Gas Appliances

Scoping Report:

Gas Appliances

EECA
Energy Efficiency and Conservation Authority
Te Tari Tiaki Pūngao
Improving energy choices

Preface

Introduction

More appliances are now regulated for energy efficiency than ever before. While energy rating labels appear on domestic whiteware appliances, other appliances are required to comply with minimum energy performance standards (MEPS).

The New Zealand energy efficiency products programme is administered by EECA and operates in close association with the Australian National Appliance and Equipment Energy Efficiency Programme. The success of these trans-Tasman programmes has prompted ministerial support to expand the coverage of the programmes.

To this end, Australia has developed a 10 year Strategy and a detailed 3-year work programme to extend coverage to include: storage and instantaneous water heaters, ducted and non ducted space heaters, commercial space and water heaters, household cook tops and ovens, and industrial boilers. The Strategy and associated documents are available to view at www.energyrating.gov.au.

It is EECA's intention to work alongside the Australian programme and to strive to achieve harmonised product and appliance standards between Australia and New Zealand. This provides a 'level playing field' for suppliers and manufacturers and promotes energy efficiency benefits on both sides of the Tasman.

As such New Zealand is considering this initiative and has released a scoping report: 'Energy Labeling and Minimum Energy Performance Standards for Gas Appliances: Economic and Environmental Impacts'.

This report

The commercial and residential sector in New Zealand uses approximately 20 petajoules of natural gas each year (approximately $400 million). The residential sector alone spends $130 million a year on gas for space and water heating.

This report, commissioned jointly by EECA and the Sustainable Energy Authority of Victoria, examines the use of gas for residential water and space heating and examimes improvements to gas space and water heater energy efficiency through the use of MEPS and energy rating labels. The possible energy savings to New Zealand consumers of such a scheme are could be as high as $10.6 million per annum by 2023.

Consultation

EECA welcomes feedback on this scoping report. Later, a detailed analysis of the economic and environmental impacts will be completed, and a formal consultation process will be held. However, anyone wishing to make any comments on this report should send them to:

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Energy Labelling and Minimum Energy Performance Standards for Gas Appliances:

Economic and Environmental Impacts

Prepared for the

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by

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February 2004

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Abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
AGA	Australian Gas Association
ALPGA	Australian Liquefied Petroleum Gas Association
AG	Australian Gas code
AGO	Australian Greenhouse Office
AS	Australian standard
BAU	Business as Usual
BCA	Building Code of Australia
COAG	Council of Australian Governments
EECA	Energy Efficiency and Conservation Authority (New Zealand)
GAMAA	Gas Appliance Manufacturers Association of Australia
GASA	Gas Appliance Suppliers Association (New Zealand)
HE	High Efficiency
IWH	Instantaneous Water Heater
LGA	Local Government Authority
MCE	Ministerial Council on Energy
MEPS	Minimum Energy Performance Standards
NAEEEC	National Appliance and Equipment Energy Efficiency Committee
NAEEEP	National Appliance and Equipment Energy Efficiency Program
OGS	Office of Gas Safety (Victoria)
SEAV	Sustainable Energy Authority Victoria
SWH	Storage Water Heater

Executive Summary

Background

Many types of gas appliances sold in Australia are labelled with their gas consumption and energy efficiency, under a program run by the gas industry since the 1980s. Some appliance types are also subject to minimum efficiency levels set out in the product standards.

In 2002 a joint industry-government working group was set up to explore options for improving the effectiveness of the current industry-run gas appliance efficiency scheme. A major technical review of the program was published in 2002, and In July 2003 the Sustainable Energy Authority Victoria (SEAV) published a Discussion Paper on behalf of the joint government-industry working group. Several submissions on the Discussion Paper have been received from manufacturers and industry associations in Australia and New Zealand.

The transition to a new national government-industry gas appliance energy efficiency program will require the endorsement of the Ministerial Council for Energy (MCE). To assist the MCE's consideration of the issue, SEAV commissioned the present study to make preliminary estimates of the impacts, costs and benefits of implementing a national gas appliance energy efficiency program in Australia. The Energy Efficiency and Conservation Authority of New Zealand (EECA) has also supported the study, and the analysis considers the impacts for New Zealand as well.

Household use of natural gas

Natural gas supplies about 30% of household energy in Australia: about 40% of space heating/cooling energy, 45% of water heating energy and 38% of cooking energy. The natural gas share of space heating and cooking is increasing steadily.

Victoria accounts for over two thirds of the Australian household gas market. The next largest household gas market is NSW+ACT, followed by WA and SA. The pattern of State gas use is gradually changing. Natural gas has only recently been introduced into Tasmania, and although gas has been used for electricity generation in the NT for some time it is only now being reticulated for household use.

There is considerable scope for rapid growth in the consumption of natural gas at the expense of other energy forms, especially wood and electricity. Most of the growth potential is in NSW and Queensland, where there are many homes on the lines of gas mains that are not yet connected.

Natural gas water heaters and space heaters have far lower greenhouse gas emissions than conventional electric appliances. Their emissions are comparable with electric-boosted solar and electric heat pump technologies. Therefore accelerating the shift to gas would have national greenhouse benefits. At the same time, it is necessary to ensure that new gas appliances achieve the optimum level of energy-efficiency.

Gas Appliances

The value of the Australian gas space heater and water heater market is approaching $600 million per annum. The New Zealand market is about one tenth this size. There are about 100 distinct water heater models and over 220 distinct space heater models certified for sale on the market.

Water heaters are classified as storage or instantaneous, and there are some differences in technology and energy efficiency according to whether they are designed for indoor or outdoor installation. Space heaters vary more widely in their design and efficiency. The space heater categorisations used in the present study are based on the likely responsiveness of buyers to energy labelling and the scope for using more stringent MEPS as a driver for greater efficiency.

Table S1 Main characteristics of household gas appliance markets, Australia

Type	Market share		Sales 2003 ('000)	Avg price $ (b)	Total value $M 2003	Suitability for labels	Suitability for MEPS
	2003	Proj 2023					
Storage WH – Indoor	21%	15%	61	926	56	High	High
Storage WH – Outdoor	49%	52%	142	926	131	High	High
Instant WH– Indoor	6%	6%	17	1,110	19	High	High
Instant WH – Outdoor	24%	27%	69	1,110	77	High	High
Total water heaters	100%	100%	289	981	283		
Unflued	41%	41%	80	774	62	Low	Low
Flued – log effect, radiant	9%	10%	18	1,485	26	Moderate	Moderate
Flued – convection only	20%	18%	40	1,485	59	High	Moderate
Ducted	30%	31%	58	2,758	160	High	High
Total space heaters	100%	100%	195	1,573	307		

Australian manufacturers supply all of the storage water heater market in Australia, and large parts of the ducted heater and flued heater markets, including log effect heaters. Imports, mainly from Japan, supply most of the instantaneous water heater market and the majority of the unflued space heater market. Gas space heaters are imported from the USA, Europe and New Zealand. All models sold in Australia must be certified by the AGA to the relevant Australian standards.

Several New Zealand manufacturers of wood heaters also make log-effect gas heater adaptations. Many of the gas appliances sold in New Zealand, especially storage water heaters and ducted air heaters, are manufactured in Australia or are identical to models sold in Australia, but there are important differences. Although gas appliances sold in New Zealand must comply with an appropriate gas product standard, this is not restricted to the Australian standard. Japanese, Canadian, USA and United Kingdom standards are also recognised. Consequently there are many model types and brand names on the New Zealand market that are not sold in Australia.

The existing gas appliance efficiency program

Gas appliance labelling was first introduced in Australia in 1981. The AGA took control of the program in 1985, and adopted the current six star rating label design in 1988, largely for visual consistency with the electrical appliance label which was introduced in late 1986. The program now covers water heaters and space heaters.

The efficiency of gas appliances offered on the market has been increasing, but the extent to which this has been in response to gas appliance labelling is unclear. The methods of test and labelling algorithms have changed from time to time, further complicating analyses of trends in gas appliance efficiency. As sales data for individual models, which underpins the impact monitoring of the electric appliance labelling program, are not available for gas appliances, it is hard to determine whether changes in the model lineup are translating into changes in the energy efficiency of the appliance stock.

The gas standards also contain minimum energy performance standards (MEPS), generally expressed as minimum thermal efficiencies, but as these have not changed since 1983 they have had no influence on driving energy efficiency. A recent review has found that the MEPS levels for water heater are less stringent than those applying in some other countries (although the differences in test procedures make direct comparison difficult), but the potential for raising average gas appliance efficiency through raising MEPS levels has not so far been explored to any great extent.

One barrier to buyer use of the labels in some segments of the space heating market is the fact that models have not been required to be retested when changes in the test occur, until they need to be re-registered (if indeed they are re-registered rather than simply retired from the market). Consequently, some space heaters can be sold without labels, or even with labels based on the superseded test standard. In December 2003, about 18% of the 137 models of non-ducted space heaters and 12% of the 85 models of ducted heaters were still marked as “not tested” or “to be retested”.

Another area of gas appliance labelling which needs to be addressed is ensuring that labels appear at the point of sale. Although the gas product standards require the manufacturer or importer to affix the correct gas energy rating label in a prominent position on the appliance, they do not bind the retailer. Therefore retailers can and do remove labels from point-of-sale displays.

Need and Opportunity for Change

The objective of the gas appliance efficiency program should be to achieve the maximum reduction in gas demand that is cost-effective, using the optimum combination of elements including product labelling and MEPS. This is somewhat different from the (implied) objective of the program to date, which is to get suppliers to disclose the energy consumption and efficiency of their products through labelling, and protect consumer from the worst products by MEPS.

Another key change needed is the ability to reconcile opposing commercial interests in the gas appliance industry, and to better balance industry and consumer interests. For example, the suppliers of both storage and instantaneous water heaters recognise that changes are required to the testing regime, but advocate changes that would serve their commercial interests.

There is at present both a need and a historic opportunity to make the necessary changes in the gas appliance efficiency regime. The need arises because the recent restructuring of the AGA means that the Certification Service Division will no longer have the same resources to bring to bear on appliance energy efficiency issues.

Broadly, there are three possible ways for the gas appliance efficiency program to proceed:

1. Business as usual: the program would proceed as more or less an industry controlled scheme;

2. Enhanced business as usual, with greater government involvement in the gas appliance standards committees, plus government funding to review and develop new testing standards, MEPS levels and labelling algorithms; or

3. A joint national government-industry gas appliance efficiency scheme modelled on the National Appliance and Equipment Energy Efficiency Program for electrical appliances. Industry would be involved in the development of the overall Strategic Plan and the detailed work plans to guide the scheme, and would be consulted on any proposed changes to MEPS levels or labelling. The AGA would continue to certify gas appliances.

Option 3 is the only one that is likely to see significant progress to review and develop new test methods, revise and upgrade MEPS levels and labelling protocols, and also ensure a consistent, coordinated and enforced national approach. Both the AGA and GAMAA recognise this, and have publicly acknowledged that a joint industry-government approach is the best way forward (SEAV 2003).[1]

Projected impacts of enhancing the gas appliance efficiency program

Three gas appliance efficiency scenarios have been developed to test the projected cots and benefits:

- Business as Usual (BAU), corresponding to Option 1 above;
- MEDIUM enhancement of the program (roughly corresponding to Option 2 above); labelling becomes significantly more effective but there is no major change in MEPS levels. The average efficiency of new appliances improves more rapidly than in the BAU scenario as consumers show a strong preference for higher rated products and new models replace older models in the market;
- HIGH enhancement of the program (roughly corresponding to Option 3 above): as for the MED scenario but with an increase in MEPS levels as well.

The reductions in gas consumption under these scenarios are illustrated in the following diagrams (note different vertical scales for Australia and New Zealand). Under the MED scenario, Australian annual residential gas consumption in 2023 would be about 2.2% lower than in the BAU case, and under the HIGH scenario gas consumption would be 5.3% lower.

Water heaters are projected to contribute the majority of the gas savings, even though space heating accounts for the majority of gas use. The greatest share of national gas savings is projected to be in Victoria, followed by NSW.

[1] It should be noted that the Gas Appliance Suppliers Association of New Zealand does not share this view, and does not support mandatory labelling or MEPS for gas appliances.

Figure S1 Projected impact of MED scenario (enhanced labelling only) on gas consumption of new water and space heaters, Australia

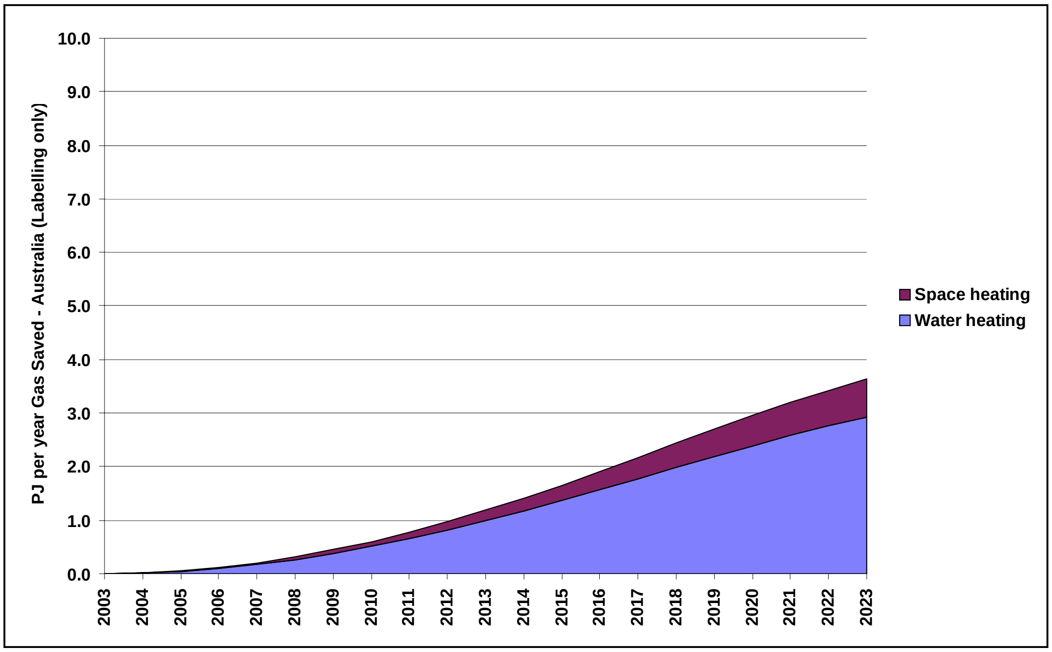


Figure S2 Projected impact of HIGH scenario (enhanced labelling and MEPS) on gas consumption of new water and space heaters, Australia

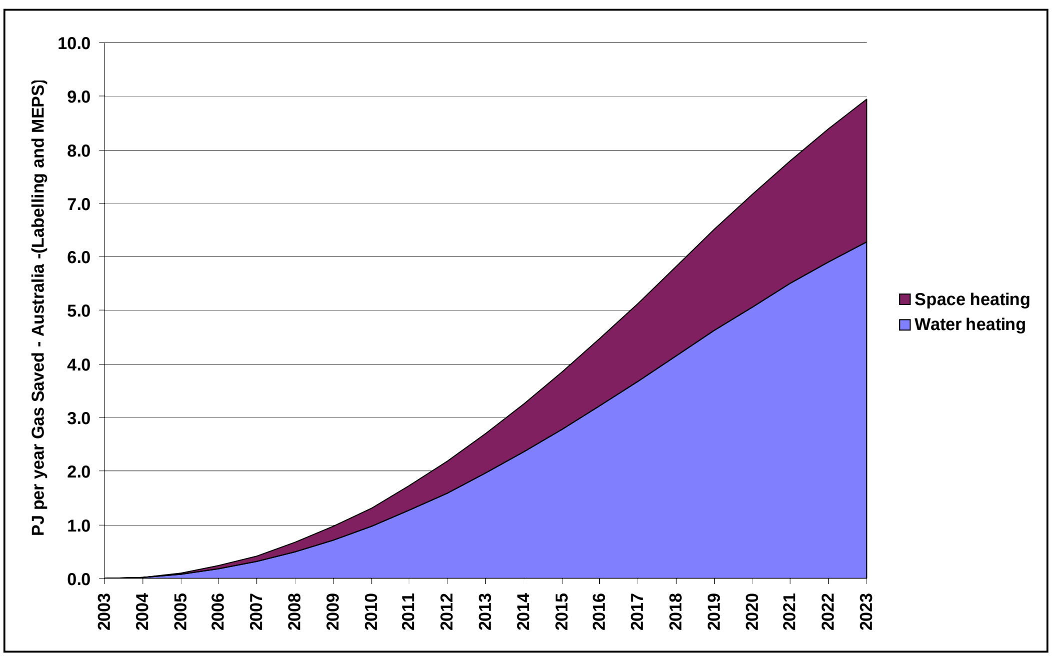


Figure S3 Projected impact of MED scenario (enhanced labelling only) on gas consumption of new water and space heaters, New Zealand

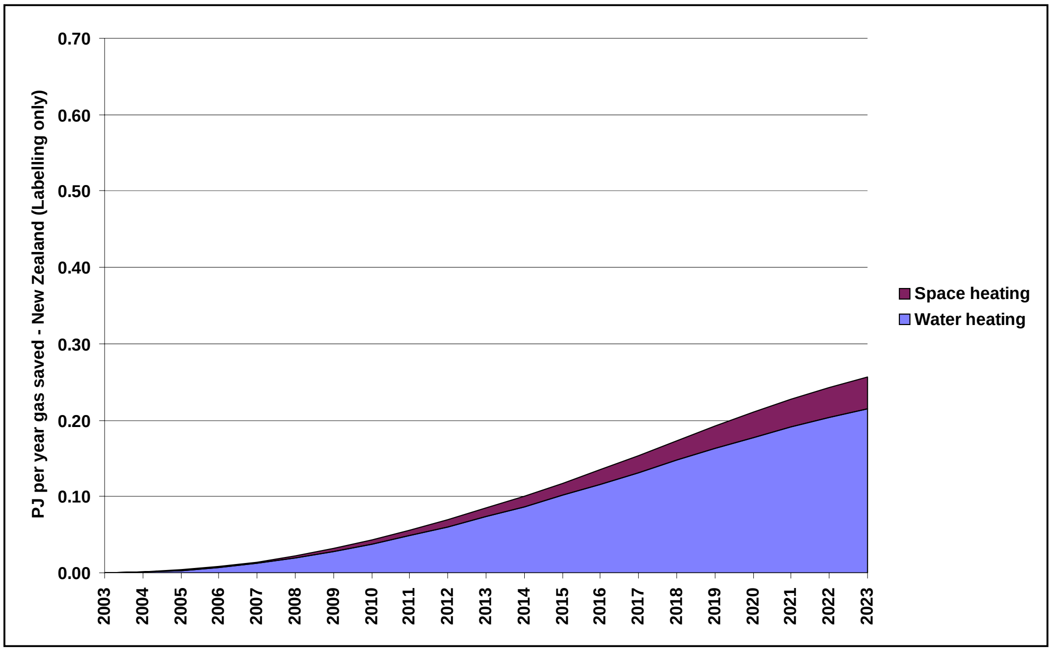
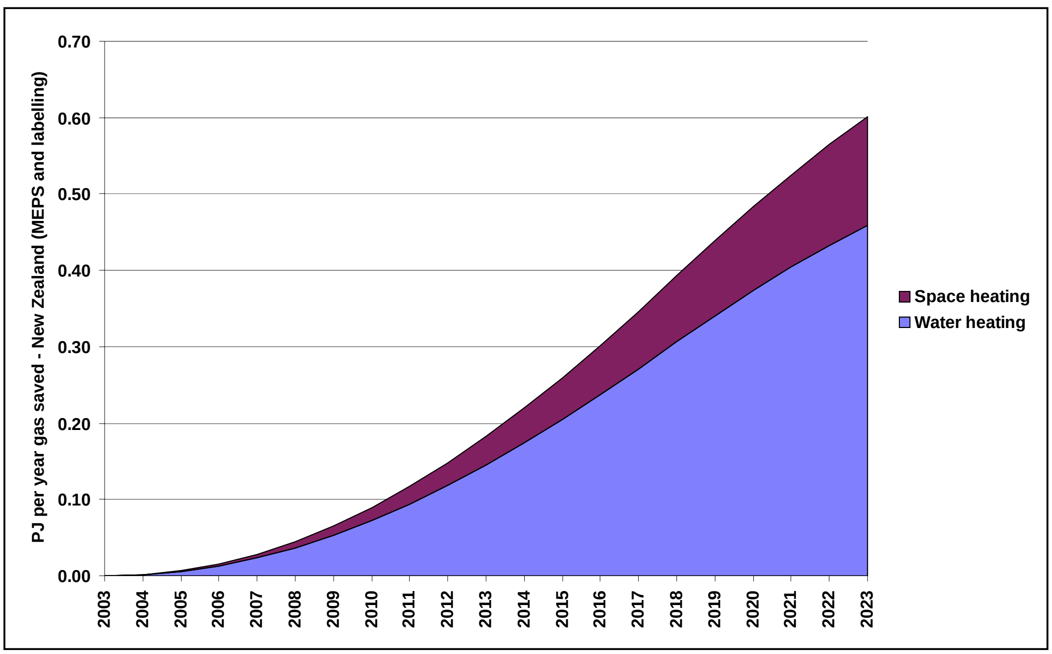


Figure S4 Projected impact of HIGH scenario (enhanced labelling and MEPS) on gas consumption of new water and space heaters, New Zealand



It is projected that annual savings on natural gas by residential sector consumers in Australia could be as much as A$115 million below BAU by 2023. The corresponding savings to gas consumers in New Zealand could reach NZ$10.6 million.

Savings on annual greenhouse gas emissions in Australia could be as much as 600 kt CO_2-e below BAU by 2023. The corresponding greenhouse savings in New Zealand could reach about 36 kt CO_2-e per annum by 2023.

Costs

The main cost elements of a labelling and MEPS program are:

1. The costs to suppliers of testing products, registering the results with the administrative body, producing and fixing labels and the internal administration associated with participating in the program;
2. The costs to the administrator of managing the program, including check testing of products, checking compliance with labelling requirements, data gathering (eg monitoring sales); program evaluations etc;
3. The costs associated with the production of more energy efficient products.

