Estimating the Effects of Energy Efficiency Policies and Programs on Usage of Electricity and Gas

transport | community | mining | industrial | food & beverage | carbon & energy



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IMPORTANT INFORMATION

Your attention is drawn to Appendix A – "Important Information – **pitt&sherry** Report". The statements presented in this Appendix are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by **pitt&sherry**, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

1. Introduction

1.1 The tasks

pitt&sherry was commissioned by AEMO to produce forecasts of the energy efficiency savings in energy usage resulting from the array of policies and programs at both national and state level which regulate and support increased efficiency in the use of electricity and gas. The report forecasts the effects of energy efficiency measures on the usage of both electricity and gas in the area covered by the National Electricity Market, i.e. Queensland, New South Wales (including the Australian Capital Territory), Victoria, South Australia, and Tasmania. Separate forecasts are prepared for each state (NEM region) and also for usage by residential and commercial consumers. Commercial consumers are defined to be all non-residential consumers, with the exception of users classified as large industry. For electricity the definition of large industry is any consumer with peak demand greater than 10 MW. For gas, a large industry is any consumer with annual consumption greater than 100 TJ. These definitions mean that commercial consumers, as defined, include, in numerical terms, the great majority of non-residential consumers of both electricity and gas.

The results, disaggregated in this way, include the following:

- The impact on annual consumption of electricity (expressed in GWh) in total and, for residential consumption, also expressed as average savings per connection (in MWh) for residential and commercial/business consumers;
- The impact on annual consumption of gas (expressed in TJ);
- For both electricity and gas, all results disaggregated into those relating to space heating, those relating to space cooling, and all the rest, termed base load;
- Separate complete sets of results are provided for the Strong and Weak scenarios.

1.2 Conceptualising energy efficiency

Some care is needed in defining what is meant by the term savings. Savings in energy usage result from both increases in the technical efficiency of energy using appliances and equipment (including buildings) and from changes in the way consumers use appliances and equipment. Both have in the past changed gradually over time, to reduce the level of energy usage required to achieve a given level of energy services, in the absence of explicit policies and programs (hereafter collectively termed measures) designed to encourage more efficient use of energy. Such changes would undoubtedly continue in the future without energy efficiency measures. However, as far as can be determined from the limited data available, this "business as usual" rate of overall energy efficiency increase was generally quite slow, though it varied depending on the particular type of appliance or equipment. The savings resulting over time from this increase is commonly termed the difference between business as usual and "frozen efficiency".

The objective of energy efficiency measures is to increase the rate at which more efficiency energy using equipment and practices are adopted. In principle, therefore, energy savings should be measured relative to a business as usual baseline of (in most cases) slowly increasing energy use efficiency, not against a frozen efficiency baseline. In practice, however, defining business as usual is far from simple, since it is the counterfactual – what would have happened had the measures of interest not been implemented. This report provides estimates of energy savings both in the past, going back to 2003, and projections into the future, out to 2036.

The most common and simplest approach is to extrapolate from relevant trends over the period preceding implementations of the measures. AEMO requires estimation of efficiency savings over the past, starting from 2001 (although very few measures were in place at that time) as well forecasts of savings in future years. Following the logic set out above, this implies use of a business as usual baseline derived from trends in energy use efficiency during the 1990s.

An additional complication arises from the fact that Australia has not been alone in deploying energy efficiency measures over recent decades; most developed and many developing countries are also doing so. Moreover, most of the energy using appliances and equipment used in Australia (excluding of course buildings) are manufactured by businesses which are also supplying markets in other countries, many of which have similar or more stringent energy efficiency measures than Australia. Even in the case of buildings, designs, materials and construction techniques which have been developed in other countries to improve the energy efficiency of buildings are gradually adopted, where relevant, in Australia. Overall, therefore, the rate of energy use efficiency increase in Australia would have accelerated over recent years, even in the absence of energy efficiency measures in Australia. To put it another way, the rate of business as usual energy efficiency increase is higher than it was in earlier years.

The issues are most acute for household appliances, many of which have relatively short service lives and are also made by global manufacturers for which the Australian market is a small part of their total business. By contrast, building, particularly residential building scarcely changed at all over decades, at least in terms of the thermal efficiency of dwellings. This is demonstrated by the fact that in the ACT, where mandatory energy performance rating at the time of sale has been in place since 1998, the great majority of houses built prior to the introduction of mandatory energy performance requirements rate as 0 or 1 stars, irrespective of whether they were built in the 1990s or the 1950s.

What does this all mean for estimating efficiency savings? We understand that AEMO's modelling of electricity and gas use incorporates energy use efficiency as a model component going back to 2000. Over this period both the coverage and the stringency of energy efficiency measures gradually increased. Our judgement is that the extent of "voluntary" uptake of more efficient appliances, equipment and behaviours also grew steadily over the period. The important, but hard to quantify drivers for this change include appliance energy efficiency labelling and numerous energy efficiency information advisory activities and programs, undertaken by governments, energy supply businesses and not for profit organisations. Since most of these started in the early 1990s, use of business as usual baselines notionally based on trends in the 1990s would have the effect of including the impact of these activites in the estimates of energy efficiency savings. We understand that savings estimated on this basis would most appropriately meet AEMO's modelling requirements.

