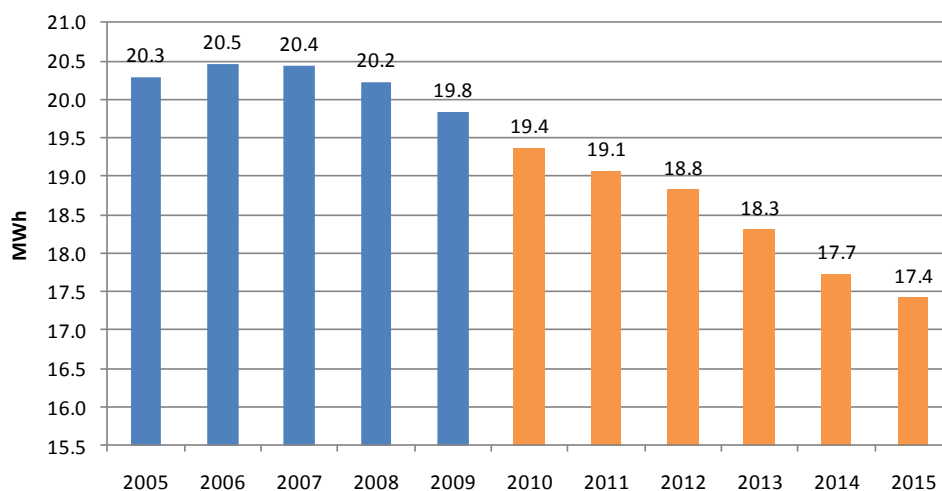
The underlying decline in forecast energy sales in the CitiPower network is attributable to a forecast fundamental shift in the behaviour of individual customers.

Figure 23 shows that overall, energy use per customer has remained relatively constant, shrinking at 0.1% per annum between 2005 and 2008, and a larger decline of 0.6% per annum between 2005 and 2009 based on a significant projected decline in 2009. CitiPower now forecasts that the decline will accelerate significantly into a decline from 2010 to 2015 at an average rate of 2.1% per annum. This represents a substantial departure from historical behaviour. As is seen in Table 21, Most of this decline is forecast to occur in the residential sector.

Given that customer numbers are growing in the residential sector and relatively flat in other sectors, this decline in usage per customer and in

particular, per residential customer, is the main source of the decline in total energy sales in the CitiPower network.

Figure 23 **CitiPower total energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report Table 7.1 and table 7.2

Table 21 **Growth in CitiPower energy sales per customer, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	0.34%	-0.22%	-3.04%
Commercial	-1.06%	-1.16%	-0.25%
Industrial	-3.53%	-6.58%	-0.44%
Total sales	-0.11%	-0.56%	-2.09%

Data source: NIEIR Electricity sales and customer numbers report Table 7.1 and 7.2

### Energy sales per customer by sector

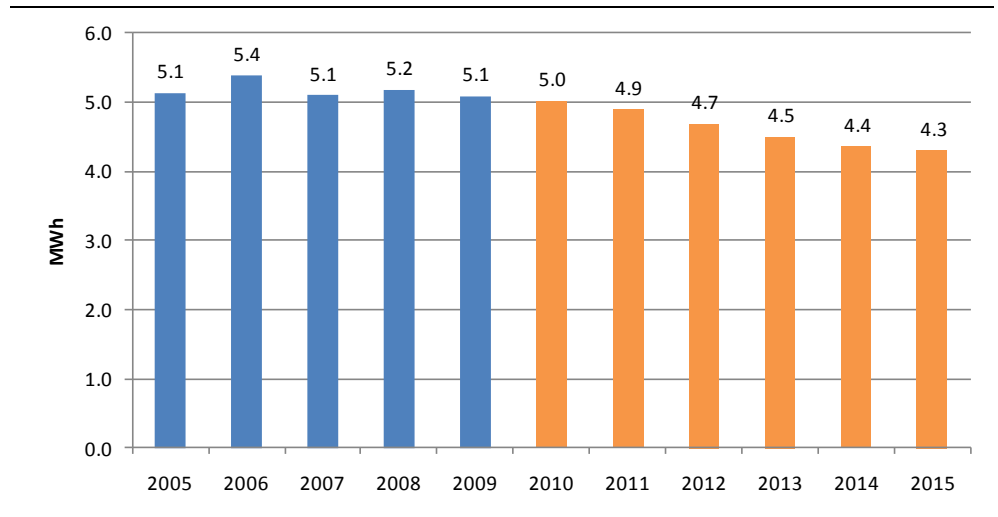
On a sector by sector basis, the main source of decline in energy use per customer arises from the residential sector, where energy use is expected to decline by approximately 17 per cent, from 5.2 MWh per customer in 2008 to 4.3 MWh by 2015 (see Figure 24).

This decline is equivalent to a rate of shrinkage of 3% per annum in the next regulatory period, compared to a slight rate of growth of 0.3% per annum in the 3 years between 2005 and 2008.

This decline in forecast energy use in the residential sector arises almost entirely from the forecast impacts of new policy initiatives such as AMI, the impact of the CPRS, and so on. As many of these policy initiatives do not have any historical precedents, ACIL Tasman considers that these policy

initiatives represent a major change in the behaviour of the individual household and as a consequence requires detailed and careful scrutiny.

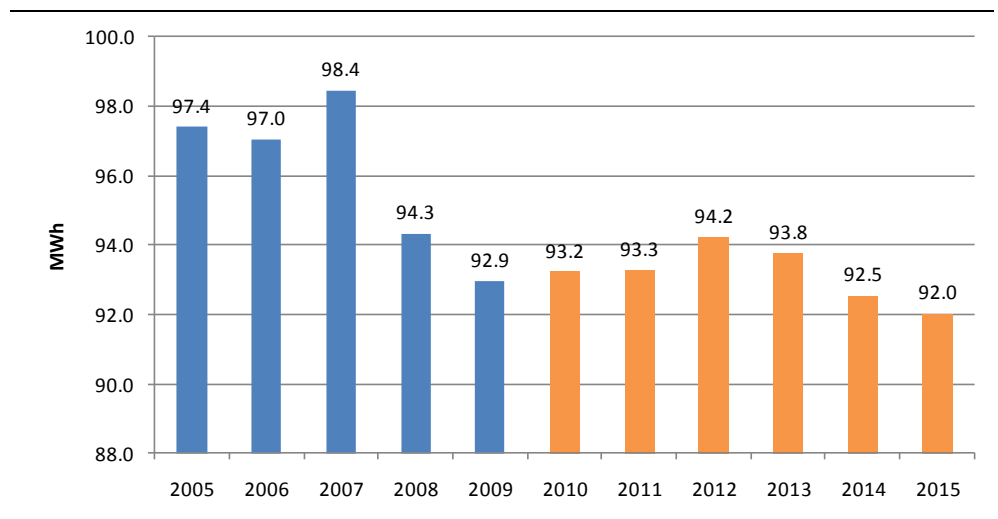
Figure 24 **CitiPower residential energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to CitiPower Table 7.1 and table 7.2

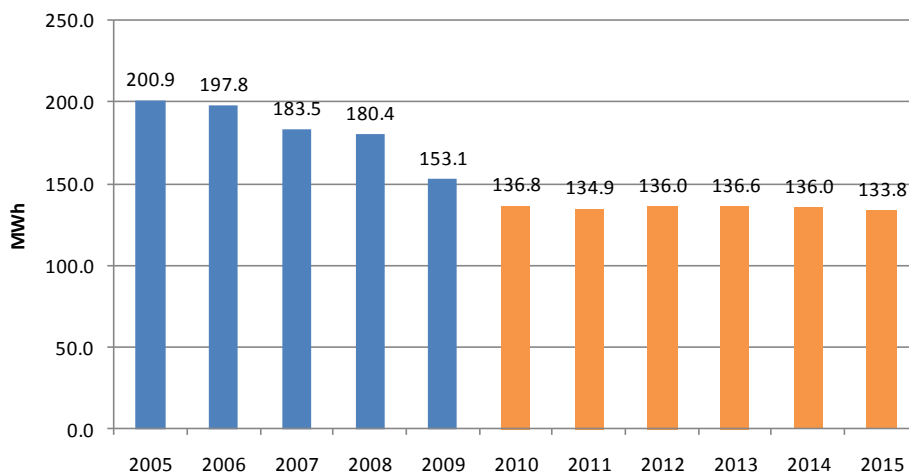
Figure 25 and Figure 26 show the energy use per customer for the commercial and industrial sectors. Unlike the residential sector, CitiPower forecasts that electricity sales per customer in these sectors will remain relatively constant. Notably, sales in these sectors are not forecast to return to the levels they were at prior to the global financial crisis.

Figure 25 **CitiPower commercial energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to CitiPower Table 7.1 and table 7.2

Figure 26 **CitiPower industrial energy sales per customer, historical and forecast**

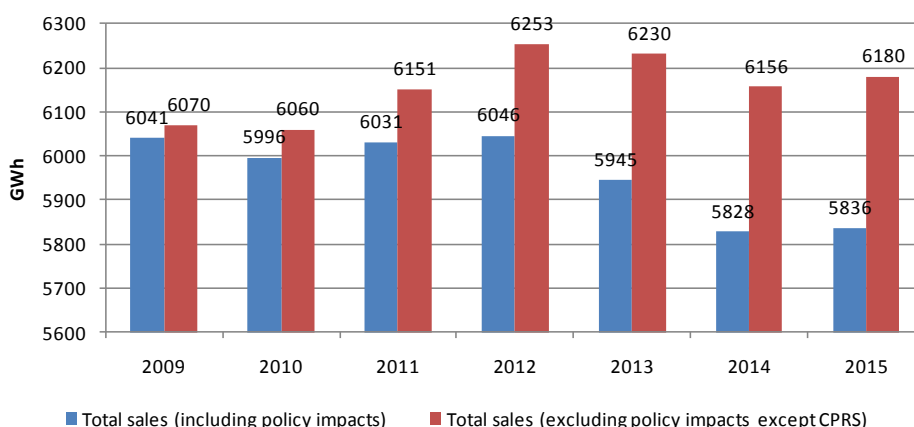


Data source: NIEIR Electricity sales and customer numbers report to CitiPower Table 7.1 and table 7.2

### 7.3.4 Energy sales with and without policy impacts

Figure 27 shows the impact on the forecast of the 9 separate policy impacts on energy sales within the CitiPower network. The figure shows that the impact of the separate policy initiatives (apart from the CPRS which is included in both series) is significant over time. By 2015, the forecasts are 344 GWh lower as a result of the various policy impacts.

Figure 27 **CitiPower forecast energy sales with and without policy impacts**

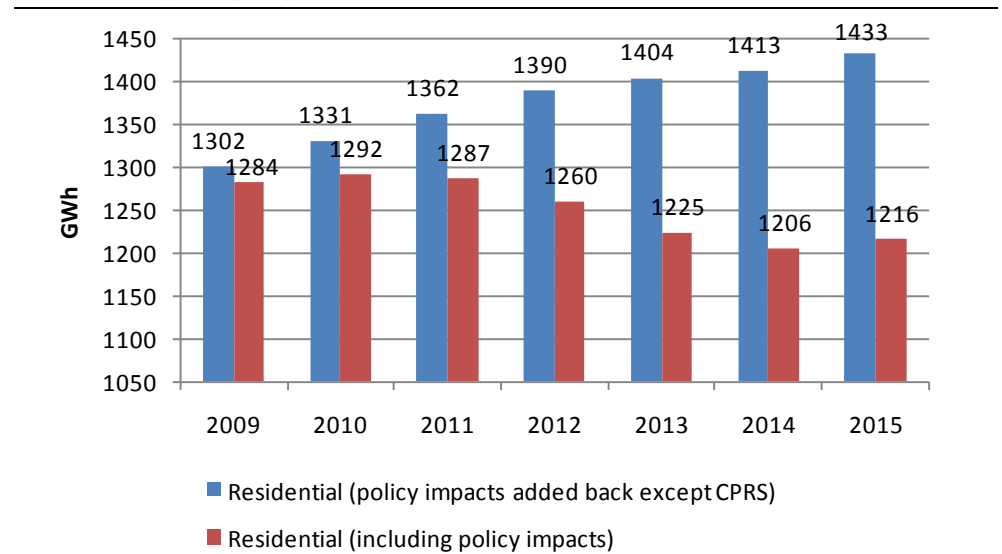


Data source: NIEIR Electricity sales and customer numbers report to CitiPower table 7.1 and table 6.2

Even after the effects of the separate policy impacts are added back to the forecasts, total energy sales in the CitiPower region experience a moderate slow down in 2014 and 2015. This is a result of a combination of close to zero economic growth forecast by NIEIR in these two years and the impact of the CPRS on energy sales.

Figure 28 shows that the majority of the policy related reduction in energy sales is accounted for by the residential sector. By 2015, residential energy sales are projected to be 217 GWh lower than they otherwise would be. The figure also shows that when the policy impacts are removed, residential energy sales resume their upward trajectory, rising from 1302 GWh in 2009 to 1433 GWh in 2015.

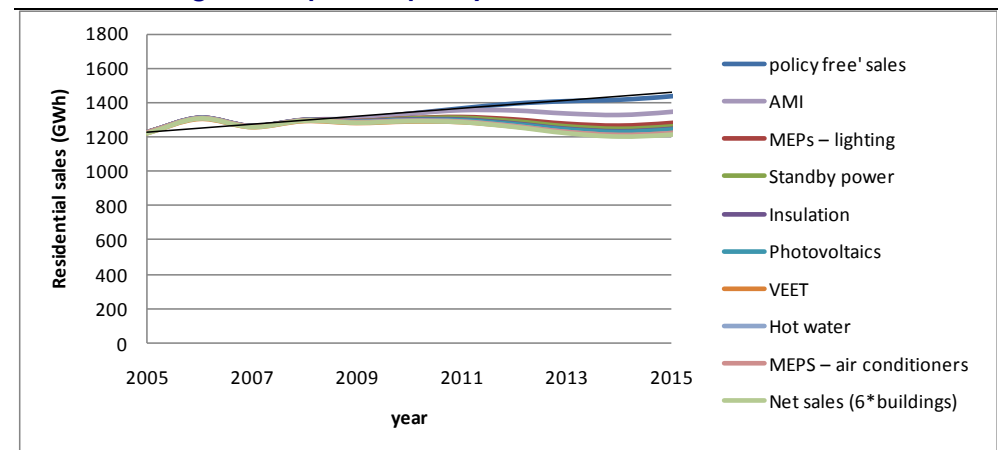
Figure 28 **CitiPower forecast residential energy sales with and without policy impacts**



Data source: NIEIR Electricity sales and customer numbers report to CitiPower table 7.1 and table 6.2

Figure 29 shows the relative impact of the different policies. The largest reductions in energy use are the forecast impact of AMI and the lighting MEPS.

Figure 29 **Energy sales to residential customers in CitiPower's distribution region – impact of policy interventions**

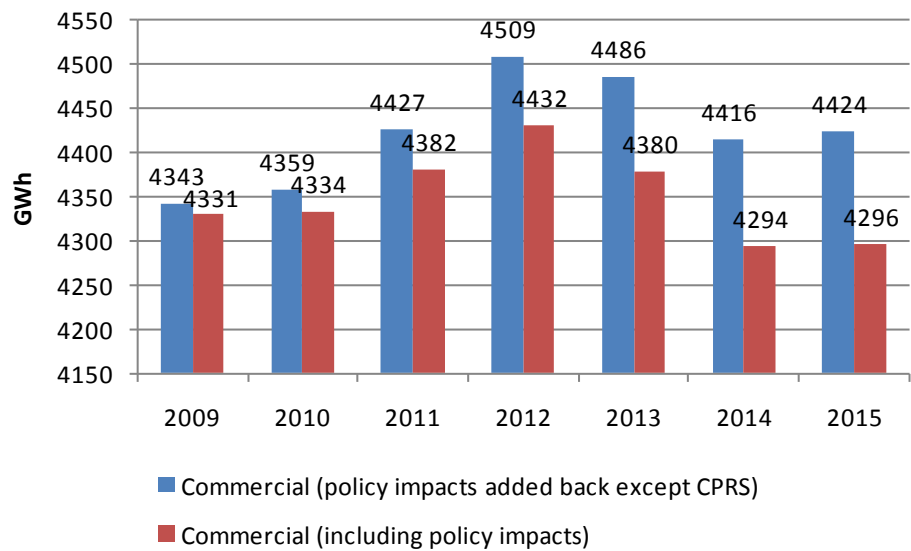


Data source: NIEIR, Electricity sales and customer numbers report to CitiPower, tables 7.1 and 6.2

As Figure 29 shows, once the policy impacts (other than CPRS) are removed, the energy sales forecasts grow approximately in line with the trend. The figure also shows that the impact of the AMI and MEPS lighting policies in particular are substantial.

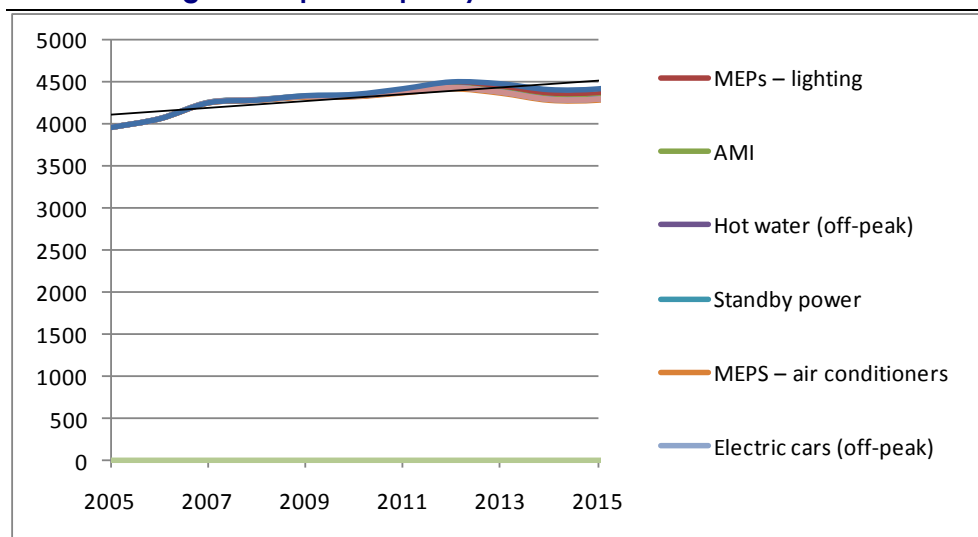
Figure 30 and Figure 31 tell a similar story for the commercial sector. Without the policy impacts, commercial energy sales in the CitiPower network would be 128 GWh higher than they would otherwise be. This is smaller than the residential sector in both absolute and percentage terms.

Figure 30 **CitiPower forecast commercial energy sales with and without policy impacts**



*NIEIR*, Electricity sales and customer numbers report to CitiPower *tables 7.1 and 6.5*

Figure 31 **Energy sales to commercial customers in CitiPower's distribution region – impact of policy interventions**



Data source: NIEIR, Electricity sales and customer numbers report to CitiPower, tables 7.1 and 6.5

## 7.4 Recommendation – CitiPower

As is discussed above, ACIL Tasman recommends that CitiPower's energy sales forecasts should be amended as follows:

1. Disregard the energy reduction attributed to the AMI rollout
2. Disregard the energy reduction attributed to the insulation rebate beyond 2009
3. Disregard the energy reduction attributed to the one watt standby target
4. Reduce the energy reduction attributed to the lighting MEPS so that it does not exceed the reduction forecast in the relevant Regulatory Impact Statement

Applying these adjustments to CitiPower's forecasts yields the amended forecasts set out in Table 22.

Table 22 **CitiPower- Energy sales forecasts adjusted for changes to policy impacts**

Sector	Residential	Commercial	Industrial	Public lighting	Total energy sales
Year	GWh	GWh	GWh	GWh	GWh
2011	1346	4420	329	33	6127
2012	1367	4499	324	30	6221
2013	1377	4474	312	27	6191
2014	1380	4402	300	28	6110
2015	1397	4409	293	30	6129

Data source: NIEIR, Electricity sales and customer numbers report to CitiPower, tables 6.2, 6.5 and 7.1, ACIL Tasman calculations





## 8 Powercor

### 8.1 Description of Powercor network

Figure 32 Map of Powercor region



Powercor’s region contains significant areas of agricultural land. It contains 54% of Victoria’s agricultural sector. It also contains almost 30% of Victoria’s population and dwelling stock and almost one quarter of the State’s agricultural sector. The finance, business, communications and public administrations sectors are underrepresented in Powercor’s area relative to the rest of Victoria.