As a regime of testing and labelling gas water heaters and space heaters is already in place, any additional supplier costs from minor changes to the tests or to the label format should be negligible. If there were major changes to the tests, or if MEPS were made more stringent more rapidly than the model turnover rate, this would impose additional costs. These costs cannot be estimated until there are specific proposals for test revisions, labelling changes or MEPS increases.

It is nevertheless possible to estimate the maximum additional costs that the value of the projected monetary savings could support. For example, at a discount rate of 5%, it would be acceptable for the average price of gas water heaters to increase by up to 10% if the projected gas savings from enhanced labelling and MEPS for water heaters were realised. The limit percentage price increases are significantly lower for space heaters than water heaters, because the estimated gas savings are lower and the average price of space heaters is higher.

Table S2 Cost-effectiveness limit indicators

	$M savings NPV			$M purchases 2004-17			NPV savings/NPV purchases		
	0%	5%	10%	0%	5%	10%	0%	5%	10%
Water heaters - labelling only	322	159	84	4769	3311	2423	7%	5%	3%
Water heaters - labelling + MEPS	668	326	172	4769	3311	2423	14%	10%	7%
Space heaters - labelling only	69	33	17	5240	3642	2667	1%	1%	1%
Space heaters - labelling + MEPS	251	121	63	5240	3642	2667	5%	3%	2%
Both - labelling only	391	192	102	10009	6953	5090	4%	3%	2%
Both - labelling + MEPS	919	448	235	10009	6953	5090	9%	6%	5%

0%, 5% and 10% columns indicate Net Present Values at those discount rates

Other Impacts

Moving to a mandatory framework *per se* should not create any costs or difficulties for Australian manufacturers and importers of water heaters and space heaters. They already comply with what is in effect a mandatory labelling and MEPS program enforced by the product registration process.

There could be additional costs to suppliers if there are changes to the test regimes or if more stringent MEPS levels are implemented. These costs could be contained by giving a sufficient lead time – of the order of 3 years for MEPS changes – and guaranteeing that requirements would not then change for a period – say 5 years.

Retailers will face new obligations under a mandatory framework that requires point of sale labelling. As many gas appliance retailers already sell electrical appliances, they should be familiar with these obligations.

The New Zealand regulatory arrangements for gas appliance certification differ from those in Australia in a number of important respects. It is possible to sell in NZ products that meet any one of a number of recognised standards, not restricted to AG/AS, whereas in Australia compliance with AG/AS is mandatory in effect (and would become mandatory in fact under the proposed new framework).

It would be difficult under these circumstances for New Zealand customers to benefit fully from the enhancement of the Australian gas product labelling program, but they may derive some benefit from the adoption of more stringent MEPS, since the average efficiency of products sourced from Australia should increase somewhat.

At present the trade in gas appliances is exempt from the mutual recognition provisions of the Trans Tasman Mutual Recognition Act (TTMRA), so NZ-originated products sold in Australia must comply with the provisions of the relevant AG/AS standards. From Australia's viewpoint it would be necessary to maintain this exemption indefinitely, otherwise sub-MEPS and unlabelled gas appliances imported from NZ would be able to compete unfairly with products that meet the requirements.

Conclusions

There is scope for significant savings in gas consumption, in household expenditure on gas and in the greenhouse emissions associated with gas use. These savings will not however be realised under the existing gas industry–run gas appliance efficiency program.

A mandatory industry-government framework is the only one capable of

- Ensuring that all tests are carried out consistently;
- Ensuring that labels are displayed at the point of sale;
- Ensuring that all labels displayed are to the same test; and
- Introducing and enforcing higher MEPS levels, once implemented

A number of urgent tasks need to be addressed once such a framework is established:

- Independent research on appliance use and purchase patterns, to improve test methods, product categorisations etc;
- The establishment of mandatory controls over point of sale labelling for gas appliances;
- The establishment of a sales-weighted monitoring regime that is independent of suppliers, so that the gas appliance efficiency program managers have reliable data with which to plan, alter and evaluate the program;

- The analysis of the market data yielded by the monitoring regime in order to assess the most cost-effective levels of MEPS.

Recommendations

It is recommended that:

1. Commonwealth, State and Territory Governments endorse the establishment of a new framework for the gas appliance energy efficiency program, involving joint management by Government and the gas appliance industry;

2. Governments consider and implement a regime of regulation (whether State, Commonwealth or a combination) that will be capable of enforcing the mandatory aspects of the new framework;

3. For the products covered by the existing gas appliance labelling program, the display of the appropriate gas efficiency labels at the point of sale should be made mandatory;

4. Governments and the gas appliance industry initiate an assessment to establish the most cost-effective MEPS levels for the products covered by the existing gas appliance labelling program;

5. Governments and the gas appliance industry initiate an effective program to collect data on the sales of individual models, so that trends in sales-weighted efficiency can be monitored;

6. Government and the gas appliance industry undertake a longitudinal study of how actual household water use patterns change in the same households over time, in order to devise a realistic delivery task test, or perhaps a suite of tests, to better represent actual use;

7. The present categorisation of products, which is based on technology and standards rather than consumer purchase categories, should be reviewed.

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1. Purpose of this Study

Background

The Sustainable Energy Authority of Victoria (SEAV), the Victorian Office of Gas Safety (OGS) and the Australian Greenhouse Office (AGO) have formed a joint industry-government working group with the Gas Appliance Manufacturers' Association of Australia (GAMAA), Australian Gas Association (AGA) and Standards Australia, to explore options for improving the effectiveness of the current industry-run gas appliance efficiency scheme to drive energy efficiency improvements in gas appliances. The existing scheme includes both Minimum Energy Performance Standards (MEPS) and energy labelling.

The aim is to put in place a new national gas appliance energy efficiency program as a joint government-industry partnership, modelled on the national appliance and equipment energy efficiency program (NAEEEP).

The process commenced in 2002 with a review of the existing MEPS and labelling program for gas appliances in Australia, and a comparison with overseas MEPS levels: *Energy Labelling and Minimum Energy Performance Standards for Domestic Gas Appliances*, prepared by Mark Ellis & Associates (MEA 2002).

In July 2003 SEAV published a Discussion Paper *Driving Energy Efficiency Improvements to Domestic Gas Appliances* on behalf of the joint government-industry working group (SEAV 2003). Several submissions on the Discussion Paper have been received from manufacturers and industry associations in Australia and New Zealand.

The first priority for action under the new framework will be water heaters, and to this end a gas water heater testing program funded by AGO is under way, with the aim of developing a revised test standard, and revised MEPS levels and labelling algorithms for gas water heaters.

The transition to a new national government-industry gas appliance energy efficiency program will require the endorsement of the Ministerial Council for Energy (MCE). SEAV and OGS, in consultation with AGO, plan to make a submission to the Ministerial Council on Energy with the aim of obtaining MCE's in-principle support for the transition to a new national scheme.

The SEAV has commissioned this study to make preliminary estimates of the impacts, costs and benefits of implementing a national gas appliance energy efficiency program in Australia. The Energy Efficiency and Conservation Authority of New Zealand (EECA) has also supported the study so that the analysis can consider the impacts for New Zealand as well.

The AGO has separately commissioned legal advice to review existing State and Territory legislation related to gas appliance standards and performance, and to set out options for the legal framework for a national gas appliance efficiency program.

Objectives and Scope

The objective of this study is to present MCE with the information necessary for it to consider in-principle endorsement of the transition from the existing industry-run gas appliance efficiency scheme to a national government-industry scheme modelled on the NAEEEP.

The immediate aim of the transition would be the upgrading of MEPS levels and labelling for domestic gas water heaters, space heaters and ducted heaters, although the actual MEPS levels and the timetable for their introduction are still uncertain. This study therefore concentrates on the impacts of the proposals on water heating and space heating gas use, which together account for 95% of residential sector gas consumption. Cookers have not previously been covered by the AGA labelling program, and as there are no current plans to include them, they are not covered by this study.

The study covers the following issues:

1. The potential for greater energy efficiency, lower operating costs, lower life cycle costs, lower greenhouse gas emissions and other benefits from the installation of more efficient gas appliances;

2. The reasons why this potential is not being fully realised within the framework of the existing industry-run scheme (drawing on the available studies of that scheme);

3. Some of the concrete changes necessary to increase the gas appliance efficiency program's effectiveness – eg changes to test methods, MEPS levels, scaling algorithms, label formats, consumer information systems and impact monitoring;

4. The advantages and disadvantages of making the proposed changes within a new mandatory framework, in the light of the feasible alternatives - ie retaining the present industry-led framework ("business as usual") or working towards an enhanced framework but without regulations;

5. The gas appliance industry (manufacturers and importers): names and locations of major firms, brands, sales volumes, value added, employment, industry associations;

6. The gas appliance market – product trends, technical developments, how and where products are sold, the roles of intermediaries, State preferences for different product types, competition with other energy forms etc; and

7. Potential synergies and/or conflicts with other resource labelling developments (comparative electric energy labels, comparative water labels, endorsement labels, disendorsement labels) and options for minimising administrative costs by integrating with other resource efficiency and/or product safety programs.

For the purposes of assessing the impacts of the proposed national gas appliance efficiency scheme, it has been assumed that whatever regulatory framework is ultimately adopted, the level of compliance will be no less than under the existing NAEEEP framework for electrical appliances.

Overview of Report

Data Sources

This report relies mainly on public sources and published reports, supplemented by some material supplied in confidence by SEAV and industry sources. There were no formal discussions with industry or other interested parties. Such consultations would be required if the MCE endorses the program in principle and authorises the preparation of a Regulation Impact Statement (see below).

Original computer modelling was undertaken to estimate costs and benefits.

Structure

Chapter 2 describes residential sector gas use in Australia and New Zealand.

Chapter 3 describes the gas appliance market, including product types, sales volumes, manufacturers and brands.

Chapter 4 sets out the existing gas appliance energy efficiency program, assesses its strengths and weaknesses and reviews the case for enhancing its effectiveness within a mandatory framework.

Chapter 5 estimates the potential benefits and monetary costs of enhancing the effectiveness of gas appliance labelling and MEPS, and considers the potential impacts on industry and trade.

Chapter 6 presents conclusions and recommendations.

Next Steps

If MCE gives approval in principle to develop the proposed mandatory government-industry framework, the following steps would be required:

- The development, by Industry and Government, of a strategic implementation plan;

- The preparation of a Regulation Impact Statement (RIS) to assess the costs, benefits and impacts of implementing the joint Industry-Government scheme through legislation. This would most likely involve the publication of a draft RIS for public comment;

- The enactment by Governments of the necessary legislation.

The present study is intended to form a basis for such a RIS, and its structure and approach follow, in general terms, the Council of Australian Governments (COAG) *Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standard-Setting Bodies* COAG 1997).

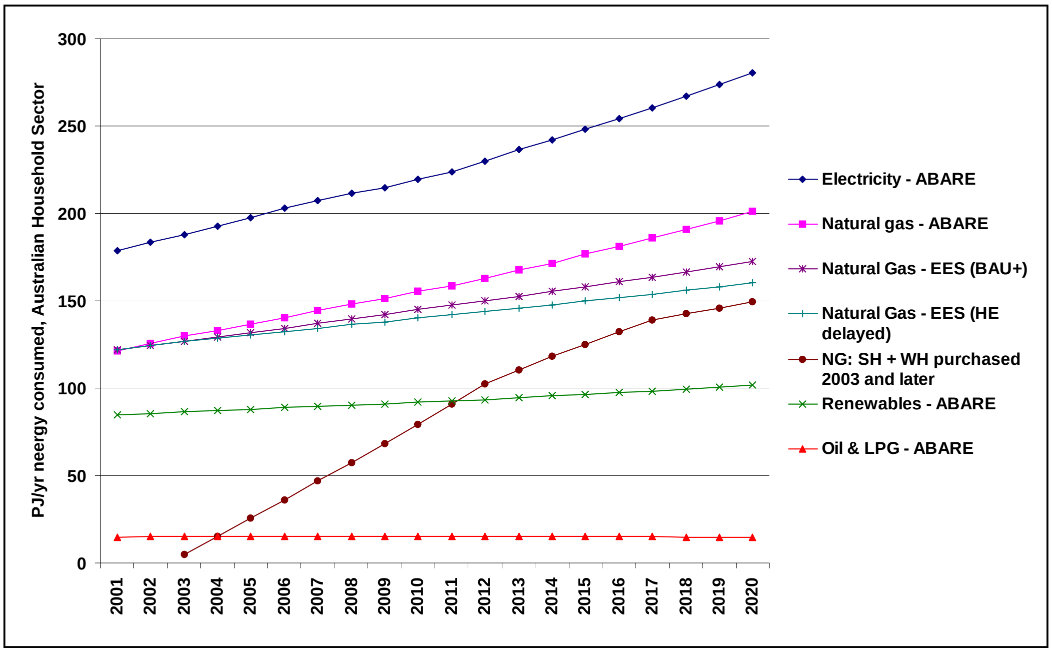
2. Gas use in the household sector

2.1 Gas consumption

Energy Projections

Natural gas meets about 31% of household energy needs in Australia, second only to electricity (45% of household energy). The Australian Bureau of Agricultural and Resource Economics (ABARE 2003) projects the gas share of household energy to increase at about 2.7% per year between 2001 and 2020, compared with 2.4% per year for electricity, 1% per year for renewables (mainly wood) and a decline of 0.1% per year in petroleum products and LPG (Figure 1).

Figure 1 Projected household sector energy, Australia



ABARE's projected growth in household gas consumption is considerably higher than the estimate in a 1999 study of greenhouse gas emissions from the residential sector (EES 1999) which is the source of the "Business as Usual +" (BAU+) gas demand scenario in Figure 1. The EES study developed a "High Efficiency" (HE) scenario in which building shell performance improves, so reducing the demand for all space heating energy, including gas.

Stricter mandatory thermal performance standards for new housing are now being implemented by the Victorian and SA governments, albeit 5 years later than projected by EES, and are likely to be implemented in other States in due course. The impact of this on natural gas demand is illustrated by the "EES (HE (delayed)" scenario in Figure 1. On this projection Australian household natural gas demand would be about 160 PJ per annum in 2020 rather than the 200 PJ projected by ABARE. Additional research is necessary to reconcile these widely divergent estimates, but one factor contributing to uncertainty is the large potential for the expansion of natural gas use in households that are already connected, or connectable at low cost. For the purposes of the present study, it is assumed that household gas demand develops as in the HE (delayed) scenario, and this has been adopted as the baseline for estimating the impacts of the proposed enhancements of the gas appliance efficiency program.

The gas consumption of all the new water heaters and space heaters to be sold in Australia between 2003 and 2023 has been modelled for the present study. As the average lifetime of water heaters and space heaters is 10-15 years (depending on type), nearly all the gas used in water heating and space heating by 2020 will be in appliances sold after 2003. Therefore the "Purchased" trend line in Figure 1 gradually increases as new products are added to the stock and by 2020 represents all Australian gas use for water and space heating. By 2020, gas consumed for cooking and minor purposes such as gas dryers accounts for all of the gap between the "Purchases" and the "HE (delayed)" lines.

In any case, the choice of baseline gas demand is not critical to the findings of the present study. The impact of increasing the effectiveness of gas appliance labelling and MEPS would be realised as a reduction in the gas consumption of *new* products purchased after 2003. This reduction can be modelled fairly accurately in isolation, whatever the overall demand for gas might be.

End Uses

Unlike electricity, which can supply any end use and is indispensable for some, household natural gas use is largely restricted to water heating, space heating and cooking. In 1999, the latest year for which a comprehensive end use analysis is available (GWA 2002) natural gas accounted for about 40% of household space heating/cooling energy compared with 48% for wood, 8% for electricity and 4% for LPG (Table 4, Figure 2).[2] Gas also provided about 45% of household water heating energy and 38% of household cooking energy in 1999.

Table 1 Residential Sector Energy Use by Type and End Use, Australia 1999

	Electricity PJ	Natural gas PJ	LPG, Pet. PJ	Wood, coal PJ	Total PJ	Share
Space heating & cooling	13.6	68.3	6.9	81.6	170.4	44.7%
Water heating	46.7	42.0	4.9		93.6	24.6%
Cooking	8.4	5.7	1.1		15.2	4.0%
Appliances	85.1				85.1	22.3%
Lighting	16.7				16.7	4.4%
Total	170.6	116.0	12.9	81.6	381.0	100.0%
Share	44.8%	30.4%	3.4%	21.4%	100.0%	

Source: GWA (2002)

Gas use varies significantly from State to State, as shown in Table 2. Victoria dominates residential sector gas use in Australia:

- Victorian gas use accounts for over two thirds of the national household gas market;
- Gas provides over two thirds of household thermal energy in Victoria; and

[2] A large proportion of wood use occurs in open fires or older heaters of very low efficiency, so natural gas, which is generally used more efficiently, provides the majority of *useful* household space heating.

- Household gas use per capita in Victoria is over 6 times the average for the rest of Australia.

The next largest household gas market is NSW+ACT, followed by WA and SA. The pattern of State gas use is gradually changing. Natural gas has only recently been introduced into Tasmania, and although gas has been used for electricity generation in the NT for some time it is only now being reticulated for household use.

Table 2 Thermal energy use in the residential sector by State and NZ, 1999

End use and energy type	NSW+ ACT (PJ)	Victoria (PJ)	Qld (PJ)	SA (PJ)	WA (PJ)	Tas (PJ)	NT (PJ)	Australia (PJ)	NZ (b)
Space heating - gas	8.1	55.2	0.1	2.3	2.7	0.0	0.0	68.3	NA
Space heating - electricity	3.3	2.1	0.7	0.7	0.4	0.5	0.0	7.8	NA
Space heating - wood	27.6	23.6	6.0	8.1	7.8	8.1	0.4	81.6	NA
Space heating - LPG, oil	2.3	2.7	0.5	0.6	0.3	0.5	0.0	6.9	NA
Water heating - gas	9.3	21.7	1.0	4.7	5.3	0.0	0.0	42.0	NA
Water heating - electricity	22.6	7.9	11.3	3.6	4.7	2.1	0.7	52.9	NA
Water heating - LPG, oil	0.9	0.9	1.3	0.6	1.0	0.0	0.1	4.9	NA
Cooking - gas	1.6	2.5	0.2	0.7	0.7	0.0	0.0	5.7	NA
Cooking - electricity	3.3	1.5	2.1	0.6	0.6	0.3	0.1	8.4	NA
Cooking - LPG, oil	0.4	0.1	0.3	0.0	0.2	0.0	0.0	1.2	NA
Total of thermal uses	79.5	118.3	23.4	21.8	23.6	11.6	1.4	279.6	NA
Natural gas total	19.0	79.5	1.2	7.7	8.6	0.0	0.0	116.0	8.0
Avg HH gas use (GJ/cap)	2.8	16.9	0.3	5.2	4.6	0.0	0.0	6.1	2.0
Share of Aust HH gas use	16.4%	68.5%	1.0%	6.6%	7.4%	0.0%	0.0%	100.0%	NA
Gas share of thermal uses	23.9%	67.2%	5.2%	35.3%	36.3%	0.0%	0.0%	41.5%	NA

Source: GWA (2002) (b) NZ Gas use for 2002 from Ministry of Economic Development website

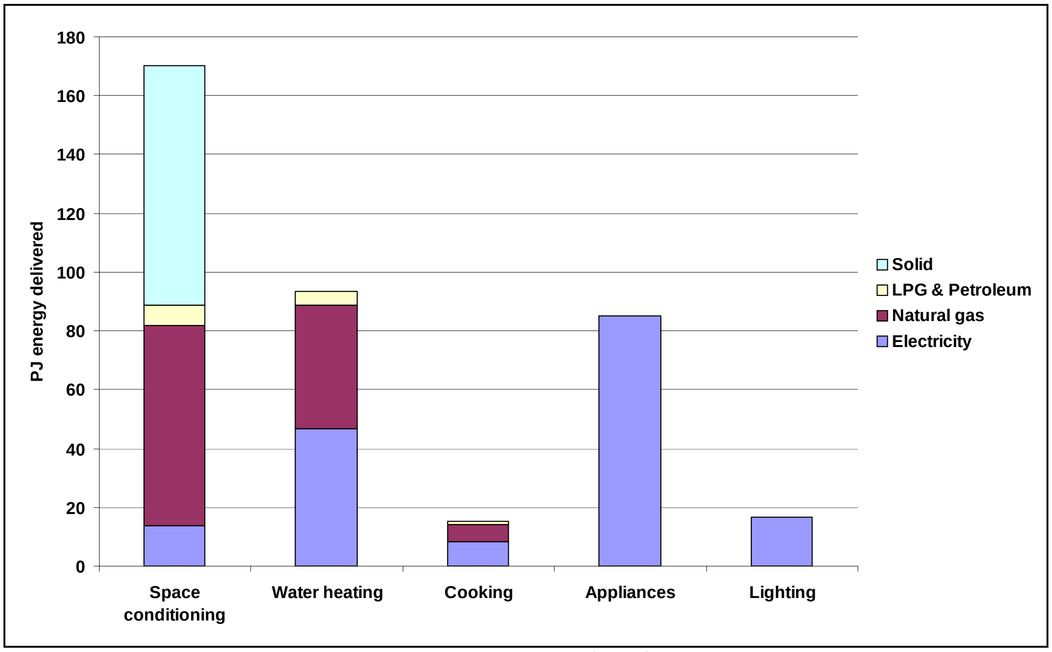
Greenhouse Gas Emissions

The greenhouse gas intensity of natural gas is less than a quarter that of electricity, when both are measured on a fuel cycle basis taking into account emissions during production, treatment and distribution as well as (for gas) combustion at the point of use. Figure 3 illustrates the relative coefficients in 1999. Victoria's electricity coefficient is by far the highest, because of the use of brown coal. The consumption of a unit of electricity in Victoria creates about six times the greenhouse gas emissions as the consumption of an equivalent energy unit of natural gas.