The forecasts compiled in this report are in most cases not based on modelling of every individual measure as it applies to each category of appliance or equipment. That would be an enormous task. Rather, our work has drawn on previous more detailed studies of many different measures, meaning that it is essentially a meta-analysis. In compiling data from these sources we have tried, to the extent the data allow, to ensure that various estimates have been made on the basis described here. For that reason, we consider that the estimates of energy efficiency savings presented in this report are those which best reflect the steadily increasing effects of energy efficiency on the total use of electricity and gas.

2. Methodology

2.1 General approach

A starting point for the analysis is to assume that all of the savings quantified in this report are realised by either residential or commercial consumers and none by large industry. We base this assumption on the understanding that appliances, equipment and buildings account for a large proportion of electricity used by residential and commercial consumers, but only a very small proportion of electricity used by large industry.

As specified in AEMO's reporting template, for each measure electricity savings are:

- allocated to either residential or commercial consumption;
- allocated to each of the five NEM regions;
- allocated to either cooling, heating or base load[1];
- calculated for a 2000-01 starting year (noting that the majority of measures do not start until some years after 2000-01), and
- extended to 2035-36.

The WEAK, MODERATE and STRONG savings cases were defined as follows:

- WEAK is the total savings from all the measures, as modelled.
- MODERATE is modelled results with all savings increased gradually to end up 10% higher, and
- STRONG is modelled results increased gradually ending up 20% higher.

These increases are intended to represent the possible outcomes of implementation of the National Energy Productivity Plan. The goal of the Plan is to increase the productivity of primary energy use in Australia by 40% by 2030. In theory this could probably be achieved with no change in the productivity of electricity use. However, since increased energy use efficiency is identified as one of the three key strategies for achieving the target, it is reasonable to anticipate that some increase in electricity use efficiency, additional to continuation of present programs, will occur under the Plan. The above percentages are intended to represent such an increase.

2.2 Energy efficiency measures covered

The national energy efficiency measures for which quantitative savings estimates have been made is as follows.

For appliances and equipment:

- All Minimum Energy Performance Standards (MEPS) currently in force or, if now superseded by more stringent Standards, previously in force.

[1] Baseload is here used as a term for any non-temperature sensitive demand

For buildings:

- Minimum Energy Performance Standards (MEPS) which appear highly likely to be implemented within the next year or two, as listed in section 2.3 below;
- All building energy efficiency regulations that have been included in the Building Code of Australia (BCA) for residential buildings, which include:
  - Minimum 4 star energy efficiency performance 2003;
  - Minimum 5 star energy efficiency performance 2008;
  - Minimum 6 star energy efficiency performance 2012;
  - Lighting;
  - Water heating.
- All building energy efficiency regulations that have been included in the Building Code of Australia (BCA) for commercial buildings, which include:
  - Minimum energy efficiency performance 2006,
  - Minimum energy efficiency performance 2010.
- The Commercial Building Disclosure (CBD) program;
- NABERS;
- The Energy Efficiency in Government Operations (EEGO) policy.

State programs for which quantitative savings estimates are as follows:

- The Victorian Energy Efficiency Target (VEET);
- The NSW Energy Savings Scheme (ESS);
- The SA Residential Energy Efficiency Scheme (REES).

The Victorian and NSW schemes have to date realised significant savings of electricity only. The SA scheme has realised savings of both electricity and gas.

2.3 Appliances and equipment: electricity

All the savings reported are those arising from the application of Minimum Energy Performance Standards (MEPS). The majority of individual MEPS measures modelled are already in place, but the modelling also includes some measures for which a fairly firm starting date, a year or two into the future, is in place. The equipment types in this category are:

- for residential consumption, standby energy, swimming pool pumps and battery chargers, and
- for commercial consumption, AC chillers, non-residential air conditioners, lamp ballasts, linear fluorescent lamps and commercial refrigeration.

Year by year savings data for each individual measure came from two main sources:

- For residential savings from refrigerators and freezers, clothes washers, dishwashers, televisions, lighting, and air conditioners, *ex post* equipment sales data collected by the Industry Department, made available to **pitt&sherry** for a previous study and used to calculate savings already realised and to project future savings, and

- For all other categories of appliances and equipment, *ex ante* savings estimates contained in the report *Impacts of the E3 Program* by George Wilkenfeld & Associates, prepared for the Industry Department and published in 2014.

All these data are reported as national totals only, meaning that procedures have to be developed for allocating shares of each savings measure to individual states, including an allowance for savings occurring in WA and the NT.

For residential appliances and equipment, three separate allocation approaches were used:

- For reverse cycle air conditioners, savings were allocated to both cooling and heating on the basis of a composite index constructed from population, ownership levels (based on data in ABS Cat. No. 4602.0.55.001 and prior issues of this series), heating degree days, cooling degree days, and the relative fuel to thermal energy efficiency of different types of heating (reverse cycle, electric resistance, gas).
- For simple air conditioners the same index, except without heating degree days, was used.
- For water heaters, savings were allocated using an index constructed from population, average ownership levels (from ABS) and **pitt&sherry** modelling data on average water heating loads by state.
- For all other types of appliances and equipment, savings were allocated on the basis of population. Note that this simple approach implicitly assumes that ownership levels are uniform across states. This is a not unreasonable assumption, given that there are no gas or solar options for these; electricity is the only energy option (with the exception of cooking, which however has no efficiency measures modelled).

