Final Report to
Independent Pricing and Regulatory Tribunal of NSW

Review of demand forecasts by the electricity Distribution Network Service Providers for the 2004 electricity network review.

21 April 2004

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TABLE OF CONTENTS

EXECUTIVE SUMMARY ......................................................................................................................... I

1 INTRODUCTION.................................................................................................................................1

2 COMMENTS FROM ENERGYAUSTRALIA...........................................................................................2
   2.1 OVERVIEW OF COMMENTS .................................................................................................................2
   2.2 RESIDENTIAL CUSTOMER NUMBERS ..............................................................................................2
   2.3 AVERAGE USAGE BY RESIDENTIAL CUSTOMERS .............................................................................4
   2.4 IMPACT OF BASIX ...............................................................................................................................6
   2.5 NON-RESIDENTIAL GROWTH ...........................................................................................................7
   2.6 STARTING POINT AND WEATHER NORMALISATION .......................................................................7
   2.7 YEAR 2003/04 TO DATE RESULTS ..................................................................................................8
   2.8 SUMMARY OF CHANGES TO FORECASTS ......................................................................................8
   2.9 PEAK DEMAND ................................................................................................................................9

3 COUNTRY ENERGY ..............................................................................................................................10
   3.1 OVERVIEW .........................................................................................................................................10
   3.2 USE OF NIEIR FORECASTS ...............................................................................................................10
   3.3 RESIDENTIAL ..................................................................................................................................12
   3.4 PEAK DEMAND .................................................................................................................................12
   3.5 REGION-SPECIFIC GROWTH ............................................................................................................13
   3.6 REGULATORY ACCOUNTS DATA 2002/03 ....................................................................................13
   3.7 THE WAY FORWARD .........................................................................................................................14
   3.8 PROCESS ..........................................................................................................................................15

4 OTHER COMMENTS ............................................................................................................................16
   4.1 INTEGRAL ENERGY ..........................................................................................................................16
   4.2 AUSTRALIAN INLAND .......................................................................................................................16
   4.3 ENERGY USERS ASSOCIATION OF AUSTRALIA/ENERGY USERS GROUP .........................17

APPENDIX A ENERGYAUSTRALIA CUSTOMER NUMBERS .................................................................19

APPENDIX B MODELLING BASIX .........................................................................................................20
LIST OF TABLES

Table 1: Results of the amendments on EnergyAustralia customer numbers, energy and peak demands ............................................................................................................................................... ii

Table 2: Results of the amendments on customer numbers and residential usage for EA .................. 8

Table 3: Results of the amendments on peak demand ......................................................................... 9

Table 4: Comparison of the NIEIR, Country Energy and MMA forecasts for Country Energy, GWh .................................................................................................................................. 10

Table 5: Use of the Country Energy 2002/03 regulatory accounts data plus NIEIR growth rates from 2002/03 ........................................................................................................................................ 14

Table 6: Comparison of the Amended and Previous Australian Inland forecasts and MMA forecasts excluding the CRNP customer for Australian Inland, GWh ........................................................................ 17
EXECUTIVE SUMMARY

Background
The Distribution Network Service Providers (DNSPs) provided forecasts of customer numbers, energy and peak demand as input into the review of the regulatory arrangements to apply from July 2004. As demand forecasts are an important component of these arrangements, the Tribunal commissioned McLennan Magasanik Associates (MMA) to critically review the forecasts and prepare its own forecasts if considered necessary.

Based on the submissions made to the Tribunal and its review of MMA’s draft report, the Tribunal adopted MMA’s growth forecasts for modeling in its draft determination.

Since the draft determination stakeholders have had a chance to comment on the MMA forecasting methodology and forecasts. This final report responds to the stakeholder comments and, where considered necessary, amends the MMA forecasts. It should be read in conjunction with the draft report.

Comments from EnergyAustralia
EnergyAustralia has expressed serious reservations about the MMA forecasts in the areas of customer numbers, average usage, and non-residential growth. Consideration of these comments must, however, be taken against the context of recent network history.

Customer numbers in the EnergyAustralia region have grown by 1.86% over the period 1998 to 2003. EnergyAustralia has forecast growth in customer numbers of 0.8%1, despite overall housing growth in NSW being forecast to remain strong. MMA has forecast growth of 1.6% pa. After some minor corrections to its modelling as a result of the comments received the MMA customer growth forecast has been reduced slightly to 1.57% pa.

Average usage per residential customer has grown by about 1% pa over the past few years. EnergyAustralia has forecast growth into the future of -0.1% pa. There appears to be no reason for such a rapid turn-around apart, possibly, for the impact of conservation measures. In its draft report MMA factored in a reduction in the recent trend of growth to take account of such (uncertain) conservation measures. The expected introduction of Basix from 1/7/2004 has allowed the impact of such measures on new houses to be more accurately modelled. We have done this for EnergyAustralia but have also removed the conservation reduction previously factored in. This, together with some minor efficiency

1 From actual customer numbers recorded at June 30th 2003 to forecast customer numbers at June 30th 2009.
changes and incorporation of reduced growth in floor area assumptions has resulted in some minor changes to the MMA forecasts provided. The residential forecasts are slightly higher in the earlier years (due to Basix only being implemented in July 2004) but slightly less from 2006. Overall, average usage is forecast to grow at 0.3% pa over the period compared to the 1% pa seen over the previous period and the 0.4% pa previously forecast by MMA. Forecast summer peak demands are reduced slightly due mainly to assumptions about more efficient air conditioning.

EnergyAustralia has argued that the non-residential forecasts are based on inappropriate elasticities. However, the methodology and the elasticity used by MMA are those specifically described by EnergyAustralia as applicable to its network. MMA accepted and used this methodology as it was well demonstrated. MMA did not accept the variation to this methodology proposed by EnergyAustralia which was not well demonstrated.

EnergyAustralia has argued that although it now expects to achieve or exceed the MMA forecasts in 2003/04 this is due only to extraordinary weather. MMA has not seen any compelling reason to review its forecast based on the data presented.

In summary, the changes to the MMA forecasts arising from the EnergyAustralia comments are provided in Table 1.