The conversion efficiency at the point of use tends to be higher for electricity than for gas, so emissions per unit of useful energy are somewhat different. This is illustrated by a closer analysis of emissions from water heating. The energy delivered to water heaters is used in the following ways:

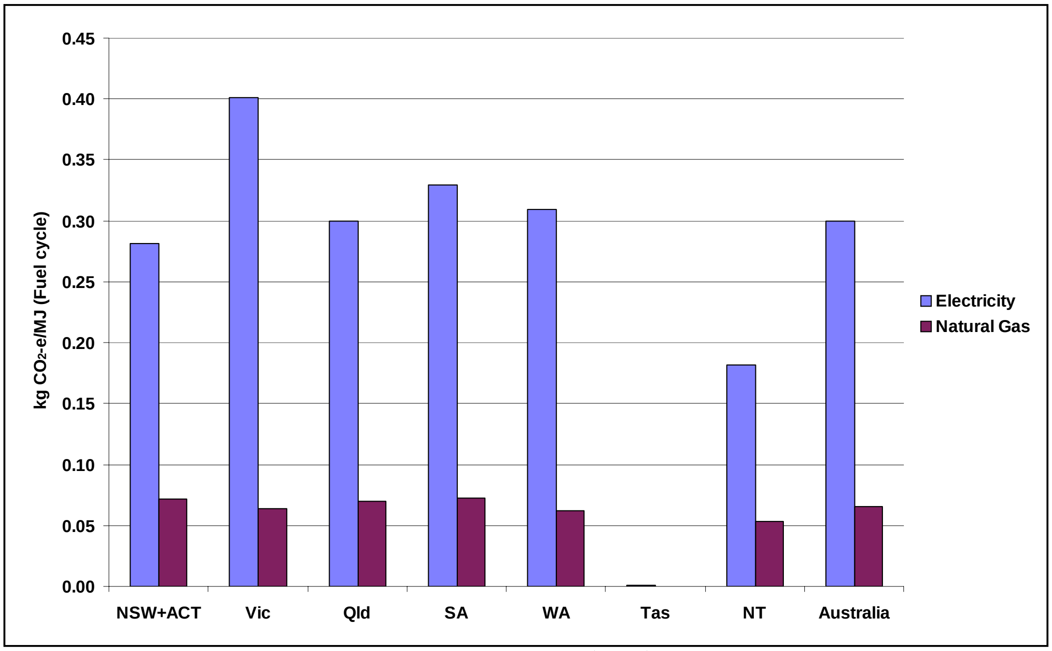
- For all gas and LPG water heaters, some energy is lost during combustion;
- For all forms of storage water heaters (electric, gas or LPG) there are heat losses from the storage vessel;
- The balance of energy is delivered from the water heater as "useful" hot water, although a proportion of this is lost from pipework before reaching the draw-off point.

Figure 2 Residential Sector 1999: Energy use by end use by energy type



Source: GWA (2002)

Figure 3 Greenhouse gas coefficients for electricity and gas, Australia 1999



Source: GWA (2002)

Table 3 indicates the amount of energy lost and delivered as useful energy for each water heater type in Australia, and the associated emissions. On average, gas and LPG water heaters had the lowest emissions per unit of useful hot water: 0.10 to 0.12 kg CO_2-e/MJ. The emissions-intensity of electric-boosted solar water heaters is significantly higher: about 0.17 kg CO_2-e/MJ.

Even though electric water heating was on average more efficient at the point of end use than gas (68.1% compared with 61.5% for gas storage) the very high greenhouse coefficient of electricity means that the emissions-intensity of water heating by electricity was about four times that of heating water by natural gas. Therefore natural gas accounts for only 16.4% of the emissions associated with household water heating, even though it provides 45% of the useful energy. Similarly, natural gas accounts for only 12.1% of the emissions from all household energy use, even though it provides 30.4% of the total energy (Table 4).[3]

Table 3 Water heaters: Energy delivered, lost and used, Australia 1999

	Solar gain PJ (a)	Losses PJ	Useful PJ	Delivered Fossil PJ	Useful/ delivered	Emissions Gg CO_2-e	kg CO_2-e/ useful MJ
Electric storage		14.43	30.75	45.18	68.1%	13268	0.43
Solar-electric	-2.36	1.29	2.57	1.50	170.7%	439	0.17
Gas storage		12.61	20.14	32.75	61.5%	2151	0.11
Gas instantaneous		3.24	6.01	9.25	65.0%	614	0.10
LPG		1.99	2.89	4.88	59.1%	343	0.12
	-2.36	33.57	62.35	93.56	66.6%	16816	0.27

Source: GWA (2002). Solar gain is indicated as a negative energy input, since it reduces fossil fuel delivered. The solar contribution to solar-electric water heating was about 61% of energy delivered (2.36/(1.29+2.57)).

Table 4 Residential Sector 1999: Emissions by end use by energy type

	Electricity Gg CO_2-e	Natural gas Gg CO_2-e	LPG, Pet. Gg CO_2-e	Wood, coal Gg CO_2-e	Total Gg CO_2-e	Share Gg CO_2-e
Space heating & cooling	4025	4409	490	2220	11145	17.9%
Water heating	13676	2764	345		16785	26.9%
Cooking	2511	376	82		2969	4.8%
Appliances	26230				26230	42.1%
Lighting	5182				5182	8.3%
Total	51624	7549	917	2220	62310	100.0%
Share HH emissions	82.9%	12.1%	1.5%	3.6%	100.0%	
Share HH energy (Table 1)	44.8%	30.4%	3.4%	21.4%	100.0%	

Source: GWA (2002)

2.2 Factors affecting gas demand

Appliance Fuel Choice

Connection Rates

A determining factor in the selection of natural gas for space heating, water heating and cooking is whether gas is already available in the home or if not, whether it is available in the street. The most direct indicator of the number of households living in homes

[3] Wood and other biofuels are less intensive than natural gas because only non-CO_2 emissions at the point of combustion are counted (ie CH_4 and N_2O) – however, the low efficiency of wood space heating will significantly reduce the apparent greenhouse advantage over natural gas on a useful energy basis. Also, wood use is now being actively discouraged in urban areas due to local pollution, so the only practical alternative to natural gas heating in those areas is electricity, which is more emissions-intensive unless used in heat pumps, in which case the emissions-intensity of electric and gas heating is similar.

connected to natural gas supply is the number of residential consumers reported by the gas utilities (Table 5). When matched with ABS data on household numbers, this indicates an Australian average gas connection rate of about 44% (16% in New Zealand). The highest rates are in Victoria (80%) and ACT (69%).

The share of household reported by the ABS as using "gas", without distinguishing natural gas from LPG was about 57% in 2002 (Table 5). This suggests that about 13% (57.3%-44.2%) of Australian households use LPG.

Table 5 also indicates the share of dwellings on the line of a gas main that remain to be connected. In Victoria this is only 5%, suggesting that gas connection is essentially saturated in the areas where gas is reticulated. In NSW, SA and WA between 19% and 33% of dwellings on the line of mains remain to be connected, and in Queensland over 80% remain to be connected.

Table 5 Estimated share of households in dwelling connected to natural gas supply

	Households 2002 ('000) (a)	Residential Consumers 2002 ('000) (b)	% of HH (c) connected to gas 2002	% of HH on line of mains connected 2000 (g)	% of HH (d) using gas or LPG 2002	% of HH (d) using gas for water heating	% of HH (d) using gas for space heating
NSW	2472	866	34%	81%	4.7%	22.3%	23.7%
Vic	1837	1481	80%	95%	88.0%	65.7%	72.7%
Qld	1430	139	10%	18%	28.9%	13.9%	3.0%
SA	613	337	54%	67%	64.4%	47.4%	32.7%
WA	754	451	59%	77%	79.9%	58.9%	41.0%
Tas	190	0	0%	NA	12.5%	1.1%	5.3%
NT	55	1	1%	NA	34.4%	4.5%	3.2%
ACT	124	87	69%(e)	NA	63.8%(e)	31.2%	56.3%
Australia	7474	3362	44%	NA	57.3%	36.4%	34.2%
NZ	1462	240	16%	NA	NA	25% (f)	NA

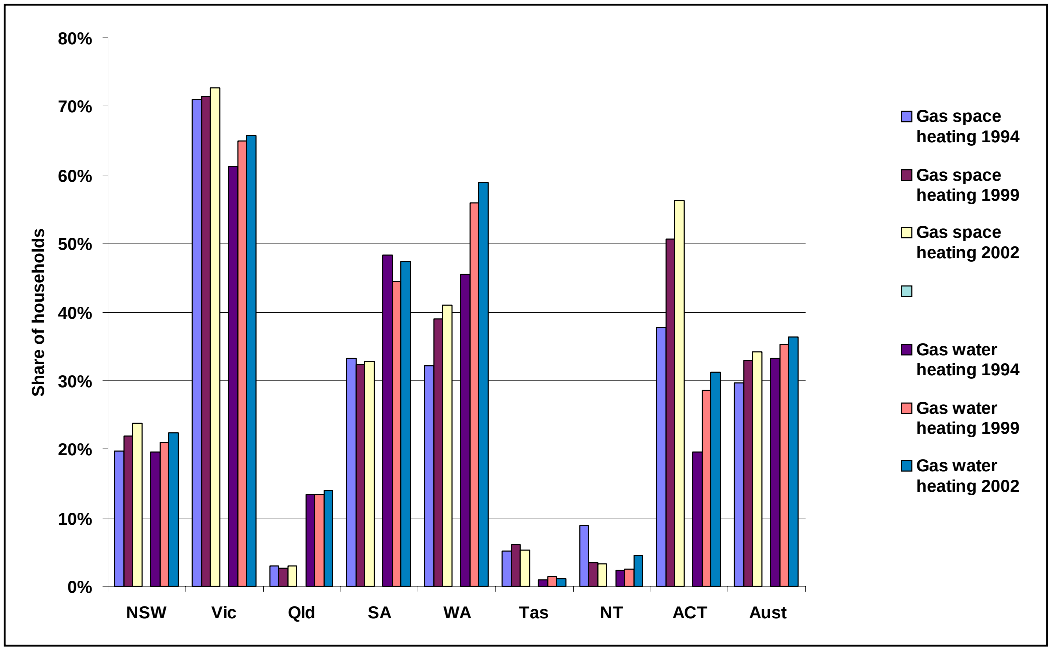
Source: (a) ABS 3236.0 *Household and Family Projections Australia 1996 to 2021*; www.stats.govt.nz; (b) Consumer numbers from AGA (2003) and Gas Association of NZ. (c) Connection rates derived by author (d) ABS 4602.0 *Environmental Indicators 2002*. (e) ABS and AGA statistics inconsistent: LPG+NG cannot exceed NG only. (f) BRANZ (2002). (g) AGA (2001): 2000 data except 1996 for NSW.

Appliance Preference

The share of households with gas water heaters has been increasing steadily in Australia, from about 33.3% in 1994 to 36.4% in 2002 (Figure 4), although the trend is complicated by the fact that the data do not consistently distinguish between natural gas and LPG (ABS 3602.0). The share of households using gas as the main form of space heating increased from 29.7% to 34.2% over the same period. As these rates are well below the rates of gas connection, and the number of connected dwellings is well below the number on the line of mains (other than in Victoria), there is considerable scope for rapid further growth in gas appliance ownership.

It is probable that the wide divergence between forecasts of household gas demand in Figure 1 are due to differences in the estimates of the rate at which the scope for further gas takeup will be realised.

Figure 4 Share of Households with Gas Space and Energy Type of Water Heaters by State, Australia 1994-2002



Source: ABS 3602.0

Useful Energy Demand

Once a decision is taken to install a gas appliance in a dwelling, the actual gas consumption will depend on a range of factors, including:

- The number, age and behaviour of the occupants;
- The physical size of the dwelling;
- The thermal characteristics of the dwelling;
- The characteristics of hot water using devices; and
- The energy efficiency of the appliances themselves.

Household demographics and the physical size of dwellings are largely beyond the reach of government policy, but their effects need to be taken into account in projecting the demand for energy services. For example, as average household size declines and households age, average household demand for hot water tends to decline. On the other hand, as the average floor area of houses increases, and internal spaces become more continuous, the demand for space heating and cooling tends to increase.

The thermal characteristics of the dwelling and the characteristics of hot water using devices are themselves subject to influence by government policy. These are discussed briefly before turning to the energy efficiency of gas appliances, which is the focus of the present study.

Thermal performance of dwellings

New residential construction is subject to mandatory minimum thermal performance standards in Victoria, SA, ACT and in some local government authorities (LGAs) in

NSW. Other jurisdictions are considering implementing such standards via adoption of the relevant sections of the Building Code of Australia (BCA).

There are usually two avenues for demonstrating compliance with thermal performance standards:

1. Prescriptive: eg achieving specified minimum insulation requirements (usually expressed as “R” values) for the main elements: ceiling/roof, walls and floors; or
2. Performance based: eg achieving a minimum rating using an accepted rating method such as *NatHERS* or *FirstRate* (usually expressed as a star rating).

The current status of thermal performance requirements by Australian jurisdiction is summarised in Table 6. The impact of the impending increase in the stringency of Victoria’s thermal performance standards on gas consumption has been projected at about 0.6 PJ per annum for each new cohort of dwellings constructed (EES 2002). As this reduction is cumulative, it would mean that Victorian gas consumption would be about 9 PJ per annum below BAU by 2020, even without any change in appliance efficiency.

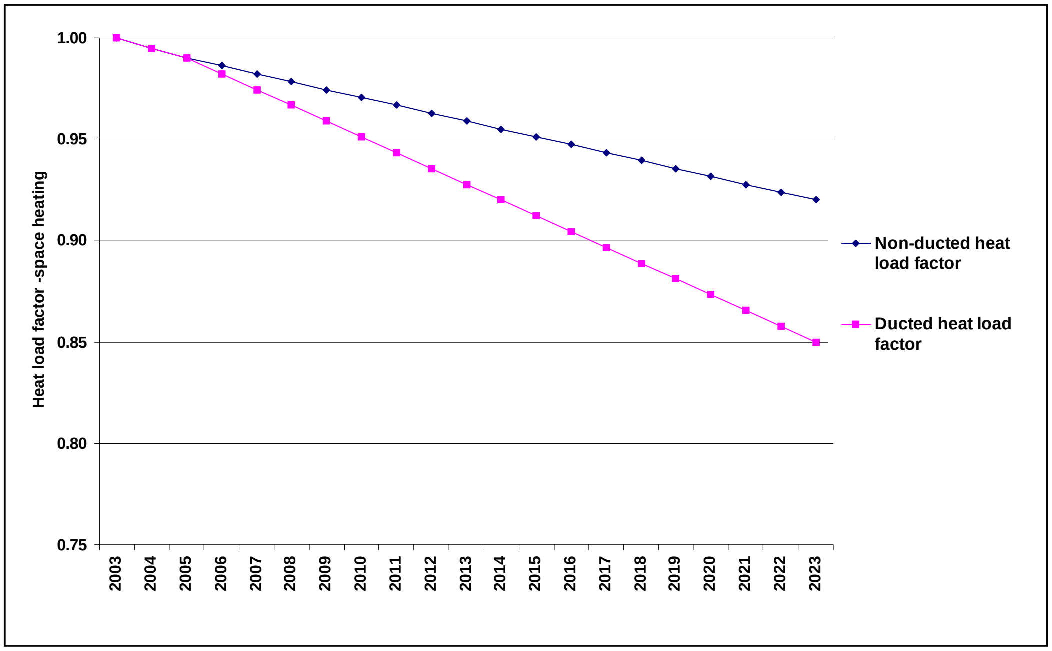
Table 6 Summary of thermal performance standards by jurisdiction, Australia

	Victoria	SA	ACT	NSW	Qld, WA, Tas, NT
Compliance with minimum provisions	Mandatory since March 1991	Mandatory since end of 2000	Mandatory since July 1995	Mandatory in some LGAs since 1999	No
Minimum rating compliance option	3 star compliance option introduced 1994; 4 stars from July 2004, 5 stars from July 2005 (a)	4 stars from Jan 2003 (b)	4 stars since July 1995 (c)	3.5 stars (d)	Under consideration via BCA

(a) Using NatHERS or FirstRate rating program; additional requirements of rainwater tank or solar water heater being considered. (b) Using NatHERS or FirstRate rating program. (c) using ACTHERS rating program. (d) Using NatHERS rating program.

The projected impact of these changes in thermal performance standards on gas heating energy demand from households in Australia is illustrated in Figure 5. The impact on ducted systems is projected to be greater, since these systems are more likely to provide whole-house heating, operate more continuously during the heating season and are controlled by thermostats and possibly time clocks. Therefore lower heat losses from the building fabric translate into lower gas demand more or less automatically. The operating parameters of non–ducted heaters are more variable: they tend to be more under the control of the occupant, are in spaces that lose heat to adjacent unheated spaces, and many heaters have at least some radiant output. It is likely that the same improvements in thermal performance will have less impact on the gas use of non-ducted heaters, because a large part of the benefit will be taken as increased comfort.

Figure 5 Projected impact of thermal performance standards on gas space heating energy demand



Hot water demand

The energy consumption of all water heaters depends in part on the demand for household hot water and the efficiency of water use. In 2002 the average daily demand for hot water was abut 170 litres per day – about 45% for showering, 11% supplied to clothes washers, 8% for baths, 1% supplied to dishwashers and 23% for basin, kitchen and laundry taps[4] (GWA et al 2003). The demand for hot water can be reduced significantly through the substitution of lower flow shower heads, more water-efficient clothes washers and, to a lesser extent, lower flow taps and more water-efficient dishwashers.

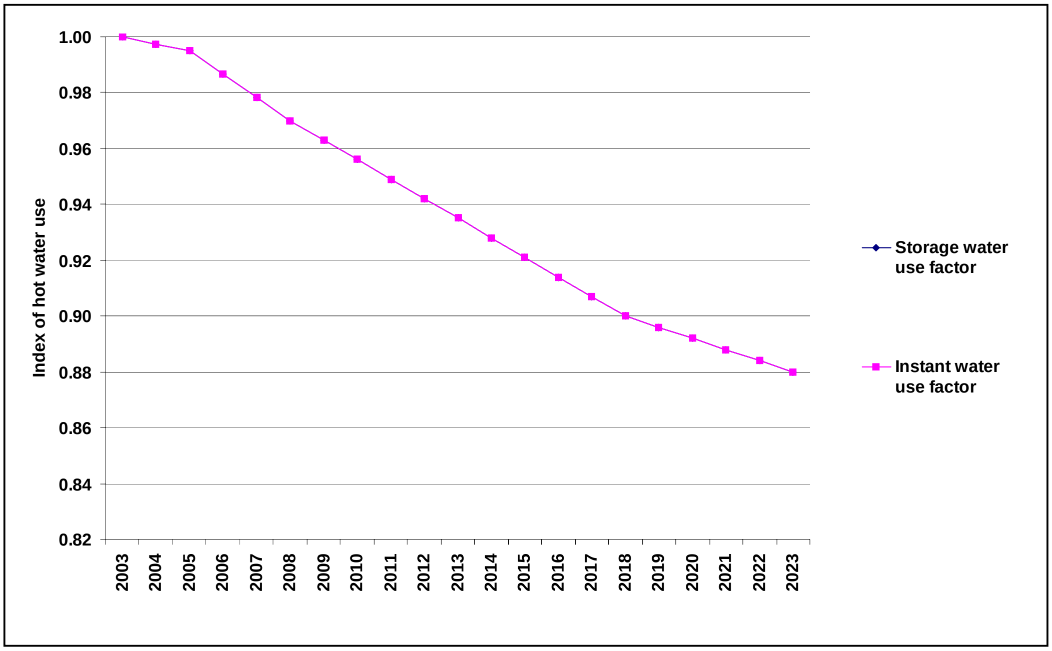
In October 2003, the Environment and Heritage Ministers of the Commonwealth, State and Territory governments and of New Zealand agreed to implement a national mandatory water efficiency labelling scheme covering showerheads, washing machines, dishwashers and toilets. Once this scheme is implemented - the current target date is mid 2005 - it will be unlawful to offer those products for sale anywhere in Australia unless they carry the water efficiency information prescribed in regulations, and in the format prescribed in regulations.

The Commonwealth has undertaken to enact the necessary legislation in order to ensure national consistency, avoid duplication and minimise administrative costs, ensure timely and uniform implementation and compliance measures, and ensure effective coordination with governments and industry. It is anticipated that mirror legislation will be passed in each State and Territory and New Zealand as soon as practicable.

[4] This does not include the water heated electrically in the clothes washers and dishwashers themselves.

If the water efficiency labelling scheme operates as predicted, it will lead to a reduction of about 5% in household indoor water use by 2020, and about 3% in hot water use (the balance of water savings are in cold water, especially in toilet flushing) (GWA et al 2003). Assuming other changes in the design of hot water systems (eg shifting the temperature and pressure relief valve on storage tanks to the cold rather than the hot side) a continuation of the trend to cold water washing and the continuing fall in household size (from an average of 2.68 persons in 2002 to 2.48 in 2021), it is projected that average hot water demand per household will fall by about 12% by 2023 (Figure 6).

Figure 6 Projected impact of more efficient hot water use on gas water heating energy demand



3. The gas appliance market

3.1 Water Heaters

Types

The two main types of gas water heater are storage and instantaneous. Storage water heaters maintain a volume of water at a constant temperature of 55-65ºC (the thermostat setting can usually be selected by the user). The storage volume required is usually between 90 litres for a 1 to 2 person household to 160-170 litres for a 6 person household.

When hot water is drawn off at the top of the tank, cold water enters at the bottom and activates the main burner. The main burner also comes on whenever the storage temperature drops below the thermostat setting, although the pilot burner is usually enough to maintain the storage temperature between drawoffs.

The main factors determining the gas efficiency of a gas storage water heater are:

- The combustion efficiency of the burner/s;
- The efficiency of heat transfer between the flame and the hot combustion products and the water storage vessel;
- The level of insulation of the storage vessel; and
- The prevention of heat loss to cold air circulation through the flue when the main burner is off.

There are two main groups of gas storage water heaters on the market: conventionally flued designs, which are suitable for either indoor or outdoor installation, and "balanced flue" models suitable only for outdoor installation. The indoor models tend to be less energy-efficient, since more heat needs to be left in the flue gases to enable them to escape by convection, whereas outdoor models are designed to extract more of the heat, to the extent of allowing the flue gases to condense on the heat exchange surfaces.

"Instantaneous" or "continuous flow" water heaters have no storage tank. They are more compact than storage types and can be mounted on an exterior wall using an inbuilt flue, or installed indoors and flued to the outside.