For commercial equipment, two allocation approaches were used:

- For air conditioning equipment, savings were allocated between cooling and heating, and between states, using an indicator constructed from population, cooling degree days, heating degree days, and an adjustment for estimated gas share in heating. Compared with residential consumers, heating degree days were considerably smaller and cooling degree days considerably larger, reflecting the greater importance of internal heat sources in commercial buildings.
- For all other equipment, savings were allocated on the basis of population.

2.4 Buildings: electricity

Estimates of energy efficiency savings from the various BCA measures are based on two separate in-house stock models, one for residential and one for commercial buildings, developed **by pitt&sherry** over recent years for use in projects of this kind. Key parameter values used to project future changes in stock using these models are as follows.

- The annual growth of building gross floor area, net of rebuilds, is 0.8% faster than population growth for all types of commercial buildings; for residential buildings floor area of detached dwellings grows at the same rate as population, floor area of semi-detached dwellings grows 0.3% faster and floor area of multi-unit dwellings grows 2.1% faster.
- Annual demolition rate of 1% per annum for all types of building.

- Annual rate of major refurbishments (large enough to trigger the provisions of Section J of the BCA) of 1% per annum, derived from an industry "rule of thumb" estimate of 3% per annum rate for all refurbishments (major and minor).

Other inputs to modelling of building energy efficiency savings include the following.

- Estimates of energy savings in residential buildings attributable to the BCA measures are also taken from the respective Regulatory Impact Statements, which for the earlier years have been amended in the light of more recent in-house data held by **pitt&sherry**. A 10% discount has been applied for the recognised extensive non-compliance[2].
- To allocate national savings in residential building heating and cooling between states and between electricity and gas, indices similar to those used for equipment were used, taking account of heating degree days, estimated gas shares of heating (from ABS), numbers of dwellings with no heating and/or cooling, and the relative efficiency of electric and gas equipment.
- Proportions of electric and gas heating in commercial buildings were taken from COAG (2012), updated with **pitt&sherry**'s most recent in-house estimates.
- Estimates of energy savings in commercial buildings attributable to the two BCA measures (2006, 2010) are taken from the respective Regulatory Impact Statements for the measures. There is uncertainty about the extent to which Section J (commercial buildings) applies to major refurbishments, and it is often argued that there is under-compliance with Section J requirements. While the extent of any under-compliance is not known, an under-compliance effect has been accounted for by adopting a 10% non-compliance savings discount.
- NABERS energy savings were modelled from FY2002 on the basis of the reported response to this measure on a voluntary basis; that is, a reported take up rate of 79% of the national office stock by FY2015 and a reported average of 8.5% energy savings for at least those buildings rated more than once. We assume that the take-up rate of NABERS reaches a plateau of 90% by FY2020 and then remains at that level through to FY2035.
- Savings attributable to NABERS decline markedly from 2011 as a result of the progressive introduction of Commercial Buildings Disclosure (CBD) program. As the latter is a mandatory program, it is assumed that from 2012, CBD is driving savings in offices >2,000 m2. Note that savings attributable to CBD program increase significantly as the program matures.
- In line with our analysis of CBD, we make an assumption that the savings rate achieved by NABERS will decline through time. This reflects an expectation that the most cost-effective savings opportunities motivated by NABERS (and CBD) will be implemented first. As the same building is rated multiple times (over decades), it is more likely than not that fewer cost-effective savings options will be available through time. The normal cycle of building demolition and major refurbishment will, over the longer term, also lead to an increasing share of the office/commercial building stock coming within the purview of the Building Code of Australia, reducing to some extent the scope for additional energy savings attributable to either NABERS or CBD.

[2] Pitt&sherry and Swinburne University of Technology, 2014. *National Energy Efficient Building Project*, Report prepared for the SA Department of State Development.

2.5 State measures: electricity

The three state programs of sufficient scale to be potentially important are the NSW ESS, VEET in Victoria and REES in SA. VEET and REES are confined to residential consumers. Both residential and commercial consumers are eligible under ESS, but the available data suggest that the great majority of the savings are realised in the commercial sector. All data on savings is taken from the annual reports of the respective programs.

Lighting upgrades are the major source of savings under all three programs. Because lighting MEPS savings in the model are based on *ex post* sales data, all the savings under the state programs are assessed as being non-additional in our model. (It is important to note that this does not mean that the state programs are without merit, but only that they are contributing to the very high levels of sales of more efficient lighting in both the residential and commercial sectors, and consequent very large estimates of electricity savings attributed to lighting MEPS.)

Most of the non-lighting savings under VEET are from standby power control devices. These are considered to be very short lived and have therefore been excluded. The result is that VEET is assessed as making no significant contribution to savings in the model. By contrast, an appreciable share of REES savings come from low flow showerheads and switching away for electric resistance water heaters, both of which save electric water heating, and installation of ceiling insulation (not eligible in VEET). These savings are assessed as being additional. An appreciable fraction of NSW ESS savings are also assessed as being additional, and added to total commercial sector electricity savings in NSW.

2.6 Gas savings

There are far fewer energy efficiency measures affecting gas use efficiency. Only one category of gas appliance, residential scale gas water heaters, is subject to Minimum Energy Performance Standards. Estimates of gas consumption savings were taken from the previously cited report by Wilkenfeld & Associates.