Table 1: Results of the amendments on EnergyAustralia customer numbers, energy and peak demands

<table>
<thead>
<tr>
<th>Amended Forecasts</th>
<th>2003/04</th>
<th>2004/05</th>
<th>2005/06</th>
<th>2006/07</th>
<th>2007/08</th>
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</tr>
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<tbody>
<tr>
<td>Residential customers</td>
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<td>Non-residential, GWh</td>
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<td>16789</td>
<td>17254</td>
<td>17561</td>
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<tr>
<td>Total, GWh</td>
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<tr>
<th>Previous Forecasts</th>
<th>2003/04</th>
<th>2004/05</th>
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<td>Total, GWh</td>
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<td>26880</td>
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<td>29331</td>
</tr>
</tbody>
</table>
Comments from Country Energy

Country Energy has expressed serious concern that the NIEIR forecasts were not used and that this resulted in forecasts which were based on average state values, rather than those specific to Country Energy. However, as pointed out in MMA’s draft report, the forecasts prepared by NIEIR are not those actually used by Country Energy. There are significant shifts in consumption in the starting year and Country Energy has used the same average growth rate for the residential and non-residential sectors for each year. Although, in total, the growth rate assumed is similar to that modelled by NIEIR, there are differences across both years and sectors.

It is unclear how the shift in consumption would impact on NIEIR’s sectoral forecasts and peak demand forecasts. NIEIR has not commented on this. While MMA is sympathetic to the data problems experienced by Country Energy and is also keen to have forecasts specific to the region it was not clear this was the case with the Country Energy forecasts.

Since producing its forecasts Country Energy has also submitted its regulatory accounts for the 2002/03 year. These show residential sales reducing by some 3.5% and an increase in non-residential sales by almost 11%. MMA has been criticised by Country Energy for forecasting too low a residential growth rate and too high a non-residential growth rate.

The significant shift in the base year numbers provided by Country Energy means that a re-think is now required. It appears appropriate to use the 2002/03 regulatory data as the new starting point. Then, given that the MMA expectations of residential demand growth being slower than forecast by Country Energy and non-residential growth being more rapid than forecast by Country Energy have already been realised, it appears reasonable to use the NIEIR growth forecasts for the remaining years of the forecast. This approach results in total consumption by 2008/09 being 3% higher than forecast by Country Energy (about 2% higher than forecast by MMA) and with some uncertainty about the impact on peak demand.

Comments from Integral Energy

Integral Energy has stated that, while it disagrees with the basis of MMA forecasting, the difference between MMA forecasts and Integral Energy’s forecasts are largely immaterial and that it will accept the use of the MMA forecasts.

MMA has modelled the same residential changes for Integral Energy as it did for EnergyAustralia: efficiency improvements for air conditioning and lights, changed floor growth, incorporation of Basix and resetting of the comfort factor to its historical value.
The results suggested that average residential usage for Integral would grow at a rate of 0.2% pa.

However, given that recent average usage by Integral Energy customers has only grown at 0.1% pa, and the expectation that Basix would act to further reduce this, MMA decided it was most reasonable to retain its initial forecasts which saw average usage decline by 0.1% pa.

**Comments from Australian Inland**

Australian Inland has revised its forecasts in light of its submission of 2002/03 regulatory accounts.

As for Country Energy, MMA accepts that for Australian Inland the 2002/03 regulatory results provide the best basis for forecasting. MMA also considers the new Australian Inland forecasts for 2003/04 to be more reasonable than the old. While the Australian Inland forecasts after this are somewhat more optimistic than MMA’s they appear to be reasonable and acceptable for use in forecasting.

**Comments from Energy Users Association of Australia/Energy Action Group**

MMA has examined EUAA/EAG’s comments and provides in the main report further explanations about the approach taken and assumptions.
1 INTRODUCTION

The Independent Pricing and Regulatory Tribunal of New South Wales (the Tribunal) is currently undertaking a review of the regulatory arrangements to apply to the NSW electricity distribution network service providers (DNSPs) from 1 July 2004. The DNSPs under review are EnergyAustralia, Integral Energy, Country Energy and Australian Inland. Under the arrangements to apply from 1 July 2004, the Tribunal will regulate:

- distribution tariffs under the weighted average price cap
- transmission tariffs under a pass through arrangement
- set specific prices for miscellaneous charges and monopoly fees under a price cap.

The operation of the weighted average price cap is sensitive to the demand or growth forecasts used. Demand forecasts are also required to assess the capital and operating costs of the DNSPs for the upcoming regulatory period.

The Tribunal asked McLennan Magasanik Associates (MMA) to carry out an independent critical review of the forecasts put forward by the DNSPs and to recommend for each DNSP growth forecasts (customer numbers, consumption and maximum demand) for the Tribunal to use for the 2004-2009 regulatory period. MMA’s draft report including both the review and independent MMA forecasts was submitted to the Tribunal in October 2003. A public version of the MMA draft report was subsequently made available on the IPART website.

Based on the submissions made to the Tribunal and its review of MMA’s draft report, the Tribunal was inclined to adopt MMA’s growth forecasts for its draft determination. Subsequent to the draft determination stakeholders have had a chance to comment on the MMA forecasts in written submissions and at a roundtable forum held on 18 March 2004.

This final report by MMA reviews the comments made by the stakeholders in both written submissions and at the roundtable forum. It is written in the form of a response to major comments by specific stakeholders and, where required, a re-forecast. It should be read in conjunction with the draft report as, in most cases, matters covered in the draft report are not repeated. MMA has considered closely all the comments raised by stakeholders in response to the draft report. While this final report attempts to answer all substantive comments made, it does not necessarily tackle each individual comment.

The report is laid out in the following manner:

- Chapter 2 covers issues raised by EnergyAustralia
- Chapter 3 covers issues raised by Country Energy
- Chapter 4 covers issues raised by others who made substantive comment, Integral Australia, Australian Inland and the Energy Users Association of Australia/Energy Action Group.
2 COMMENTS FROM ENERGYAUSTRALIA

2.1 OVERVIEW OF COMMENTS

EnergyAustralia has expressed serious reservation about MMA forecasts in the following key areas:

- **Customer numbers.** EnergyAustralia believes that MMA’s forecast growth in customer numbers is over-stated, possibly because of misinterpretation of census data, inclusion of Baulkham Hills in EnergyAustralia’s zone and changes to economic factors.