When a hot water tap is turned on the flow of water activates gas to the burners beneath the heater exchanger. In older designs the ignition of the main burner is achieved by a standing pilot burner, but most designs now achieve higher energy-efficiency by using electronic ignition (battery, mains power or in one case piezo-quartz ignition activated by a turbine in the water flow).

The hot water supply temperature may be controlled by varying the rate of water flow through the heat exchanger, and by modulating the flow of gas to the burners. Many units have electronic controls which accurately regulate the output water temperature to the level selected at the draw-off point. Modern units are capable of providing flow rates from 2 to 26 litres per minute (for a nominal 25^{o}C temperature rise), depending on the desired output temperature rise and ambient inlet water temperature.

The main factors affecting the energy-efficiency of instantaneous gas water heaters are:

- The combustion efficiency of the burner/s;
- The efficiency of heat transfer; and
- The mode of ignition.

The relative energy- and water-efficiency of storage and instantaneous water heaters has become a matter of some controversy between competing manufacturers, who have advanced the following arguments:

- Instantaneous water heaters are inherently more energy-efficient than storage water heaters because the standing losses are much lower: only the energy remaining in the heat exchanger at the end of the drawoff is lost, whereas a storage water heater loses the energy required to keep the stored water up to temperature between drawoffs;
- The task efficiency of storage water heaters falls off with a decline in the volume of hot water used because standing losses remain more or less constant, whereas the task efficiency of instantaneous water heaters remains largely the same irrespective of drawoff patterns. This would have major implications for gas water heaters installed in households where hot water demand falls over time due to a reduction in the number of occupants or an increase in the efficiency of hot water use;
- Conversely, the drawoff from a storage water unit reaches the temperature required by the user more rapidly than the drawoff from an instantaneous unit, which must be heated from cold. If the user allows this early part of the drawoff to run to waste, then the instantaneous water heater leads to somewhat higher downstream water and energy use than the storage water heater.

There are also several gas-boosted solar water heater designs on the market. Some are "close-coupled" in which the storage tank, and the gas burner, sit above the solar collectors on the roof. Other configurations use combinations of solar collectors and conventional storage or instantaneous units.

Market Size

The only available source of public data on the sales of gas water heaters in Australia is BIS (2000). Sales tend to be volatile from year to year, depending on the rate of dwelling completions (Figure 7), so it is necessary to distinguish between long term trends and actual sales. The estimated trend sales of gas water heaters in Australia were about 290,000 units in 2003 (Table 7).

Table 7 Estimated market size and value, gas water heaters 2003

Type	Market share		Sales 2003 ('000)	Avg price $ (b)	Total value $M 2003	Suitability for labels	Suitability for MEPS
	2003(a)	2023					
Storage – Indoor	21%	15%	61	926	56	High	High
Storage – Outdoor	49%	52%	142	926	131	High	High
Instant – Indoor	6%	6%	17	1110	19	High	High
Instant – Outdoor	24%	27%	69	1110	77	High	High
Total	100%	100%	289	981	283		

Author estimates, based on industry sources (b) From BIS (2002)

The estimated market share of the main gas water heaters types is indicated Table 7 (the market share of gas-boosted solar water heaters was negligible). It is projected that instantaneous water heaters will gain market share from storage heaters, and that outdoor types will gain market share from indoor types (Figure 8). The value of the gas water heater market in 2003 was about $M 283. It is estimated that the New Zealand gas water heater market is about one tenth this size.

Figure 7 Electric and gas water heater sales, Australia, 1988-2020

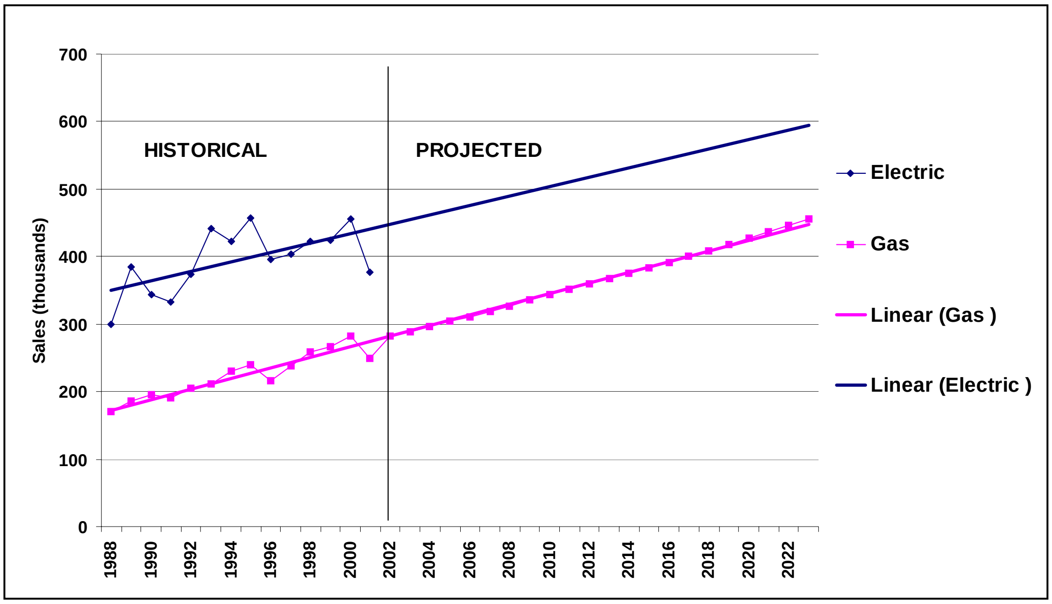
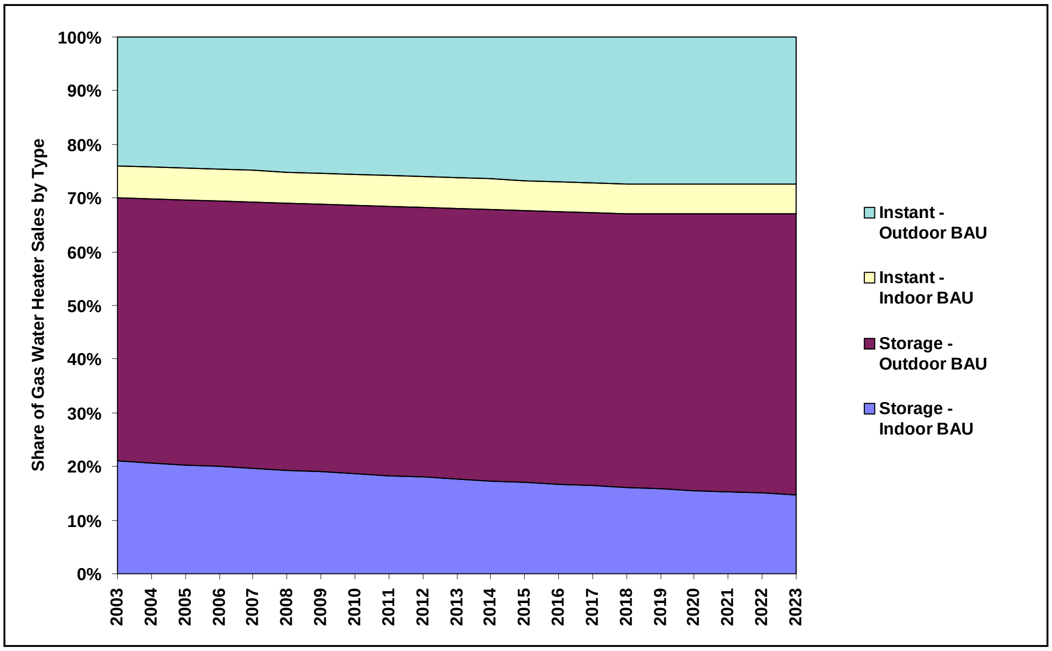


Figure 8 Projected market shares of gas water heaters by type, 2003-2020



3.2 Space Heaters

Types

There is a very wide range of gas space heaters on the market, and the categorisation is not entirely consistent, as Table 8 indicates. The AGA has historically used a system based on its technical standards, whereas GAMAA uses a categorisation that more closely corresponds to the way that gas heaters are marketed.[5]

Table 8 Various categorisation of gas space heater types

GAMAA Categories	AGA Categories	Models(a)		Categories for this study	Models(a)	
		Log effect	Other		Log effect	Other
Central Heaters	Ducted air heaters	NA	85	Ducted	NA	85
Flame fires	Flued radiant/convection	53	13	Flued – radiant/effect (b)	56	13
Flued radiant						
Portable convection	Flueless convection	NA	17	Unflued	3	49
Portable radiant	Flueless radiant/ convection	3	32			
Portable radiant convection						
Power flued	Balanced flue convection	3	11	Flued – convection only	NA	17
Wall furnaces	Wall furnaces	NA	6			

(a) Certified models from AGA Directory 2003 and Addendum (b) Includes all flued and balanced fuel types with a radiant component, including log effect types.

The main distinguishing characteristics of the 222 gas space heater models currently on the market are:

- Whether they are intended to heat air that is circulated by ducts to several rooms (ie "ducted air heaters" or "central heaters") or whether they are intended to heat only the space in which they are installed (and perhaps the adjacent space – some wall furnaces have a rear register for that purpose)[6];
- Whether they have a flue to the outside, or whether they release the combustion products into the heated space (i.e. "unflued"). Unflued heaters are sometimes called "portable" since they are usually connected to a bayonet point and can be disconnected for use in another room, or for storage outside the heating season;
- Whether their heat output is entirely in the form of heated air ("convection") or whether some of the heat output is in the form of visible radiation ("radiant", or "radiant/convection").

There are of course many other differences, including whether the flue is fan-assisted ("power flue" or "balanced flue"), whether the combustion air is taken from the room or from outside ("room sealed"). In the case of radiant/convection heaters there is a growing class of "log effect" models, in which the gas flame is directed on to ceramic logs, to make them glow.[7] These tend to be less efficient than non log-effect heaters of

[5] The BIS (2000) categories resemble, but do not exactly match, the GAMAA categories.
[6] There are also "hydronic" gas central heating systems in which gas-heated water is circulated to water-air heat exchangers, or "radiators", in different spaces, but these are rare in Australia.
[7] The gas standards also refer to "flame effect" heaters: the terms appear to be used interchangeably.

similar type and heat output, since the design of the burners, air circulation paths, heat exchangers etc are compromised to some extent in order to achieve the log flame effect.

For the purposes of the present study the models have been grouped largely according to their suitability for energy labelling and MEPS as follows:

- Ducted heaters: there are 85 certified models, with a wide range of efficiencies, all operating in a similar way and all providing a similar service – analogous to water heaters. Unlike heaters installed in rooms, the appearance of the product is largely irrelevant.[8] This segment of the heater market is highly suitable for both energy labelling and MEPS, and given the large average annual gas use per unit, this segment offers the highest energy savings;
- Flued convection heaters all provide a reasonably similar service, and aesthetic considerations are less important than for radiant or log effect heaters, so labelling is likely to have a moderate impact on consumer choice. However, the number of models may be too few to allow more stringent MEPS;
- The flued radiant and radiant/convection heater market is now dominated by log effect models (47 out of the 51 certified models available). Aesthetic considerations will obviously predominate in this market, even though there are wide variations in efficiency, so reducing the impact of labelling. The most effective approach may be MEPS, to eliminate the least efficient models;
- Unflued heaters all have about the same labelled efficiency (between 5.7 and 5.9 stars), and choice is highly influenced by aesthetic considerations, Neither labelling nor MEPS are expected to have a major influence on this market;

Market Size

Australian gas space heaters sales in 2003 were about 195,000 units with a value of about $M 307 (Table 9). The State breakdown of heater sales in 2003 is shown in Figure 9, and the projected growth in the market is shown in this study is in Figure 10. It is estimated that the New Zealand gas space heater market is about a tenth this size.

Table 9 Main characteristics of gas space heater market

Type	Market share		Sales 2003 ('000)	Avg price $ (b)	Total value $M 2003	Suitability for labels	Suitability for MEPS
	2003(a)	2023					
Unflued	41%	41%	79.8	774	62	Low	Low
Flued – log effect, radiant	9%	10%	17.5	1485	26	Moderate	Moderate
Flued – convection only	20%	18%	39.6	1485	59	High	Moderate
Ducted	30%	31%	58.1	2758	160	High	High
Total			195.0	1573	307		

(a) Author estimates, based on industry sources (b) From BIS (2002)

[8] Aesthetics was the top driver of brand and model selection for non-ducted gas heaters, ahead of features and price, but was not in the first 6 criteria for ducted gas heaters (BIS 2000).

Figure 9 Estimated sales of gas space heaters by type and State, 2003

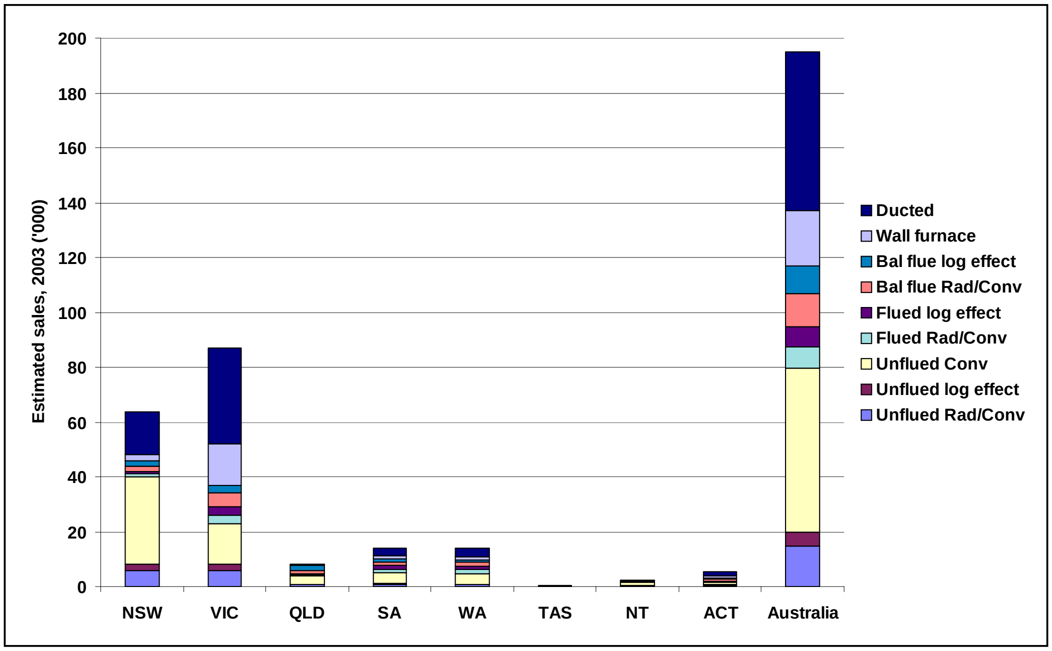
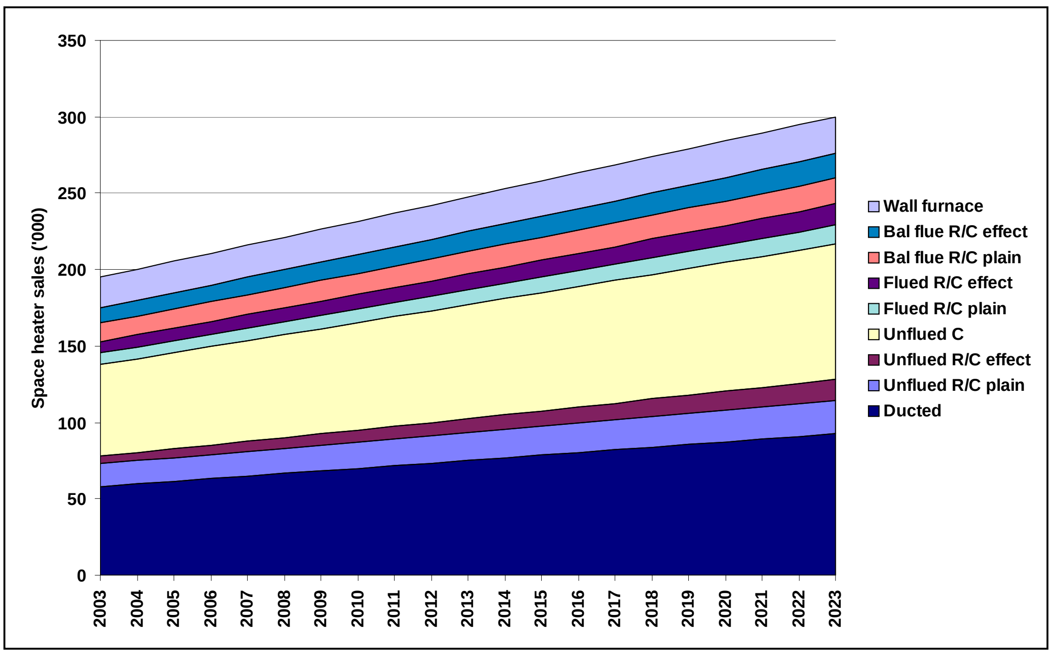


Figure 10 Projected sales of gas space heaters by type, Australia 2003-2023



3.3 Producers, Importers and Exporters

All natural gas and LPG appliances sold in Australia must be certified by the AGA and/or the ALPGA. The AGA and ALPGA certify the product meets the relevant standards for safety and performance in the former Australian Gas (AG) codes, now republished as Australian Standards (AS). The following listings of Australian products are taken from the AGA *Directory of Certified Gas Appliances and Components*; information on the companies making or importing the products has been compiled from additional research.

Gas appliances sold in New Zealand must comply with an appropriate standard recognised under the New Zealand Standard NZS5262, which governs the safety of gas appliances. Acceptable standards include the Australian AG/AS standards, as well as Japanese, Canadian, USA and United Kingdom standards. Information on gas products sold in NZ has been obtained from the current Gas Appliance Suppliers' Association *Full Listing of GASAC Notifications* at www.gasa.org.nz, (dated 8 October 2002) and from the websites of the main distributors, eg Aber and Rheem NZ.

Australia

Water Heaters

The major manufacturers of gas storage water heaters in Australia are:

- Aqua-Max Pty Ltd, which manufactures Aquamax brand water heaters at Moorabbin in Melbourne;
- Rheem Australia Pty (now owned by the Japanese-based global water heater manufacturer Paloma), which makes the Rheem and Vulcan brands at Rydalmere in Sydney;
- Dux Manufacturing Limited (a division of the Brisbane-based GWA International), which manufactures Dux brand water heaters at Moss Vale in NSW.

These three manufacturers account for nearly all of the gas storage water heaters sold in Australia. Some solar water heater manufacturers (Beasley, Solahart, Edwards, Hot Water Systems Australia) also offer the storage tank of their solar-gas systems as stand-alone gas models, but the sales of these are negligible. Morcraft Industries (Heatmaster brand) also has one storage water heater model listed in the AGA Directory.

Instantaneous gas water heaters are more freely traded than gas storage types because they are popular in all markets, whereas storage types are generally restricted to markets with lower density housing where space is at less of a premium. Also, instantaneous water heaters are smaller and command higher prices than storage types, so the economics of shipping them are more favourable.

Most of the instantaneous gas water heaters sold in Australia are imported from Japan or Europe. The main import brands are Paloma (Rheem's parent company), Rinnai (a global corporation also based in Japan) and Robert Bosch (a global corporation based in Germany). Some imported instantaneous water heaters from the above brands and from Raypak are rebadged as Aquamax, Rheem, Dux or Edwards, so that those suppliers are able to offer both storage and instantaneous units under the one brand name.

The only Australian manufacturer of instantaneous gas water heaters is Everdure in Welshpool WA, which is now owned by Shriro, a Japan-based trading company.

Other import brands with only one or two instantaneous models registered in Australia are Douglas and Company, Hunt Heating (Cascade brand), Morcraft Industries (Heatmaster) and Servgas.

Space Heaters

The main manufacturers of gas space heaters in Australia are:

- Seeley International Pty Ltd, which manufactures Braemar brand wall furnaces and ducted heaters at Albury, NSW;
- Climate Technologies Pty Ltd, which manufactures wall furnaces, ducted heaters and flued radiant/convection heaters under the Vulcan, Ilec, Pyrox, Bonaire and Celaire brands. It has plant at Salisbury, SA and at Leeton, NSW;
- Sampford and Staff, which manufactures Cannon brand flued radiant/convection heaters at Fitzroy in Melbourne;
- Bowin Manufacturing Pty Ltd, which manufactures Bowin brand balanced flue convection heaters at Brookvale in Sydney;
- Brivis Australia Pty Ltd, which manufactures Brivis Brand ducted heaters, at Braeside, Melbourne;
- Everdure, which manufactures flueless radiant/convection heaters at Welshpool in WA;
- Aurora Climate Systems, based in Melbourne, which manufactures a high efficiency (balanced flue) Archer brand gas log fire;
- Stadt Industries, based in Melbourne, which manufactures Stadt brand gas ducted heaters.

Some of the above companies export heating products: the main destinations are New Zealand and the USA.

There are several gas-log adaptations of wood heaters available from wood heater manufacturers, eg A.F.Gason of Bayswater, Melbourne (Eureka and Jindara brands) and Woodland Home Products.

There are many suppliers of imported gas heaters. Some of the water heater suppliers, eg Rinnai and Paloma, import a wide range of flued and unflued heaters. Lennox (based in the USA) specialises in ducted heaters and Masport (based in New Zealand) and Jetmaster specialise in gas-log heaters.

New Zealand

Water Heaters

Some, but not all, of the Australian-manufactured Rheem and Dux mains pressure gas storage water heaters are also registered for sale in NZ. Ruud brand storage water heaters made by Rheem USA, which are not sold in Australia, are also available in NZ. Some low-pressure gas-fired storage water heaters are manufactured in NZ.

Most of the Rinnai, Paloma, Robert Bosch and Raypak brand instantaneous water heaters that are sold in Australia are also available in New Zealand. Some of these suppliers offer models not seen in Australia – eg Paloma single-point storage heaters of 5 litre storage volume. There are also some brands (eg GEO) that are not registered in Australia.