National residential building energy efficiency gas savings were taken from the same sources as used for electricity savings from building efficiency measures, and allocated between states using the same sets of indices, based on population, heating degree days, fuel mix and fuel use efficiency. The result is that most of the savings are in Victoria, which is consistent with the fact that about two thirds of total national residential gas consumption is also in Victoria.

In commercial buildings gas consumption is relatively small and tends to be concentrated in large buildings or building complexes, such as hospitals and university campuses, where it is used for a variety of functions other than space heating. The data in **pitt&sherry**'s commercial building stock model suggests that savings from the BCA measures are extremely small. They are therefore set at zero for the purpose of these forecasts.

The only state measure for which the reported data indicate significant savings of gas is REES in South Australia. Estimates of gas savings from water heating, as a result of reduced hot water consumption, and space heating, as a result of ceiling insulation, are included.

2.7 Forecasting future savings

All estimates of savings from the national measures are based on models of the stocks of each type of appliance, equipment, residential building and commercial building, as applicable to the particular measure. As explained above, estimates of building related energy savings use **pitt&sherry**'s in-house stock models. For appliances and equipment, each of the primary sources, from which the data used in this report were drawn, uses a stock model for the particular category of appliance or equipment. Common elements of all stock models include:

- Initial stock or ownership level (for appliances),
- Annual growth and ultimate saturation level (for appliances),
- Where relevant, differential rates of growth sub-categories, e.g. for dwellings, air conditioners
- Turnover rate or life,
- Changes over time in size or capacity.

The ultimate driver of all stock models is population growth. The population projections provided by AEMO were used to develop forecasts for all the building measures and for those appliances for which **pitt&sherry** developed he savings estimates, as described above. Forecasts or projections of savings for all other appliances and equipment rely on the population projections used by the authors of those projections, which are certain to be inconsistent with those used by AEMO for this set of forecasts. However, the impact of such inconsistencies on the final total energy savings forecast numbers is certain to be much smaller than other sources of uncertainty in the forecasts.

As noted above, forecasts of savings from regulated equipment minimum energy performance measures include savings for several measures not yet in place. They have been included on the basis that they are firmly planned. Savings from other possible, but much more uncertain future measures have not been included. Similarly, savings from possible future increases in the stringency of the energy performance measures in the BCA have not been included.

In December 2015 all Australian governments, though the COAG Energy Council, adopted the National Energy Productivity Plan (Department of Industry, Innovation and Science). The Plan contains a long list of proposed measures to assist in achieving the goal of improving Australia's energy productivity, measured as GDP per PJ of national primary energy consumption, by 40% between 2015 and 2030.

None of the listed measures has yet been implemented. With any broad plan of this kind, past experience suggests that, once implementation starts, some measures will not be implemented at all, others will prove to be ineffective and others still will be significantly amended. Of the measures listed, a number relate to transport energy use and a number of others relate to the upstream electricity and gas supply industries, rather than final consumption of electricity and gas. Many of the measures proposed to affect the productivity of final consumption of electricity and gas are directed towards change consumer behaviour. It is notoriously difficult to estimate the impact of behavioural change measures *ex post*. It is even less reliable to forecast impacts *ex ante*.

Having regards to all these matters, it was decided, in consultation with AEMO, not to attempt to model any individual measure proposed in the National Energy Productivity Plan. Instead, it was decided to allow for the effect of the measures in the Plan by imposing a gradual increase to the modelled savings each year, starting in 2016-17 and increasing linearly each year to reach 10% by 2035-36 for the MODERATE scenario. In other words, total savings, as modelled, of electricity and gas used for heating, cooling and base load in each state are increased by 0.5% in 2016-17, 1.0% in 2017-18 and so on up to 10% in 2035-36. For the STRONG scenario the 2025-36 increase is set at 20%, so the annual increment is 1%, rather than 0.5%. For the WEAK scenario no increase is applied to the modelled results.

3. Results

3.1 Electrical energy consumption savings

The results of the modelling took the form of year by year estimates of electricity savings, disaggregated by:

- State (NEM region);
- Sector (residential, commercial);
- Whether related to appliances and equipment efficiency measures or building energy efficiency measures;
- Whether affecting electricity used for heating, for cooling, or for "baseload".

Graphical summaries of the results are presented here, showing trends over time. A sharp increase in the rate at which savings grow each year can be seen in 2005-06. This is caused by the introduction in that year of regulatory measures affecting refrigerators, washing machines and other residential whitegoods, combined with the start of state programs encouraging the replacement of incandescent lamps with compact fluorescents.