- **Average residential customer consumption growth.** EnergyAustralia believes that MMA’s forecast growth in average usage is overstated as it uses state or national rather than local trends, inappropriate weather adjustments, inaccurate appliance usage and efficiency assumptions and makes assumptions which contravene Government policy.

- **Non-residential consumption elasticity.** EnergyAustralia believes MMA used inappropriate state rather than network trends and was selective in its use of years for analysis.

- **Peak demand forecasts.** As peak demand forecasts are based on energy consumption forecasts the same comments apply as for the above three.

- **Reaching forecast 2003/04 levels.** Although EnergyAustralia believes it will achieve the MMA forecasts for 2003/04 it says this is only because of exceptional weather and a leap year.

EnergyAustralia also provides comment on the Transgrid forecasts and MMA forecasts for other DNSPs. MMA did not assess or use the Transgrid forecasts and, therefore, does not comment on these. MMA prepared forecasts for each DNSP based on both DNSP-specific and general assumptions. In this response to EnergyAustralia only the assumptions relevant to the specific DNSP commenting are considered.

2.2 RESIDENTIAL CUSTOMER NUMBERS

2.2.1 Census data and Baulkham Hills

According to EnergyAustralia’s analysis, dwellings in its region grew by 1.4% between 1996 and 2001 while MMA has stated that growth was 1.8%.

The difference in estimated census growth appears to be due to three main reasons:
• MMA’s categorisation of two areas, Baulkham Hills and Merriwa as supplied by two DNSPs

• Mis-typing by MMA of a 1996 census number for Willoughby

• Different definition of dwellings, EnergyAustralia includes “non-stated” and unoccupied dwellings in its comparison while MMA does not.

However, as stated in the draft report, the methodology used by MMA in forecasting residential growth was largely derived from the independent MDP forecasts. Less than 20% of EnergyAustralia customers are from areas outside the MDP/Illawarra regions. In the MDP analysis conducted by MMA Baulkham Hills was allocated to the Integral Energy network.

Correcting the MMA errors and using the definitions used by EnergyAustralia results in MMA forecast growth rates for EnergyAustralia reducing from 1.61% pa to 1.57% pa. MMA has factored this change into its forecasts.

This issue is elaborated in Appendix A

### 2.2.2 Overall growth rates

EnergyAustralia makes much of its lower historic growth rates estimated from census data and the stimuli operating over the period 1996 to 2001 which are unlikely to be repeated. However, two items of significance to forecasting stand out.

• Firstly, actual EnergyAustralia residential customer numbers between 1998 and 2003 grew at an average annual rate of 1.86% pa. Significantly higher than the rate of growth over the period 1996 to 2001 and higher than the 1.6% pa forecast by MMA.

• BIS Shrapnel, a reputable forecaster of housing trends, is forecasting dwelling completions for NSW over 2003/04 and 2004/05 which are greater than the average achieved over the period 1998 to 2003 by some 3% to 4% and even greater underlying demand for new housing in NSW beyond this.

Overall, MMA believes its residential customer growth forecasts of around 1.6% pa to be reasonable and robust for the purposes of the Network Determination. It certainly considers them to be much more reasonable than the 0.8% pa growth forecast by EnergyAustralia¹.

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¹ Between customer numbers recorded at June 30th 2003 and those forecast for June 30th 2009.
2.3 AVERAGE USAGE BY RESIDENTIAL CUSTOMERS

MMA projects average usage by EnergyAustralia’s residential customers to increase by 0.4% pa while EnergyAustralia forecasts average consumption to decline by 0.1% pa.

EnergyAustralia contends that this is due to inappropriate, inaccurate and inconsistent assumptions.

2.3.1 Recent History

It is instructive, again, to consider recent history. Between 1998 and 2003 average consumption recorded by EnergyAustralia’s residential customers grew by 0.9% pa. However, 2002 and 2003 were particularly warm years. Trend analysis suggests that growth in average usage over the period was actually higher, some 1.1% pa.

EnergyAustralia is forecasting that this growth will, from the start of the regulatory period, turn around to -0.1% pa. EnergyAustralia has forecast this despite using an appliance based model, because its model does not project historical growth trends forwards.

2.3.2 Appliance Modelling and the Need for the “Comfort Factor”

MMA has, in common with EnergyAustralia, used appliance modelling in order to estimate future directions in average usage. However, “backcasting” from this modelling suggested that average usage should have been significantly less than has actually been the case for EnergyAustralia. In order to reflect actual historical outcomes, MMA has added a “comfort factor”. This “comfort factor” is further explained below. It is applied in addition to assumed changes in floor area and persons per dwelling.

In order to explain the historical trends observed, the comfort factor was estimated to be 1.2% pa. In forecasting, MMA conservatively reduced this factor by half in order to account for (at the time unknown) conservation impacts.

2.3.3 Comfort Factor and Weather Assumptions

As explained in the draft report, the “comfort factor” is used to enable the appliance model to match historical growth in average consumption from 1994 to 2002. Without it the model only accounts for 35% of the observed growth. Without further data it is not possible to know whether the missing growth is due to additional appliances, increased use of existing appliances or a combination of these. Consequently the factor we have invoked simply adds 1.2% pa to consumption of all non-water heating appliances on top of all other trend factors, this being the amount necessary for the appliance model to match the observed growth trend. The trend is unrelated to weather normalisation and its continuation does not rely on assumptions that the weather will become increasingly harsh in future.
In using the model to prepare the DNSP forecasts we have assumed that the trend is reduced in future, owing to energy conservation measures. Figures 11 and 12 in the draft report show forecasts for EnergyAustralia and Integral Energy based on trend continuation of the comfort factor at three levels: Full (1.2% pa); Half (0.6% pa); and None (0% pa). We selected the Half forecasts as the most likely outcome of future (at that stage unknown) conservation measures, i.e. we assumed that non-water heating appliance consumption trends would be 0.6% pa below historical trends. This assumption is clearly consistent with the new Basix policy and MMA rejects EA’s implication that the forecast assumptions contravene the policy.