NIEIR’s forecast of population growth over the next regulatory period in Powercor’s region varies significantly area by area. At one extreme, NIEIR forecasts annual growth of 2.2% in Western Melbourne, dominated by growth in the fringe areas. At the other extreme, the forecast growth rate in the Wimmera is 0.4% per annum. NIEIR forecasts population growth of 1.6% per annum for Powercor’s area as a whole.

The forecast growth in dwelling stock is approximately the same as that for population. In each of Powercor’s regions, dwelling stock is forecast to grow at

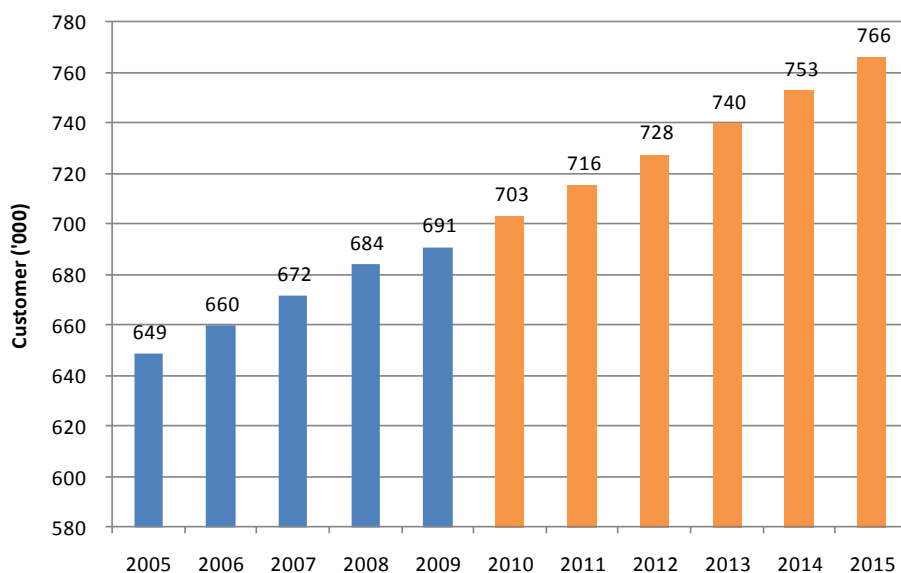
a slightly lower rate than population. This is notably in contrast to the forecast prepared for CitiPower in Melbourne.

## 8.2 Powercor customer numbers

### 8.2.1 Total Customer numbers

Customer numbers in the Powercor network are projected to increase from 691 thousand in 2009 to 766 thousand in 2015. Figure 33 shows that forecast growth in customer numbers during the next regulatory period are consistent with historical growth.

Figure 33 **Powercor network total customer numbers, historical and forecast**



Data source: Powercor RIN Table 1

Between 2005 and 2008, annualised growth in Powercor's customer numbers was 1.8% per annum. Over the period from 2005 to 2009, growth in customer numbers was 1.6% per annum (see Table 23). Customer numbers are projected by NIEIR to grow at 1.7% per annum.

Table 23 **Growth in Powercor customer numbers, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	1.82%	1.62%	1.73%
Small business	1.42%	1.33%	1.73%
Large Business	2.43%	2.08%	1.73%
Total customer numbers	1.77%	1.58%	1.73%

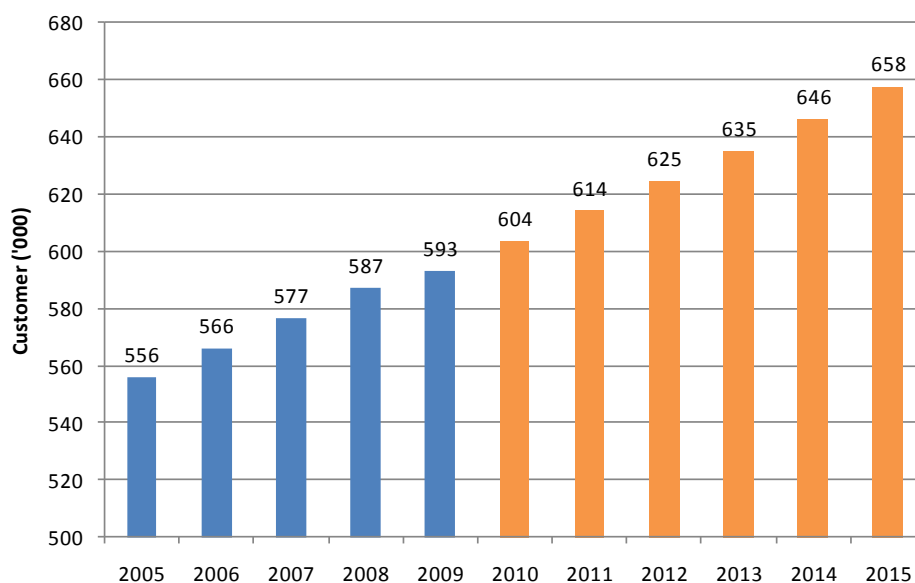
Data source: Powercor RIN Table 1

### 8.2.2 Customer number by sector

In the case of Powercor, customer numbers for small and large business are forecast to grow at the same rate as residential customers.

Residential customers are forecast to reach 658 thousand by 2015 and are consistent with historical growth trends.

Figure 34 **Powercor network residential customer numbers, historical and forecast**

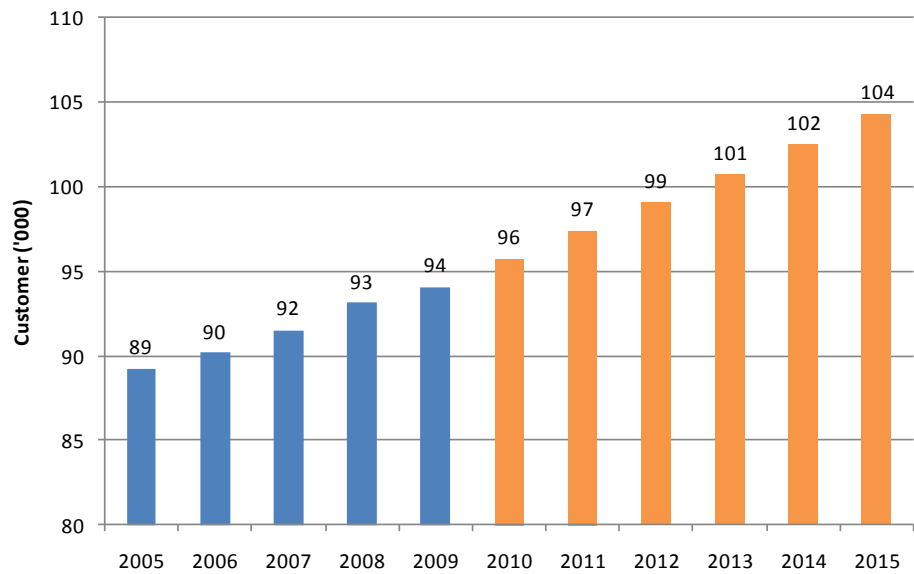


Data source: Powercor RIN Table 1

Historical and forecast small and large businesses in the Powercor network are shown in Figure 35 and Figure 36 respectively. Compared to historical growth trends, small business customer numbers are forecast to grow at a moderately faster rate, while large business customers are projected to grow moderately more slowly compared to the past.

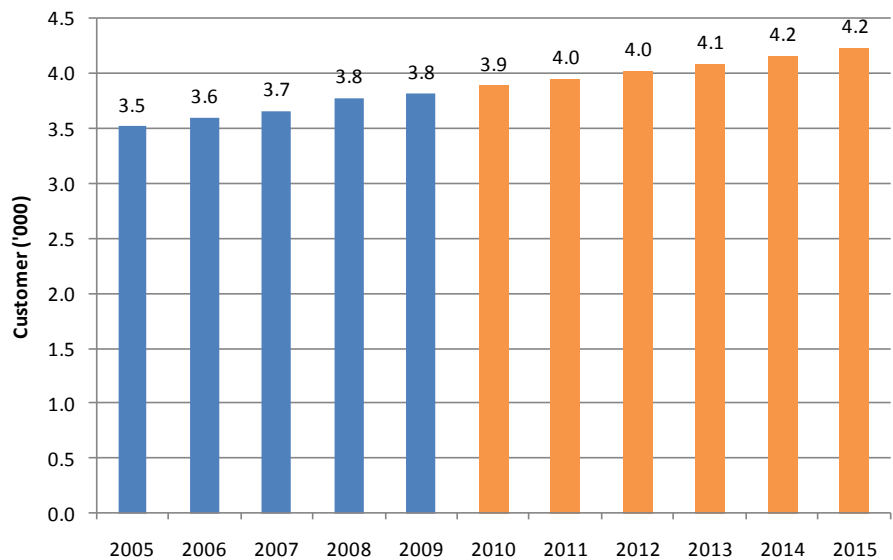
Despite these small differences in projected growth rates, ACIL Tasman believes that the small and large business customer number forecasts are broadly consistent with historical trends.

Figure 35 **Powercor network small business customer numbers, historical and forecast**



Data source: Powercor RIN Table 1

Figure 36 **Powercor network large business customer numbers, historical and forecast**



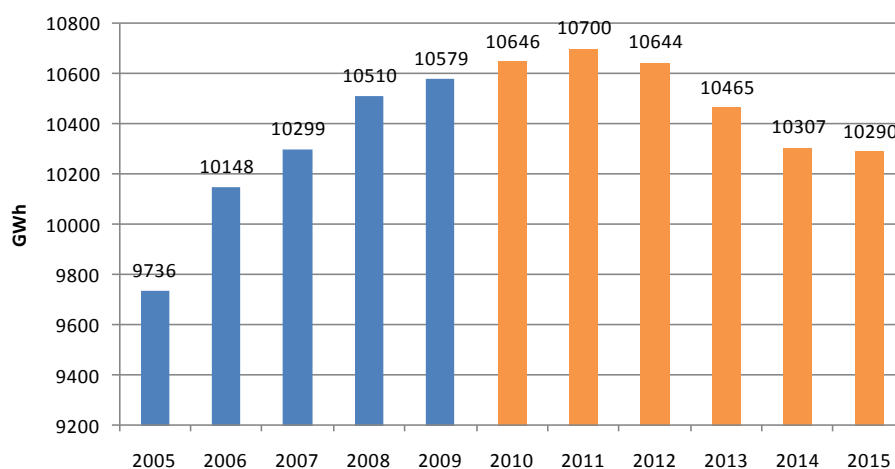
Data source: Powercor RIN Table 1

## 8.3 Powercor energy sales

### 8.3.1 Total energy sales

Total energy sales in the Powercor network are forecast to decline from 10510 GWh in 2008 to 10,290 GWh in 2015 (see Figure 37). This represents a decline of 0.3% per year compared to growth of almost 2.6% per annum from 2005 to 2008.

Figure 37 **Powercor total energy sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to PowerCor Table 7.1

Table 24 **Growth in Powercor energy sales, historical and forecast, percent per annum**

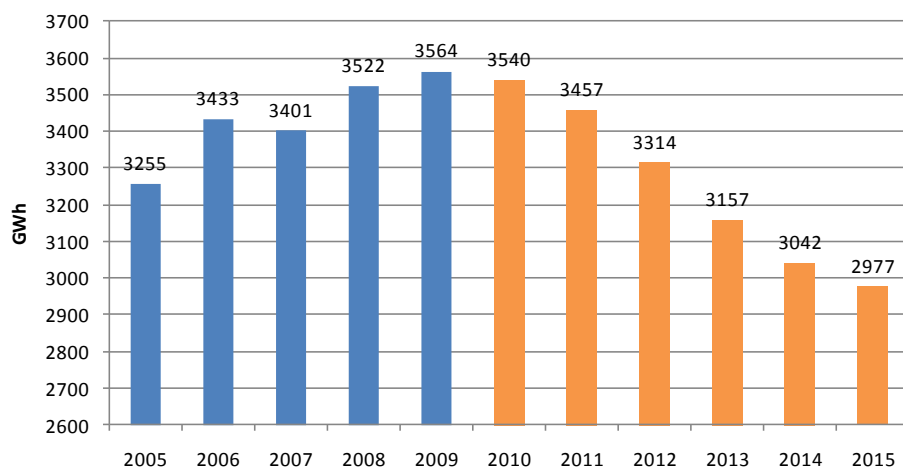
Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	2.67%	2.29%	-3.41%
Commercial	3.06%	2.71%	2.52%
Industrial	2.11%	1.38%	-1.19%
Total energy sales	2.58%	2.10%	-0.68%

Data source: NIEIR Electricity sales and customer numbers report to PowerCor Table 7.1

### 8.3.2 Energy sales by sector

By far the largest contribution to this overall decline in forecast sales is the residential sector. Powercor's residential sales are projected to decline to 2977 GWh in 2015 from 3564 GWh in 2009 (see Figure 38). In percentage terms, this is a decline of 3.4% per annum over the course of the next regulatory period. This is in sharp contrast to historical growth of 2.7% per annum between 2005 and 2008.

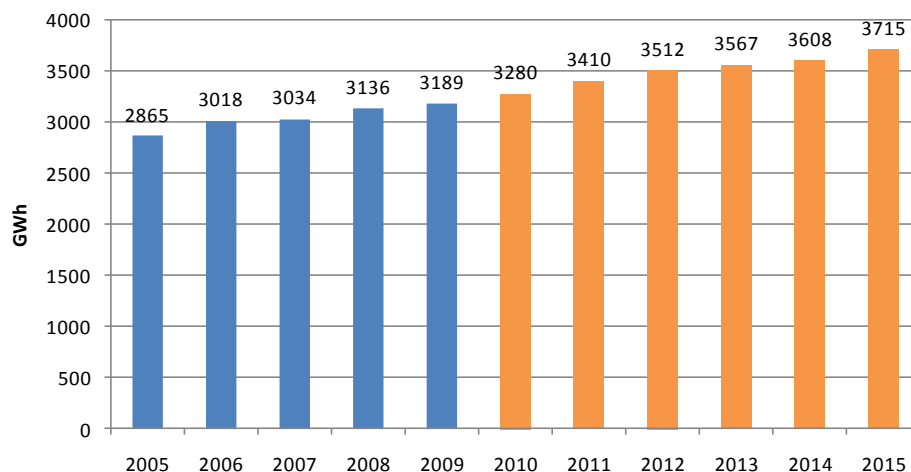
Figure 38 **Powercor total residential sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to PowerCor Table 7.1

Powercor’s historical and forecast commercial and industrial energy sales are presented in Figure 39 and Figure 40. In the next regulatory period, Powercor’s commercial energy sales are projected to grow at a rate of just over 2.5% per annum. This is compared to growth of 3.1% over the 4 years from 2005 to 2008.

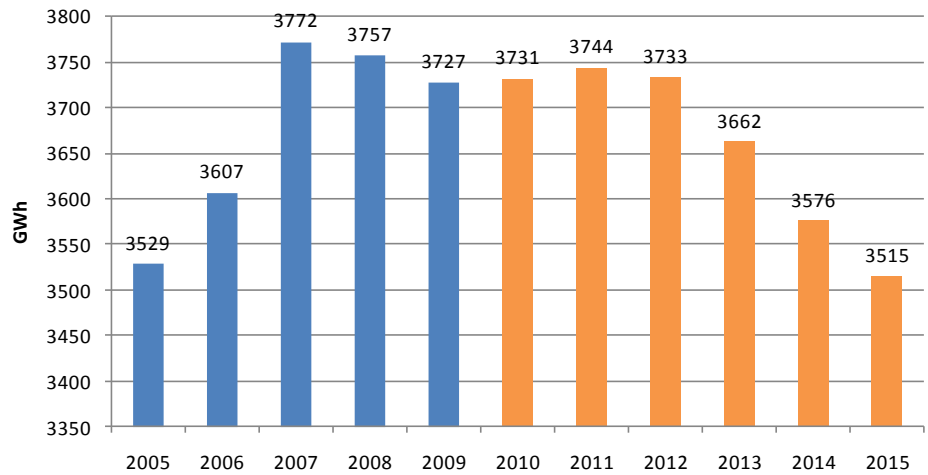
Figure 39 **Powercor total commercial sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to PowerCor Table 7.1

Powercor’s industrial sales are forecast to decline at a rate of 1.2% per annum over the next regulatory period.

Figure 40 **Powercor total industrial sales, historical and forecast**



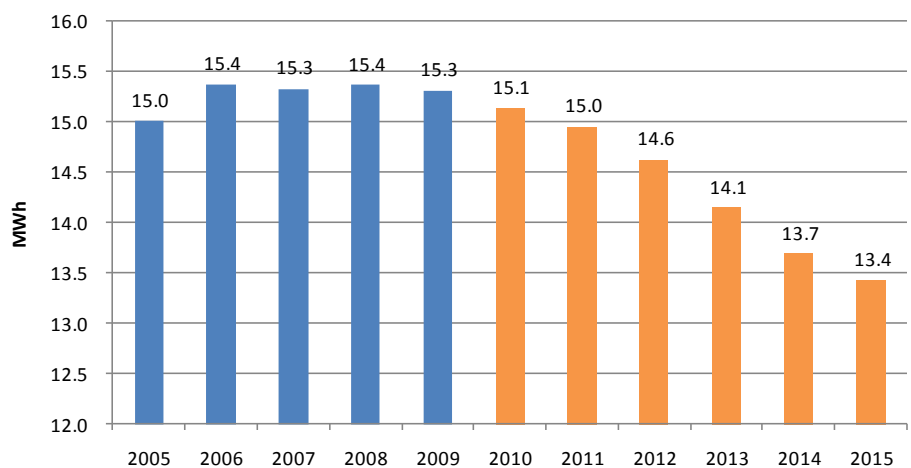
Data source: NIEIR Electricity sales and customer numbers report to PowerCor Table 7.1

### 8.3.3 Energy sales per customer

#### Total energy sales by customer

After extracting the impact of rising customer numbers from the energy sales data, the major behavioural shift predicted by Powercor becomes more evident. Figure 41 shows that on a per customer basis, energy sales are predicted to decline from 15.3 MWh per customer to 13.4 MWh by 2015.

Figure 41 **Powercor total energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to PowerCor Table 7.1 and Powercor RIN Table 1

This is equivalent to a decline of 2.4% per annum between 2010 and 2015 and again is a major departure from historical behaviour (see Table 25).<sup>73</sup>

Table 25 **Growth in Powercor energy sales per customer, historical and forecast, percent per annum**

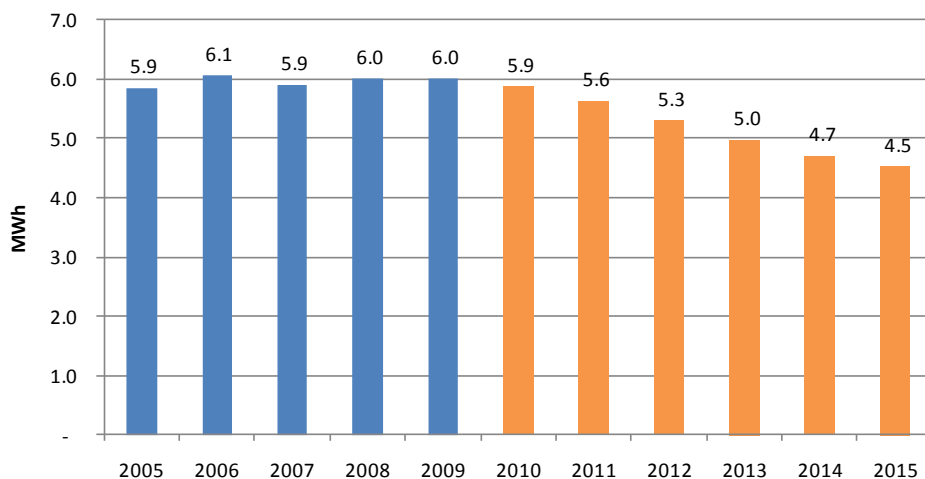
Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	0.83%	0.66%	-5.05%
Total sales per customer	0.80%	0.51%	-2.37%

Data source: NIEIR Electricity sales and customer numbers report to PowerCor Table 7.1 and Powercor RIN Table 1

### Residential energy sales per customer

The majority of the decline in energy use per customer is taking place in the residential sector. After stripping away customer number growth, Powercor forecasts residential energy use per customer to decline from 6.0 MWh in 2008 to 4.5MWh by 2015. For this to occur, energy use per customer needs to shrink at a rate of 4.2% per annum, when it has been growing at a moderate pace historically.