Space Heaters

New Zealand has several manufacturers of wood heaters who also make gas-log models (eg Masport, Yunca Leedz, Real Fire). Gas log inserts, which can be fitted to an existing fireplace or wood heater, are also available.

Most gas space heaters are imported, however. The same range of Japan-made Rinnai space heaters is available as in Australia, and Australian-made Vulcan wall furnaces and central heaters are also sold. There are also several brands and models of convection and balanced flue space heaters not seen in Australia – eg GEO and DRU.

4. The gas appliance efficiency program

4.1 The existing program

Program Elements

Energy Labelling

The main objectives of appliance energy labelling (electric or gas) are to:

1. Enable appliance buyers to identify the more efficient of the models on the market;
2. By making the information readily available, encourage buyers to seek out the more efficient models; and
3. By stimulating customer demand for more efficient products, increase the incentive for suppliers to introduce and market more efficient products.

Although the main impacts are restricted to the product type labelled, there may be secondary impacts on fuel choice (eg gas vs electric vs solar-gas or solar-electric water heaters), on choice of appliance type (eg instantaneous vs storage gas water heaters, log effect vs convection heaters) and on the overall effectiveness of energy labelling for all products (eg by reinforcing consumer awareness of resource efficiency issues).

Gas appliance labelling was first introduced in Australia by the Gas and Fuel Corporation of Victoria (GFCV) in 1981 when the first "high efficiency" balanced flue gas storage water heaters (SWH) came on to the market. In fact, the scheme was largely designed to create market interest in the new products, which were distinguished in GFCV showrooms with an "E" label.

The AGA took control of the program in 1985 and devised a scheme whereby products could carry "20%", "30%" or "40%" labels to indicate the extent to which they consumed less gas than the maximum specified in AG102. In 1988 the AGA adopted the current six star rating label design, largely for visual consistency with the electrical appliance label which was introduced in late 1986. The AGA labelling program now covers the products listed in Table 10.

Table 10 Gas Appliance Types Labelled

AGA Product category	**Most efficient**		**Least efficient**		**Model Avg(c)**	**Comments**
	Stars	MJ(a)	Stars	MJ(a)		
Storage water heaters	5.2	20303	1.3	28168	3.5	
Gas boosted solar water heaters	4.4	22100	3.4	24000	NA	Does not cover solar input
Instantaneous water heaters	5.9	18969	2.9	25072	4.9	
Flued radiant/convection heaters	4.2	(b)	1.0	(b)	2.1	18 models not tested
Balanced flue convection heaters	5.5	(b)	1.0	(b)	3.6	
Wall furnaces	3.5	(b)	1.4	(b)	2.4	
Unflued rad/convection heaters	5.9	(b)	4.6	(b)	5.9	Nearly all rated 5.9
Unflued convection heaters	5.9	(b)	1.4	(b)	5.4	Nearly all rated 5.8
Ducted air heaters	5.4	128/m^3	1.0	245/m^3	3.4	10 models not tested

Source: AGA/ALPGA Directory, January 2003 Edition and July 2003 update. (a) MJ per annum based on standard task. (b) MJ values relate to specified annual hours of operation at the capacity of the heater, rather than to a standard task, so not directly comparable. (c) Average of rated models, not of sales.

The water heater energy test relates to a standard annual hot water delivery task, so gas storage and instantaneous water heaters can be compared using both the star rating and the MJ value.[9] The delivery task is equivalent to raising 200 litres per day from 15ºC to 60ºC (i.e. a useful energy output of 13,760 MJ/yr) while the water heater stands in an ambient air temperature of 20ºC. Under these conditions a reference model, which just meets the minimum efficiency level, one would consume 28,900 MJ of gas, giving a task efficiency of 47.6%.[10]

The star rating scale is based on 7% intervals: units consuming between 100% and 93% of the energy of the reference get one star, those consuming between 86% and 93% get 2 stars and so on (see Table 11). The formula allows the calculation of fractional (ie decimal) stars, but these were not reported before 1999.

Because there are no losses from stored water, and many units now have electronic ignition rather than pilot burners, instantaneous water heaters generally achieve higher star ratings than storage water heaters with comparable burner ratings and heat transfer efficiencies. As a result, both the maximum and the model average star ratings are higher for IWHs than for SWHs. The highest IWH rating at present is 5.9 stars, although 6.4 stars has been reported in the past (possibly an overstatement based on incorrect interpretation of the test). The highest SWH rating has been 5.2 for several years.

Table 11 AGA Energy Efficiency Ratings - Water Heaters

Star rating	Max MJ/yr (a)	% of reference	Task efficiency for storage water heater
1	28900	93 - 100%	47.6 - 51.1%
2	26880	86 - 92.9%	51.2 - 55.3 %
3	24850	79 - 85.9%	55.4 - 60.2%
4	22830	72 - 78.9%	60.3 - 66.0%
5	20810	65 - 71.9%	66.1 - 73.1%
6	18790	Less than 65%	73.2% or more

Source: derived by author from AGA data
(a) To deliver 13760 MJ of useful energy in hot water

Gas space heaters tend to vary in their mode of heat output (eg radiant, convection or both), presence and type of flue and output capacity. For some years the energy performance of all types was expressed in terms of MJ/m^3 of heated room volume over a specified number of operating hours. The method of test was significantly changed in mid-1998, from a complex test involving both thermal efficiency and effectiveness of heat distribution in a test room, to a simple bench test of thermal efficiency. This significantly changed the star ratings – ratings for most flued heaters were reduced by around 0.5 stars, while most flueless heaters increased their star rating to 5.8 or higher.

The changes also affected the label, which no longer indicated gas consumption per volume of room air heated ($MJ/m^3/yr$) but MJ/yr. Buyers can now compare gas space heater thermal efficiency using the star ratings, but not the MJ values, since these are

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[9] However, gas-boosted solar water heaters are not rated on the basis of a realistic task performance, but as if they used gas only. Therefore their label shows no advantage over conventional gas units.
[10] The reference water heater has a storage volume of 140 litres and a burner rating of 30MJ/hr, and just complies with the AG102 MEPS limits of 70% thermal efficiency and 1.14 MJ/hr maintenance rate. A unit with these characteristics actually existed, but no longer appears to be on the market.

affected by both efficiency and capacity. For ducted air heaters, both the star ratings and the $MJ/m^3/yr$ values on the label are direct indications of energy efficiency.

One barrier to buyer use of the labels in some segments of the space heating market is the fact that the AGA has not required older models to be retested to the 1998 test until they need to be re-registered (if indeed they are re-registered rather than simply retired from the market). Consequently, some space heaters can be sold without labels, or even with labels based on the superseded test standard. In December 2003, about 18% of the 137 models of non-ducted space heaters in the AGA directory of certified appliances and 12% of the 85 models of ducted heaters were still marked as “not tested” or “to be retested.”

Gas appliance MEPS

Minimum Energy Performance Standards (MEPS) define the lowest level of efficiency deemed to be acceptable. The AG codes specify the way in which efficiency is measured for each product type, and also specify the minimum energy efficiency levels shown in Table 12. This effectively makes those levels mandatory in Australia, since only products complying with the AG Codes may be connected to the gas network. The MEPS levels are also significant in that they represent the starting point for the energy labelling scales. The MEPS criteria in Table 12 have not been significantly revised since 1983, which is before labelling was introduced, and most gas appliances exceed these levels by a significant margin (MEA 2002).

Table 12 Summary of MEPS criteria for gas appliances

Product	**Minimum efficiency**	**Maximum maintenance rate (MJ/hr)**
Storage water heater	70% thermal efficiency (a)	$0.42 + 0.02V^{2/3} + 0.006R$ (b)
Instantaneous water heater	70% thermal efficiency (a)	NA
Radiant heaters	30% radiant efficiency (c)	NA
Convection heaters	60% total efficiency with natural convection, 70% with forced convection (c)	NA
Radiant/convection heaters	60% total efficiency with natural convection, 70% with forced convection (c)	NA
Room sealed heaters	70% total efficiency (c)	NA
Ducted air heaters	70% total efficiency (d)	NA

(a) As defined in AG102/AS4552. (b) V = nominal volume, R = nominal gas consumption, as defined in AG102/AS45553. (c) As defined in AG102/AS4552. (d) As defined in AG106/AS4556.

There is a further class of gas heaters covered by AG108/AS4558 *Decorative gas log and other fuel effect appliances,* which does not include MEPS levels. AG108 is intended to cover appliances designed “primarily to have a decorative appearance” while AG103 is intended to cover appliances designed primarily for space heating (MEA 2002). The distinction between decorative and heating features is not entirely clear: 47 of the 60 ducted AG103 space heaters for which energy ratings are given in the AGA Directory are listed as “log effect”, but there are no AG108 products listed at all.

Program Impacts to date

In their submissions to the SEAV discussion paper (SEAV 2003), some suppliers report an increase in the average efficiency of the products they sell. Any of the following mechanisms could be contributing to this increase:

1. An increase in the minimum energy efficiency of products – all else being equal, this would increase the average efficiency of sales even if there were no energy labelling;
2. An increase in the maximum energy efficiency of products – all else being equal, this would increase the average efficiency of sales even if there were no energy labelling;
3. Greater consumer preference for more efficient products – this could only occur if consumers had access to, and made use of, information about energy efficiency (ie the labels, or the AGA Directory).

There is evidence of mechanisms 1 and 2. Figure 11, Figure 12 and Figure 13 show the proportion of storage water heater, instantaneous water heater and ducted space heaters respectively falling into the lower (1 and 2 star), medium (2 and 3 star) and higher (5 and 6 star) bands between 1996 and 2003. Figure 14 presents the same data in another way, as model average star rating trends. Suppliers appeared to offer a more efficient range of instantaneous water heaters and ducted air heaters, but there was less change in storage water heaters. Comparable trends cannot be estimated for non-ducted space heaters because of the changes in the basis of testing and labelling over the period.

It is likely that gas appliance energy labelling was at least one of the factors behind these trends, although:

- it is not clear to what extent labelling influenced suppliers to offer models with higher efficiencies;
- it is not clear to what extent labelling may have influenced consumers to prefer models with higher efficiencies; and
- it is not clear whether, or how, labelling could have been more effective in influencing the behaviour of both suppliers and consumers

Whatever doubts there may be over the impact of labelling on the observed efficiency trends, there are no doubts about the impact of MEPS: there was none. The MEPS criteria in Table 12 did not change between 1996 and 2003, and indeed have remained largely unchanged since 1983.

Figure 11 Share of certified gas storage water heater models on the Australian market falling into higher, medium and lower efficiency segments, 1996-2003

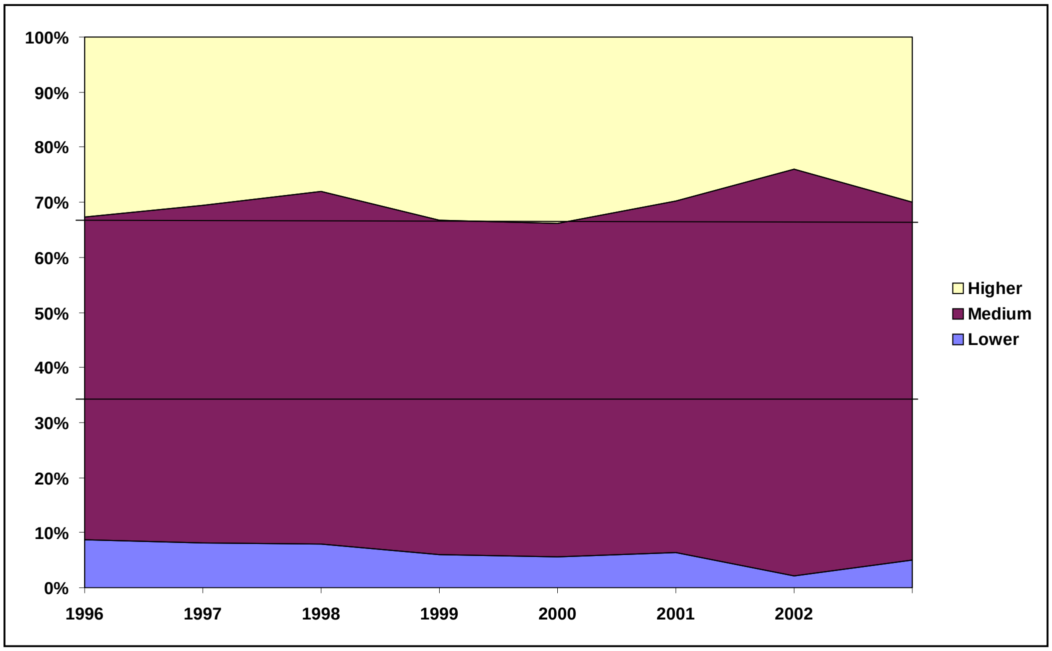


Figure 12 Share of certified gas instantaneous water heater models on the Australian market falling into higher, medium and lower efficiency segments, 1996-2003

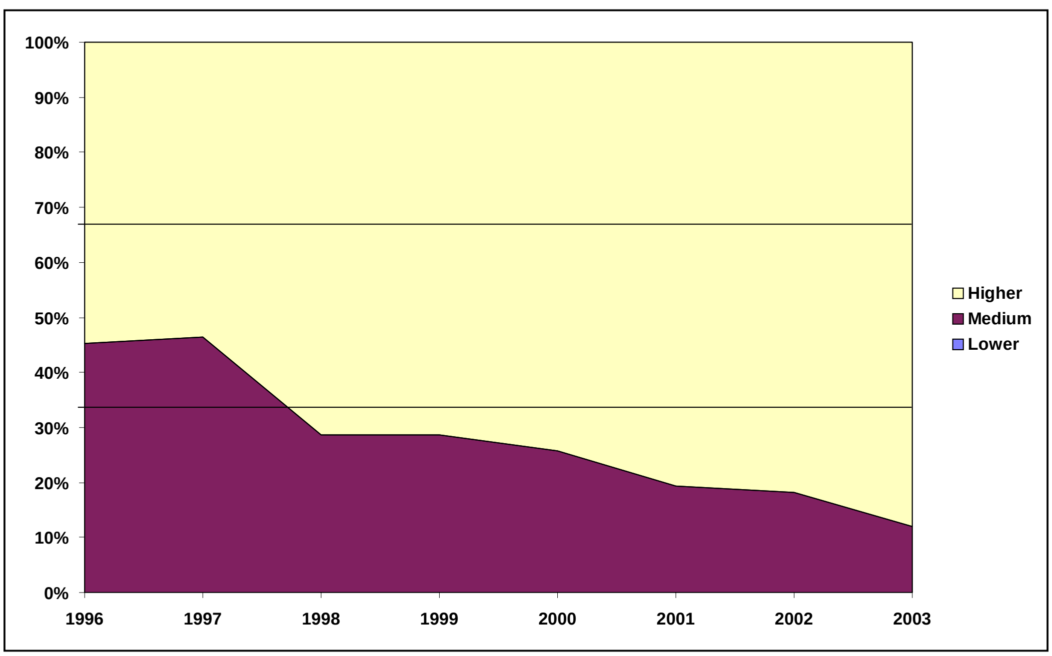


Figure 13 Share of certified gas ducted air heater models on the Australian market falling into higher, medium and lower efficiency segments, 1996-2003

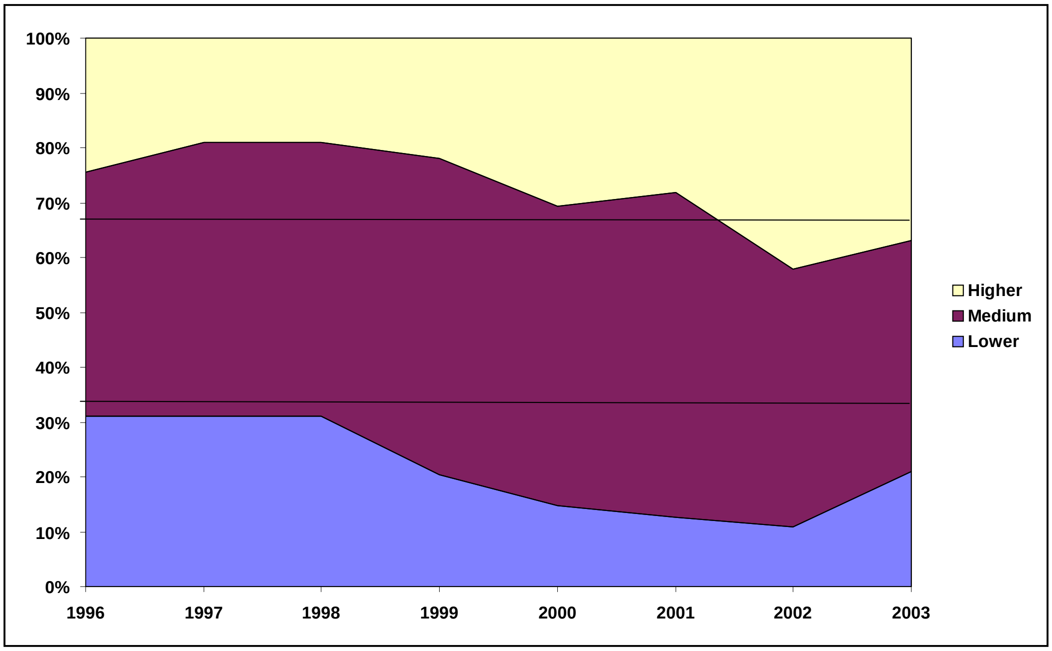
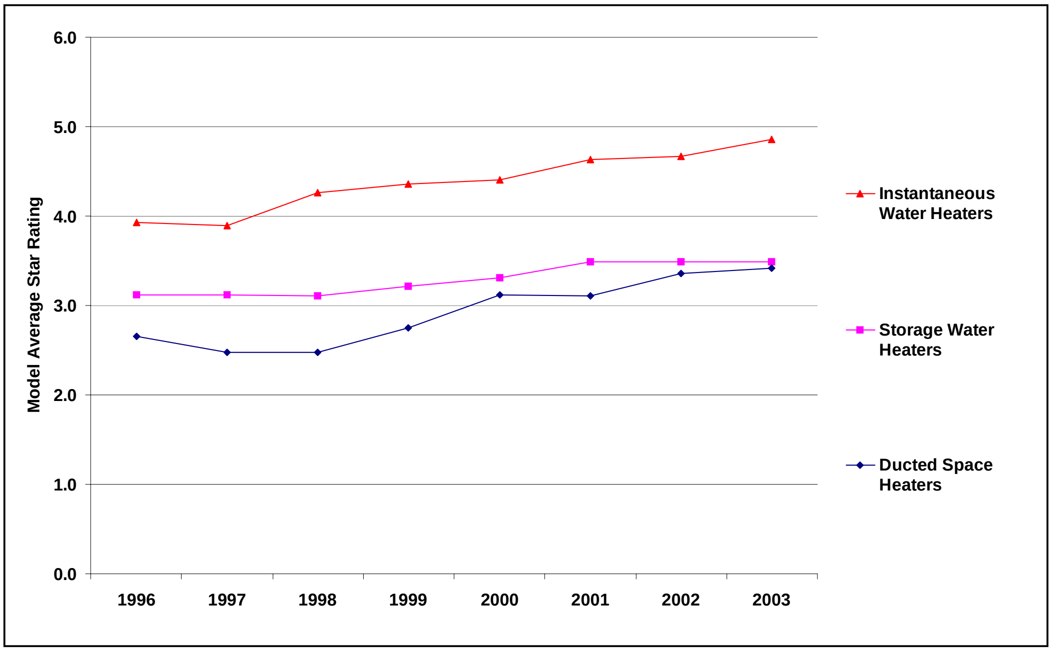


Figure 14 Trends in model average star ratings for gas water heaters and ducted air heaters, Australia 1996-2003



4.2 Potential for greater effectiveness

Reviews of Program

There have been three reviews of various aspects of the gas appliance efficiency program in the past few years.

In 2000 George Wilkenfeld and Associates reviewed the effectiveness of energy labelling of gas water heaters (GWA 2000), and recommended a number of ways in which labelling could be made more effective.

In 2002 Mark Ellis and Associates reviewed the impact of both energy labelling and MEPS for gas water heaters, gas space heaters and cookers (MEA 2002). The review concentrated on testing and MEPS levels in particular – many of the conclusions regarding labelling were drawn from GWA (2000). The review made several recommendations for changes to the energy tests, and for raising the stringency of MEPS levels for gas water heaters to match those due to take effect in the USA in 2004.[11]

The third review is the SEAV discussion paper (SEAV 2003), which raised issues about the administrative structure of the program.

None of the above reviews have considered the optimum balance between labelling and MEPS within an overall gas appliance energy efficiency strategy. Driving efficiency via increasing MEPS levels is not necessarily the preferred approach in all product segments. The USA appears to rely on appliance MEPS more heavily than almost any other country because of the ineffectiveness of it energy labelling program. By contrast, Australian government agencies have developed considerable expertise in making energy labelling effective.

The following sections summarise the main issues identified in the reviews.

Energy Tests

MEA (2002) identified a number of issues related to the testing of gas water heaters, including the maintenance rate test, recovery efficiency for storage water heaters and treatment of startup energy for instantaneous water heaters. Some of these are now being addressed by the relevant subcommittees of Standards Australia.

MEA also recommended that consideration should be given to amending the non-ducted space heating test methodology to take into account the benefits of radiant heating and the ventilation requirements of convection heaters.

One important aspect of the testing regime of water heaters is the delivery task. As household size falls and the efficiency of hot water using devices increases, it is likely that most water heaters in the field will supply much less hot water than the current

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[11] The AGA has made a number of comments on the conclusions and recommendations in MEA (2002). Some of the comments correct apparent factual errors, some note that the approaches recommended in the report have now been initiated, and others question the basis of some recommendations (C.Blogg, personal communication August 2003).