2.3.4 Changes to appliance model following comment from EnergyAustralia

2.3.4.1 Floor area trends

The comfort factor is unrelated to floor area trends. We agree that the trend to non-detached dwellings in the EnergyAustralia area will tend to reduce the growth rate. Based on historical data we have reduced the floor area growth trends for EnergyAustralia to 0.89% pa instead of 1.3% pa.

2.3.4.2 Appliance efficiency assumptions

We have re-examined efficiency data for air-conditioners and accept an improvement of 0.5% pa is appropriate. This will reduce Maximum Demand forecasts substantially more than energy forecasts.

We acknowledge the potential for lighting efficiency gains and have incorporated into our forecasts the 0.5% pa efficiency improvement proposed by EnergyAustralia and Integral Energy.

2.3.4.3 Appliance usage assumptions

Attempts by EnergyAustralia to replicate MMA’s forecasts appear to fail because EnergyAustralia has assumed the comfort factor applies only to air-conditioning. As explained in our report and re-iterated above, this is incorrect.

2.3.5 Difference between DNSPs

Differences in growth in MMA average usage forecasts between EA (0.4%) and Integral (-0.1%) are due to differences in the annual rates of change in appliance penetration (MMA Table 24), for off-peak water and air-conditioning. These rates of change are in general agreement with the DNSPs’ assumptions. The 0.5% difference between EA and Integral is similar to the 0.3% difference between the DNSPs’ own forecasts: EA (-0.1%) and Integral (-0.4%). MMA is higher for both because of the additional observed but unexplained growth trend.
2.4 IMPACT OF BASIX

Local and state governments have become increasingly active in requiring that new housing become more sustainable. For example, the Victorian Government has required implementation of various energy and water efficiency requirements in new houses, while the South East Queensland Regional Organisation of Councils (SEQROC) is considering the adoption of a Sustainable Housing Code. These requirements generally impact on the appliances selected in new homes. Some councils in NSW have also been active in this regard leading, for example, to increased adoption of gas hot water in new houses.

The NSW Department of Infrastructure, Planning and Natural Resources (DIPNR) has foreshadowed the introduction of Basix, a building sustainability index, to require improved energy and water sustainability for new houses built in NSW. As we understand it, the Basix requirement is for new homes to be designed and use appliances which allow reduction of water and energy usage of between 25% and 40% compared to that of comparable average housing.

Basix is intended to apply to all residential developments in Sydney from 1/7/2004 and in the rest of NSW from 1/7/2005. It is intended to replace other local planning requirements.

According to DIPNR, Basix requirements will be effectively met if:

- AAA showerheads and tap fittings are used
- Rainwater tanks and/or dual flush toilets are included
- The hot water system is efficient (assumed to be gas or solar)
- Houses are well designed to make the most of natural cooling, heating and lighting.

As a result of the expected implementation of Basix, the penetration and usage of gas is expected to increase.

We have modelled our understanding of the impact of Basix on electricity consumption in NSW. The modelling is described in Appendix B. Although MMA met with personnel from DIPNR to explore the likely impact of Basix on both electricity and gas usage in new homes it must be stressed that modelling the impact of Basix is complicated by uncertainties about its exact form.

We have in the modelling for the draft report reduced the historical “comfort factor” from 1.2% pa to 0.6% pa in order to simulate a conservation impact. Now that the direction of

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the conservation effort is better understood we consider it reasonable to replace the comfort factor reduction with modelling of Basix. Consequently, with the incorporation of the Basix modelling we have reset the comfort factor to the historically observed 1.2%. We consider this a more reasonable option as the direction and impact of the conservation initiative is now better understood.

2.5 NON-RESIDENTIAL GROWTH

EnergyAustralia argues that MMA has incorrectly used a statewide elasticity for determining non-residential growth for the DNSP and considers this makes it likely to be inflated.

It appears that EnergyAustralia has misinterpreted the MMA methodology applied for EnergyAustralia. MMA specifically provided and used the graph (Figure 6), analysis and elasticity (0.8) provided by EnergyAustralia in its submission.

However, having demonstrated this specific relationship, EnergyAustralia proposed to change it for forecasting purposes, substituting regional gross product for state gross product in its analysis. MMA has considered this unacceptable and has used the actual relationship demonstrated by EnergyAustralia.

2.6 STARTING POINT AND WEATHER NORMALISATION

EnergyAustralia has criticised MMA for using trend analysis to determine the starting point for the average residential usage. It is clear, however, that the starting point for any weather sensitive market should be weather normalised. This is especially important as 2002/03, the base year, was particularly mild.

MMA has used a starting average value of 7228 kWh per residential customer. This is some 90 kWh, or 1.3%, greater than the average actually observed in that mild year. In total it results in about 120 GWh of weather normalisation for the residential market. MMA did not apply any weather normalisation to the actual results for the non-residential market.

We understand from information supplied by EnergyAustralia subsequent to the draft report that the correction applied by EnergyAustralia itself for 2002/03 is of the order of 120 GWh. This means that, in total, the “weather correction” amounts applied are actually very close.

It could certainly be argued that the 120 GWh of weather normalisation should be distributed between the residential and non-residential sectors. Given the difficulty in estimating relative proportions, consistency with the trend analysis and the likelihood that the end outcomes would not be materially different, we do not consider this worthwhile.
2.7 YEAR 2003/04 TO DATE RESULTS

EnergyAustralia has argued that, although it is actually achieving year to date results which are exceeding MMA forecasts this is because of combined abnormal weather and daytype results.

(Note that MMA modelling of average residential energy usage does make allowance for leap years. As the non-residential modelling is based on GSP forecasts from other parties we are uncertain as to whether leap years are taken into account or not.)