Figure 42 **Powercor residential energy sales per customer, historical and forecast, historical and forecast. Historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to PowerCor Table 7.1 and Powercor RIN Table 1

### Commercial and industrial sales per customer

We are unable to construct commercial and industrial sales per customer information for Powercor due the absence of commercial and industrial

<sup>73</sup> Note that 2009 is an estimate. The decline is even more pronounced against recorded history.



customer numbers data in the NIEIR report to Powercor. The disaggregated energy sales data in the Powercor RIN has also proven to be unsuitable as a means of generating energy sales per small business and large business customer due to technical problems in disaggregating the data which were outlined by Powercor.

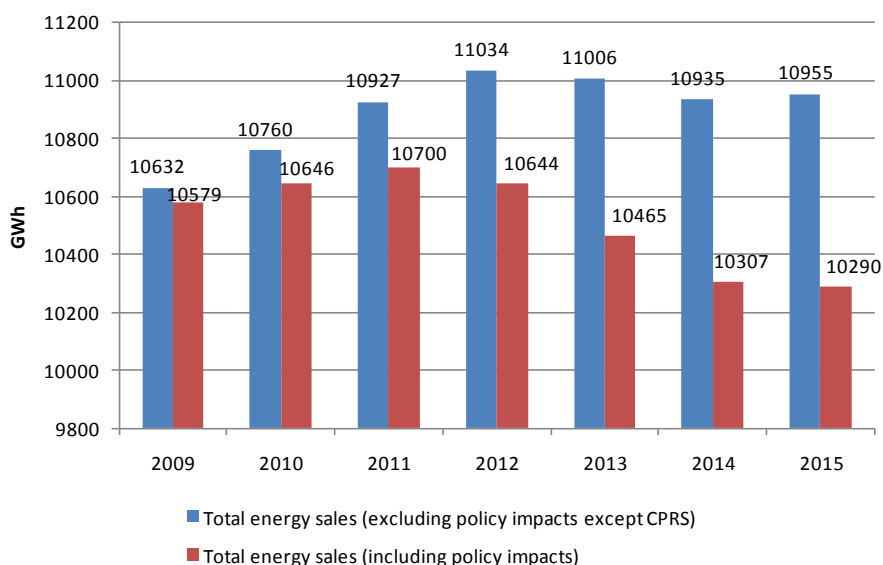
Despite the absence of this information, we can nevertheless still conclude that the largest and most significant impact on energy sales originates from the residential sector.

### 8.3.4 Energy sales with and without policy impacts

The cumulative impact of the various policies estimated by NIEIR has a significant effect on overall energy sales within the Powercor network.

Figure 43 indicates that the cumulative policy impact, exclusive of the CPRS reaches a total of 665 GWh by 2015. Without the separate policy impacts, total energy sales are forecast to be 10955 GWh by 2015, instead of 10290 GWh with the separate policy impacts accounted for.

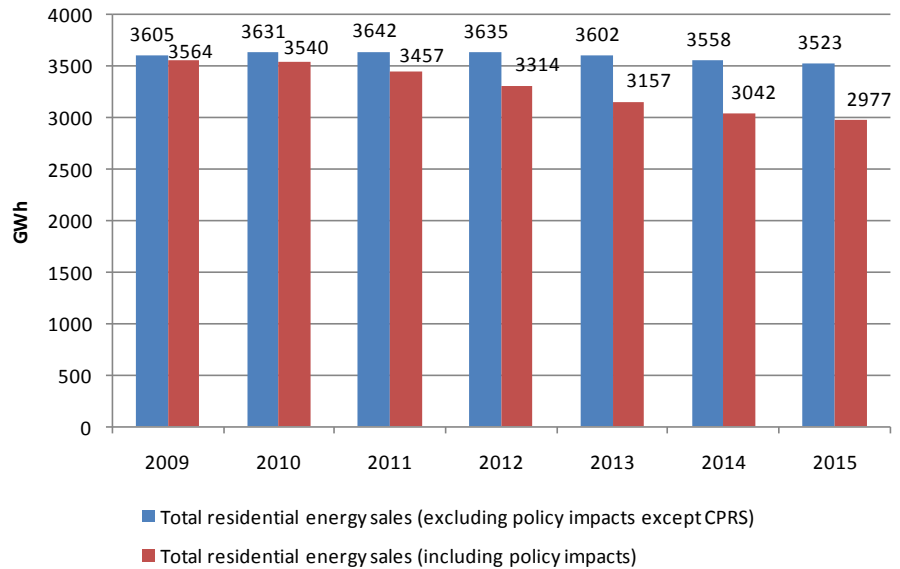
Figure 43 **Powercor forecast energy sales with and without policy impacts**



Data source: NIEIR Electricity sales and customer numbers report to PowerCor table 7.1, table 6.2 and table 6.5

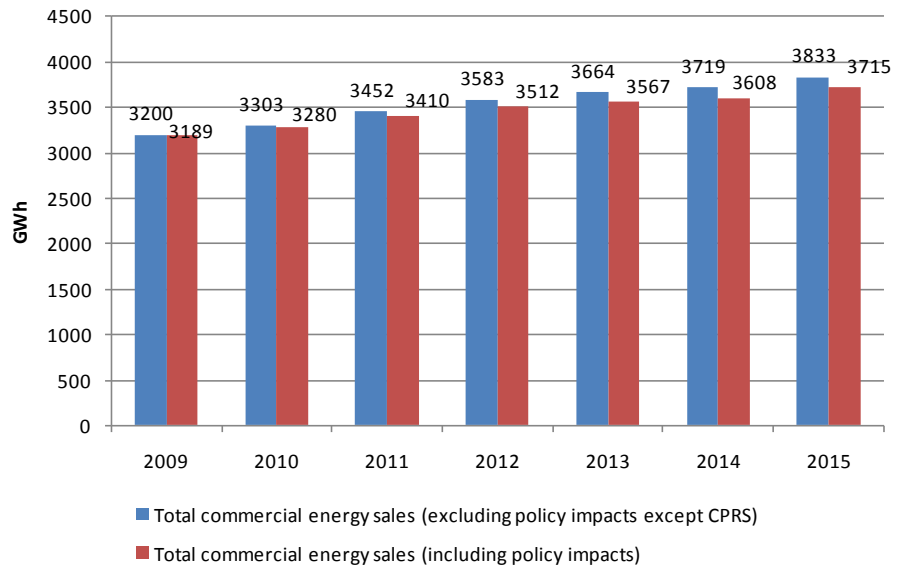
From Figure 44 and Figure 45 it can be observed that NIEIR's calculated policy impacts are having the greatest impact in the residential sector. Of the total 665 GWh reduction in total energy sales arising from the separate policy initiatives (not including the CPRS) by 2015, 546 GWh are removed from the residential sector and only 118 GWh are lost in the commercial sector.

Figure 44 **Powercor forecast residential energy sales with and without policy impacts**



Data source: NIEIR Electricity sales and customer numbers report to PowerCor table 7.1 and table 6.2

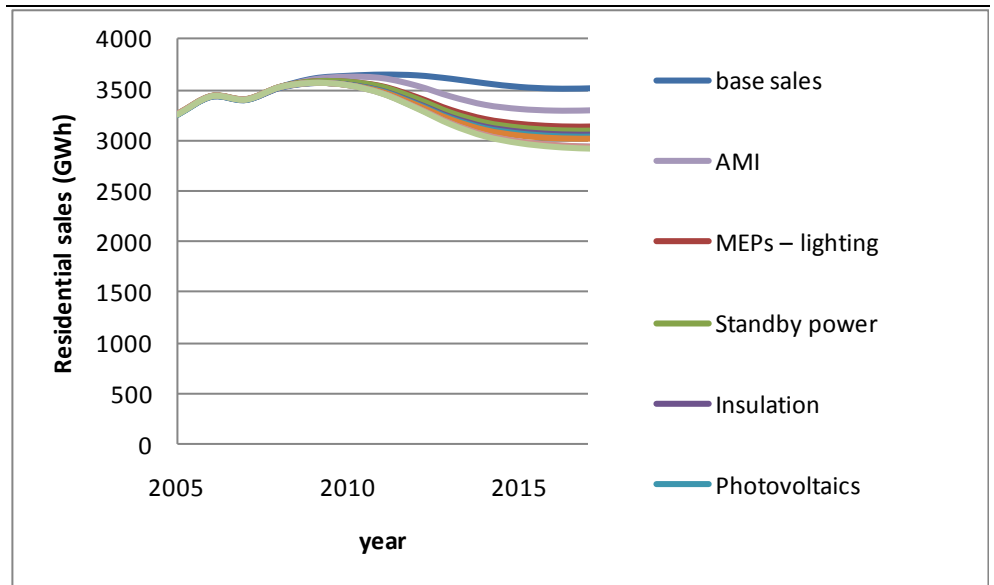
Figure 45 **Powercor forecast commercial energy sales with and without policy impacts**



Data source: NIEIR Electricity sales and customer numbers report to PowerCor table 7.1 and table 6.5

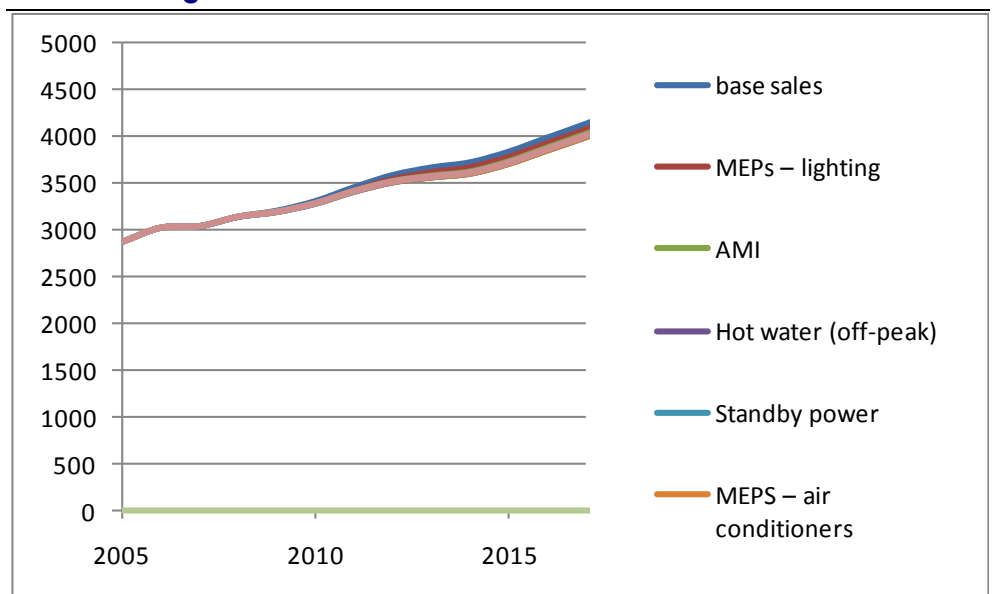
Figure 46 and Figure 47 show the impact of individual policy impacts on residential and commercial sales.

Figure 46 Policy impacts on residential sales – Powercor distribution region



Data source: NIEIR Electricity sales and customer numbers report to PowerCor table 7.1 and table 6.2

Figure 47 Policy impacts on commercial sales – Powercor distribution region



Data source: NIEIR Electricity sales and customer numbers report to PowerCor table 7.1 and table 6.5

## 8.4 Recommendation – Powercor

As is discussed above, ACIL Tasman recommends that Powercor’s energy sales forecasts should be amended as follows:

1. Disregard the energy reduction attributed to the AMI rollout
2. Disregard the energy reduction attributed to the insulation rebate beyond 2009

3. Disregard the energy reduction attributed to the one watt standby target
4. Reduce the energy reduction attributed to the lighting MEPS so that it does not exceed the reduction forecast in the relevant Regulatory Impact Statement

Applying these adjustments to Powercor's forecasts yields the amended forecasts set out in Table 22.

Table 26 **Powercor- Energy sales forecasts adjusted for changes to policy impacts**

Sector	Residential	Commercial	Industrial	Public lighting	Total energy sales
Year	GWh	GWh	GWh	GWh	GWh
2011	3593	3444	3744	89	10870
2012	3563	3571	3733	84	10951
2013	3509	3650	3662	79	10899
2014	3446	3702	3576	81	10805
2015	3394	3814	3515	84	10807

*Data source:* NIEIR, Electricity sales and customer numbers report to PowerCor, tables 6.2, 6.5 and 7.1, ACIL Tasman calculations



## 9 Jemena

### 9.1 Description of Jemena network

Figure 48 **Map of Jemena network**



Jemena’s distribution region covers approximately 950 square kilometres to the north of Melbourne. It incorporates industrial and residential areas as well as the Tullamarine Airport.

Jemena’s region accounts for approximately 12% of Victoria’s population and dwelling stock. It is characterised by a relatively large proportion of manufacturing activity, with nearly 13% of Victoria’s manufacturing output coming from Jemena’s area.<sup>74</sup>

On average, NIEIR forecasts that population growth in Jemena’s area will be 1.0% per annum over the next regulatory period, which is 0.2 percentage points below the Victorian average. Similarly, gross regional product in Jemena’s area is forecast to be 1.6% per annum, lagging the Victorian average growth rate by 0.5 percentage points. Also lagging the Victorian average is the rate of growth in the dwelling stock, which NIEIR forecasts will be 1.3% per annum in Jemena’s area, 0.2 percentage points behind the Victorian average.

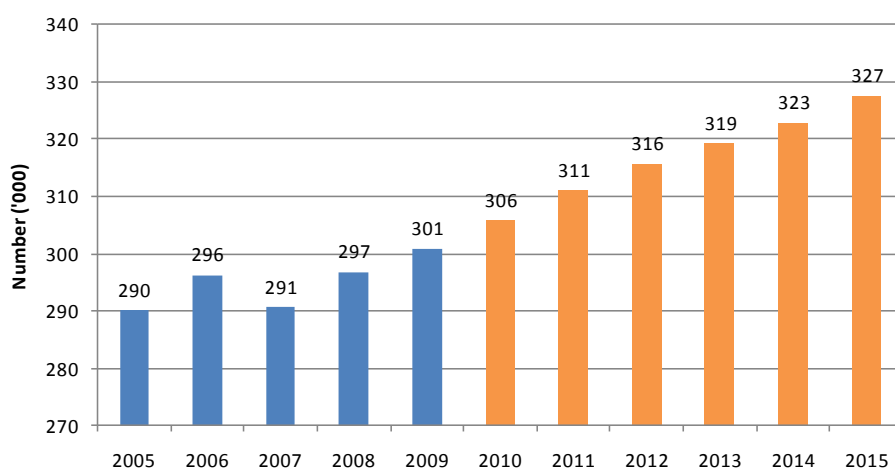
<sup>74</sup> This compares to only 9% of Victoria’s GSP coming from this area.

## 9.2 Jemena customer numbers

### 9.2.1 Total Customer numbers

Customer numbers in the Jemena network are forecast to increase from 301 thousand in 2009 to 327 thousand by the end of the next regulatory period in 2015.

Figure 49 **Jemena total customer numbers, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.2

Growth in total customer numbers is forecast to be 1.4% per annum during the next regulatory period. This is faster than the overall rate of growth observed historically, but the comparison appears to be muddled by a discontinuity in the number of small business customers between 2006 and 2007 which would bias the historical growth rate downwards as a result.

Table 27 **Growth in Jemena customer numbers, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	1.54%	1.56%	1.46%
Small business	-6.24%	-4.91%	0.59%
Large business	8.99%	6.52%	0.38%
Total customers	0.77%	0.92%	1.39%

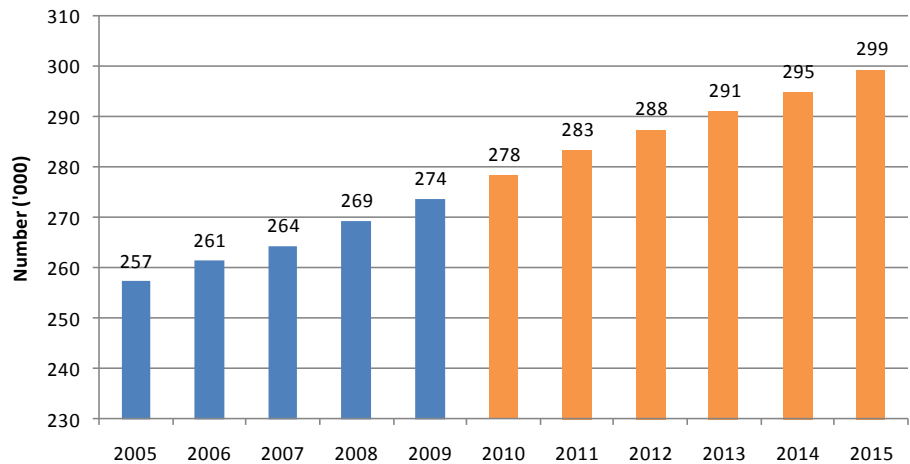
Data source: NIEIR Electricity sales and customer numbers report to Jemena, Table 7.2

### 9.2.2 Customer number by sector

Customer number growth in the residential sector is broadly in line with historical growth, projected to grow at 1.5% per annum between 2010 and 2015 compared to a growth rate of 1.6% between 2005 and 2009. The number

of residential customers in the Jemena network is forecast by NIEIR to reach 299 thousand by 2015.

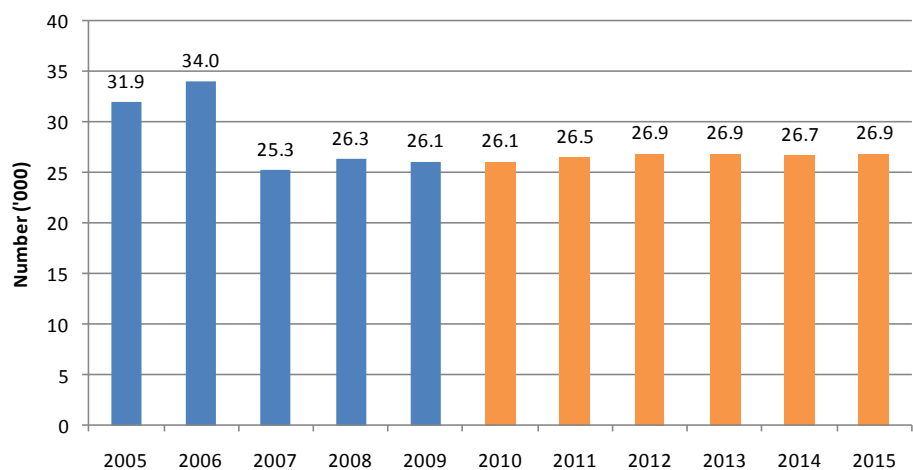
Figure 50 **Jemena residential customer numbers, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.2

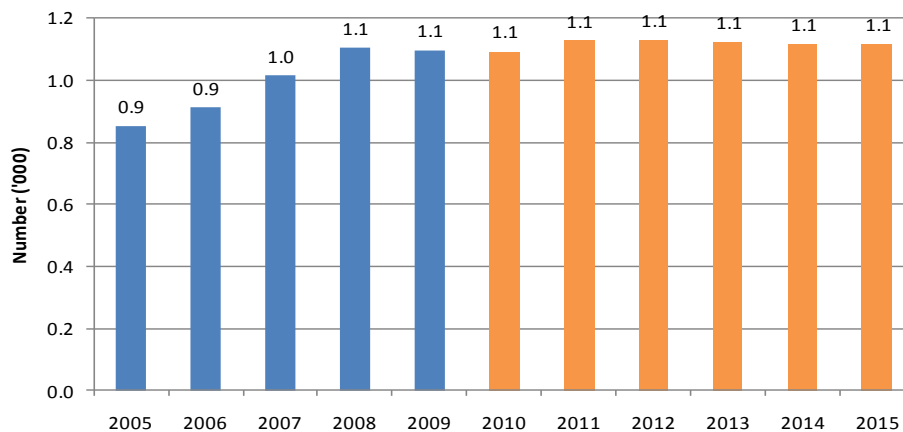
In contrast to the robust growth in residential customer numbers, small and large business customer numbers are expected to remain relatively stable (see Figure 51 and Figure 52).