Figure 1: Total electrical energy efficiency savings by state

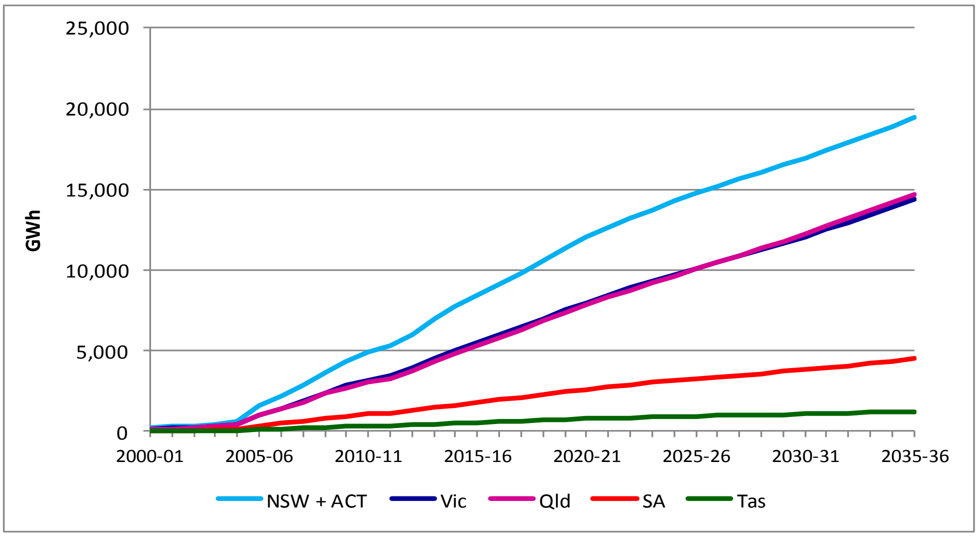


Figure 2: Whole of NEM energy efficiency savings by consumer group

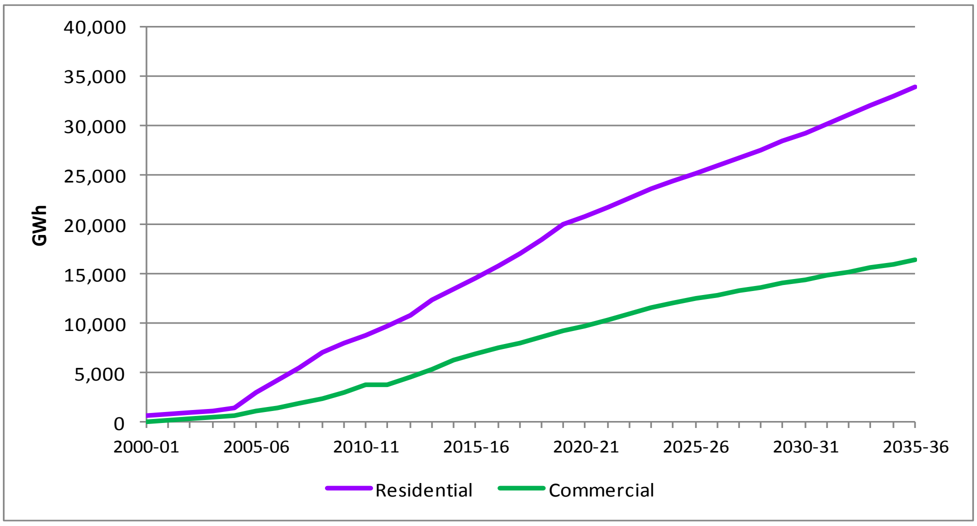


Figure 3: Whole of NEM energy efficiency savings by source of savings

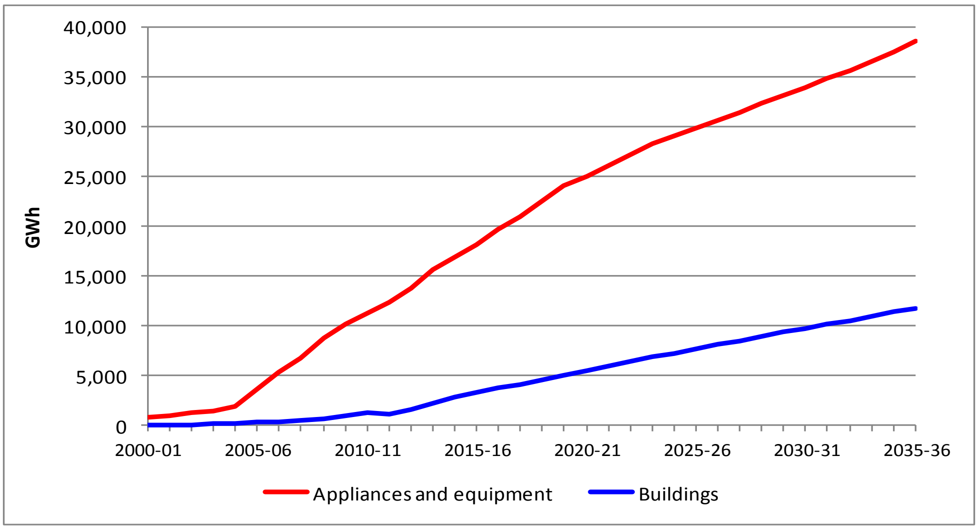