A month ago EnergyAustralia had stated that it was confident that the MMA forecast would not be met. “Similarly, EA contends that the MMA forecasts are overly optimistic and have a very low probability of occurrence.”

Things can change very quickly. MMA believes that the 2003/04 results provided by EnergyAustralia show that the results forecast, as amended below, can be achieved. Given that MMA has not identified any compelling reason to institute methodological changes beyond those noted above, MMA considers its forecasts to be reasonable and does not propose to further change them.

2.8 SUMMARY OF CHANGES TO FORECASTS

The methodological changes discussed above have been implemented in the MMA modelling. The results are provided in Table 2.

Table 2: Results of the amendments on customer numbers and residential usage for EA

<table>
<thead>
<tr>
<th>Amended</th>
<th>2003/04</th>
<th>2004/05</th>
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</tr>
</tbody>
</table>

Note that modelling the impact of Basix but also restoring the “comfort factor” to the historically observed 1.2% has resulted in an overall reduction of 93 GWh by the end of the
period, but actually increased usage slightly in the early years as Basix does not take effect in Sydney until 2004/05 and elsewhere in NSW until 2005/06.

### 2.9 PEAK DEMAND

MMA acknowledges that residential air-conditioning has a disproportional impact on peak load, especially in local networks where the penetration of air-conditioning is high. However, as it causes only 25% of summer peak load, it should not be the sole focus of DM initiatives.

The changes to the model described above have had the following impact on forecast peak demand.

**Table 3: Results of the amendments on peak demand**

<table>
<thead>
<tr>
<th>Amended</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter peak</td>
<td>5165</td>
<td>5305</td>
<td>5464</td>
<td>5594</td>
<td>5750</td>
<td>5911</td>
</tr>
<tr>
<td>Summer peak</td>
<td>5112</td>
<td>5285</td>
<td>5478</td>
<td>5635</td>
<td>5820</td>
<td>6013</td>
</tr>
<tr>
<td><strong>Previous</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter peak</td>
<td>5160</td>
<td>5301</td>
<td>5462</td>
<td>5592</td>
<td>5751</td>
<td>5913</td>
</tr>
<tr>
<td>Summer peak</td>
<td>5115</td>
<td>5296</td>
<td>5499</td>
<td>5666</td>
<td>5863</td>
<td>6068</td>
</tr>
</tbody>
</table>
3 COUNTRY ENERGY

3.1 OVERVIEW

Country Energy has criticised MMA’s demand forecasts for:

- Not using the independent and highly rigorous and transparent forecasts prepared by NIEIR.
- Not applying due process.
- Applying state-wide rather than regional drivers.
- Not using a credible or recognised peak demand forecasting methodology.

3.2 USE OF NIEIR FORECASTS

The forecasts contained in the NIEIR report may have been independent and rigorous. Unfortunately, except in the total, they bear no resemblance to the regulatory accounts data or forecasts provided by Country Energy.

Table 30 in the draft report which provided the comparison between the forecasts from the NIEIR report and the Country Energy forecasts is reproduced (with minor amendments) in Table 4 below.

Table 4: Comparison of the NIEIR, Country Energy and MMA forecasts for Country Energy, GWh

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NIEIR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>4181</td>
<td>4236</td>
<td>4314</td>
<td>4389</td>
<td>4476</td>
<td>4555</td>
<td>4630</td>
<td>4698</td>
</tr>
<tr>
<td>Business + Lighting</td>
<td>5784</td>
<td>5756</td>
<td>5928</td>
<td>6034</td>
<td>6169</td>
<td>6280</td>
<td>6385</td>
<td>6467</td>
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<tr>
<td>Total</td>
<td>9965</td>
<td>9993</td>
<td>10242</td>
<td>10423</td>
<td>10645</td>
<td>10835</td>
<td>11014</td>
<td>11166</td>
</tr>
<tr>
<td><strong>Country Energy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>4622</td>
<td>4700</td>
<td>4780</td>
<td>4861</td>
<td>4944</td>
<td>5028</td>
<td>5113</td>
<td>5200</td>
</tr>
<tr>
<td>Business</td>
<td>5343</td>
<td>5434</td>
<td>5526</td>
<td>5620</td>
<td>5716</td>
<td>5813</td>
<td>5912</td>
<td>6012</td>
</tr>
<tr>
<td>Total</td>
<td>9965</td>
<td>10134</td>
<td>10306</td>
<td>10482</td>
<td>10660</td>
<td>10841</td>
<td>11025</td>
<td>11213</td>
</tr>
</tbody>
</table>
Independent Pricing and Regulatory Tribunal of NSW

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>4622</td>
<td>4694</td>
<td>4767</td>
<td>4815</td>
<td>4888</td>
<td>4950</td>
<td>5043</td>
<td>5108</td>
</tr>
<tr>
<td>Business</td>
<td>5343</td>
<td>5432</td>
<td>5559</td>
<td>5712</td>
<td>5884</td>
<td>5998</td>
<td>6142</td>
<td>6297</td>
</tr>
<tr>
<td>Total</td>
<td>9965</td>
<td>10126</td>
<td>10326</td>
<td>10527</td>
<td>10773</td>
<td>10949</td>
<td>11185</td>
<td>11405</td>
</tr>
</tbody>
</table>

The Country Energy forecasts:

- Have completely different starting and ending points from the NIEIR forecasts in the residential sector.

- Have completely different starting and ending points from the NIEIR forecasts in the non-residential sector.

- Have different annual growth rates. For example, from 2002 to 2003 NIEIR forecasts a 1.3% increase in sales to the residential sector, a 0.5% drop in sales to the non-residential sector and a 0.3% increase in sales overall. Country Energy has forecast a flat 1.7% growth rate across both sectors. Over the period 2002 to 2009, NIEIR forecast average growth rates of 1.7% for residential and 1.4% for non-residential, while Country Energy forecast a flat 1.7% for both.

- Have different components of growth. For example, in the residential sector NIEIR has forecast 1.7% customer growth between 2002 and 2009 and virtually no growth in average usage, while Country Energy has forecast 1.4% customer growth and 0.3% growth in average usage.