Figure 51 **Jemena small business customer numbers, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.2

Figure 52 **Jemena large business customer numbers, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.2

## 9.3 Jemena energy sales

### 9.3.1 Total energy sales

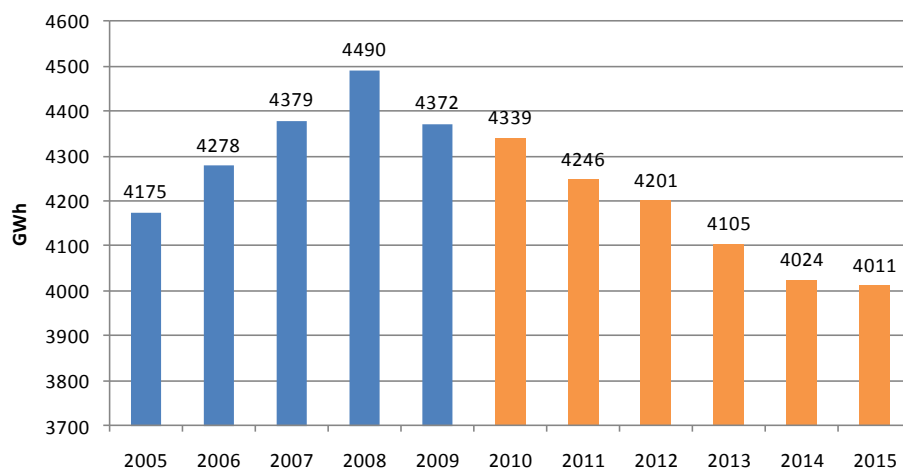
Energy sales in the Jemena network are forecast to decline from 4490 GWh in 2008 to 4011 GWh in 2015 (see Figure 53).

This represents a decline of 1.6% per annum over the next regulatory period and is in contrast to overall growth of 2.5% per annum in the three years between 2005 and 2008.<sup>75</sup>

<sup>75</sup> Note that the estimated result for 2009 is significantly below the actual observed in 2008. If the 2009 estimate is included in the historical series, the growth rate falls to 1.6% (on average from 2005 – 2009).



Figure 53 **Jemena total energy sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.1

Table 28 **Growth in Jemena energy sales, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	2.92%	2.21%	-1.67%
Commercial	4.86%	2.84%	-0.11%
Industrial	0.51%	-0.79%	-3.19%
Total sales	2.45%	1.16%	-1.56%

Data source: NIEIR Electricity sales and customer numbers report to Jemena, Table 7.2

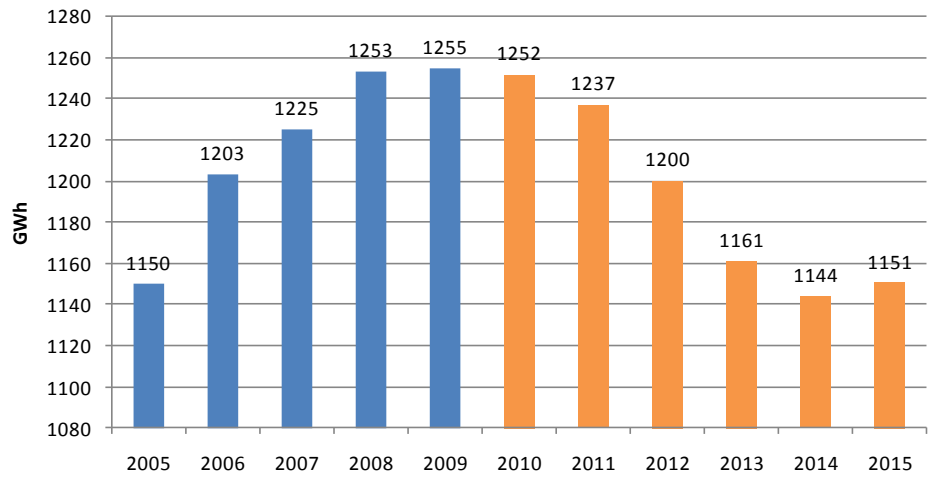
### 9.3.2 Energy sales by sector

Energy sales across all the individual sectors are forecast to decline in relative to historical growth rates.

In the residential sector, historical annualised growth of over 2% is forecast to decline to -1.7% per annum in the next regulatory period. Similarly in the commercial sector, robust historical growth of about 2.9% per annum between 2005 and 2008 is projected to drop to around zero. Industrial sales which experienced a moderate rate of decline between 2005 and 2008 are forecast to decline at a more rapid pace in the next regulatory period.

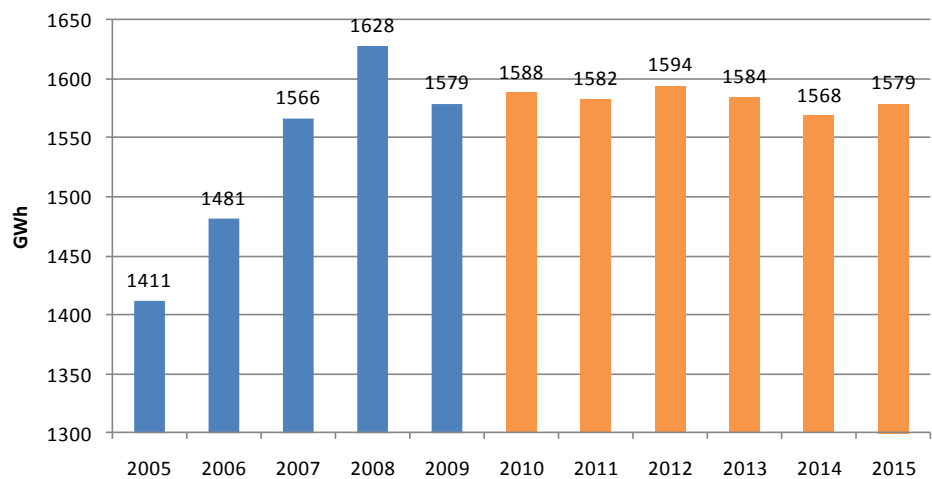
Figure 54, Figure 55 and Figure 56 show Jemena’s historical and forecast residential, commercial and industrial energy sales respectively.

Figure 54 **Jemena total residential sales, historical and forecast**



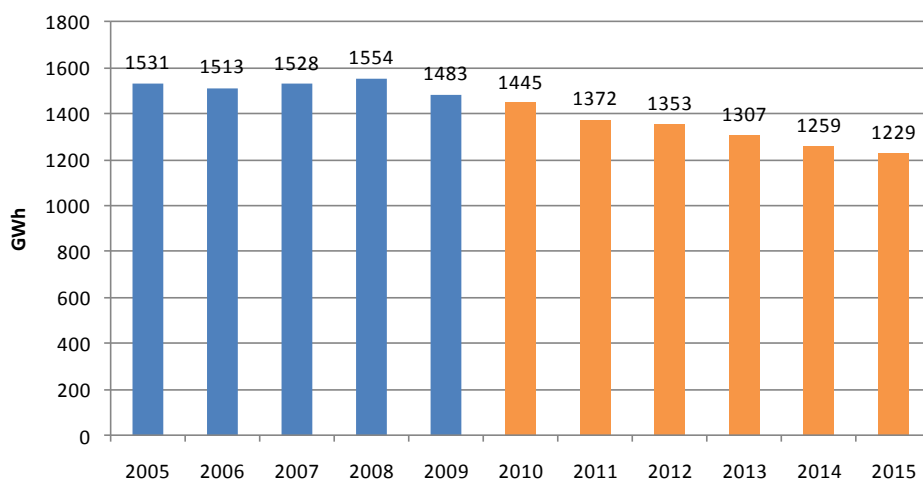
Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.1

Figure 55 **Jemena total commercial sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.1

Figure 56 **Jemena total industrial sales, historical and forecast**



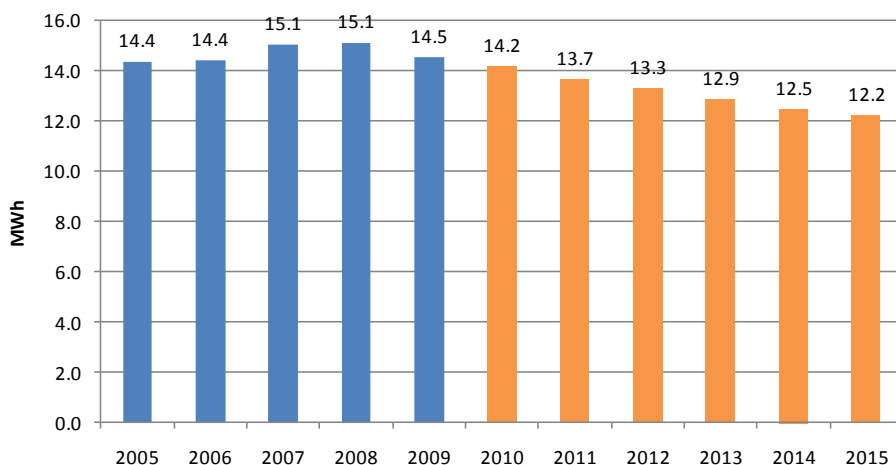
Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.1

### 9.3.3 Energy sales per customer

#### Total energy sales by customer

Total energy sales per customer within the Jemena network are forecast to decline from 15.1 MWh per customer in 2008 to 12.2 MWh in 2015.

Figure 57 **Jemena total energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.1 and table 7.2

While historical growth has been moderate across the Jemena network, running at just over 1.5% per annum between 2005 and 2008<sup>76</sup>, growth in the next regulatory period is forecast to be -2.9% per annum. As is the case with

<sup>76</sup> If the estimated result for 2009 is included, the average growth was 0.2% per annum.

the other distribution businesses analysed in this review, this represents a significant departure from historical behaviour.

Table 29 **Growth in Jemena energy sales per customer, historical and forecast, percent per annum**

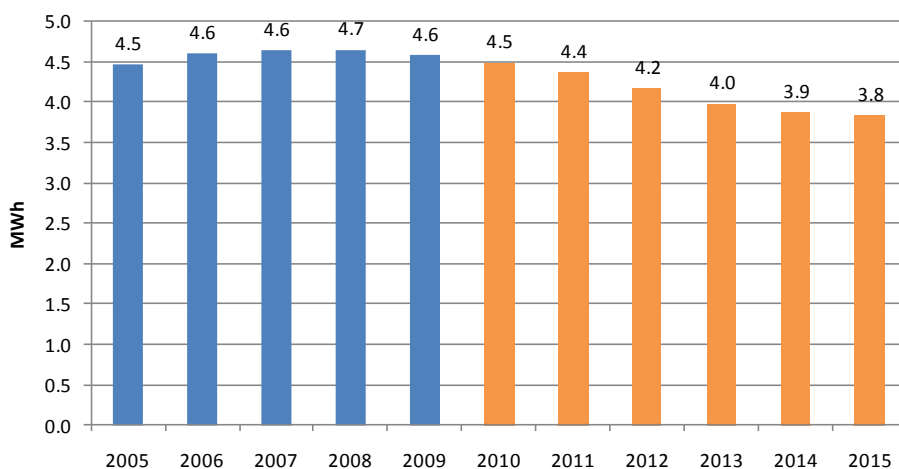
Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	1.35%	0.64%	-3.09%
Small business	10.49%	7.57%	-2.00%
Large business	-6.10%	-5.57%	-1.94%
Total	1.67%	0.24%	-2.91%

Data source: NIEIR Electricity sales and customer numbers report to Jemena, Table 7.1 and 7.2

### Energy sales per customer by sector

Residential sales per customer in the Jemena network are projected to decline by 3.1% per annum during the next regulatory period after recording a moderate rate of growth in the last 4 years.

Figure 58 **Jemena residential energy sales per customer, historical and forecast**



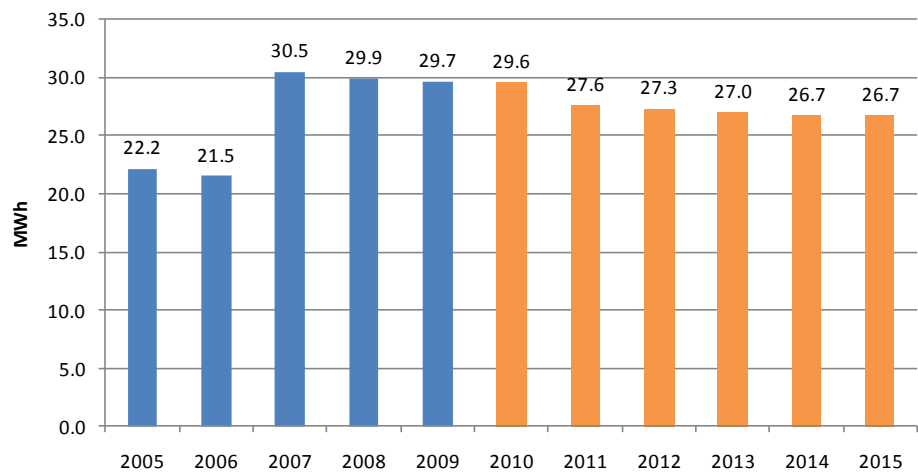
Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.1 and table 7.2

Small to medium business energy and large business sales per customer are forecast to decline at -2% and -1.9% per annum respectively in the next regulatory period. This is a significant slowdown in the rate of decline compared to that experienced historically, particularly as the historical period includes 2008 and 2009, two years in which the rate of economic growth was adversely affected by the global financial crisis (see Figure 59 and Figure 60).

It is important to bear in mind when comparing the historical and forecast growth rates shown in Table 29 that the small business historical calculations

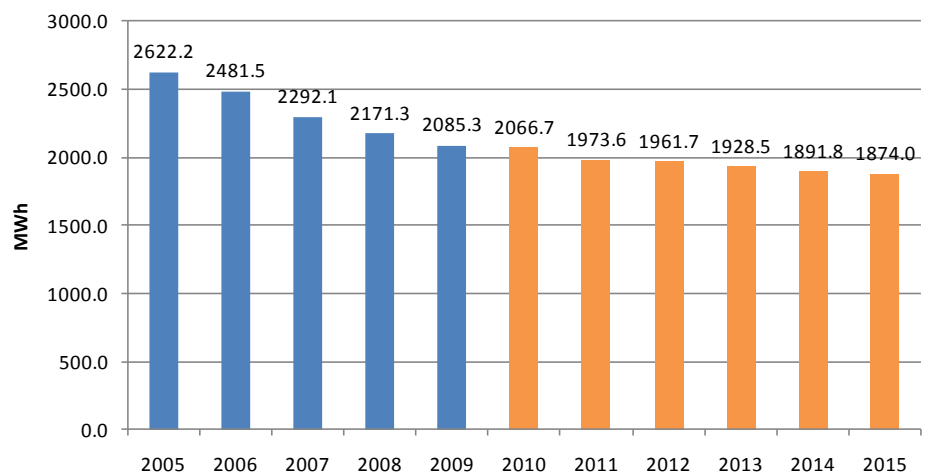
appear to be distorted by a step change in the number of businesses between 2006 and 2007.

Figure 59 **Jemena small/medium business energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.1 and table 7.2

Figure 60 **Jemena large business energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to Jemena Table 7.1 and table 7.2

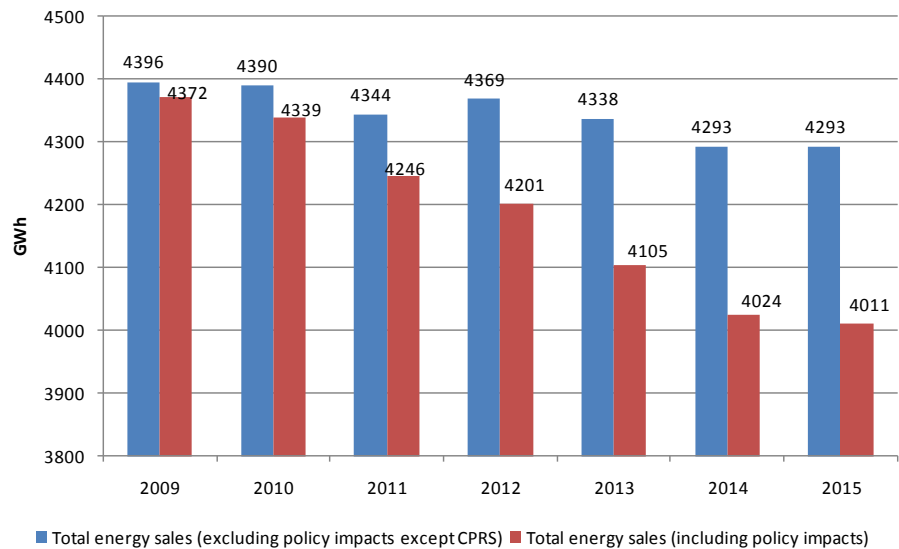
### 9.3.4 Energy sales with and without policy impacts

The cumulative impact of the various policies estimated by NIEIR has a significant effect on overall energy sales within the Jemena network.

Figure 61 indicates that the cumulative policy impact, exclusive of the CPRS reaches a total of 280 GWh by 2015. Without the separate policy impacts,

total energy sales are forecast to be 4293 GWh by 2015, instead of 4011 GWh with the separate policy impacts accounted for.

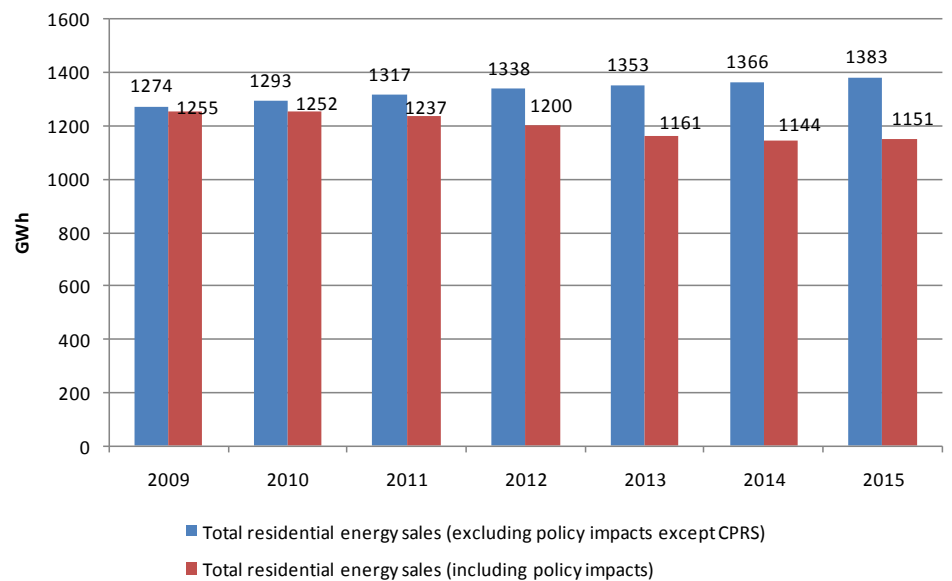
Figure 61 **Jemena forecast energy sales with and without policy impacts**



Data source: NIEIR Electricity sales and customer numbers report to Jemena table 7.1 and table 6.2

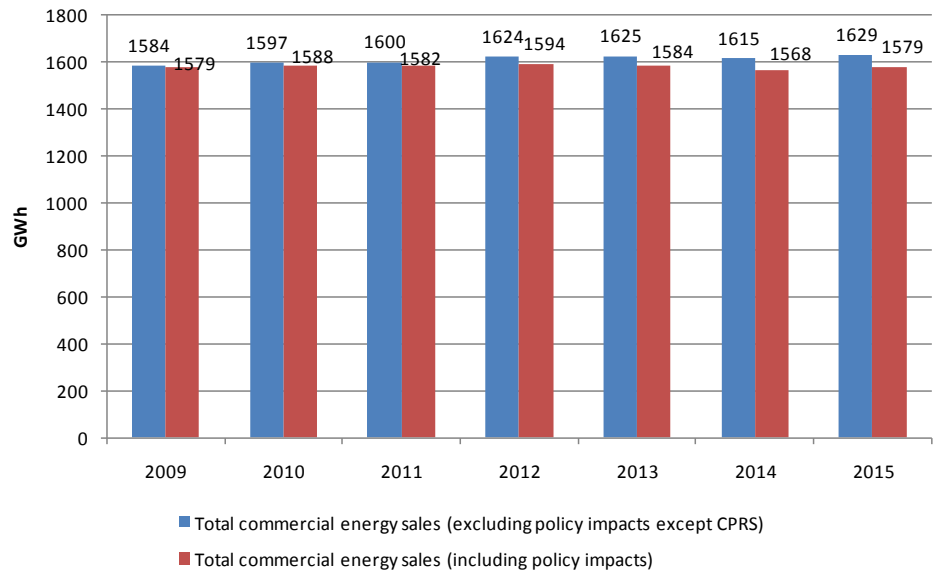
Figure 62 and Figure 63 present the residential and commercial energy forecasts with and without the inclusion of NIEIR’s policy impacts.