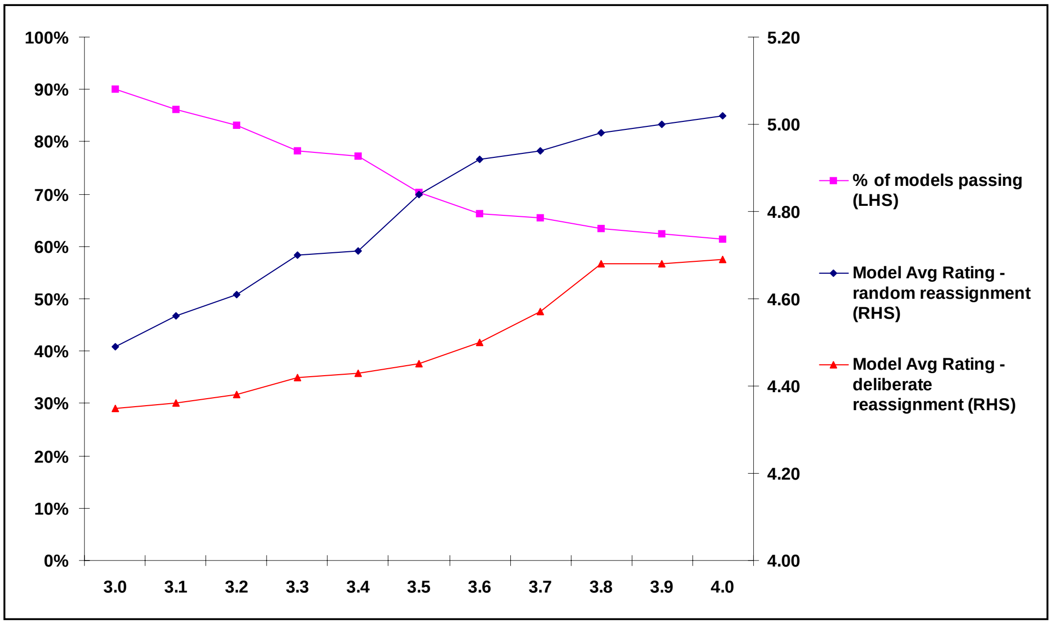
standard annual delivery of 13,760 MJ. There is a case for testing at lower deliveries as well as at full load, or using test data to model the gas consumption for lower deliveries.

MEPS levels

Although MEA (2002) found that the MEPS levels for water heater were less stringent than those applying in some other countries (although the differences in test procedures made direct comparison difficult), the potential for raising average gas appliance efficiency through raising MEPS levels has not so far been explored to any great extent.

Figure 15 illustrates the application to gas water heaters of one of the MEPS assessment techniques used in the electric appliance labelling program. The current MEPS level is effectively 0 stars, even though the lowest water heater ratings on the market are 1.3 (storage) and 2.9 (instantaneous). As the MEPS cutoff increases (expressed as star ratings on the horizontal axis), the proportion of the models on the market passing MEPS declines – from about 90% for a MEPS of 3.0 stars to about 60% for a MEPS of 4.0 stars.

Figure 15 Indicative impact of raising MEPS levels on water heater market (2003 model range)



The overall market impact of removing the less efficient models depends on the sales of the models affected – if the best-selling models were to fail MEPS then this would have a very significant impact. In the absence of sales data on gas appliances, it is necessary to proceed on the assumption that all models sell in equal numbers.

As models are removed from the market by rising MEPS, the market share that those models would have met must be reassigned to other models in order to maintain the overall sales volume. If these reassigned sales are distributed equally among all the models remaining on the market, the model-weighted efficiency trend will follow the "random reassignment" curve in Figure 15. In this scenario the average rating increases 0.53 stars (i.e. a reduction in average gas use of about 1,070 MJ/yr). If however the prospective purchasers the water heater models removed from the market by MEPS instead purchase the next least efficient and next cheapest option, the model-weighted efficiency trend will follow be the "deliberate reassignment" curve. In this scenario the average rating increases by only 0.35 stars (a reduction in gas use of about 710 MJ/yr).

There may be a correlation between energy efficiency and price, although it is not always a clear one, since higher-price appliances usually have many other additional features as well as higher energy efficiency. If so, it is necessary to judge the point at which a forced increase in the average price of gas products equals the value of the gas saved through a forced increase in efficiency. This form of analysis establishes the most cost-effective MEPS level for any appliance group. It tends to be conservative in that it ignores the ability of suppliers to introduce new low-cost higher efficiency models in response to the revised MEPS levels.

Labelling

Compliance

One area of gas appliance labelling which needs to be addressed is ensuring that labels appear at the point of sale. Although the gas product standards require the manufacturer or importer to affix the correct gas energy rating label in a prominent position on the appliance, they do not bind the retailer. Therefore retailers can, and apparently do remove labels from point-of-sale displays. A mandatory regime such as the one for electrical appliances is necessary to ensure labelling compliance along the entire supply chain.

Consistency

Under the current labelling regime, as long as the supplier complies with the testing and labelling requirements in force at the time of product registration, it is not required to retest or relabel that product once there is a change in the test. The Australian Consumers Association commented recently:

> "This means the star ratings you see in shops may not be based on comparable test conditions, and a model with a higher star rating may actually be less efficient than another with fewer stars – rendering the star rating scheme useless. We suggest you ignore the number of stars on this type of water heater til things are sorted out" (*Choice*, October 2003).

The key to resolving this is mandatory control over labelling at the point of sale.

Rating Scale

Judging from consumer research on electrical appliance labels, Australian consumers are very familiar with the star rating scale and value it as a quick indication of relative energy efficiency (Artcraft 2003).

The conditions which necessitated the re-scaling of the electric appliance labels in 2000 may not apply to gas appliances. In most product categories (except unflued heaters) there is a reasonable range of star ratings on the market, and bunching at the top of the scale is less of a problem (Table 10). Of course, the range covers units of all capacities, so a buyer searching in a narrower capacity range (e.g. 90 litre delivery storage water heaters) may face a narrower star rating range.

The key to increasing sales-weighted energy efficiency of gas appliances may not be the introduction of still more efficient products, but shifting consumer preference toward the more efficient of those already on the market. This could be accomplished by building a more effective communication strategy on the present label.

A potential area of improvement in the electrical label design which could be applied to the gas label is the standardisation on half-star steps. Integer steps are too coarse but giving star ratings to one decimal place, which are equivalent to nominal differences of only 200 MJ/yr, may be too fine, and confuse rather than clarify the real efficiency differences between models. User awareness of the gas label may be assisted if it could be read in the same steps as the new electrical appliance label.

One area where gas labelling is much less developed than electric is in the use of supplementary communications media. The Internet now offers a flexible and low-cost opportunity to rectify this. The AGA directory has all the data necessary for a user-friendly, searchable site. There could be links to it from the AGO's energyrating.gov.au site and from gas utility sites.

Categorisation

Analysis of the model register suggests that product groups fall into distinct efficiency categories. For example, water heaters tend to fall into three categories:

1. Outdoor instantaneous (the most energy-efficient category);
2. Indoor instantaneous and outdoor storage; and
3. Indoor storage.

Label-related communications should emphasise the following linked but separate messages:

- that large efficiency gains can be made through category selection alone (ie by preferring instantaneous to storage water heaters, and outdoor to indoor types);
- the star rating should then be used to select the best of the category.

Similarly, the data in Table 8 suggest that some simple energy-efficiency selection rules can be formulated for space heaters, as well as for water heaters:

- Unflued space heaters, like outdoor instantaneous water heaters, mostly have high efficiency;
- A log effect reduces the efficiency rating of a space heater by one star on average.

These points are of course generalisations, as the wide range of star ratings in Table 13 illustrates, but they are sufficiently applicable to be promoted as simple decision rules for consumers who may take only limited interest in the contents of the labels, but who can still be influenced to prefer more efficient products. The present categorisation of products, which is based on technology and standards rather than consumer purchase categories, should be reviewed.

Table 13 Model average, maximum and minimum star rating of gas heaters by category, Australia 2003

	Number of rated models(a)	Model average star rating	Minimum star rating	Maximum star rating
Unflued	47	5.68	1.4	5.9
Flued – radiant/effect	51	2.15	1.4	5.5
Flued - convection only	15	3.17	1.4	5.2
Ducted	75	3.42	1.0	5.4
All rated models	188	3.62	1.0	5.9

(a) Out of total of 222 certified models listed in the AGA Directory (Table 8)

Value of Stars

Each star rating step represents about 2020 MJ of annual gas consumption on the AGA standard water heating task. (The effect of each star step for on space heaters depends on the output of the heater as well as the efficiency). At 1c/MJ, a typical urban natural gas price, this would represent about $20/yr, or $240 over a 12-year service life. Therefore there is both scope and monetary incentive to seek out more highly rated products.

Consumer research indicates that buyers make more use of simple reminders of the relative "energy value" indicated by the star rating of products than they do of complex running cost or life-cycle cost messages (Artcraft 2003). They are more likely to use the label information in their purchase if they have a sense of whether 3 stars is "good" or just "acceptable". These reference points have shifted since the launch of labelling. Whereas 4 stars was originally considered "good" it is now just "acceptable" to label-aware buyers, who regard 5 and 6 stars as "good".

There is considerable scope for building in value references of this type into the communications supporting gas water heaters labelling - eg "less than 3 stars is poor, 3 and 4 is acceptable and 5 and 6 is good" could be part of the message.

These approaches are used in the electric appliance label design and in the communication strategies supporting the label. They have not so far been taken up in gas labelling, which has evolved along technical lines and with a focus on the standards, rather than on how consumers select and purchase appliances.

4.3 Realising the potential of the Program

Changes Needed

The objective of the gas appliance efficiency program should be to achieve the maximum reduction in gas demand that is cost-effective, using the optimum combination of elements including product labelling and MEPS. This is somewhat different from the (implied) objective of the program to date, which is to get suppliers to disclose the energy consumption and efficiency of their products.

Once an objective is agreed appropriate strategies and performance indicators should be devised.

A key change needed is the ability to reconcile opposing commercial interests in the gas appliance industry, and to better balance industry and consumer interests. For example, the suppliers of both storage and instantaneous water heaters both recognise that changes are required to the testing regime, but advocate different changes that would serve their respective commercial interests. Also, suppliers have in the past been reluctant to undertake retesting and re-labelling when tests have changed, even though this may have resulted in buyer confusion and ultimately a loss of confidence in the gas labelling regime.

These issues could be addressed through:

- Independent research on how appliances are used so that more objective criteria can be applied to overcome commercial differences;
- Mandatory controls over point of sale labelling, so that relabelling (due to changes in test methods, labelling algorithms or rescaling) can be enforced if necessary; and
- The establishment of a sales-weighted monitoring regime that is independent of suppliers, so that the gas appliance efficiency program managers have reliable data with which to plan, alter and evaluate the program.

Opportunity for Change

Historically, the gas MEPS and labelling scheme has been controlled by the AGA and GAMAA, with only limited involvement by government energy agencies and consumer groups, via the standards development process.

In late 2003 the retail and network divisions of the AGA combined with the relevant sections of the ESAA to form the Energy Retailers Association of Australia and the Energy Networks Association of Australia. The AGA now essentially consists of its former Certification Services Division.

This development provides both the need and the opportunity to place the program on a different footing. The need arises because the Certification Service Division will no longer have the resources of the previous AGA structure, including the direct involvement of the gas utilities, to bring to bear on appliance energy efficiency issues. The opportunity arises because both the AGA and GAMAA recognise this, and have publicly acknowledged that a joint industry-government approach is the best way forward (SEAV 2003).[12]

Alternative ways to achieve change

Broadly, there are three possible ways for the gas appliance efficiency program to proceed:

[12] It should be noted that the Gas Appliance Suppliers Association of New Zealand does not share this view, and does not support mandatory labelling of gas appliances.

1. Business as usual: the program would proceed as more or less an industry controlled scheme, possibly with greater government involvement in gas appliance standards committees.

2. Enhanced business as usual: there would be greater government involvement in the gas appliance standards committees, plus government funding to review and develop new testing standards, MEPS levels and labelling algorithms, etc. Government incentive to do this would probably be somewhat reduced if government were not driving the process through a nationally regulated scheme.

3. A national gas appliance efficiency scheme. This could be managed by a group based on the Gas Technical Regulators Committee, with representatives from the AGO and some (or all) state energy agencies. Its functions would be to:
   - liaise with the gas appliance industry;
   - develop strategic and action plans, and oversee the review and development of new testing standards, MEPS levels and labelling;
   - oversee the check testing and label compliance monitoring programs; and
   - oversee promotional, education and best practice programs.

It would be very difficult to achieve the changes which the gas appliance efficiency program needs under Option 1.

Option 2 might see better progress in developing revised test methods, MEPS levels and labelling protocols, but it would not solve the problems with the lack of a coordinated and enforced national approach, and would not improve product check-testing.

Option 3 is the only one that is likely to see significant progress to review and develop new test methods, revise and upgrade MEPS levels and labelling protocols, and also ensure a consistent, coordinated and enforced national approach. It is also the only option that is likely to lead to the establishment of a product check-testing program for gas appliances that is consistent with that for electrical appliances. Under this option, government will be in a position to arbitrate in negotiations between competing product suppliers, eg between the interests of storage and instantaneous gas water heaters, to achieve an outcome that is fair for appliance consumers. Option 3 will also help government to coordinate gas appliance efficiency standards with national policy and programs, eg the National Greenhouse Strategy and the National Framework for Energy Efficiency (currently being developed).

5. Projected impacts

5.1 Costs and Benefits

Scenarios

Three gas appliance efficiency scenarios have been developed to test the projected cots and benefits:

- Business as Usual (BAU): there is no major change in the gas appliance labelling program or in MEPS levels, but the average efficiency on new appliances continues to improve slowly for most types (not all), as consumers show a slight preference for higher rated products and new models replace older models in the market;

- MEDIUM enhancement of the program (roughly corresponding to Option 2 in the previous section): labelling becomes significantly more effective but there is no major change in MEPS levels. The average efficiency of new appliances improves more rapidly than in the BAU scenario as consumers show a strong preference for higher rated products and new models replace older models in the market;

- HIGH enhancement of the program (roughly corresponding to Option 3 in the previous section): labelling becomes significantly more effective and there is also an increase in MEPS levels. The average efficiency on new appliances improves more rapidly than in the MEDIUM scenario as consumers show a strong preference for higher rated products and new models replace the least efficient models, which are withdrawn more rapidly due to MEPS.

The impacts of each scenario have been modelled using the following method:

1. Project the total sales of new gas water heaters and space heaters in each State, Territory and New Zealand between 2003 and 2023;

2. Allocate total sales in each State to the water heater categories in Table 7 and the space heater categories in Table 9 (see Table 14);

3. Project the average efficiency of each appliance category for each of the BAU, the MED and the HIGH scenarios;

4. Calculate the total annual gas consumption for each cohort of appliances sold each year from 2003 to 2023 (assuming a 12 year average service life for appliances);

5. Calculate the value of gas purchased by each cohort of post-2003 appliances, based on an estimated 0.5% per annum rate of real increase. The rate of increase in real household gas prices between 1991 and 2001 averaged 0.7% per annum (AGA 2003). The national sales-weighted average *marginal* gas price (i.e. allowing for initial lower or higher cost blocks) was 1.2 c/MJ at the end of 2003 (Figure 16);

6. Calculate the greenhouse gas emissions associated with the gas supplied, using the coefficients in Figure 3;

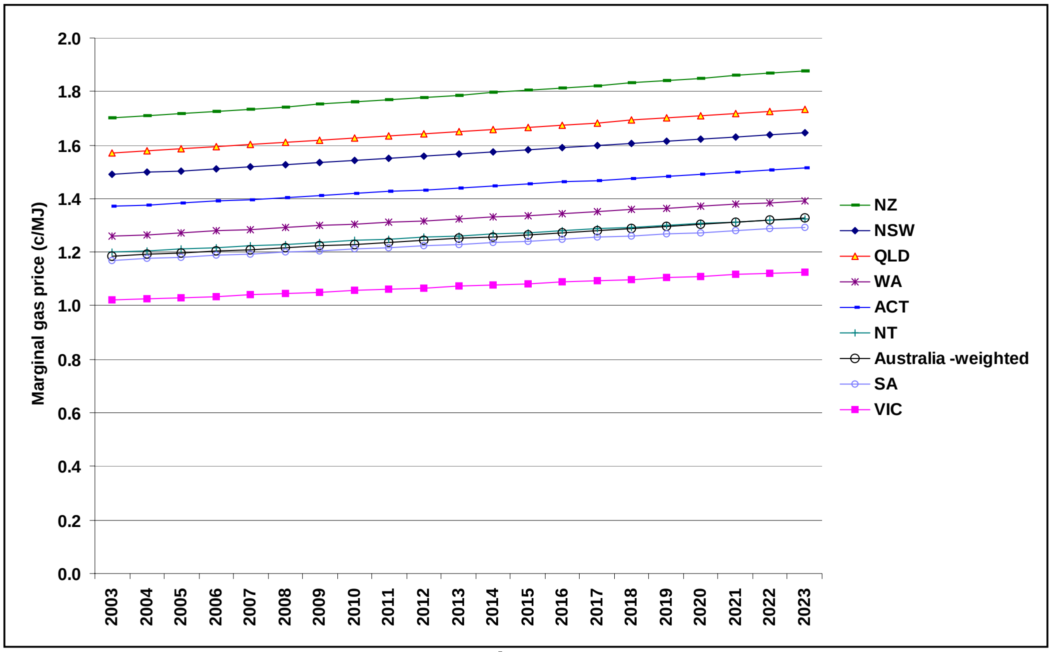
7. Compare the gas consumption, gas cost and greenhouse emissions in the MED scenario with the BAU scenario to calculate the impacts of the MED scenario; and

8. Compare the gas consumption, gas cost and greenhouse emissions in the HIGH scenario with the BAU scenario to calculate the impacts of the HIGH scenario.

Table 14 Estimated market shares by State and appliance type, 2003 and 2023

	Share Aust WH sales		Share Aust SH sales		Inst share of WH sales 2003	Share of SH sales by type, 2003			
	2003	2023	2003	2023		Unflued	Flued – rad & log effect	Flued – convect & wall	Ducted
NSW	28.0%	28.9%	33.3%	33.0%	30%	64%	5%	8%	24%
Vic	43.0%	44.4%	44.0%	40.0%	25%	14%	15%	30%	41%
Qld	6.0%	3.5%	4.2%	7.0%	35%	57%	19%	25%	0%
SA	9.0%	10.0%	7.2%	5.0%	35%	37%	16%	26%	21%
WA	11.0%	9.9%	7.1%	9.0%	35%	35%	17%	28%	21%
Tas	0.0%	0.5%	0.3%	2.0%	30%	0%	20%	60%	20%
NT	1.0%	0.8%	1.3%	2.0%	35%	56%	28%	16%	0%
ACT	2.0%	2.0%	2.8%	2.0%	30%	29%	13%	26%	32%
Australia	100.0%	100.0%	100.0%	100.0%		41%	9%	20%	30%

Figure 16 Projected prices for household natural gas (inflation-adjusted)



Author estimates

Impacts on Gas Appliance Efficiency

The projected trends in sales-weighted star ratings are illustrated in Figure 17 and Figure 18 respectively. In no case does the projected sales-weighted efficiency in 2018 exceed the highest rated model on the market in 2003. There is no assumption that more efficient models will be introduced, only that customers will show a stronger preference for the more efficient of the models on the market today (in the MED scenario) and that the least efficient will also be removed (in the HIGH scenario).

For some product categories (eg unflued space heaters) the range between the three scenarios is very narrow, since all the models on the market are already near the technical limits of efficiency for this design. For ducted heaters on the other hand, there is a wide range of designs and efficiencies, so more effective labelling could certainly change buyer preferences. In general however it is assumed that there is more scope to increase the effectiveness of labelling in the water heater market than in the space heater market. All water heaters provide a similar energy service so efficiency considerations are easier to introduce into the decision process than for space heaters, where factors such as the presence of a log effect or the style of the cabinet may have a large impact on selection and narrow the choice to only one or two alternatives.

Figure 17 Historical and projected sales-weighted star ratings, gas water heaters

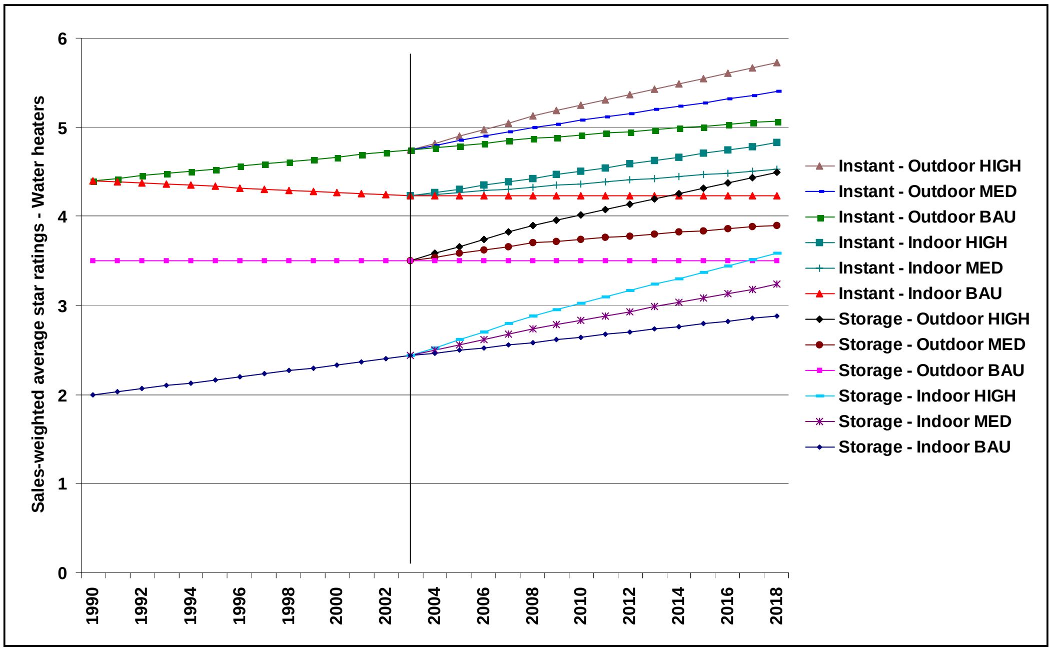
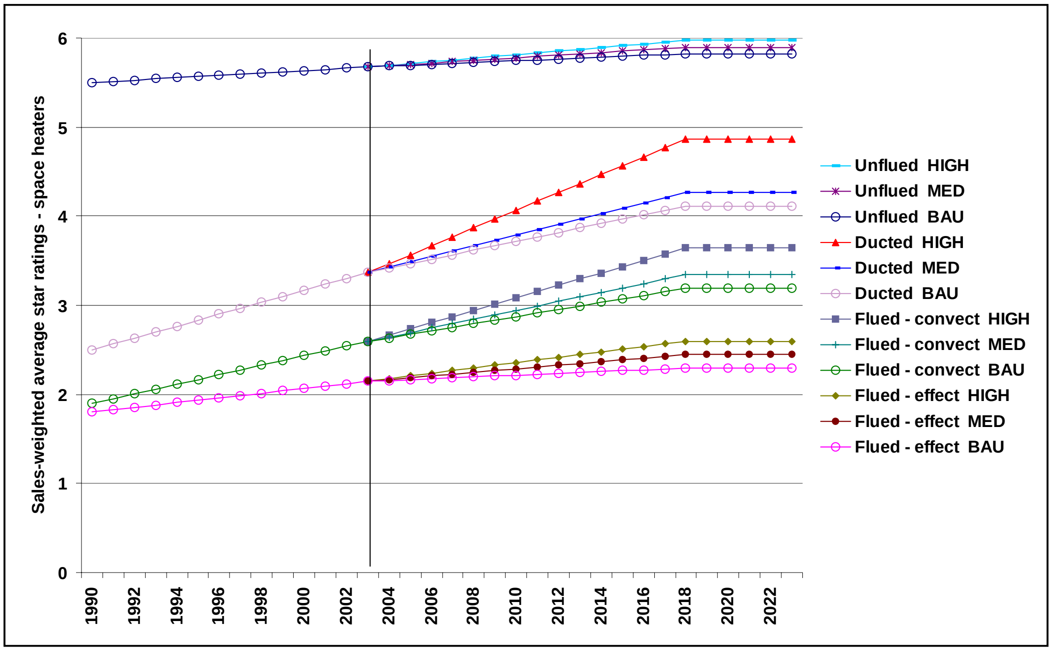


Figure 18 Historical and projected sales-weighted star ratings, gas space heaters



Impacts on Gas Consumption

The projected impacts on natural gas consumption in Australia are illustrated in the following diagrams. Figure 19 and Figure 20 show the projected reduction in the gas consumption of new water heaters entering the stock from 2003, under the MED and HIGH scenarios respectively. The greatest share of the gas savings occurs in Victoria, which accounts for the largest share of the national gas water heater market.