- Despite the shift in sectors of usage and timing of growth, Country Energy has retained the NIEIR forecasts for maximum summer and winter demands. It is unclear whether this has been acceptable to NIEIR.

NIEIR has not commented on the shift itself or its potential impact on its demand or peak demand forecasts.

Country Energy provided the following explanations as to why the differences occurred and how they were resolved:

[quotation removed form public version]

As well as lack of transparency as to why the underlying forecasts are so different and whether, given the shifts, the energy and peak data could still be relied upon, there is also a lack of transparency in the modelling carried out by NIEIR.

Country Energy claims that “The methodology adopted was clearly defined in a 200 plus page report from NIEIR,...”. What MMA means by transparent is that the components
should be visible and capable of verification. The NIEIR approach is not capable of verification because it relies upon the NIEIR energy modelling system, which is described only in broad terms in Appendix E (of the 200+ page report the majority is output tables). The report states that business sales are linked to gross product by region, and that residential sales are linked to customer numbers, real income growth and real prices. However details of GSP, income and price elasticities are not provided and there is nothing to verify but the outputs themselves, which can only be done by producing an independent forecast as MMA has done. If the base assumptions change, as obviously occurred between the NIEIR and Country Energy forecasts, are the forecasts still relevant?

MMA chose to forecast itself rather than rely on forecasts that were potentially not relevant to the changed base numbers.

3.3 RESIDENTIAL

1.1.1 Average Customer Consumption

Country Energy claims MMA’s methodology is not clear or stated. As noted in section 5.3.1 of our report we have used the same model for each DNSP. We have presented the parameters only for EA and Integral because only they presented appliance data in support of their forecasts. It seemed pointless to us to provide details for Country Energy when there are no Country Energy derived data to compare them with.

MMA considers the approach it has taken to model Country Energy’s average residential usage to be reasonable given the lack of historical data. We note that Country Energy’s own forecast of growth in average residential usage is similar to MMA’s at about 0.3% pa. By comparison, NIEIR’s forecast growth in average residential usage was virtually zero.

3.4 PEAK DEMAND

Country Energy, supported by NIEIR, claims MMA’s forecasts are not based on a credible or recognised methodology.

MMA’s approach is designed to satisfy the objective of having peak demand and energy forecasts that respond to the same set of external drivers, so that, for example, changes in air-conditioning penetration assumptions are reflected in both forecasts. Information provided by the DNSPs, with the exception of EnergyAustralia, did not assist in meeting this objective.

Country Energy’s peak demand methodology, as documented by NIEIR (in Country Energy Appendix C), comprises non-linear regression analysis to derive historical demand temperature relationships and establish the historical and base year 10%, 50% and 90% percentile peak demands. No explanation is provided of:

- how base year peak demands are projected forwards
• the relationship between peak demand and energy forecasts
• what happens if the energy forecasts are shifted, with significantly greater consumption in one sector and corresponding less in the other.

The description of NIEIR’s energy modelling system (Appendix E of NIEIR’s report to Country Energy) does not refer to peak demand forecasts.

MMA was therefore compelled to develop a simple but effective method of forecasting peak demand. The approach involves:

1. Estimating base year peak demands, using simple trends (the study timeframe did not permit detailed sensitivity modelling and we do not consider such modelling would have substantially changed the outcome). This yields 50% percentile peak estimates only, which are almost the same as the DNSPs’ estimates.

2. Apportioning base year peak demands to residential and non-residential sectors, using data provided by EA and adapted to the other DNSPs

3. Projecting residential peaks using winter and summer peak demand versions of the MMA appliance model. Model parameters were selected to fit base year data.

4. Projecting non-residential peaks using a simple load factor model.

While step 1 may lack the sophistication of the NIEIR regression analysis, steps 2-4 do at least comprise a coherent whole which allow changes to peak demand forecasts if there is a shift in underlying demand.

3.5 REGION-SPECIFIC GROWTH

Country Energy has criticised MMA for not using region-specific growth factors. MMA accepts that in the non-residential sector this would have been preferable to adopting the state-wide approach taken for all DNSPs other than EnergyAustralia. However, only EnergyAustralia provided MMA with sufficient information to allow a DNSP specific elasticity to be determined.

In terms of residential customer growth and average usage, MMA did attempt to derive a Country Energy specific forecast based on the very limited data provided.

3.6 REGULATORY ACCOUNTS DATA 2002/03

The regulatory accounts information submitted by Country Energy for 2002/03 are now available. They show:

• A drop in residential customer numbers of 1%
• A drop in residential sales of 3.5%
- An increase in non-residential sales of almost 11%
- An increase in total sales of 4.2%

MMA forecasts have been criticised for being too negative in the residential area and too bullish in the non-residential – the opposite to the outcomes for 2002/03.

3.7 THE WAY FORWARD

Despite the major changes from the previous year, the regulatory accounts data for 2002/03 probably provide the best estimate of demand in that year. Country Energy has expressed confidence in the 2002/03 regulatory accounts data and considers these reasonable to use as the starting point for forecasting.

However, this causes some difficulties in determining which forecasts are best to use going forward. Given that the MMA expectations of higher non-residential growth and lower residential growth than forecast by Country Energy have already been exceeded in the (unusual) base year results, it would appear reasonable to temper the MMA forecasts over the remaining years of the forecast.

It may be most appropriate to use the 2002/03 regulatory accounts numbers as the starting base and apply the NIEIR growth rates to them. By 2009 this would result in total usage which, while closer to the initial MMA forecast than to the other forecasts, still exceeds it by some 2%.

We provide in Table 5 below the results of such an analysis. The peak day demand estimates are rather crude, being derived from the peak day methodology previously used by MMA.