Figure 62 **Jemena forecast residential energy sales with and without policy impacts**



Data source: NIEIR Electricity sales and customer numbers report to Jemena table 7.1 and table 6.2

Figure 63 **Jemena forecast commercial energy sales with and without policy impacts**

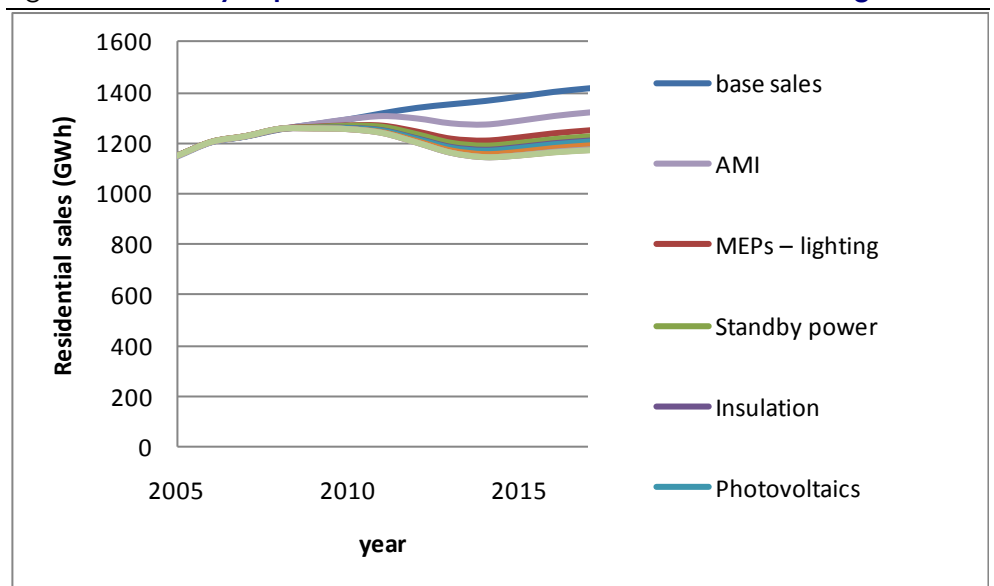


Data source: NIEIR, Electricity sales and customer numbers report to Jemena, tables 6.5 and 7.2

It is evident from these figures that the policy impacts are accruing predominantly in the residential sector. In the residential sector, energy sales are 232 GWh lower by 2015 as a result of the various calculated policy impacts, not including the CPRS. In the commercial sector, the cumulative policy impact reaches 50 GWh by 2015.

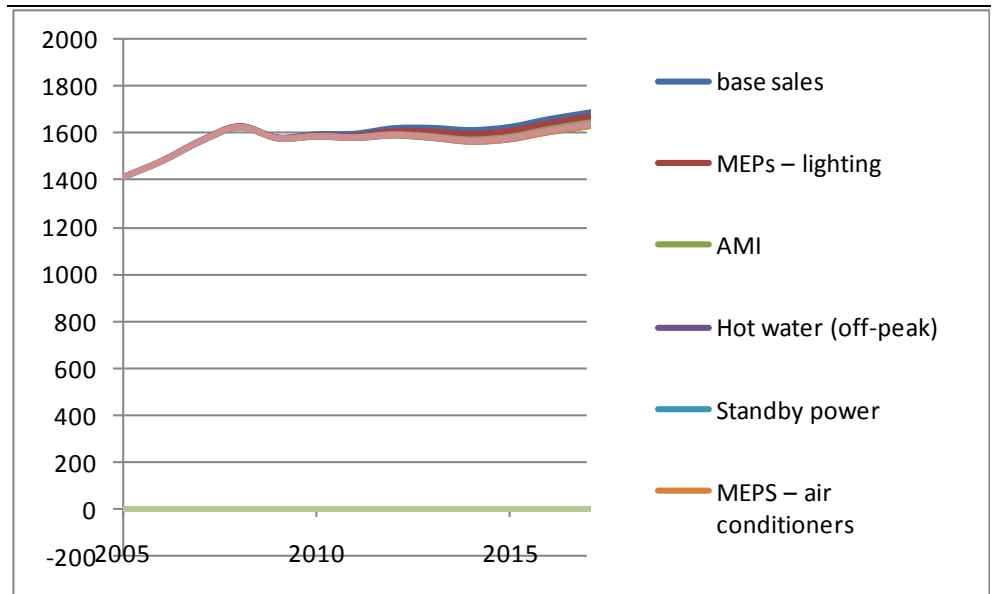
Figure 64 and Figure 65 show the impact of individual policy interventions on residential and commercial sales respectively.

Figure 64 **Policy impacts on residential sales – JEN distribution region**



Data source: NIEIR, Electricity sales and customer numbers report to Jemena, tables 6.2 and 7.1

Figure 65 **Policy impacts on commercial sales – JEN distribution region**



Data source: NIEIR, Electricity sales and customer numbers report to Jemena, tables 6.5 and 7.1

## 9.4 Recommendation – Jemena

As is discussed above, ACIL Tasman recommends that Jemena's energy sales forecasts should be amended as follows:

1. Disregard the energy reduction attributed to the AMI rollout
2. Disregard the energy reduction attributed to the insulation rebate beyond 2009
3. Disregard the energy reduction attributed to the one watt standby target
4. Reduce the energy reduction attributed to the lighting MEPS so that it does not exceed the reduction forecast in the relevant Regulatory Impact Statement



Applying these adjustments to Jemena's forecasts yields the amended forecasts set out in Table 22.

Table 30 **Jemena- Energy sales forecasts adjusted for changes to policy impacts**

Sector	Residential	Commercial	Industrial	Public lighting	Total energy sales
Year	GWh	GWh	GWh	GWh	GWh
2011	1299	1597	1372	54	4322
2012	1313	1619	1353	54	4339
2013	1321	1619	1307	53	4300
2014	1328	1609	1259	52	4248
2015	1340	1622	1229	52	4243

*Data source:* NIEIR, Electricity sales and customer numbers report to Jemena, tables 6.2, 6.5 and 7.1, ACIL Tasman calculations

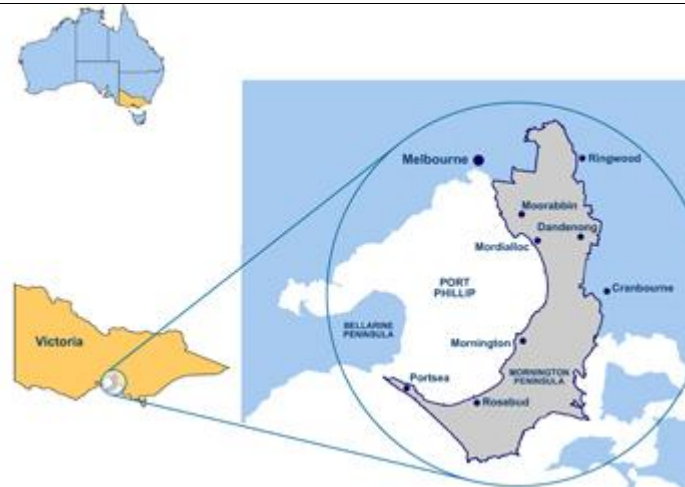


## 10 United Energy

### 10.1 Description of United Energy network

United's distribution region services the south-eastern suburbs of Melbourne and the Mornington Peninsula. It is largely urban in nature.

Figure 66 **Map of United area**



United's region accounts for approximately 23% of Victoria's population and dwelling stock. It is characterised by a large proportion of manufacturing activity, with slightly more than 29% of Victoria's manufacturing output coming from United's region.<sup>77</sup>

On average, NIEIR forecasts that population growth in United's area will be 0.8% per annum over the next regulatory period, which is 0.4 percentage points below the Victorian average. Also lagging behind the Victorian average is the forecast rate of growth in dwelling stock in United's region, which NIEIR forecasts will be 0.7% per annum, less than half the Victorian average of 1.6%. By contrast, gross regional product in United's area is forecast to be 2.2% per annum, ahead of Victorian average growth rate by 0.1 percentage points.

<sup>77</sup> This compares to 22.7% of Victoria's GSP coming from this area (in 2001) (NIEIR, "Maximum demand forecasts for United Energy terminal stations to 2019", November 2009)

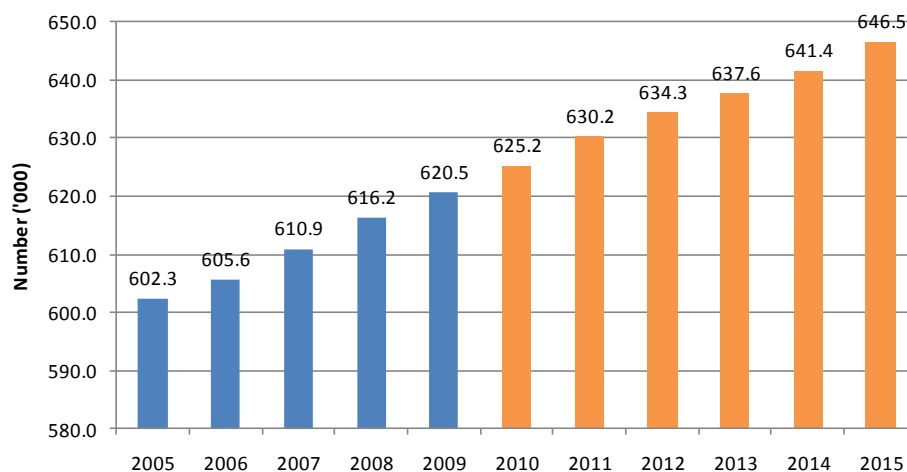
## 10.2 United Energy customer numbers

### 10.2.1 Total Customer numbers

Figure 67 shows the historical and forecast customer numbers for the United Energy network.

Customer numbers are projected to increase from 620.5 thousand in 2009 to 646.5 in 2015. The figure also shows that future growth is expected to be broadly in line with historical performance.

Figure 67 **United network total customer numbers, historical and projected**



Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.2

In terms of growth rates, Table 31 shows that the number of customers in the United Energy network is projected to grow at a rate of 0.7% in the next regulatory period compared to a historical growth rate of about 0.8% per annum.

Table 31 **Growth in United Energy customer numbers, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	0.69%	0.71%	0.68%
Commercial	1.44%	1.02%	0.71%
Industrial	1.91%	1.41%	-0.11%
Total customer numbers	0.76%	0.75%	0.67%

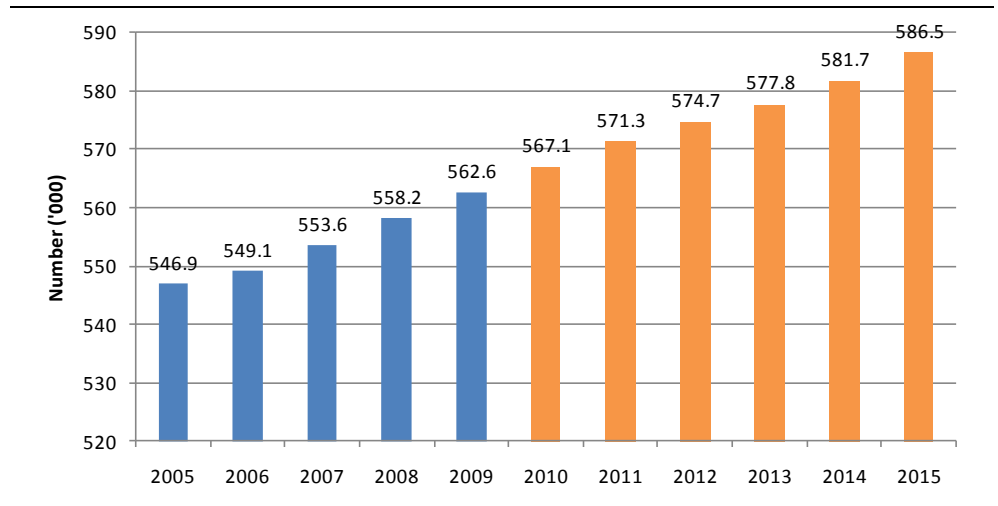
Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.2

### 10.2.2 Customer numbers by sector

Total customer numbers are dominated by the residential sector (see Figure 82). Residential customer numbers are projected by NIEIR to increase at a

rate of 0.7% per annum in the next regulatory period which is about the same as historical customer number growth.

Figure 68 **United network residential customer numbers, historical and forecast**

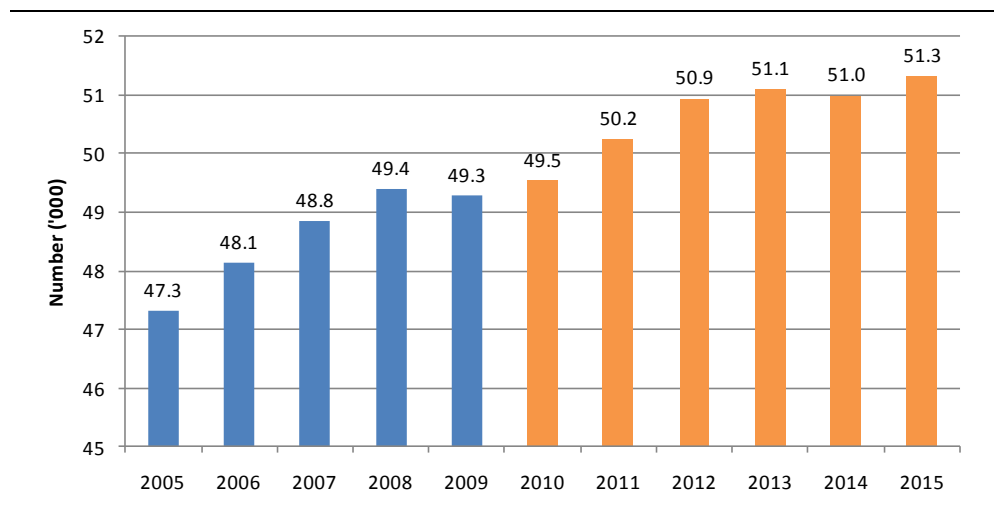


Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.2

Commercial customer numbers are also projected to increase in the next regulatory period from 49.3 thousand customers to 51.3 thousand by 2015.

This represents a moderate slow down in the growth in customer numbers to 0.7% per annum from 1.02% per annum between 2005 and 2009.

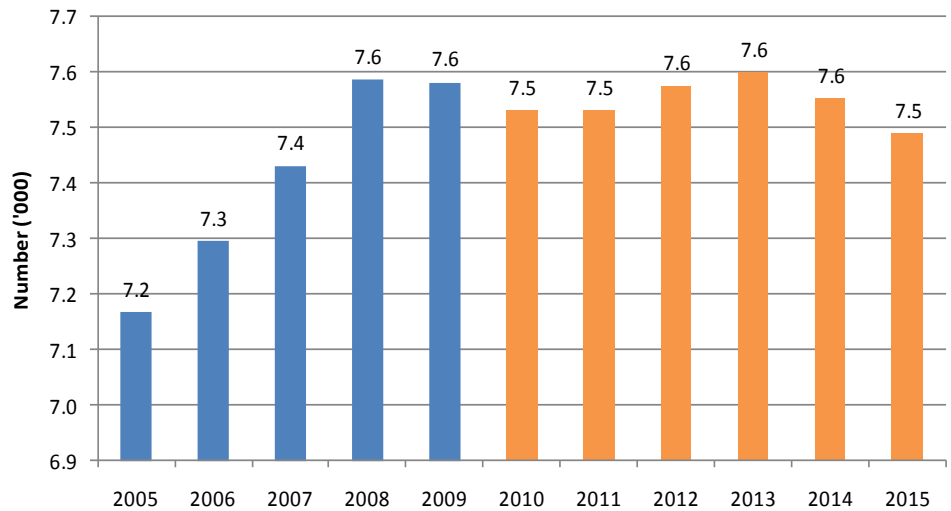
Figure 69 **United network commercial customer numbers, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.2

Growth in industrial customer numbers is expected to stabilise at around 7.5 thousand after growing at an annualised rate of 1.4% between 2005 and 2009.

Figure 70 **United network industrial customer numbers, historical and forecast**



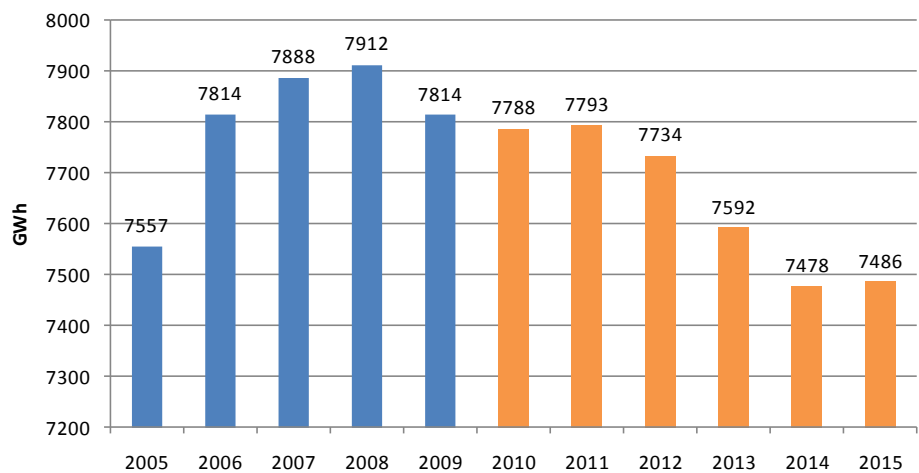
Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.2

## 10.3 United energy sales

### 10.3.1 Total energy sales

United Energy forecasts their energy sales to decline from 7814 GWh in 2009 to 7485 GWh by the end of the next regulatory period (see Figure 71).

Figure 71 **United total energy sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.1

The forecast decline in United Energy’s total energy sales represents a major deviation from the historical trend.

Table 32 **Growth in United Energy's energy sales, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	2.40%	1.47%	-2.42%
Commercial	2.11%	1.37%	0.80%
Industrial	-0.74%	-1.16%	-0.95%
Total sales	1.55%	0.84%	-0.79%

Data source: Calculations based on NIEIR Electricity sales and customer numbers report to United Energy table 7.1

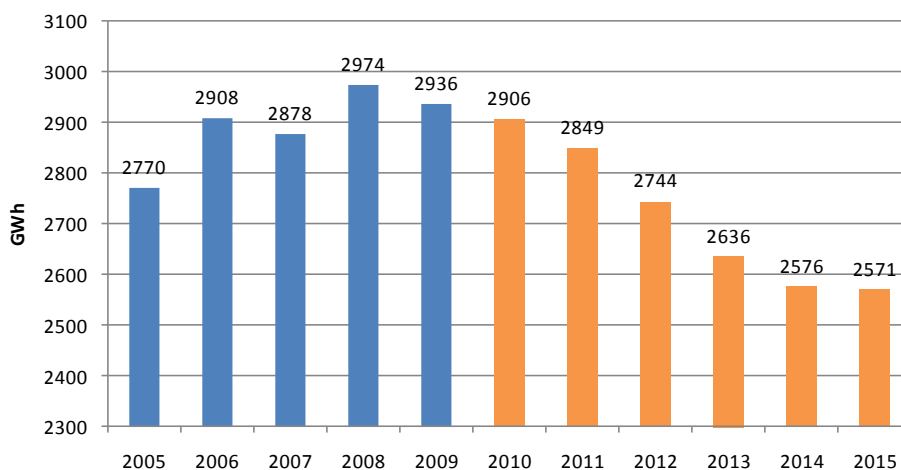
As shown in Table 32 above, while total sales have exhibited annual growth of over 1.5% in the three years to the end of 2008 and 0.8% per annum between 2005 and 2009, energy sales are projected to decline by -0.8% per annum between 2010 and 2015.