Figure 21 and Figure 22 show the projected reduction in the gas consumption of new space heaters entering the stock from 2003, under the MED and HIGH scenarios respectively, on the same vertical scale as for water heaters. The greatest share of the gas savings by far occurs in Victoria, which accounts for the largest share of the national space heater market, as well as the highest gas use per space heater.

Figure 23 and Figure 24 show the contribution of water heaters and space heaters to the total projected gas savings under the MED and HIGH scenarios respectively. In each case, water heaters are projected to contribute the majority of the gas savings, even though space heating accounts for the majority of gas use (Table 2). This is because enhanced labelling and MEPS are projected to have a greater impact on water heater purchases than on space heater purchases.

The gas savings illustrated in Figure 19 to Figure 24 apply only to new appliances purchased from 2003. The magnitude of these savings in relation to the entire gas consumption of the residential sector is illustrated in Figure 25. Under the MED scenario, annual residential gas consumption in 2023 would be about 2.2% lower than in the BAU case, and under the HIGH scenario gas consumption would be 5.3% lower.

The impacts on gas consumption in New Zealand are projected in Figure 26 and Figure 27 (note that the vertical scale differs from the Australian data). The impact on total projected residential gas consumption has not been calculated, because a BAU projection was not available at the time of drafting.

Monetary Benefits

The application of the gas prices in Figure 16 to the projected gas savings indicates that annual expenditure on natural gas by residential sector consumers in Australia could be as much as A$115 million below BAU by 2023 (Figure 28). The corresponding savings to gas consumers in New Zealand could reach NZ$10.6 million (Figure 29).

Greenhouse Benefits

The application of the greenhouse gas intensities in Figure 3 to the projected gas savings indicates that annual emissions in Australia could be as much as 600 kt CO_2-e below BAU by 2023 (Figure 30). The corresponding greenhouse savings in New Zealand could reach about 36 kt CO_2-e per annum by 2023.

Figure 19 Projected impact of MED scenario (enhanced labelling only) on gas consumption of new water heaters, Australia

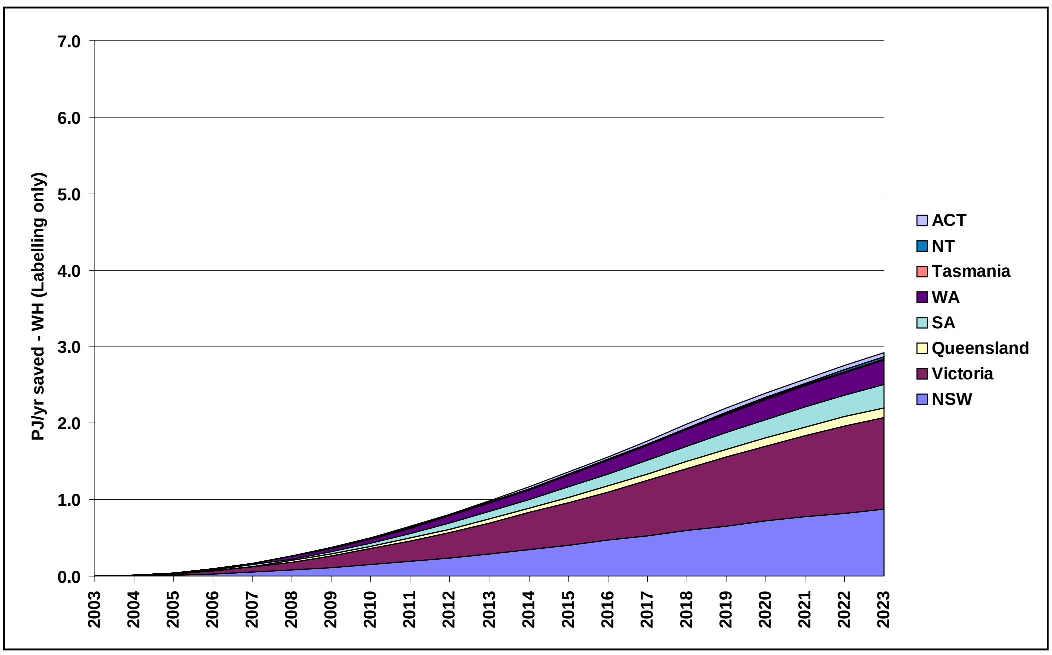


Figure 20 Projected impact of HIGH scenario (enhanced labelling + MEPS) on gas consumption of new water heaters, Australia

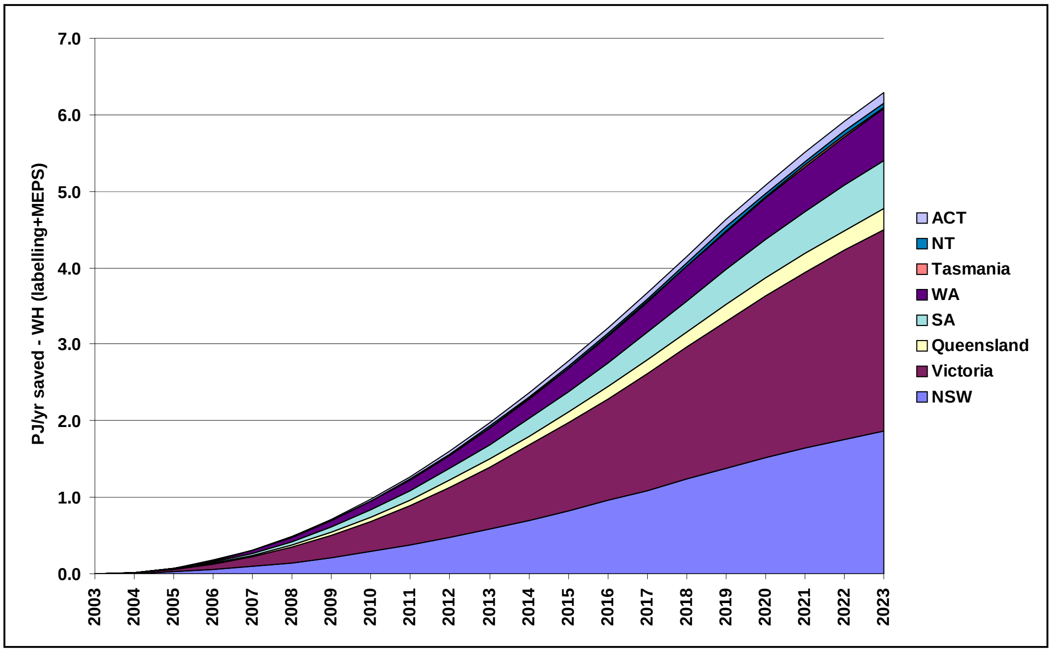


Figure 21 Projected impact of MED scenario (enhanced labelling only) on gas consumption of new space heaters, Australia

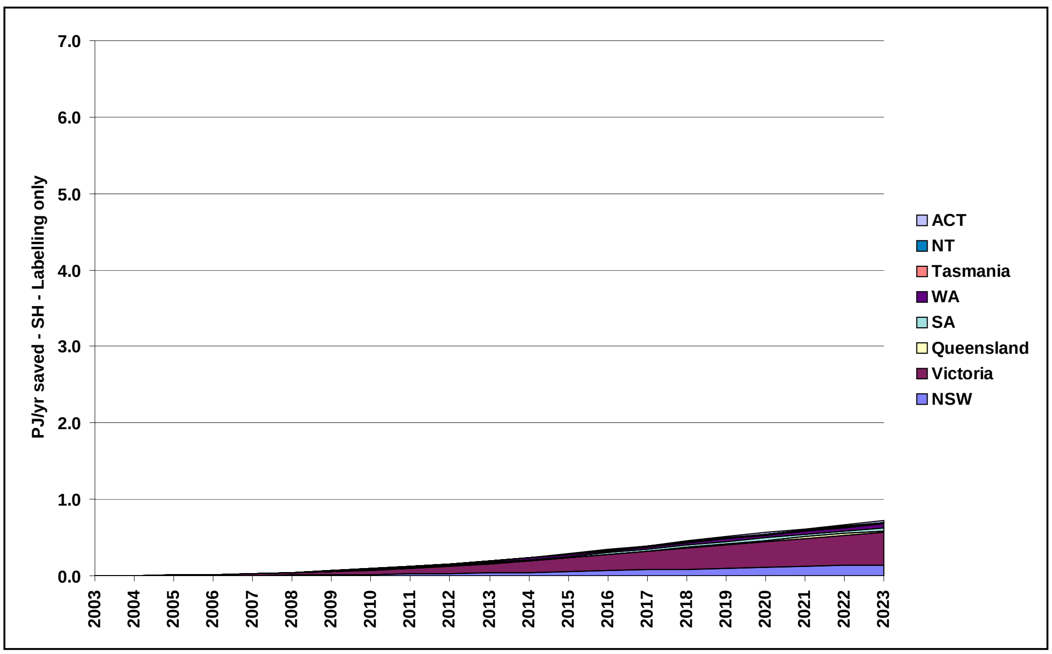


Figure 22 Projected impact of HIGH scenario (enhanced labelling + MEPS) on gas consumption of new space heaters, Australia

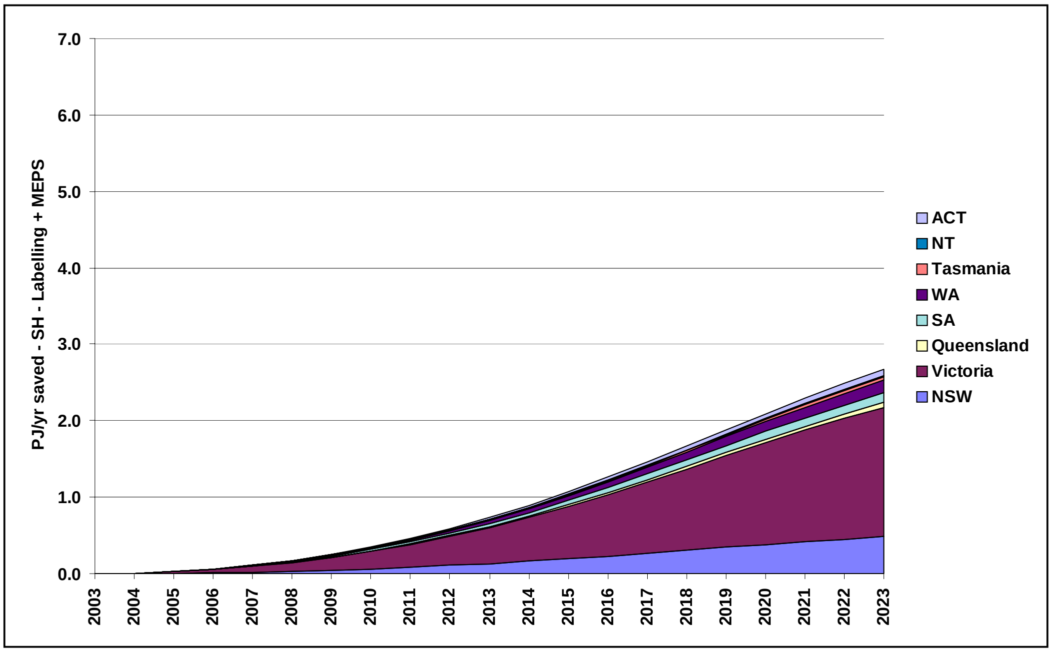


Figure 23 Projected impact of MED scenario (enhanced labelling only) on gas consumption of new water and space heaters, Australia

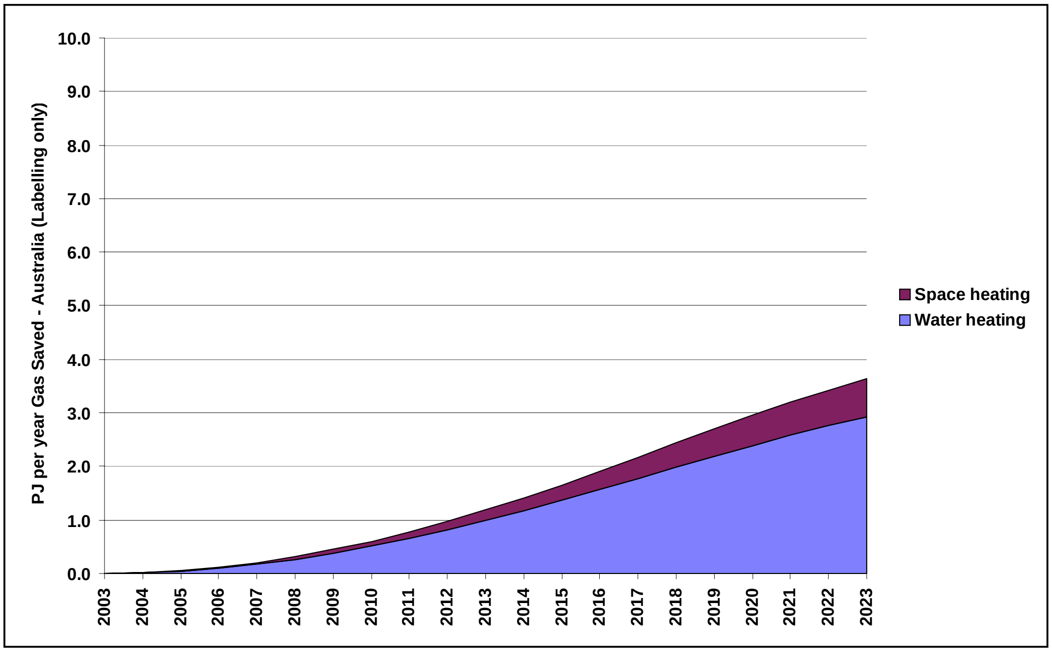


Figure 24 Projected impact of HIGH scenario (enhanced labelling + MEPS) on gas consumption of new water and space heaters, Australia

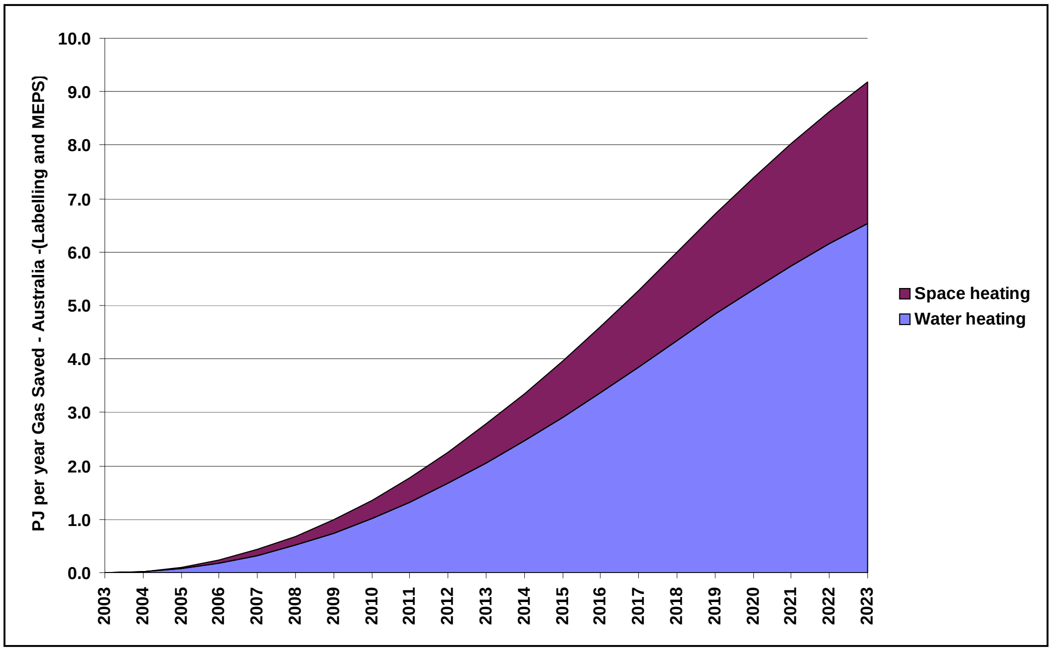


Figure 25 Projected impact on total residential sector gas consumption, Australia

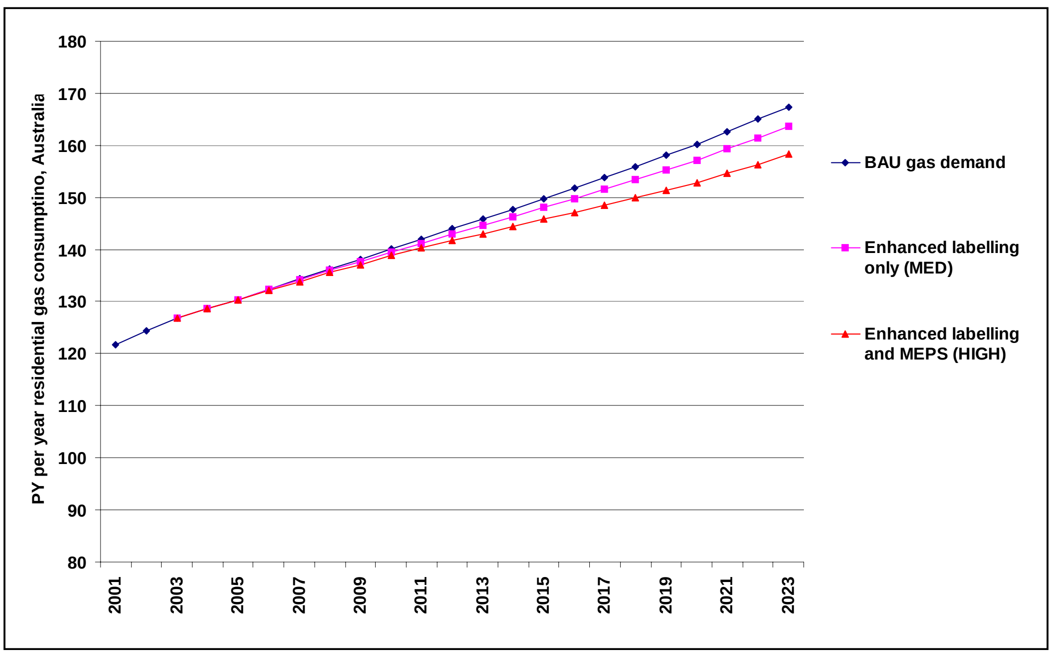


Figure 26 Projected impact of MED scenario (enhanced labelling only) on gas consumption of new water and space heaters, New Zealand

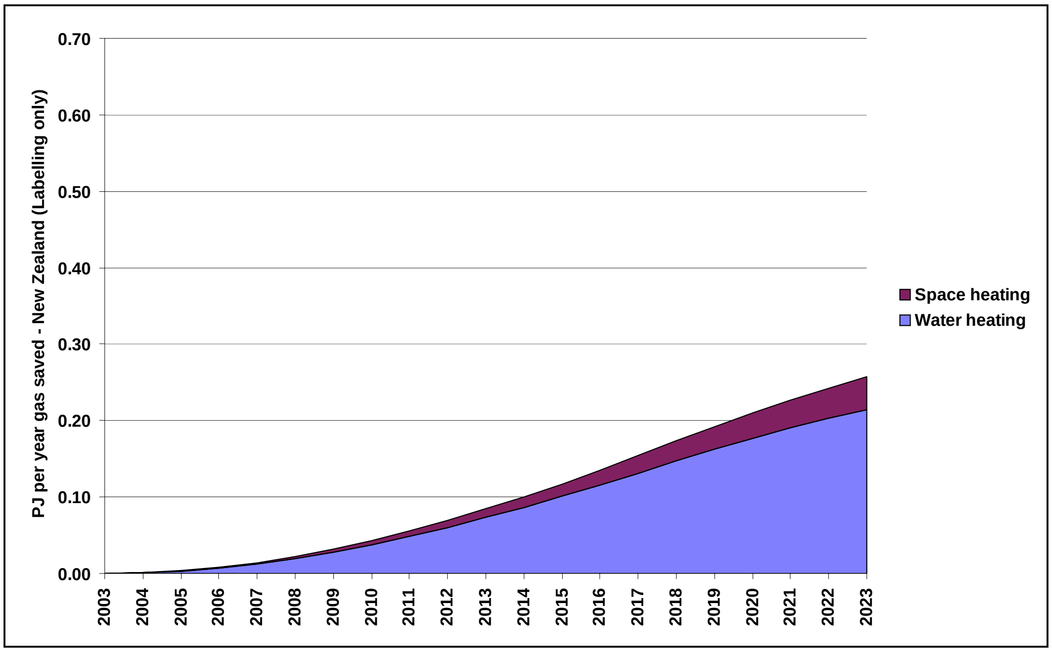


Figure 27 Projected impact of HIGH scenario (enhanced labelling + MEPS) on gas consumption of new water and space heaters, New Zealand