**Table 5: Use of the Country Energy 2002/03 regulatory accounts data plus NIEIR growth rates from 2002/03**

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer numbers</td>
<td>622045</td>
<td>631143</td>
<td>642358</td>
<td>654691</td>
<td>665987</td>
<td>676769</td>
<td>687348</td>
</tr>
<tr>
<td>Residential usage, GWh</td>
<td>4458</td>
<td>4540</td>
<td>4619</td>
<td>4712</td>
<td>4795</td>
<td>4873</td>
<td>4944</td>
</tr>
<tr>
<td>Non-residential usage, GWh</td>
<td>5929</td>
<td>6106</td>
<td>6215</td>
<td>6354</td>
<td>6469</td>
<td>6577</td>
<td>6661</td>
</tr>
<tr>
<td>Total, GWh</td>
<td>10387</td>
<td>10646</td>
<td>10834</td>
<td>11066</td>
<td>11264</td>
<td>11450</td>
<td>11606</td>
</tr>
<tr>
<td>Winter peak, MW</td>
<td>1992</td>
<td>2049</td>
<td>2097</td>
<td>2154</td>
<td>2205</td>
<td>2255</td>
<td>2300</td>
</tr>
<tr>
<td>Summer peak, MW</td>
<td>1629</td>
<td>1687</td>
<td>1735</td>
<td>1791</td>
<td>1842</td>
<td>1893</td>
<td>1939</td>
</tr>
</tbody>
</table>
3.8 PROCESS

MMA accepts that there was less direct discussion between MMA and Country Energy about forecasting methodologies than with EnergyAustralia and Integral Energy. However, MMA attributes this mainly to:

- The inaccuracy of the data provided initially by Country Energy
- The time taken by Country Energy to provide more accurate information, despite repeated phone-calls.
- The fact that Country Energy could explain little about the forecasting methodology, given that the forecasts were based on NIEIR data.
- The very poor data quality which could not be resolved.
4 OTHER COMMENTS

1.1 INTEGRAL ENERGY

Integral Energy has stated that, while it disagrees with the basis of MMA forecasting, the difference between MMA forecasts and Integral Energy’s forecasts are largely immaterial and that it will accept the use of the MMA forecasts.

To be consistent with the updates to the MMA modelling carried out for EnergyAustralia, MMA revised the following component in the model used for Integral Energy.

- Efficiency improvements for air conditioners
- Efficiency improvements for lights
- Assumptions about growth in floor area
- Incorporation of Basix and resetting of the “comfort factor” to recent historical levels.

The changes, which are described in Sections 2.3.4 and 2.4, have had the impact of increasing MMA’s forecast of residential growth for Integral Energy by about 0.3% pa, from growth of -0.1% pa initially to 0.2% pa. In MMA’s updated modelling Integral Energy was affected by the increased floor growth assumptions and, because its hot water penetration was already in decline, the estimated downward impact of Basix on new homes was more than offset by the resetting of the “comfort factor” to its original value.

The trend line increase in Integral Energy’s average residential usage over the past five year has only been 0.1% pa. Given that Basix is expected to have additional conservation impact, we consider that the above modelling may overstate the changes to average usage likely to be seen by Integral Energy. We have, therefore, concluded that the results from our initial modelling, with average usage declining at -0.1% pa, is likely to be more realistic for Integral Energy and consider the forecast contained in the draft report to be most suitable for the network determination.

1.2 AUSTRALIAN INLAND

Australian Inland has amended its forecasts in light of its sales in 2002/03 as presented in its regulatory accounts data. Australian Inland’s previous and current forecasts and a comparison against MMA forecasts are provided in Table 6.

---

3 With Integral Energy’s growth in floor area being greater than the average and EnergyAustralia’s being less than the average.
Table 6: Comparison of the Amended and Previous Australian Inland forecasts and MMA forecasts excluding the CRNP customer for Australian Inland, GWh

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI Residential Previous</td>
<td>106.6</td>
<td>103.4</td>
<td>105.7</td>
<td>108.1</td>
<td>110.6</td>
<td>113</td>
<td>115.6</td>
</tr>
<tr>
<td>AI Residential Amended</td>
<td>103.3*</td>
<td>105.5</td>
<td>107.7</td>
<td>109.9</td>
<td>112</td>
<td>114.2</td>
<td>116.4</td>
</tr>
<tr>
<td>Residential MMA</td>
<td>107</td>
<td>108</td>
<td>108</td>
<td>109</td>
<td>110</td>
<td>111</td>
<td>112</td>
</tr>
<tr>
<td>AI Non-residential – Previous</td>
<td>166.7</td>
<td>170.6</td>
<td>174.5</td>
<td>178.4</td>
<td>182.4</td>
<td>186.5</td>
<td>190.7</td>
</tr>
<tr>
<td>AI Non-residential – Amended</td>
<td>161.6*</td>
<td>173.4</td>
<td>176.9</td>
<td>180.5</td>
<td>184</td>
<td>187.6</td>
<td>191.2</td>
</tr>
<tr>
<td>Non-residential – MMA</td>
<td>157</td>
<td>161</td>
<td>165</td>
<td>170</td>
<td>174</td>
<td>178</td>
<td>183</td>
</tr>
<tr>
<td>AI Total Previous</td>
<td>273.3</td>
<td>274</td>
<td>280.2</td>
<td>286.5</td>
<td>293</td>
<td>299.5</td>
<td>306.3</td>
</tr>
<tr>
<td>AI Total Amended</td>
<td>264.9</td>
<td>278.9</td>
<td>284.6</td>
<td>290.4</td>
<td>296</td>
<td>301.8</td>
<td>307.6</td>
</tr>
<tr>
<td>Total – MMA</td>
<td>264</td>
<td>268</td>
<td>274</td>
<td>280</td>
<td>284</td>
<td>289</td>
<td>295</td>
</tr>
</tbody>
</table>

* Actuals according to Australian Inland

Australian Inland had initially forecast sales growth of 8% in 2002/03, but actuals were only 4.7% higher than the previous year. This has resulted in Australian Inland reducing its starting point but apparently increasing its growth rates thereafter.

As was the case for Country Energy, MMA accepts that the starting point should be the most recent set of numbers, the 2002/03 regulatory accounts data. Given this new starting base, MMA accepts that the new Australian Inland forecasts for 2003/04 are more reasonable than the old, and than MMA’s forecasts for that year. While MMA has forecast slower growth after 2003/04 then does Australian Inland, the faster growth forecast by the latter may be due to regional-specific factors.