### 10.3.2 Energy sales by sector

On a sector by sector basis, commercial energy sales are projected to continue growing albeit at a slower annual growth rate (see Figure 73) and industrial sales (see Figure 74) are projected to continue their decline at a reasonably similar rate to that observed historically.

It is in the projection of residential energy sales where a major deviation from historical behaviour is projected by NIEIR to take place.

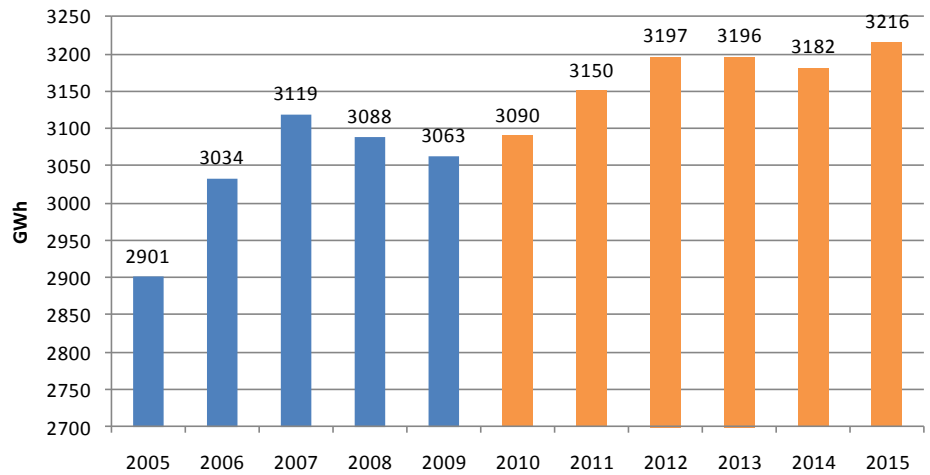
Figure 72 **United total residential sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.1

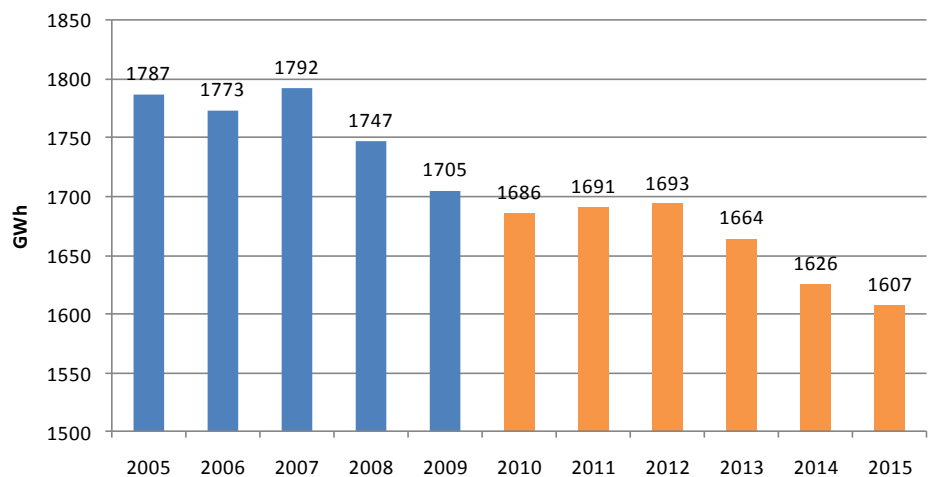
Figure 72 shows that residential sales are projected to decline to 2571 GWh in 2015 from a starting point of 2936 GWh in 2009. This represents a decline of 2.4% per annum in the next regulatory period compared to an annual growth rate of the same magnitude but opposite sign in the 3 years between 2005 and 2008.

Figure 73 **United total commercial sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.1

Figure 74 **United total industrial sales, historical and forecast**



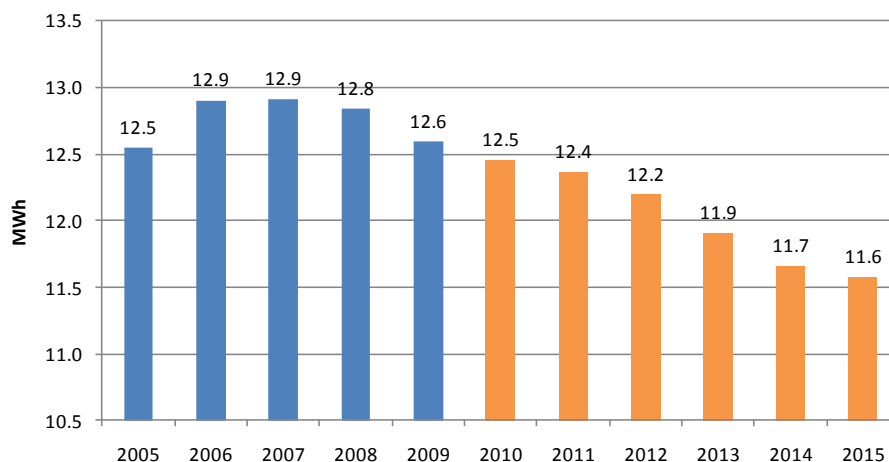
Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.1

### 10.3.3 Energy sales per customer

#### Total energy sales by customer

When customer number growth is stripped away from energy sales and energy sales per customer are analysed, it becomes evident that the projected decline in total energy sales in the United network is driven by a fundamental shift in the energy consumption behaviour of the individual customers in the United network. Figure 75 shows that total energy use per customer is forecast decline from 12.6 MWh per customer to 11.6 MWh per customer by 2015.

Figure 75 **United total energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.1 and table 7.2

Table 33 **Growth in United energy use per customer, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	1.70%	0.75%	-3.08%
Commercial	0.66%	0.34%	0.09%
Industrial	-3.30%	-3.35%	-2.07%
Total energy use per customer	0.78%	0.09%	-1.45%

Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.1 and 7.2

The reduction in energy use per customer is projected to occur at a rate of 1.45% per annum in the next regulatory period. This is compared to a growth rate of 0.8% per annum in the 3 years between 2005 and 2008.

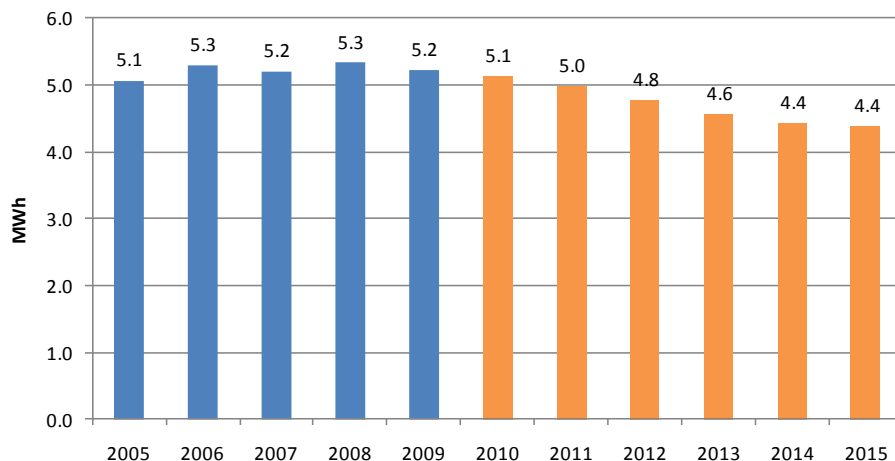
### Energy sales per customer by sector

When the data is analysed on a sector by sector basis, it becomes clear that the residential sector is responsible for a large contribution to this overall behavioural change.

Figure 76 shows that residential energy use is forecast to decline to 4.4 MWh per customer in 2015 from 5.3 MWh per customer in 2008.



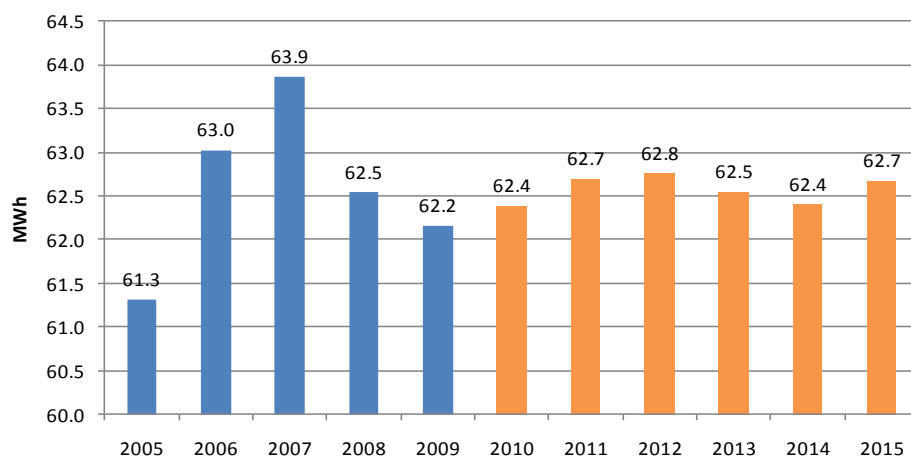
Figure 76 **United residential energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.1 and table 7.2

In terms of growth rates this is a decline of 3.1% per annum between 2010 and 2015, compared to growth of 0.5% per annum between 2005 and 2008.

Figure 77 **United commercial energy sales per customer, historical and forecast**

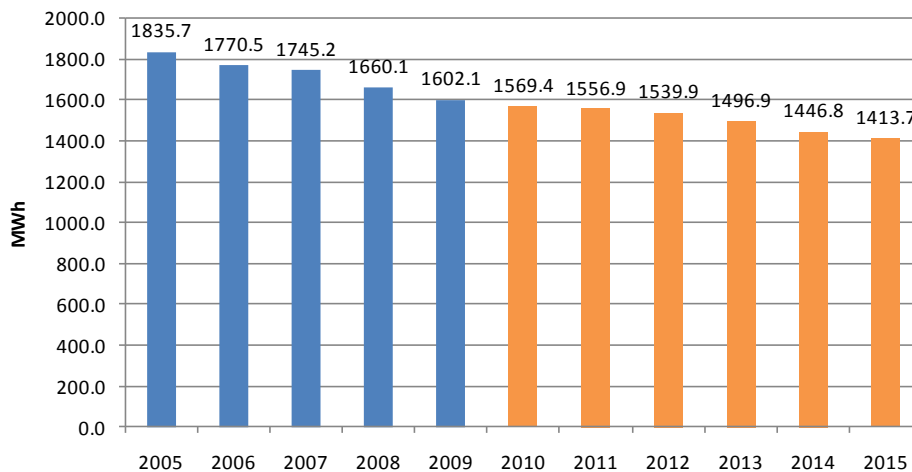


Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.1 and table 7.2

In contrast, commercial energy use per customer is forecast to stabilise at around 62 MWh per customer from a moderate rate of growth in the historical period (see Figure 77).

Industrial energy use per customer is forecast to decrease at a rate of 2.1% per annum over the next regulatory period which is a slowdown in the rate of decline compared to the period between 2005 and 2008. This can be seen in Figure 78.

Figure 78 **United industrial energy sales per customer, historical and forecast**

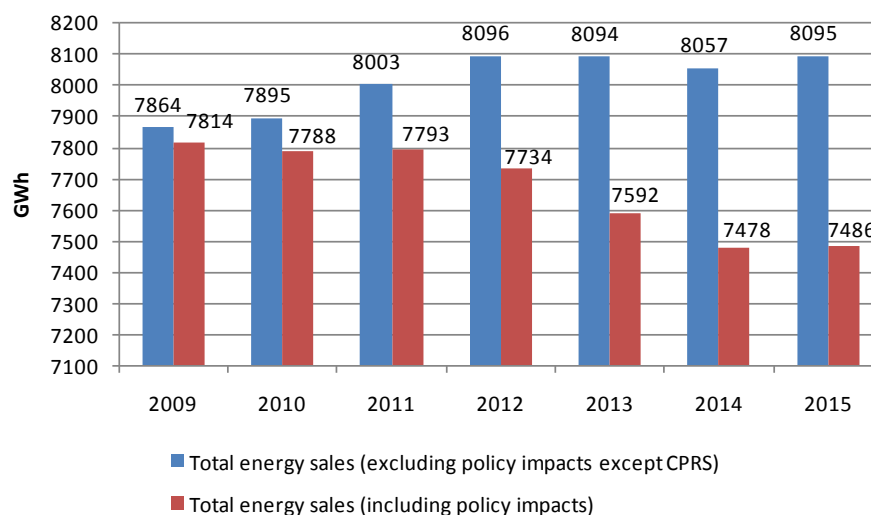


Data source: NIEIR Electricity sales and customer numbers report to United Energy Table 7.1 and table 7.2

### 10.3.4 Energy sales with and without policy impacts

The decline in total energy sales is driven by the various policy impacts that are assumed by NIEIR on the base forecasts. Figure 79 shows the cumulative impact of the various policies excluding the CPRS reaches 609 GWh by 2015.

Figure 79 **United Energy forecast energy sales with and without policy impacts**

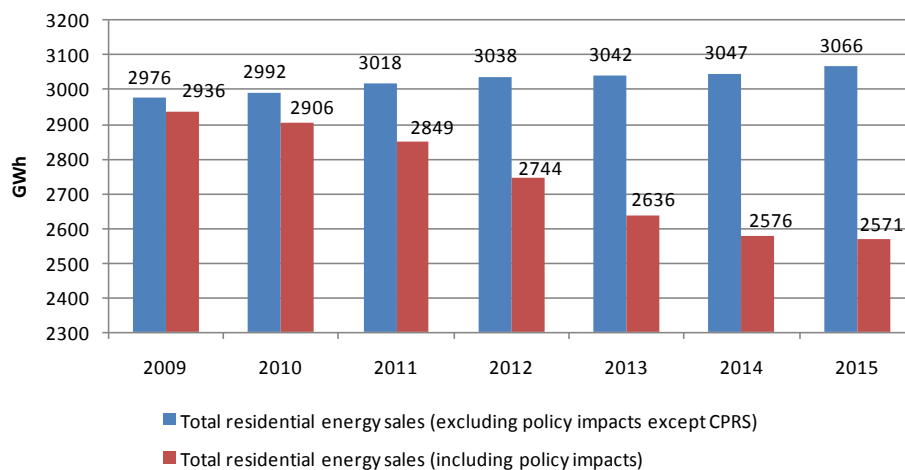


Data source: NIEIR Electricity sales and customer numbers report to United Energy table 7.1 and table 6.2

Without the adjustments for policy impacts United’s total energy sales would continue growing and would reach 8095 GWh in 2015.

The vast majority of the policy impacts take place in the residential sector with energy sales being 497 GWh lower in 2015 as a result of the policy adjustments (see Figure 80).

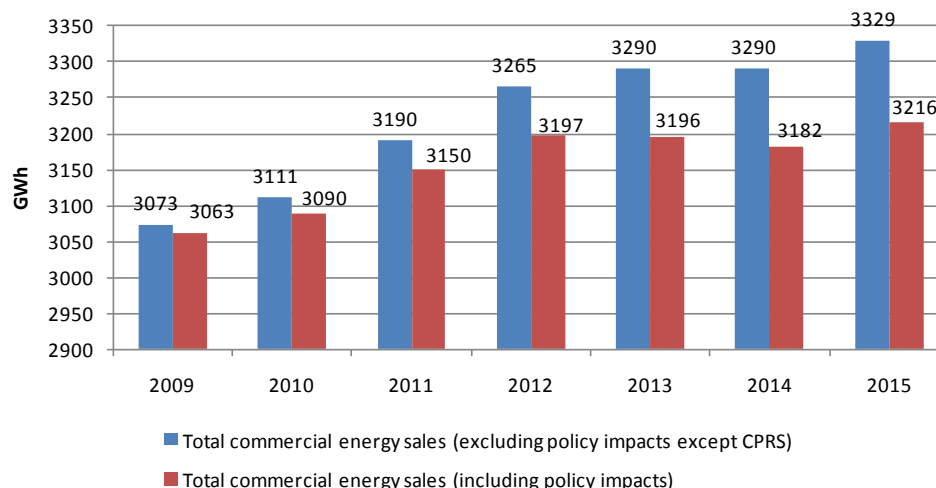
Figure 80 **United Energy forecast residential energy sales with and without policy impacts**



Data source: NIEIR Electricity sales and customer numbers report to United Energy table 7.1 and table 6.2

Figure 83 shows that the impacts of the various policy adjustments on the commercial sector are relatively small in comparison to the residential sector. Energy sales to the commercial sector are only 113 GWh lower as a result of the policy impacts not including the CPRS.

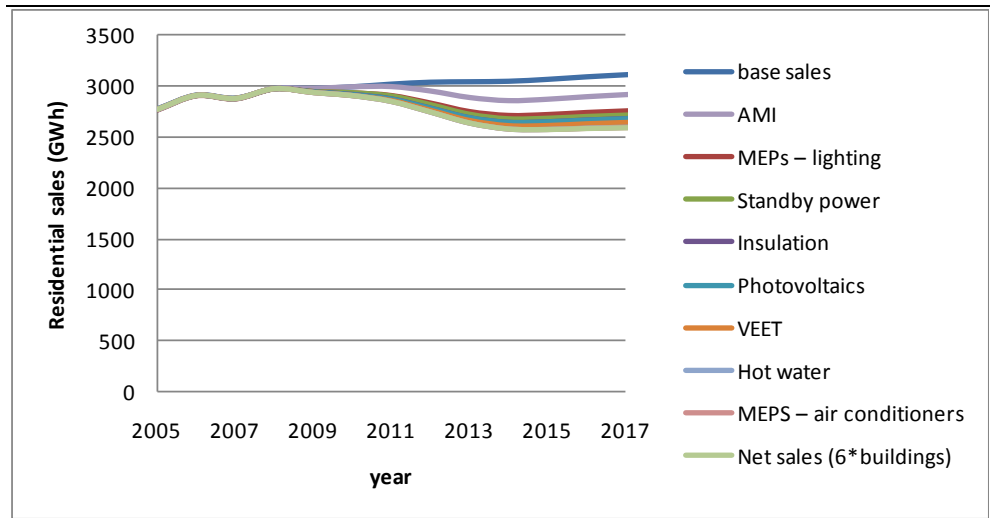
Figure 81 **United Energy forecast commercial energy sales with and without policy impacts**



Data source: NIEIR, Electricity sales and customer numbers report to United Energy tables 6.5 and 7.2

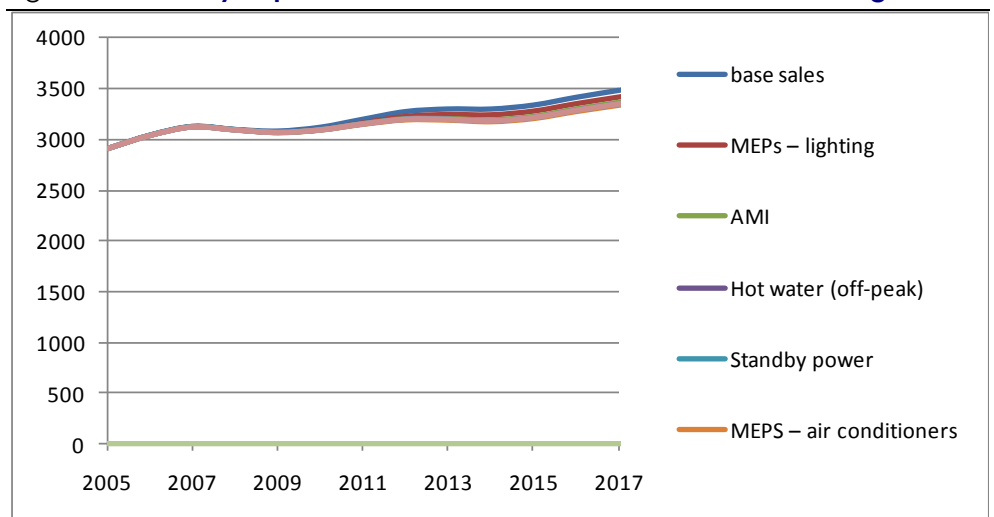
Figure 82 and Figure 83 show the impact of the individual policy interventions.