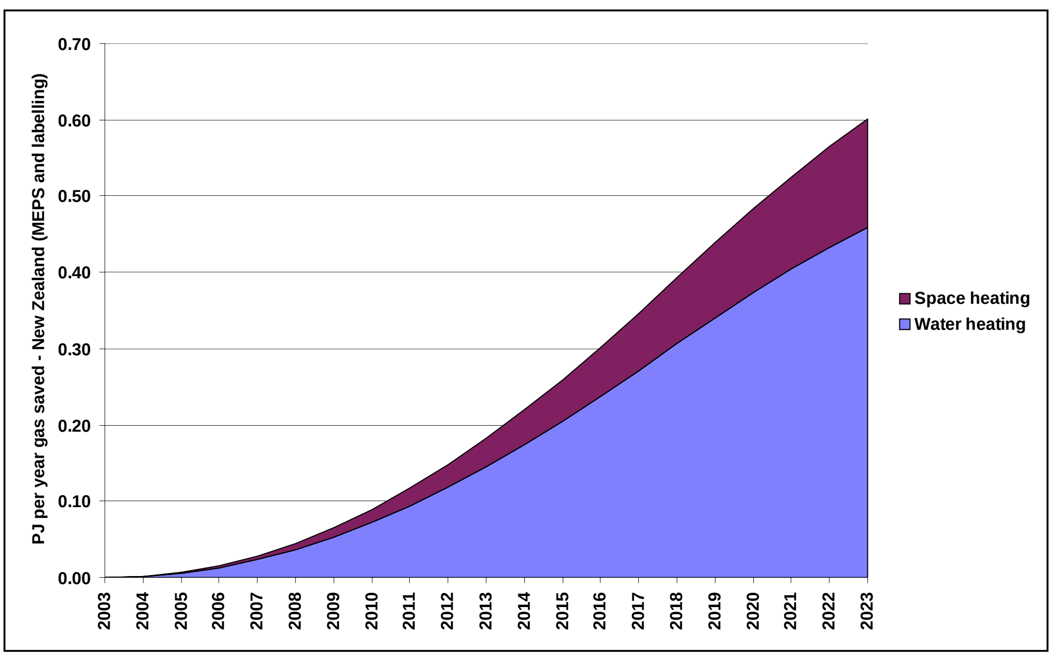


Figure 28 Projected monetary savings, Australia

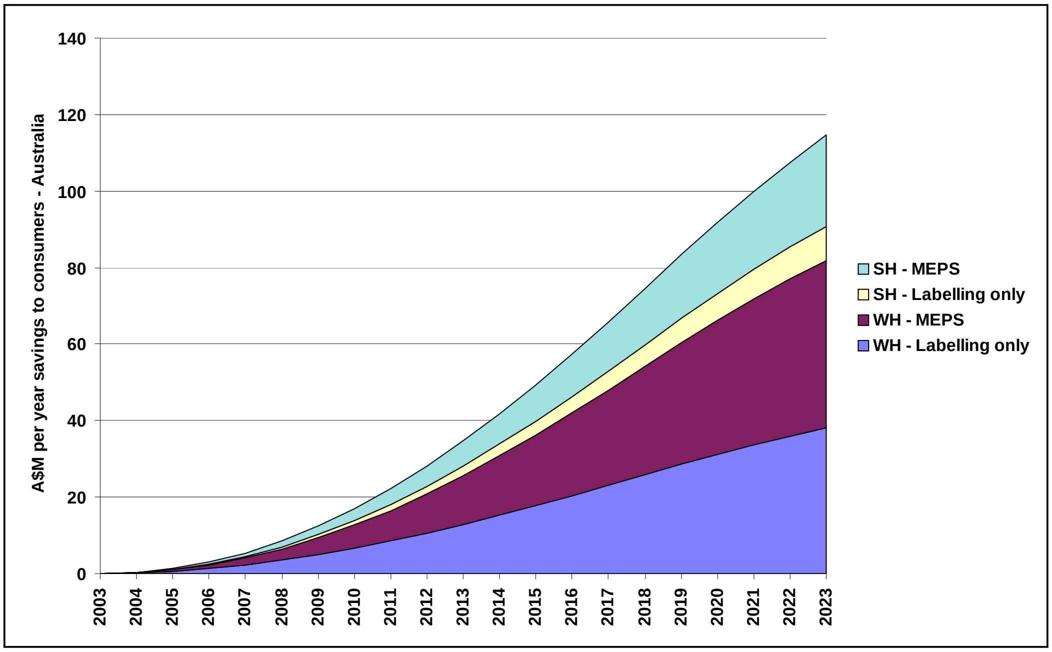


Figure 29 Projected monetary savings, New Zealand

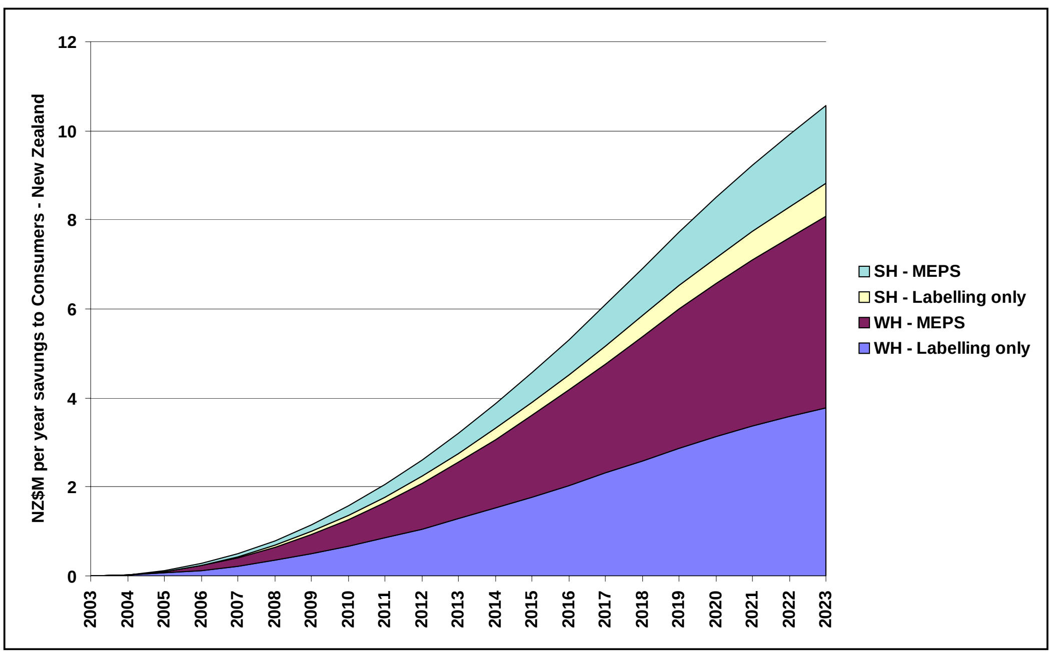
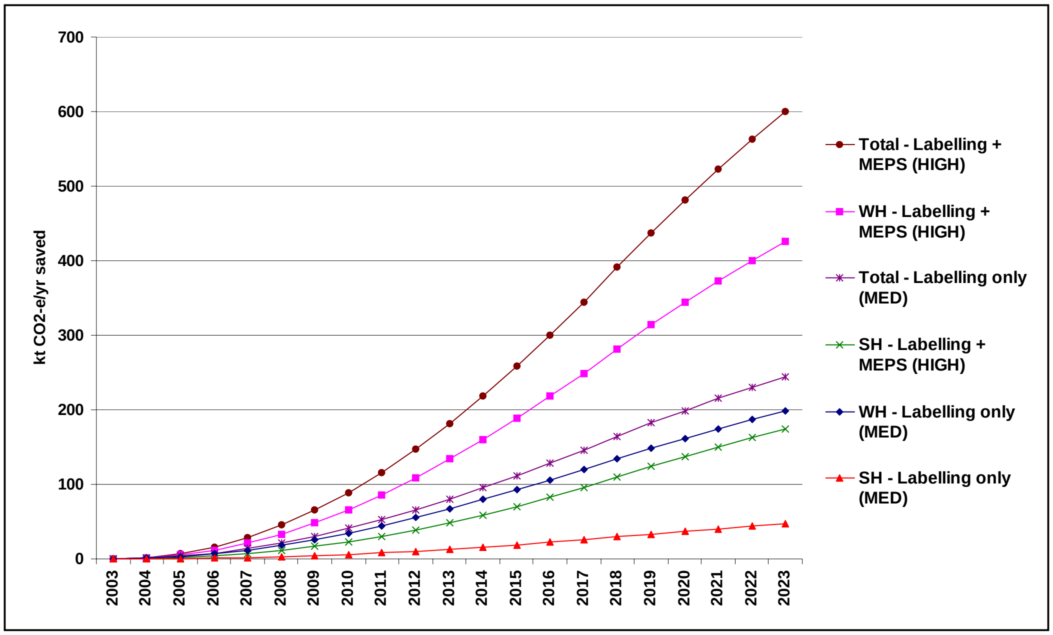


Figure 30 Projected greenhouse reductions, Australia



Cumulative Benefits

The projected cumulative savings in natural gas demand, gas cost and greenhouse gas emissions over the period 2003-2023 are indicated in Table 15 (Australia) and Table 16 (New Zealand). The introduction of more stringent MEPS levels for water heaters would more than double the impact of the gas appliance program, compared with labelling alone, and the introduction of more stringent MEPS levels for space heaters could more than triple the impact compared with labelling alone. Even then, however, the maximum space heaters benefit would still be less than the potential benefit from more effective labelling for water heaters alone. Table 17 summarises the cumulative reductions in gas demand by State and Territory. The greatest share of national gas savings is projected to be in Victoria, followed by NSW.

Table 15 Cumulative projected savings, 2004 – 2023, Australia

	Gas PJ	Gas cost $M	kt CO_2-e
Water heating - labelling only	24.6	322	1670
Space heating - labelling only	5.6	69	365
Water heating - MEPS	26.5	346	1798
Space heating - MEPS	15.0	182	982
Maximum impact	71.7	918.5	4816.1
WH - Additional %	108%	107%	108%
SH - Additional %	270%	264%	269%

Table 16 Cumulative projected savings, 2004 – 2023, New Zealand

	Gas PJ	Gas cost $M	kt CO_2-e
Water heating - labelling only	1.8	32.1	109.4
Space heating - labelling only	0.3	5.6	19.2
Water heating - MEPS	1.9	34.1	116.4
Space heating - MEPS	0.7	13.2	44.9
Maximum impact	4.8	85.0	289.9
WH - Additional %	106%	106%	106%
SH - Additional %	233%	233%	233%

Table 17 Cumulative projected gas savings by jurisdiction, 2004-2023, Australia

	WH labelling	WH MEPS	SH labelling	SH MEPS	Total	Share of Total
NSW	7.4	7.8	1.1	2.6	18.9	26.4%
Vic	10.1	11.2	3.3	9.8	34.4	47.9%
Qld	1.2	1.3	0.2	0.3	2.9	4.1%
SA	2.5	2.6	0.3	0.7	6.1	8.4%
WA	2.7	2.8	0.4	0.9	6.7	9.4%
Tas	0.1	0.1	0.1	0.2	0.4	0.6%
NT	0.2	0.2	0.1	0.1	0.6	0.9%
ACT	0.5	0.6	0.2	0.5	1.7	2.4%
Australia	24.6	26.5	5.6	15.0	71.7	100.0%

All values PJ

Cost-Effectiveness

Costs

The main cost elements of a labelling and MEPS program are:

1. The costs to suppliers of testing products, registering the results with the administrative body, producing and fixing labels and the internal administration associated with participating in the program;
2. The costs to the administrator of managing the program, including check testing of products, checking compliance with labelling requirements, data gathering (eg monitoring sales); program evaluations etc;
3. The costs associated with the production of more energy efficient products.

The first group of costs is generally passed on by suppliers to the purchasers of gas appliances. The second group of costs may also be transferred to suppliers and hence purchasers, depending on the magnitude of the registration charges or other fee arrangements between suppliers and the administrator. If the full administration costs are not met by supplier fees and charges, the administrator may need other sources of funding as well – eg in the electric appliance labelling program the administrators are government agencies, so the balance of costs is met by the taxpayer.

The third group of costs tends to be the largest component by far – typically about 90% of program costs. MEPS imposes costs on all consumers involuntarily, to the extent that it increases the average price of all products. The introduction or enhancement of labelling tends to impose some costs on all consumers – as suppliers respond by increasing the average efficiency of their product range – while other costs are voluntarily assumed by those consumers who use the label to purchase a more efficient product than if labelling had not been present.

As a regime of testing and labelling gas water heaters and space heaters is already in place, any additional supplier costs from minor changes to the tests or to the label format should be negligible. If there were major changes to the tests, this could impose cost in the following way:

- The costs of tests on new models would increase if more complex equipment or multiple tests at different settings were required; and
- If the changes in the test were such that the results could not be compared across the previous and the revised test, then all existing models would need to be retested. Retesting in these circumstances is a cost that the present gas appliance efficiency program does not impose on suppliers, but it could become a factor in an enhanced program, since the persistence of labels determined by different tests has been identified as a problem.

However, no costs can be estimated until there are specific proposals for test revisions. Similarly, it is not possible to estimate product price increases as a result of program enhancement until there is better information on the sales volumes and prices of all gas water heaters and space heaters.

Cost/Benefit Indicators

In the absence of data on the additional costs that may be imposed by enhancement of the gas appliance labelling and MEPS program, it is still possible to estimate the maximum additional costs that the projected monetary savings could support before the enhancement ceased to be cost-effective.

The net present value (NPV) of the cumulative monetary savings in Table 15 is calculated in Table 18, at three discount rates: 0%, 5% and 10%. The NPV of the sale price of all the gas water heaters and appliances projected to be sold over the period 2004 to 2017 is also calculated, at the same discount rates.[13] Comparing the pairs of values at the same discount rate indicates the maximum increase in average purchase price that could be sustained for the program to still be cost effective. For example, at a discount rate of 5%, it would be acceptable for the average price of gas water heaters to increase by up to 10% if the projected gas savings from enhanced labelling and MEPS for water heaters were realised.

The limit price increases are significantly lower for space heaters than water heaters, because the estimated gas savings from enhancing the appliance efficiency program are

[13] Selecting 2107 as the cutoff date is a simple but reasonably accurate way to treat the fact that savings accrue after the product is purchased, but costs are borne at the time of purchase. Because the estimated average service life appliances is 12 years, half the lifetime gas savings of units purchased in 2017 are included in the calculation and half are excluded. For appliances bought after 2017, less than half the lifetime gas savings are included in the calculation, whereas for appliances purchased before 2017, more than half the lifetime savings are included (and for products purchased before 2011, all of the lifetime savings).

lower for space heaters than for water heaters, and the average price of space heaters is higher than for water heaters.

Table 18 Cost-effectiveness limit indicators

	$M savings NPV			$M purchases 2004-17			NPV savings/NPV purchases		
	0%	5%	10%	0%	5%	10%	0%	5%	10%
Water heaters - labelling only	322	159	84	4769	3311	2423	7%	5%	3%
Water heaters - labelling + MEPS	668	326	172	4769	3311	2423	14%	10%	7%
Space heaters - labelling only	69	33	17	5240	3642	2667	1%	1%	1%
Space heaters - labelling + MEPS	251	121	63	5240	3642	2667	5%	3%	2%
Both - labelling only	391	192	102	10009	6953	5090	4%	3%	2%
Both - labelling + MEPS	919	448	235	10009	6953	5090	9%	6%	5%

0%, 5% and 10% columns indicate Net Present Values at those discount rates

5.2 Other Impacts

Industry

Australia

Moving to a mandatory framework *per se* should not create any costs or difficulties for Australian manufacturers and importers of water heaters and space heaters. They already comply with what is in effect a mandatory labelling and MEPS program enforced by the product registration process.

There could be additional costs if the following changes occurred under the mandatory framework:

- Changes in the test regime: in the past, suppliers have been able to delay or avoid these costs. A mandatory obligation to display only labels based on the current test (with a one year notice period and a limited changeover time, say 1 year) would no longer allow delay or avoidance;
- The implementation of more stringent MEPS levels would lead to product costs for redesign and retooling. GAMAA has indicated that such costs could be reduced considerably if sufficient lead time for implementation were given. A 3 year notice period following publication of new MEPS requirements in the relevant Australian Standard is the norm for electric appliances, and is probably acceptable for gas appliances. An undertaking not to change the new MEPS levels for a period (say 5 years) would also help with capital planning;
- Manufacturers with large model ranges would have a greater compliance task, and low-selling models would have higher compliance costs. Therefore higher MEPS may lead to the abandonment of some models, with a consequent reduction in consumer choice and possibly in price competition.
- For some importers, meeting higher MEPS levels may require changing product sourcing.

Retailers will face new obligations under a mandatory framework that requires point of sale labelling. As many gas appliance retailers already sell electrical appliances, they should be familiar with these obligations. A retailer information program should accompany any change in regulations.

New Zealand

The adoption of a new gas labelling and MEPS framework in Australia may have only limited impact on New Zealand, because manufacturers, importers and retailers of gas appliances in New Zealand operate under a different regulatory regime.

Gas appliances may be sold in New Zealand so long as they are made to an accepted standard (the Australian standard or another) and will operate safely on New Zealand gases. The product supplier must register compliance with these requirements on the Energy Safety Service website, and the claims made may be audited at any time.

If the New Zealand government wished to enforce the appearance of gas labels at the point of sale for products registered in New Zealand as complying with Australian standards (which may include some NZ-manufactured space heaters as well), new regulations would be needed. Products registered to other standards would not have to be labelled – indeed labelling to other standards should be prohibited, since a proliferation of different gas label types would undermine the value to consumers of having at least some products labelled to the Australian standard. Whether this would give the labelled products an advantage or a disadvantage is arguable.[14]

An alternative would be to retain the present situation where labelling at the point of sale is optional, but only one form of label (probably but not necessarily the Australian one) may be used.

New Zealand gas users may gain some benefit from any increases in MEPS levels in the Australian gas standards, provided that increased manufacturing costs did not make them uncompetitive against other products not subject to gas MEPS. Manufacture of the Australian-made water heaters and space heaters that did not meet the higher MEPS level would cease, unless NZ and other export sales were large enough to maintain those models without domestic Australian sales, which is unlikely. However NZ would probably continue to receive supplies of sub-MEPS products for some time after the new MEPS levels took effect in Australia, as run-out stock would most likely be diverted there.

Sub-MEPS product that was registered to AS/AG but was made outside Australia would probably remain on the NZ market, unless the loss of the Australian market for those products somehow made export to both markets uneconomic.

NZ-made product exported to Australia would have to meet the higher MEPS levels, assuming that TTMRA exemption continues (see overleaf).

[14] GASA members are adopting a certification mark for products that have been registered with the Energy Safety Service. However, this is not a comparative energy label.

TTMRA and other trade issues

At present the trade in gas appliances is exempt from the mutual recognition provisions of the Trans Tasman Mutual Recognition Act (TTMRA), so NZ-originated products must comply with the provisions of the relevant AG/AS standards. From Australia's viewpoint it would be necessary to maintain this exemption indefinitely, otherwise sub-MEPS and unlabelled gas appliances imported from NZ would be able to compete unfairly with products that meet the requirements.

Australian manufacturers export gas appliances to a number of markets, in addition to New Zealand. Most of the models exported appear to be at the higher end of the energy efficiency range, since higher-value items are more profitable. Their efficiency levels may well already exceed any realistically likely increases in MEPS levels.

6. Conclusions and Recommendations

Conclusions

There is scope for significant savings in gas consumption, in household expenditure on gas and in the greenhouse emissions associated with gas use. These savings will not however be realised under the existing gas industry–run gas appliance efficiency program.

A mandatory industry-government framework is the only one capable of

- Ensuring that all tests are carried out consistently;
- Ensuring that labels are displayed at the point of sale;
- Ensuring that all labels displayed are to the same test; and
- Introducing and enforcing higher MEPS levels, once implemented

A number of urgent tasks need to be addressed once such a framework is established:

- Independent research on appliance use and purchase patterns, to improve test methods, product categorisations etc;
- The establishment of mandatory controls over point of sale labelling for gas appliances;
- The establishment of a sales-weighted monitoring regime that is independent of suppliers, so that the gas appliance efficiency program managers have reliable data with which to plan, alter and evaluate the program;
- The analysis of the market data yielded by the monitoring regime in order to assess the most cost-effective levels of MEPS.

Recommendations

It is recommended that:

1. Commonwealth, State and Territory Governments endorse the establishment of a new framework for the gas appliance energy efficiency program, involving joint management by Government and the gas appliance industry;

2. Governments consider and implement a regime of regulation (whether State, Commonwealth or a combination) that will be capable of enforcing the mandatory aspects of the new framework;

3. For the products covered by the existing gas appliance labelling program, the display of the appropriate gas efficiency labels at the point of sale should be made mandatory;

4. Governments and the gas appliance industry initiate an assessment to establish the most cost-effective MEPS levels for the products covered by the existing gas appliance labelling program;

5. Governments and the gas appliance industry initiate an effective program to collect data on the sales of individual models, so that trends in sales-weighted efficiency can be monitored;

6. Government and the gas appliance industry undertake a longitudinal study of how actual household water use patterns change in the same households over time, in order to devise a realistic delivery task test, or perhaps a suite of tests, to better represent actual use;

7. The present categorisation of products, which is based on technology and standards rather than consumer purchase categories, should be reviewed.

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