MMA notes that Australian Inland continues to forecast a slightly lower growth for its CRNP customer than expected by MMA. However, taken in combination, the non-residential numbers forecast by both MMA and Australian Inland are very similar.

Given that the difference between the new Australian Inland forecasts inclusive of the CRNP customer and the MMA forecasts are relatively immaterial, MMA considers the new Australian Inland forecasts to be reasonable and acceptable for regulatory use.

1.3 ENERGY USERS ASSOCIATION OF AUSTRALIA/ENERGY USERS GROUP

EUAA/EAG has noted that ABS data shows air-conditioning penetration increasing by 5.3% pa in NSW between 1999 and 2002 and that MMA has used much lower rates of increase in its forecast. MMA has used rates consistent with longer-term ABS increases (1994 to 2002) and EnergyAustralia and Integral Energy estimates. The ABS 1999 air-conditioning penetration in NSW is lower than the 1994 figure, a fact we consider questionable and which may lead to the shorter-term penetration growth rate being exaggerated.
EUAA/EAG has estimated an increase in air-conditioning contribution to peak summer demand of 1,250 MW over 5 years and claims that MMA is including only 400-500MW. MMA’s original forecasts in fact included 905 MW over 6 years (2003 to 2009).

EUAA/EAG claims MMA’s model is no more robust than its linear regression curve fitting. We cannot comment on the accuracy of the EUAA/EAG curve but note that a more complex model, such as the one we have used, is essential to link forecast assumptions to outcomes and to link annual and peak demand forecasts.
APPENDIX A  ENERGYAUSTRALIA CUSTOMER NUMBERS

There are three main reasons for the differences between the MMA assessment of growth rates between the 1996 and 2001 census and those of EnergyAustralia.

Firstly, MMA categorised the census data by DNSP according to DNSP allocations produced by Land and Property Information NSW. This showed two regions as shared, Baulkham Hills (between EnergyAustralia and Integral Energy) and Merriwa (between EnergyAustralia and Country Energy).

Baulkham Hills is included in the MDP analysis where it was included and analysed within the Integral Energy region. Although it impacted the census growth numbers it did not impact at all on the MMA methodology as in the MDP analysis it was categorised as Integral Energy.

Merriwa, a region with few dwellings was categorised as shared between EnergyAustralia and Country Energy. Changing this to EnergyAustralia alone had minimal impact on the census analysis.

Secondly, MMA mis-typed a 1996 census numbers for Willoughby, exaggerating the growth rate. Correcting this mistake reduces the MMA estimate of dwellings growth in the EnergyAustralia region to 1.6% between census periods. This does not impact on the MMA forecasts as Willoughby is an MDP region which was forecast separately.

Thirdly, MMA has compared on the basis of occupied dwellings, excluding “non-stated” and unoccupied dwellings while EnergyAustralia has included both these in its comparison. While it is arguable which measure of customer numbers is most appropriate, it makes very little difference to the MMA results. This is because, as stated in the draft report, over 80% of the forecast residential growth was derived from the independent MDP forecasts. Less than 20% of growth related to areas outside the MDP/Illawarra regions. Willoughby and most Sydney LGAs are included within the MDP analysis and census growth rates were not considered applicable.

The Hunter Valley is the main EnergyAustralia region not included within the MDP analysis. Using the EnergyAustralia growth numbers instead of the MMA numbers for the Hunter region results in a reduction of overall forecast growth from 1.61% pa to 1.57% pa.
APPENDIX B  MODELLING BASIX

A.1 Heating and Cooling Requirement

New home heating and cooling requirements are to fall to 75% of current levels. We assume that existing customers remain at 100% and ignore demolitions (so new homes equal net customer growth), so the average requirement after n years is:

\[
\text{Ave Req} = \frac{(100\% \times C_0 + 75\% \times (C_n - C_0))}{C_n}
\]

where \(C_n\) = customer numbers in year n

\[
= \frac{100\%}{(1+g)^n} + 75\% \times (1 - \frac{1}{(1+g)^n})
\]

where g is the customer growth rate

\[
= 100\% \times (1-ng) +75\% \times (1-(1-ng))
\]

approximately

\[
= 100\% - ng \times 25\%
\]

This is equivalent to the average efficiency improving by g *25% each year. We have modelled this as though it is independent of other efficiency trends, which seems a reasonable assumption as it is not related to appliances.

A.2 Efficient Hot Water System

A.1.1 Gas reticulated areas

In gas reticulated areas (assumed to be all of EA and Integral) it is assumed that all new homes use a gas water heater. The penetration of electric water heaters therefore falls at least as fast as the customer growth rate. As it is not clear how this interacts with existing trends in electric water heater penetration we have calculated the resultant penetration as:

\[
\text{HW penetration (n+1)} = \text{HW penetration (n)} \times \min(1/(1+g), 1+t)
\]

where t is the old trend, zero for EA, negative for Integral.

A.1.2 Non-gas reticulated areas

In non-gas reticulated areas it is assumed that all new homes use an electric boosted solar water heater. This reduces the water heating requirement by a factor of approximately 68% based on relative power consumption estimates\(^4\). The impact is calculated as for the heating and cooling requirement. This will affect other trends because it changes the appliance type but this has been ignored as it is unclear what the effect is.

A.3 Water heating Requirement

This is as for heating and cooling requirements but only impacts electricity usage in non-gas reticulated areas, where it compounds the efficiency gains due to the switch to solar boosted water heating. The compound factor is given by:

\[ \text{Factor} = 1-(1-0.68)*(1-0.25) = 76\% \]

A.4 Modelling 25% greenhouse gas savings

The way we have modelled Basix results in 25% fewer greenhouse gas emissions than current average levels. Savings in other areas, for example by using higher efficiency gas appliances, may help to meet the 25% target but have not been included. We have, however, not included any further electricity measures in order to achieve the target 40% reduction which is expected to be required from 1/7/2006. Further savings, if required, are assumed to come about through a combination of elements already included, for example improvements in lighting efficiency factored in elsewhere, and other measures such as higher efficiency gas appliances.