Figure 4: Whole of NEM energy efficiency savings by load component

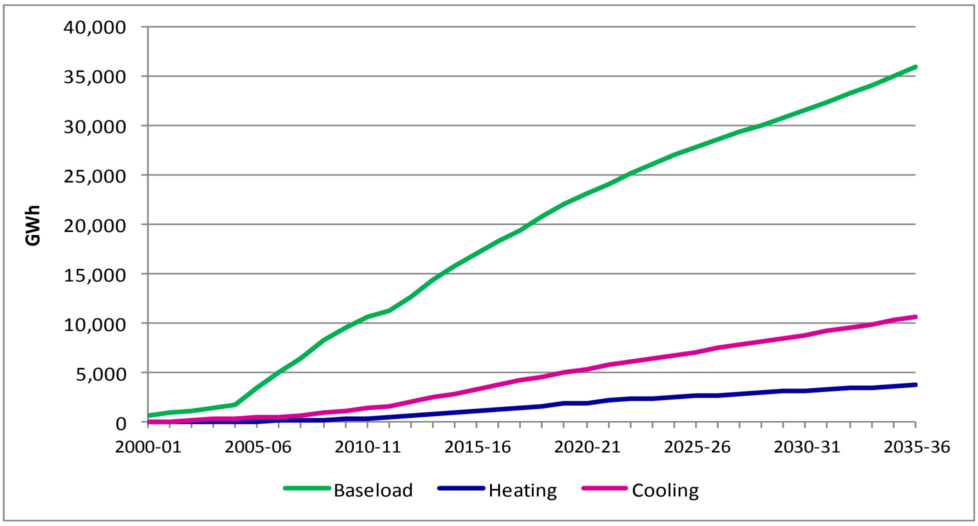


Figure 5: Appliance and equipment efficiency savings by consumer group

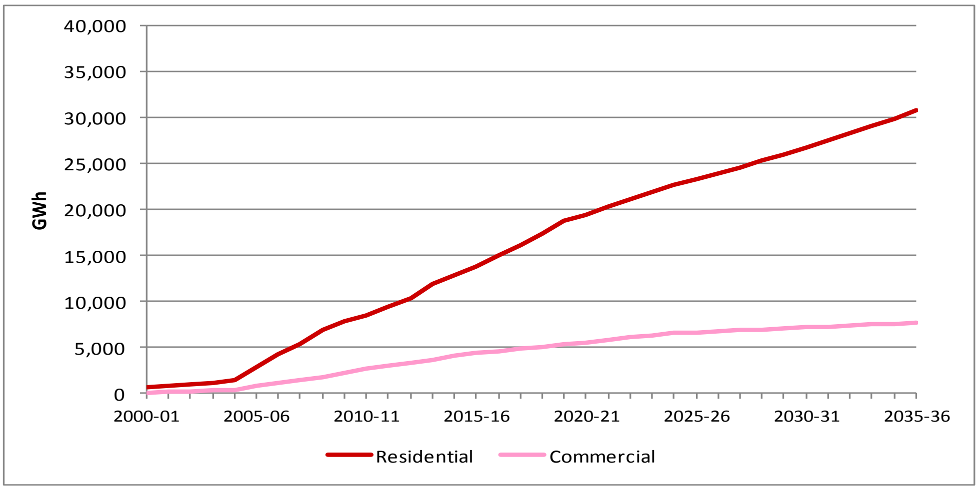


Figure 6: Building efficiency savings by consumer group

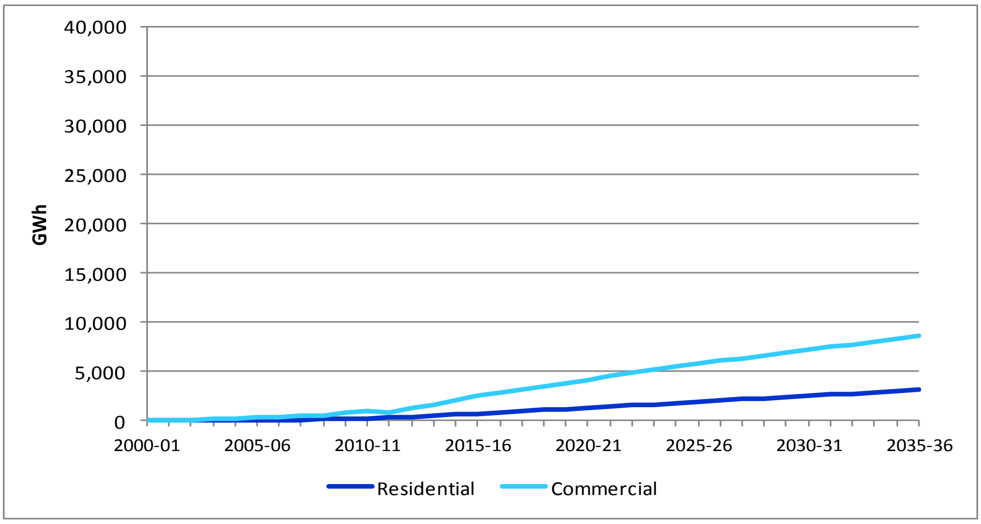


Figure 7: Residential sector efficiency savings by source of savings