Figure 82 Policy impact on residential sales – UED distribution region



Data source: NIEIR, Electricity sales and customer numbers report to United Energy, tables 6.2 and 7.1

Figure 83 Policy impact on commercial sales – UED distribution region



Data source: NIEIR, Electricity sales and customer numbers report to United Energy, tables 6.5 and 7.1

## 10.4 Recommendation – United

As is discussed above, ACIL Tasman recommends that United’s energy sales forecasts should be amended as follows:

1. Disregard the energy reduction attributed to the AMI rollout
2. Disregard the energy reduction attributed to the insulation rebate beyond 2009
3. Disregard the energy reduction attributed to the one watt standby target
4. Reduce the energy reduction attributed to the lighting MEPS so that it does not exceed the reduction forecast in the relevant Regulatory Impact Statement

Applying these adjustments to United's forecasts yields the amended forecasts set out in Table 34.

Table 34 **United Energy- Energy sales forecasts adjusted for changes to policy impacts**

Sector	Residential	Commercial	Industrial	Public lighting	Total energy sales
Year	GWh	GWh	GWh	GWh	GWh
2011	2977	3185	1691	104	7956
2012	2979	3258	1693	100	8030
2013	2967	3282	1664	97	8010
2014	2958	3281	1626	95	7958
2015	2965	3319	1607	92	7984

*Data source:* NIEIR, Electricity sales and customer numbers report to United Energy, tables 6.2, 6.5 and 7.1, ACIL Tasman calculations

## 11 SP AusNet

### 11.1 Description of SP AusNet network

Figure 84 Map of SP AusNet area



SP AusNet’s distribution region includes over 600,000 customers across eastern Victoria. This network spans approximately 46,000 kilometres across an area of 80,000 square kilometres.

SP AusNet’s region accounts for approximately 24% of Victoria’s population and 23% of its dwelling stock. It is characterised by a relatively large proportion of mining activity, with more than half of Victoria’s mining activity in SP AusNet’s area. It is also home to 35% of Victoria’s agriculture industry.

On average, NIEIR forecasts that population growth in SP AusNet’s area will be 1.4% per annum, 0.2 percentage points above the Victorian average. Similarly, gross regional product in SP AusNet’s area is forecast to be 2.6% per annum, outperforming the Victorian average growth rate by 0.4 percentage points. Also outperforming the Victorian average is the rate of growth in the dwelling stock, which NIEIR forecasts will be 1.6% per annum reflecting rapid growth in Melbourne’s south eastern and north eastern growth corridors.

### 11.2 SP AusNet – analysis

On Wednesday, 24 March 2010 ACIL Tasman was advised that the forecasts SP AusNet had given to the AER had double counted the impact of the AMI

rollout. ACIL Tasman understands that NIEIR applied the same approach to modelling electricity sales for SP AusNet as it had applied for the other distribution businesses. This included a reduction of 8% in electricity sales to customers with smart meters. Starting from this point, SP AusNet applied its own model of the impact of the time of use tariffs it proposed and adjusted NIEIR's forecasts accordingly, thus double counting the impact.

ACIL Tasman received updated forecasts relating to SP AusNet on Tuesday 30 March 2010. These forecasts showed a decline in energy sales, which was counter intuitive, given that the intention was to remove the double counting of a policy that was modelled to reduce sales by more than 8%. On Wednesday 31 March 2010, ACIL Tasman was advised that these forecasts were prepared using an updated version of NIEIR's model, in which certain parameters had been changed.

ACIL Tasman has no further information concerning the forecasts that have now been provided. In these circumstances ACIL Tasman has been unable to perform an analysis of the forecasts provided by SP AusNet.

The analysis in the sections that follow is based upon NIEIR's (original) electricity sales and customer numbers forecast report to SP AusNet.

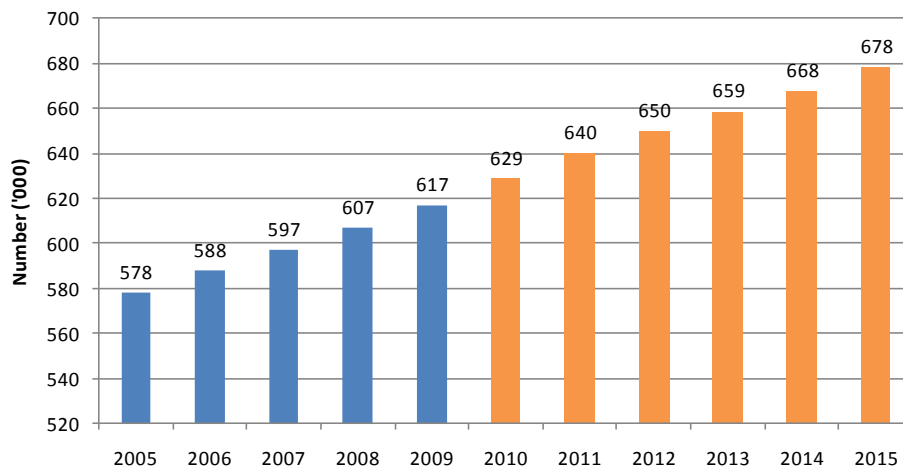
## **11.3 SP AusNet customer numbers**

### **11.3.1 Total Customer numbers**

Figure 85 shows the historical and forecast customer numbers for SP AusNet.

Customer numbers are projected to increase from approximately 617,000 in 2009 to approximately 678,000 in 2015. The figure also shows that future growth is expected to be broadly in line with historical performance.

Figure 85 **SP AusNet network total customer numbers, historical and projected**



Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.2

Table 35 shows that the number of customers in the SP AusNet network is projected to grow at a rate of 1.5% per annum in the next regulatory period compared to a historical growth rate of more than 1.6% per annum.

Table 35 **Growth in SP AusNet customer numbers, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	1.91%	1.84%	1.65%
Commercial	0.52%	0.48%	1.26%
Industrial	-4.14%	0.60%	-1.59%
Total customer numbers	1.63%	1.65%	1.53%

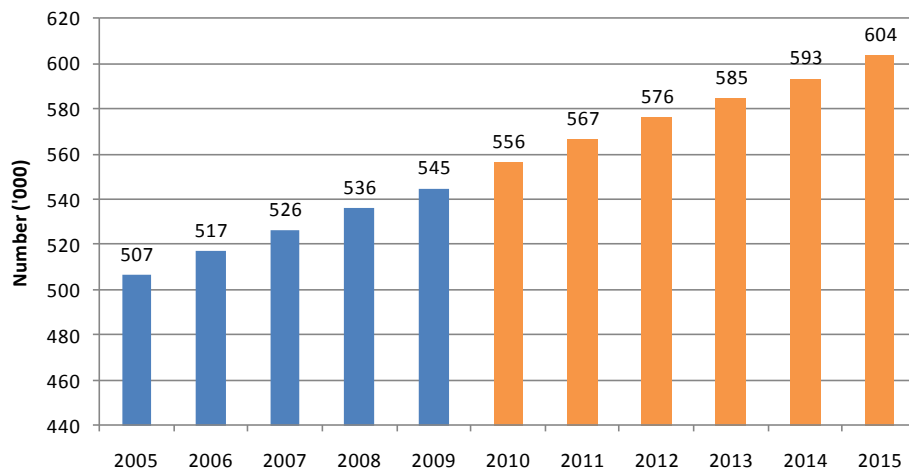
Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.2

### 11.3.2 Customer numbers by sector

Total residential customer numbers are shown in Figure 86. Residential customer numbers are projected by NIEIR to increase at a rate of 1.7% per annum in the next regulatory period which is slightly below historical growth.



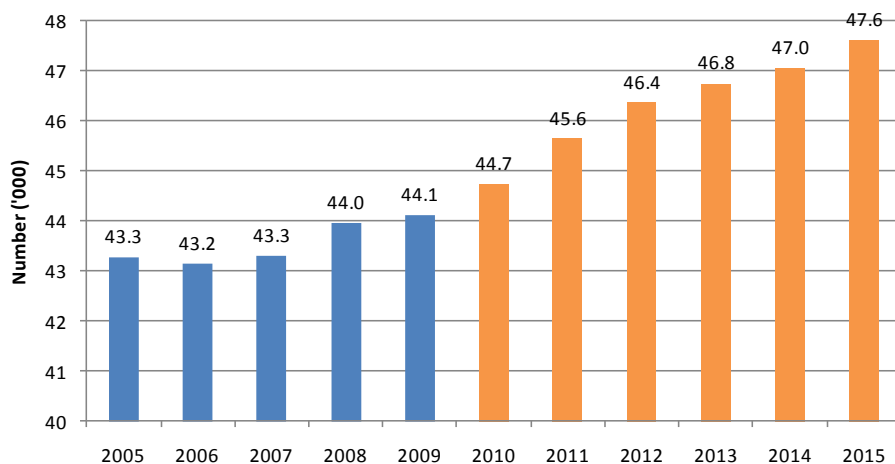
Figure 86 **SP AusNet network residential customer numbers, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.2

Commercial customer numbers are projected to increase in the next regulatory period from approximately 44,100 customers in 2009 to approximately 47,600 customers by 2015 (see Figure 86). This represents a higher rate of growth in commercial customer numbers of 1.3% per annum compared to 0.5% per annum between 2005 and 2009.

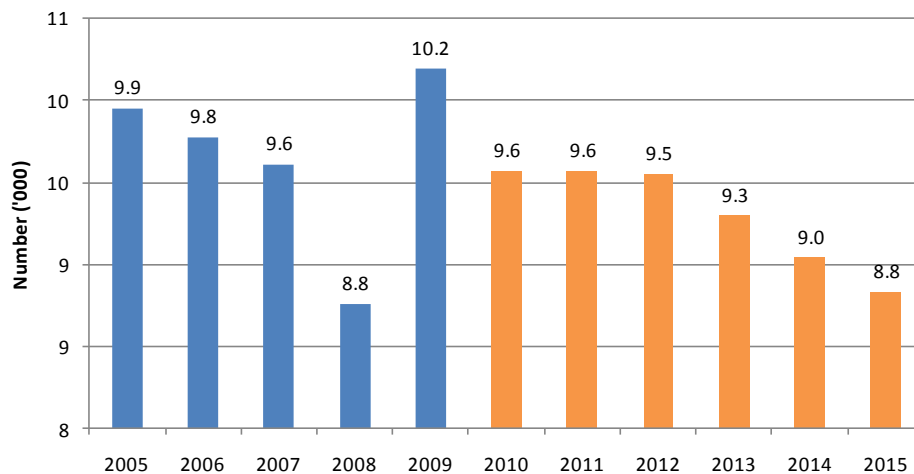
Figure 87 **SP AusNet network commercial customer numbers, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.2

Industrial customer numbers are expected to decline from approximately 10,200 in 2009 to approximately 8,800 in 2015 (Figure 88).

Figure 88 **SP AusNet network industrial customer numbers, historical and forecast**



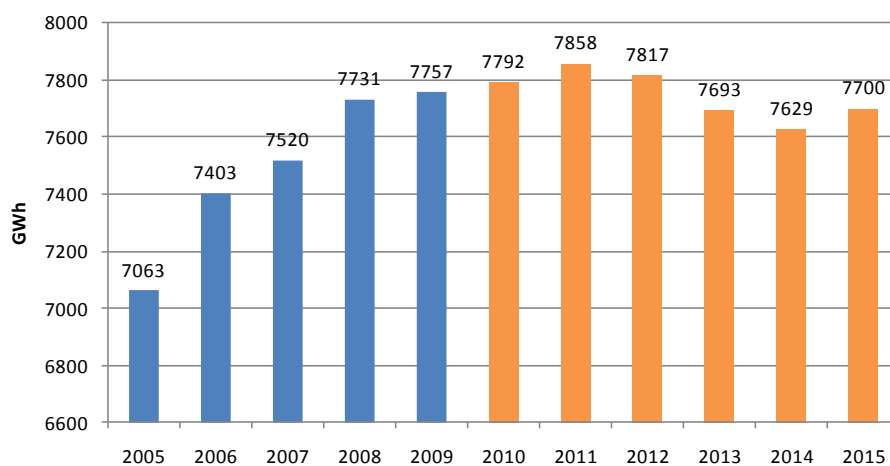
Data source: NIEIR Electricity sales and customer numbers report to SP AusNet t Table 7.2

## 11.4 SP AusNet energy sales

### 11.4.1 Total energy sales

SP AusNet energy sales are forecast to decline from 7757 GWh in 2009 to 7700 GWh by the end of the next regulatory period (see Figure 89)

Figure 89 **SP AusNet total energy sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.1

The forecast decline in represents a major deviation away from the historical trend.

Table 36 **Growth in SP AusNet energy sales, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	3.37%	2.26%	-2.00%
Commercial	4.74%	4.23%	2.48%
Industrial	0.19%	-0.11%	-1.57%
Total sales	3.06%	2.37%	-0.24%

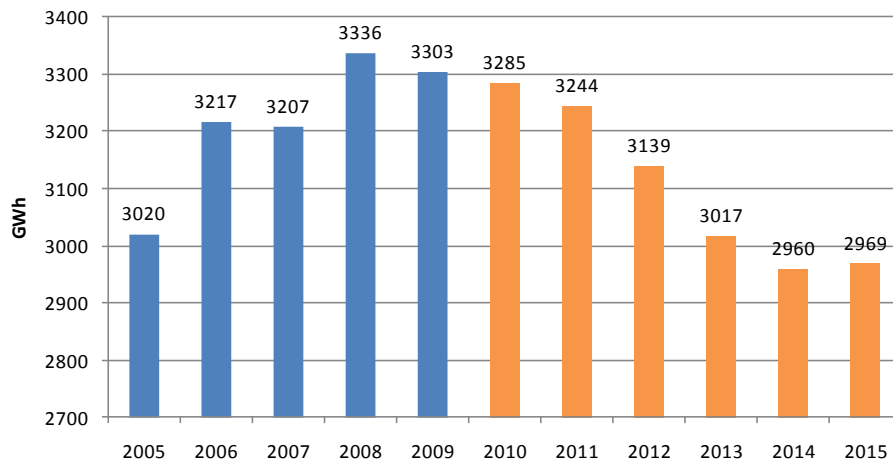
*Data source:* Calculations based on NIEIR Electricity sales and customer numbers report to SP AusNet table 7.1

As shown in Table 36 above, while total sales have exhibited annual growth of 3.1% in the three years to the end of 2008 and 2.4% per annum between 2005 and 2009, energy sales are projected to decline by -0.2% per annum between 2010 and 2015.

### 11.4.2 Energy sales by sector

On a sector by sector basis, residential energy sales are projected to decline from 3303 GWh in 2009 to 2969 GWh by 2015. The decline occurs at a rate of 2% per annum over the next regulatory period (see Figure 90).

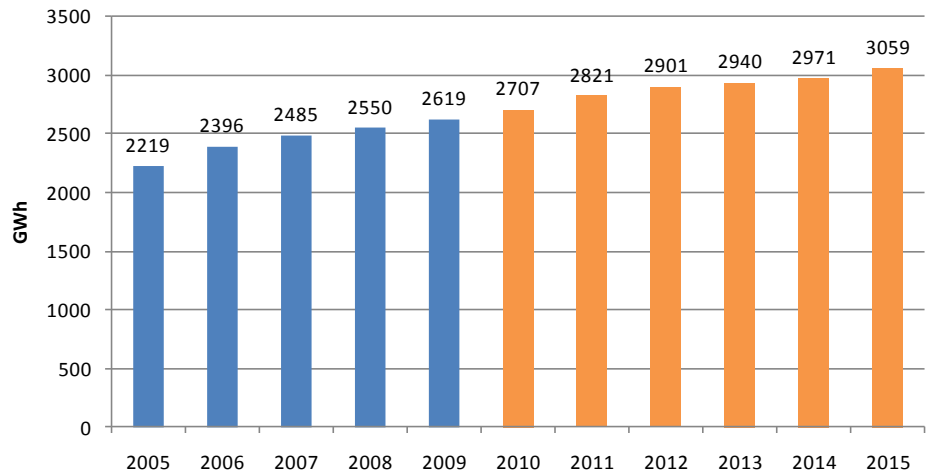
Figure 90 **SP AusNet total residential sales, historical and forecast**



*Data source:* NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.1

Figure 91 shows that commercial sales are projected to increase to 3059 GWh in 2015 from a starting point of 2619 GWh in 2009. This represents an increase of 2.5% per annum in the next regulatory period compared to an annual growth rate of over 4% per annum in the historical period.

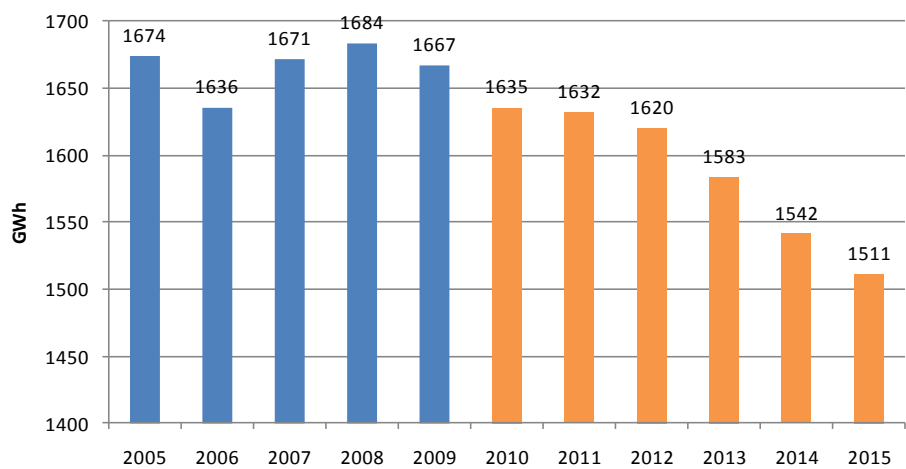
Figure 91 **SP AusNet total commercial sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.1

Industrial sector energy sales for the SP AusNet region are projected to decline at a rate of 1.6% per annum over the next regulatory period (Figure 92).

Figure 92 **SP AusNet total industrial sales, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to SP AusNet 7.1

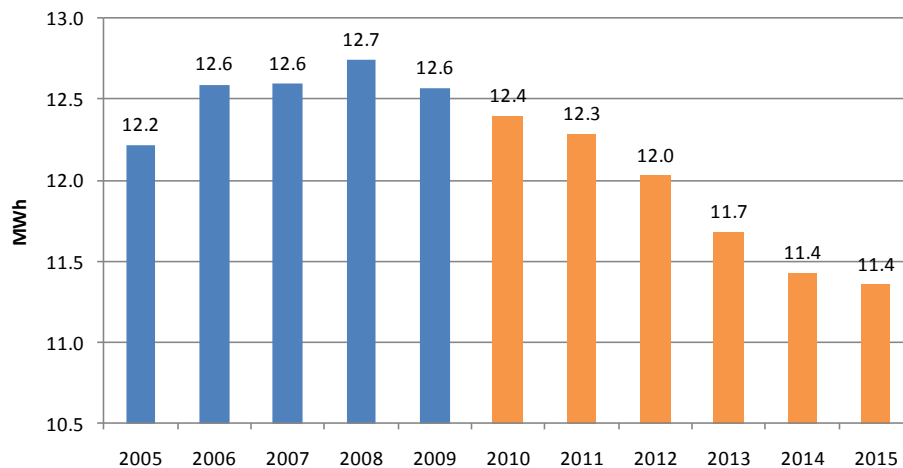
### 11.4.3 Energy sales per customer

#### Total energy sales by customer

When customer number growth is removed from energy sales and energy sales per customer are analysed, it becomes evident that the projected decline in total energy sales in the SP AusNet network is driven by a fundamental shift in the forecast energy consumption behaviour of the individual customers.

Figure 93 shows that total energy use per customer is forecast to decline from 12.6 MWh per customer to 11.4 MWh per customer by 2015.