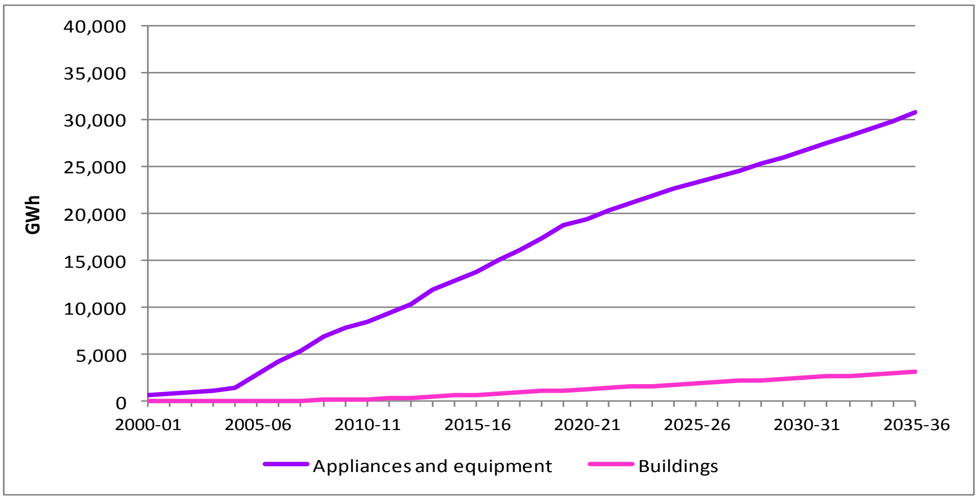


Figure 8: Commercial sector efficiency savings by source of savings

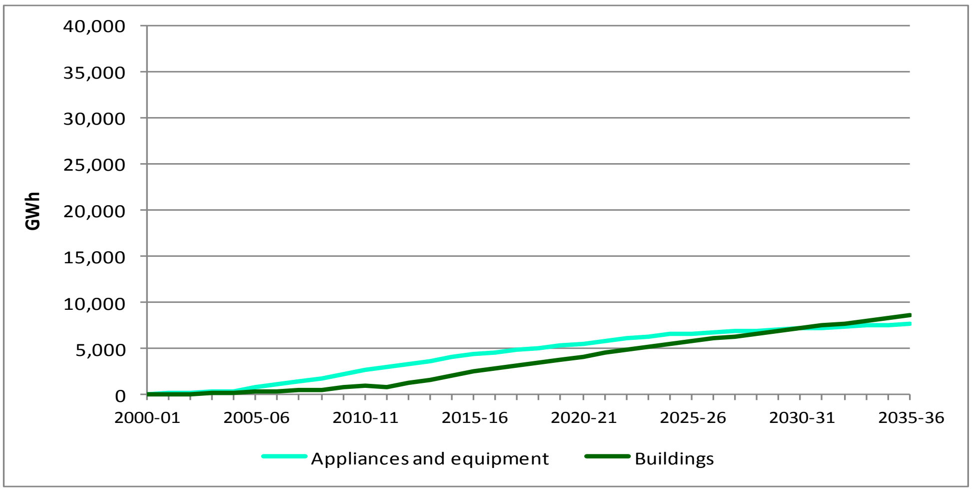
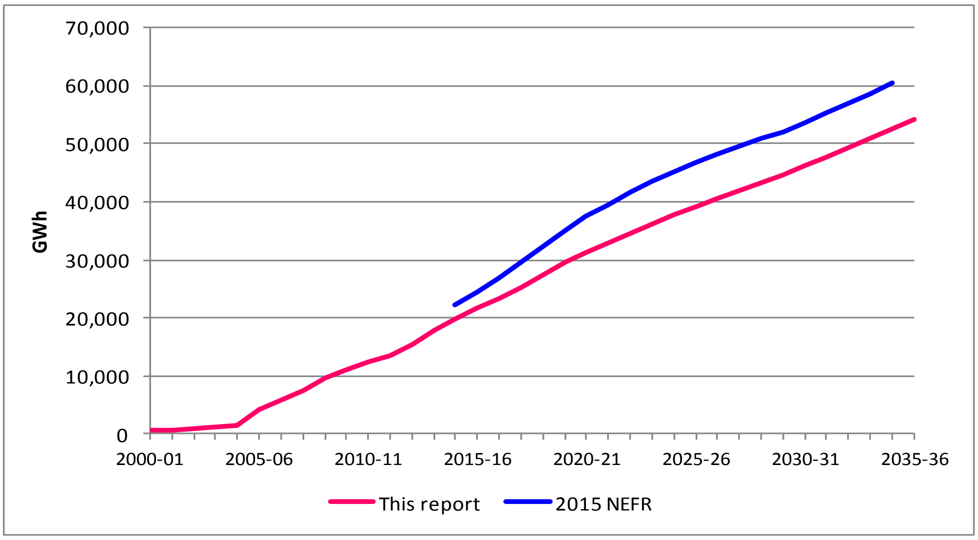


Figure 9: Comparison of these energy efficiency savings estimates with 2015 NEFR



Key features of the results include the following:

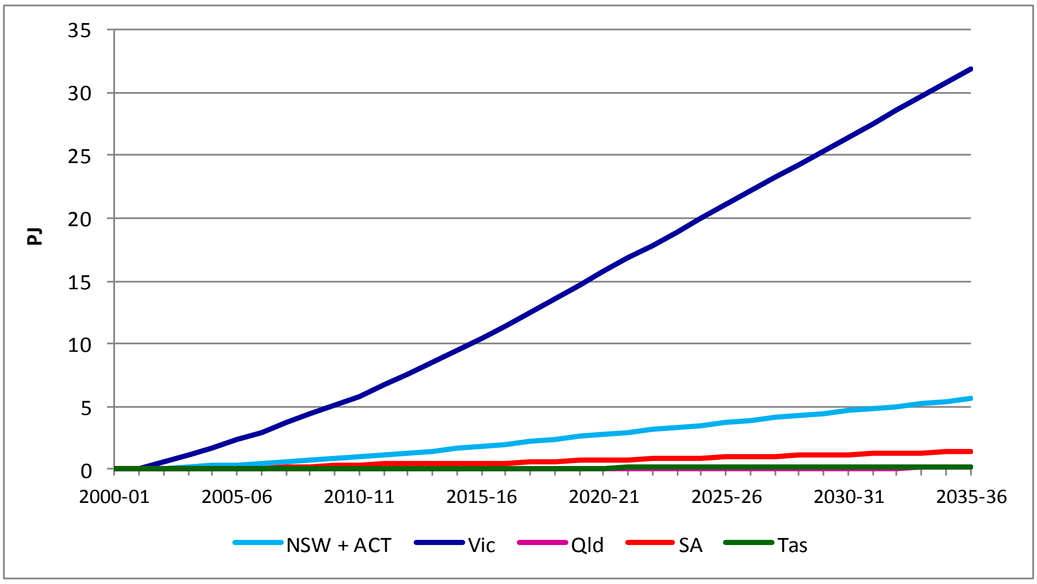
- Total savings are roughly proportional to total state residential and commercial electricity consumption. More detailed data (not graphed here) show that this proportionality applies broadly to all appliance and equipment efficiency measures except water heating, for which the mix of electricity and gas varies widely between states, and air conditioning, for obvious climatic reasons. However, climate and fuel mix differences mean that building energy efficiency savings are less proportional to total electricity consumption.
- Residential sector savings are roughly twice as large as commercial sector savings.
- Savings related to appliance and equipment efficiency are more than twice as large as building energy efficiency savings.
- The residential sector accounts for the majority of appliance and equipment savings, but the commercial sector accounts for the majority of building energy efficiency savings.
- Building efficiency savings are a small proportion of residential sector savings, but roughly half of commercial sector savings.

- Baseload savings are about two thirds of the total NEM savings, and cooling energy savings account for more than two thirds of the remainder, meaning that heating energy savings are quite small.
- Total energy savings across the NEM are a little smaller than those estimated for the 2015 NEFR.

3.2 Gas energy consumption savings

As already explained, energy efficiency savings of gas are confined to residential sector consumption and arise from the efficiency measure applying to gas water heating and from savings of gas used for space heating arising from the mandated higher energy efficiency of new dwelling. Most residential consumption of gas for both space heating and water heating occurs in Victoria and hence it is not surprising that most of the savings are projected to occur in that state, as Figure 11 shows.

Figure 11: Total gas energy efficiency savings by state



3.3 Comments and discussion

By definition, all projections or forecasts about the future are subject to considerable uncertainty for a wide variety of reasons, some of which characterise all types of forecasts and some of which are specific to the particular type of forecast being made. All the projections of energy efficiency savings of electricity and gas described in this report are subject to particular uncertainties arising from two main sources. The first of these is the uncertainty about future stock numbers of each category of appliance, equipment, dwelling and other types of building, including both rates of turnover and rates of growth in total stock numbers. The second is the uncertainty about the counterfactual baseline – what would the average efficiency of each category have been in the absence of the various energy efficiency regulations and other programs and measures.

The high level modelling which this report describes uses as input a large number of detailed models of the impact of individual measures, undertaken at different times. Consequently, despite our best endeavours, inconsistencies in the input assumptions about the key parameters, such as population and economic growth, which affect stock growth and turnover in these many separate models, are unavoidable. It is almost certain that assumptions in some of the individual models do not align with the input assumptions used for the aggregate modelling described here, and hence this is a source of uncertainty in the results.

The second and more subtle major source of uncertainty is the question of counterfactual baseline, which is discussed in section 1.2 of this report. As explained there, our assessment is that most of the data inputs to the modelling undertaken are measured against baselines based on trends in energy efficiency improvement during the 1990s, prior to the accelerated impact of factors additional to those explicitly modelled here. In that sense, the baselines might be considered to be closer to frozen efficiency than more recent underlying trends in improved energy efficiency. It follows that, when these data are used in comprehensive models of energy demand, alongside other economic drivers, it may be appropriate to apply a modest discount factor to the estimates reported here.

APPENDIX A
Important information – **pitt&sherry** Report

These notes are additional to any limitations noted within the report and are provided by **pitt&sherry** to help clients and other users understand the limitations of their Reports. Further, the notes are included to clearly identify where **pitt&sherry's** responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Accordingly, it is important that the client read all documents from **pitt&sherry** closely and not to hesitate to ask any questions.

Report prepared for Specific Purposes and for Specific Client

pitt&sherry has prepared this report in accordance with the scope of work outlined in the Agreement between AEMO and **pitt&sherry** commencing 26 February 2016 in accordance with the usual care and thoroughness of the consulting profession for the use of AEMO. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. AEMO recognises and understands that **pitt&sherry's** recommendations rely upon an assessment of specifications indicated from published sources and the investigation described. AEMO acknowledges that **pitt&sherry** can form no more than an opinion based on the information obtained from these sources.

Your report has been developed on the basis of **pitt&sherry's** understanding of your unique, project-specific requirements as understood by **pitt&sherry**, and applies only to the project to which the report relates. No responsibility is accepted for the use of this report, in whole or in part, in other contexts or for any other purpose. In addition, it is recognised that the passage of time affects the information and assessment provided in a Report. **pitt&sherry**'s opinions are based upon information that existed at the time the information is collected.

Recommendations are Professional Judgments

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