Figure 93 **SP AusNet total energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.1 and Table 7.2

Table 37 **Growth in SP AusNet energy use per customer, historical and forecast, percent per annum**

Sector	2005 to 2008	2005 to 2009	2010 to 2015
Residential	1.43%	0.41%	-3.59%
Commercial	4.19%	3.72%	1.21%
Industrial	4.52%	-0.70%	0.02%
Total energy use per customer	1.41%	0.71%	-1.74%

Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.1 and 7.2

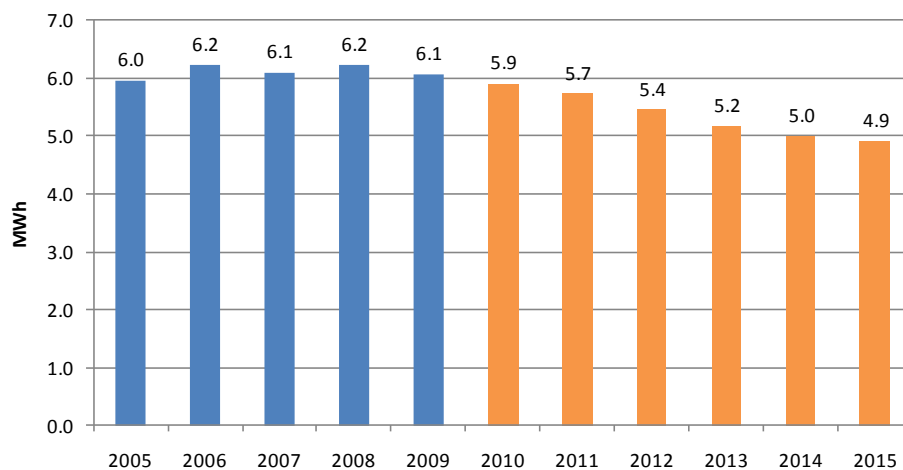
The reduction in energy use per customer is projected to occur at a rate of 1.7% per annum in the next regulatory period. This is compared to a growth rate of 1.4% per annum in the 3 years between 2005 and 2008.

### Energy sales per customer by sector

When the data is analysed on a sector by sector basis, it becomes clear that the residential sector is responsible for a large contribution to this overall decline.

Figure 94 shows that residential energy use is forecast to decline to 4.9 MWh per customer in 2015 from 6.1 MWh per customer in 2009.

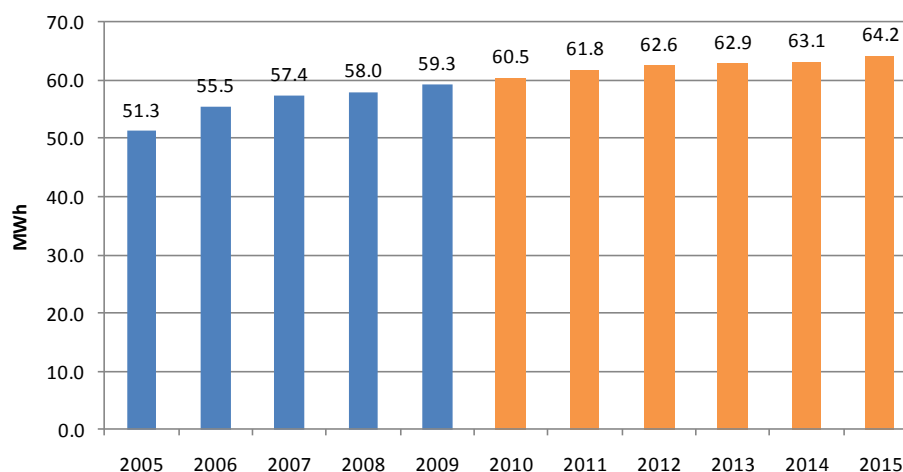
Figure 94 **SP AusNet residential energy sales per customer, historical and forecast**



Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.1 and table 7.2

In terms of growth rates this is a decline of 3.6% per annum between 2010 and 2015, compared to growth of 1.4% per annum between 2005 and 2008.

Figure 95 **SP AusNet commercial energy sales per customer, historical and forecast**

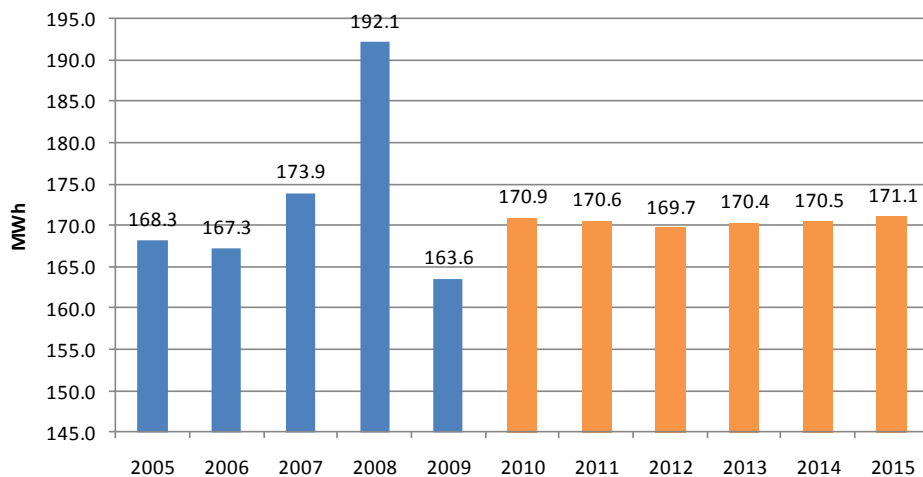


Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.1 and table 7.2

In contrast, commercial energy use per customer is forecast to grow at the moderate rate of 1.2% per annum to 64 MWh per customer, compared to a faster rate of growth in the historical period (see Figure 95).

Industrial energy use per customer is forecast to remain stable during the next regulatory period in the SP AusNet region at about 171 MWh per customer. This can be seen in Figure 96

Figure 96 **SP AusNet industrial energy sales per customer, historical and forecast**

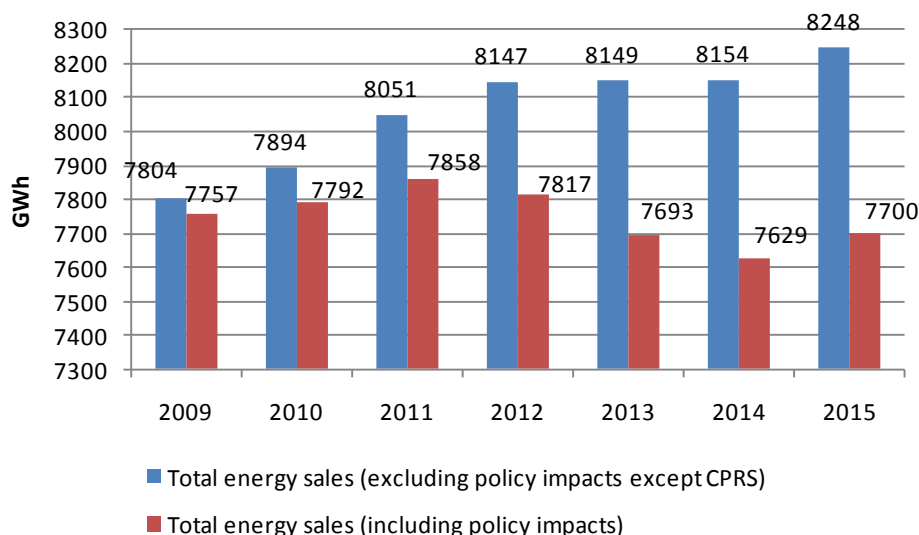


Data source: NIEIR Electricity sales and customer numbers report to SP AusNet Table 7.1 and table 7.2

#### 11.4.4 Energy sales with and without policy impacts

The decline in total energy sales is driven by the various policy impacts that are assumed by NIEIR on the base forecasts. Figure 97 shows the cumulative impact of the various policies excluding the CPRS and the phase out of electric resistance water heaters reaches 548 GWh by 2015.

Figure 97 **SP AusNet forecast energy sales with and without policy impacts**

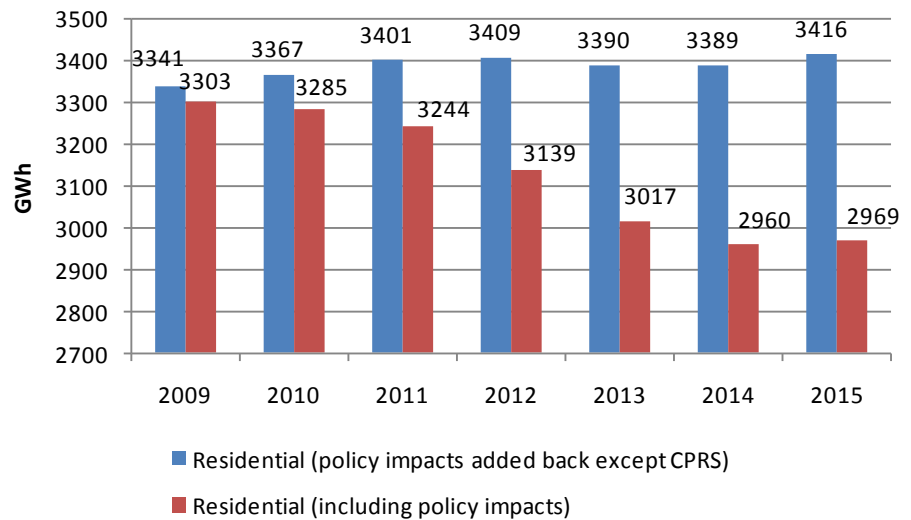


Data source: NIEIR Electricity sales and customer numbers report to SP AusNet table 7.1, table 6.2 and table 6.5

Without the adjustments for policy impacts SP AusNet’s total energy sales would continue growing and would reach 8248 GWh in 2015.

The majority of the policy impacts occur in the residential sector with energy sales being 447 GWh lower in 2015 as a result of the policy adjustments (see Figure 98).

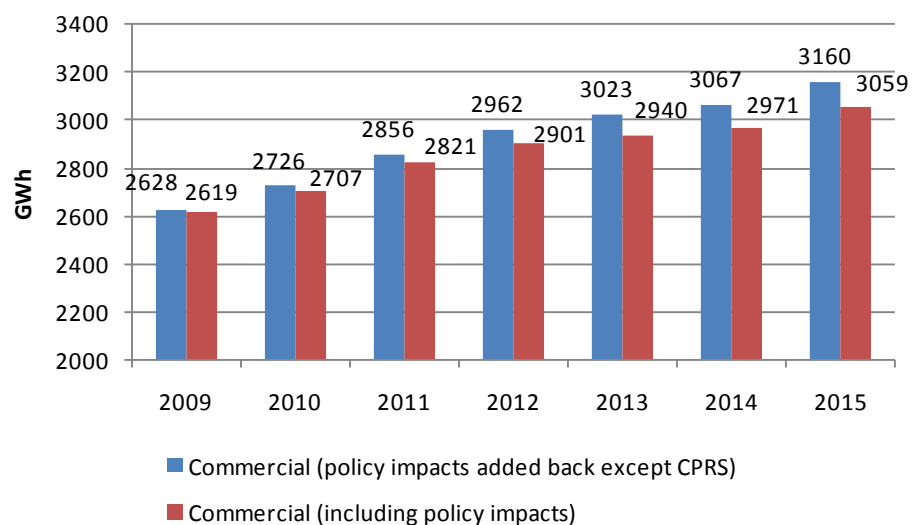
Figure 98 **SP AusNet forecast residential energy sales with and without policy impacts**



Data source: NIEIR Electricity sales and customer numbers report to SP AusNet table 7.1 and table 6.2

Figure 99 shows that the impacts of the various policy adjustments on the commercial sector are relatively small in comparison to the residential sector. Energy sales to the commercial sector are only 101 GWh lower as a result of the policy impacts not including the CPRS.

Figure 99 **SP AusNet forecast commercial energy sales with and without policy impacts**



Data source: NIEIR Electricity sales and customer numbers report to SP AusNet table 7.1 and table 6.5



## 11.5 SP AusNet - recommendation

In a qualitative sense, ACIL Tasman understands that the approach taken to modelling energy sales for SP AusNet was the same as that taken to modelling energy sales for the other distribution businesses with the sole exception being the way the AMI rollout was modelled. Therefore to the extent that this is the case, the recommendations and conclusions made in relation to the other businesses should stand for SP AusNet as well. In terms of AMI policy adjustments, given the moratorium, ACIL Tasman's recommendation is that the policy impacts be rejected. As this recommendation is not dependent on the way the impacts were modelled, this should apply equally to SP AusNet.

On this basis, ACIL Tasman recommends that SP AusNet's original forecasts should be amended as follows:

1. Disregard the energy reduction attributed to the AMI rollout
2. Disregard the energy reduction attributed to the insulation rebate beyond early 2010
3. Disregard the energy reduction attributed to the one watt standby target
4. Reduce the energy reduction attributed to the lighting MEPS so that it does not exceed the reduction forecast in the relevant Regulatory Impact Statement

Applying these adjustments to the forecasts contained in NIEIR's original report to SP AusNet yields the amended forecasts set out in Table 38.

Table 38 **SP Ausnet- Energy sales forecasts adjusted for changes to policy impacts**

Sector	Residential	Commercial	Industrial	Public lighting	Traction	Total energy sales
Year	GWh	GWh	GWh	GWh	GWh	GWh
2011	3368	2851	1632	71	90	8012
2012	3365	2954	1620	65	92	8096
2013	3337	3013	1583	59	94	8087
2014	3328	3055	1542	61	96	8081
2015	3349	3147	1511	63	98	8168

*Data source:* NIEIR Electricity sales and customer numbers report to SP AusNet table 6.2, 6.5 and 7.1, ACIL Tasman calculations

## 12 Conclusions

### 12.1 Forecasting methodology and drivers

Based on its review of the energy sales and customer numbers forecasts, ACIL Tasman concludes that the population growth forecast that underpins the energy sales and customer numbers forecasts is too pessimistic. ACIL Tasman considers that the ABS' series B forecast represents a more reasonable expectation of the likely growth in Victoria's population.

Similarly, ACIL Tasman expects that economic growth in Victoria will prove to be higher than the forecasts underpinning the energy sales forecasts would suggest. ACIL Tasman considers it likely that an economic growth forecast made in early 2010, which would have the benefit of knowledge of Australia's recent economic performance and unexpectedly strong recovery from the global financial crisis, would provide a better indication of likely future economic growth.

In terms of the forecasting methodology, ACIL Tasman considers it essential to the credibility of forecasts that they are subjected to appropriate tests regarding accuracy and lack of bias. In this case, none of the distribution businesses have provided this type of information. ACIL Tasman has been given no reason to believe that the appropriate tests have been conducted or that the results were satisfactory.

ACIL Tasman was limited in its ability to review the energy sales and customer numbers forecasts by the lack of information it was provided about the methodology by which they were prepared. This raises two concerns. First, ACIL Tasman regards it as essential to the credibility of forecasts that they are prepared transparently and in such a way that could be repeated by an independent party. In this case, ACIL Tasman understands that not even the distribution businesses themselves have sufficient information regarding the forecasting methodology that they would be able to replicate the forecasts. Second, ACIL Tasman's review has been limited by being based only on general descriptions of the forecasting methodology, which were substantially verbal. In many cases ACIL Tasman has been unable to independently verify the basis of the forecasts.

Another factor that ACIL Tasman regards as essential to the credibility of forecasts is that they incorporate the relevant drivers. Subject to the reservations described above about the particular assumptions made as to each of these drivers, it appears that these forecasts did take account of the appropriate drivers.

## 12.2 Policy impacts

The forecasts have been adjusted to account for a number of policy impacts that are expected to influence energy sales over the coming regulatory period. These policy impacts are not likely to be reflected in the historical data or in the forecasts of key drivers, so ACIL Tasman considers it appropriate to make adjustments in this context. However, ACIL Tasman has concerns about a number of the individual adjustments that were made. For the reasons described above, ACIL Tasman recommends that the adjustments regarding the following policies be disregarded or modified:

- Advanced Metering Infrastructure (disregard)
- One watt standby (disregard)
- Mandatory energy performance standard for lighting (adjust)

Further, several of the relevant policies appear unlikely to influence energy sales to the extent that would reasonably have been expected when the forecasts were prepared. This is not a comment on the forecasting methodology applied to these forecasts, but on the fact that the policy environment has changed. For this reason, ACIL Tasman recommends that the following policy impacts be disregarded:

- Advanced Metering Infrastructure
- Insulation rebate/ target

Finally, ACIL Tasman has some concerns with the estimated impact of the hot water standards. The information that has been provided is not sufficient to analyse the impact of this forecast.

## A Excerpt from terms of reference

...the demand forecasting consultant will be required to provide a full written assessment of the DNSPs' forecasts of ...energy consumption and customer numbers.

...

The demand forecasting consultant must conduct an assessment of ... customer numbers and energy consumption, including advice on the reasonableness and/or appropriateness of:

- (a) the DNSPs' methodologies;
- (b) key assumptions and inputs, and their use<sup>78</sup>;
- (c) any base year(s) selected for the demand forecasts;
- ...
- (h) any appliance models, where used, or assumptions relating to average customer energy usage (by customer type); and
- (i) where scenarios are employed, the appropriateness of the scenarios developed and justifications for selecting one particular scenario over others in developing expenditure proposals.

The demand forecasting consultant will also be required to examine and provide advice on the explanations provided by each DNSP on:

- a. how the forecasting methodology used is consistent with and takes into account historical observations (where appropriate); and
- b. the resulting forecast data is consistent at different levels of aggregation.

The full assessment of the DNSPs' forecasts must include a comparison with other relevant measures of demand by other organisations (e.g. AEMO).

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<sup>78</sup> Some examples of key assumptions include but are not limited to are gross state product, energy efficiency requirements, embedded generation, advanced metering infrastructure and demand elasticities used.

The demand forecasting consultant is also expected to undertake a brief comparison of each DNSP's demand forecasts for the next regulatory period with:

- (a) actual demand outcomes for the current and previous regulatory periods and
- (b) forecasts provided in the current and previous regulatory periods.

Such a comparison should comment on any identified trends over the time period studied and consider any differences in the demand forecasts between the DNSPs. Any improvements or changes in forecasting methods over time should also be identified.

In the event that the demand forecasting consultant considers that a DNSP's forecast methods or data sources are materially deficient in any way, the consultant must identify and explain these deficiencies in its report, and recommend alternatives that the DNSP could reasonably adopt in its regulatory proposal. The alternatives could range from selecting a different scenario provided by the DNSPs' demand forecaster (e.g. using the alternative base scenario) to modifying inputs, assumptions and/or the methodology used to obtain demand forecasts. The alternative methods and data sources must be fully explained in the demand forecasting consultant's report and be compliant with the NER.

## B AMI summary of past studies

Study name	TOU/CPP	Tariff differential (CPP:peak:off peak, c/kWh)	Load shifting	Conservation	Comments	Conclusion
PSE&G residential (my power sense)	Both	8.6:1.7:9	Elasticity =-0.085	Not discussed	High level of information	Not helpful – too large a tariff spread No discussion of conservation
PSE&G residential	Both	8.6:1.7:9	Elasticity = -0.137	Not discussed	Automatic air con control	Not helpful – too large a tariff spread; No discussion of conservation Enabling technology
Ontario Energy Board smart price pilot	TOU only	:-10:3.5	Not distinguishable from zero	6%		Reasonably comparable Different climate Very low tariff levels

Study name	TOU/CPP	Tariff differential (CPP:peak:off peak, c/kWh)	Load shifting	Conservation	Comments	Conclusion
Anaheim critical peak pricing experiment	Neither	Rebate based				This is essentially a baseline and credit scheme, which is not comparable to what is going to happen in Australia.
Idaho residential pilot program – time of day pilot	TOU	8.3:4.5	Nil	Not analysed		Reasonably comparable although very low tariffs
Idaho residential pilot program – energy watch pilot	CPP					Not comparable – CPP
Energy Australia network tariff reform				Slight, more in winter than in summer No effect on business customers		

Study name	TOU/CPP	Tariff differential (CPP:peak:off peak, c/kWh)	Load shifting	Conservation	Comments	Conclusion
Illinois – Community Energy Cooperative's energy-smart pricing plan	TOU	Variable hourly up to 50 c/kWh Announced day ahead High price notification via phone or email when price > \$0.10/kWh		Roughly 3 to 4%	The only residential program “that has been tested at any scale” Tested hypothesis that tariffs would work without enabling technology High level of information Price cap f \$0.50/kWh	Very low tariffs and very large differential resulted in 3~4% conservation
AmerenUE CPP pilot (TOU group only)	TOU	17.3:7.5:4.8	Nil in first year, not reported in second year			Comparable to Australian proposal, although very low tariffs No demonstrable effect
Automated Demand Response System pilot (California)	CPP				Very high technology solution, automated home climate control system	Not comparable



Study name	TOU/CPP	Tariff differential (CPP:peak:off peak, c/kWh)	Load shifting	Conservation	Comments	Conclusion
State wide Pricing Pilot (California) (TOU group)	TOU	-.22:9	Not presented	~0.55%		