



MINISTRY OF ENERGY AND UTILITIES
NEW SOUTH WALES GOVERNMENT

INQUIRY INTO ENERGY CONSUMPTION IN RESIDENTIAL BUILDINGS

September 2003

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Executive Summary

This submission to the Legislative Assembly Standing Committee on Public Works' *Inquiry into Energy Consumption in Residential Buildings* has been prepared by the Ministry of Energy and Utilities (the Ministry).

The submission provides overview information for the benefit of the Committee on energy consumption trends, changes in the nature of consumer demand, factors that impact on and influence the changes, some implications of the changes for electricity networks, and current initiatives being taken by the Ministry relevant to the residential sector.

The main points contained in the submission are:

- The Ministry has forecast that increased electricity will be required to meet summer and winter peaks over the period until 2010.
- Residential energy consumption has increased by almost 20% since 1991/92, with energy consumption per capita increasing by 7.6%.
- Increased appliance penetration, particularly air conditioners, second fridges, clothes dryers, dishwashers and personal computers is contributing to the overall increase in residential energy consumption.
- NSW has moved from winter peaking to summer peaking, meaning the peak level of demand for electricity is now higher in summer than winter.
- Factors influencing the increasing summer peak include higher average temperatures, an increasing proportion of Sydney's population being located in hotter areas, and the increased affordability and uptake of air conditioners.
- Whilst the increasing number of air conditioners is contributing to higher summer peaks, they also appear to be moderating the winter peaks as less efficient heaters are displaced.
- In terms of responding to increasing demand, electricity distributors are required to forecast network demand growth for at least the next five years.
- Demand management options must be considered by the network operators when solutions to overcoming network constraints are being formulated.
- Government and industry initiatives and policies are focussing on modifying and reducing overall consumption, and increasing the efficiency of appliances that are driving higher consumption levels.

For any queries in relation to this submission, please contact Andrew Lewis on tel. 9901 8648.

Introduction

The Ministry of Energy and Utilities is generally not involved in policy matters or programs directly targeting energy consumption in the residential energy sector, except where initiatives are developed at a national level, such as through the Ministerial Council on Energy. The Ministry does collect, analyse and assess data related to energy generation, transmission, consumption and appliance penetration.

In terms of the residential sector, over the 10 year period from 1991/92 to 2001/02 total residential energy consumption increased by 19.8%, while electricity consumption increased by 22.8%, natural gas consumption increased by 62.9%, and solar consumption increased by 61.2%. Electricity, natural gas and solar energy all increased their share of total residential energy consumption, primarily at the expense of wood and oil.

Along with the general increase in residential energy consumption, the last 10 years has seen an increase in peak demand levels, i.e. the level of energy needed to meet demand on the hottest and coldest days of the year. Peak demand is predominantly met by electricity, particularly during the summer months.

The increase in peak residential electricity demand is largely driven by factors such as increasing average temperatures, the shifting of the demographic centre of Sydney into hotter areas, the increased affordability (and uptake) of air conditioning systems, and the general increased penetration of electrical appliances into households, such as computers, home entertainment systems, and the like.

During times of peak electricity demand, the appliances that are contributing most to the demand levels include air conditioners, space heaters, cooking appliances, hot water heaters and refrigerators. The order of these appliances in their contribution to the peak depends on the season.

During summer, the increasing penetration of air conditioners is driving increased levels of peak electricity demand. However this is not necessarily being repeated in winter. Reverse-cycle air conditioners tend to be more energy-efficient than other forms of space heating (eg electric bar heaters), and appear to be contributing to a moderation in the peak demand levels.

In order to meet the peak demand levels, electricity networks either have to build more capacity, or implement demand management initiatives to keep the demand levels within the existing network capacity. Electricity networks (distributors as well as TransGrid) are required to implement and report on demand management strategies, which are designed to assess whether demand management initiatives are a cost-effective alternative to simply building more capacity. In addition, the networks are required to publish reports on anticipated demand growth, and identify areas of possible network constraints.

There are also a number of Government and industry initiatives that are aiming to encourage demand management and increase appliance efficiency in order to limit increases in peak electricity demand levels.

Changes in Annual Energy Consumption

As well as internal sources, the Ministry of Energy and Utilities (the Ministry) uses a range of external data sources to identify patterns and trends in, amongst other things, energy generation, transmission, consumption and appliance penetration. These sources include, but are not limited to:

- Australian Bureau of Statistics (ABS)
- Australian Bureau of Agriculture and Resource Economics (ABARE)
- Electricity Supply Association of Australia (ESAA)
- Australian Gas Association (AGA)
- National Electricity Market Management Company (NEMMCO)
- TransGrid's Annual Planning Reports

In June 2002 the Ministry published the NSW Statement of System Opportunities (SoSO). The SoSO provided updated information regarding electricity demand in NSW and overall system adequacy. The purpose of the SoSO was to assist existing and prospective market participants in assessing options for future investment in generation, network capacity or demand side management.

The key conclusions contained in the SoSO were:

- Increasing forecasts for the total amount of electricity required to be generated to meet both summer and winter peak demands over the period until 2010.
- NSW was expected to change from winter peaking to summer peaking from as early as 2002/03 (and this in fact occurred during January 2003).
- Demand management is an important strategy providing flexibility in meeting energy needs. Existing demand management capacity was estimated to be around 130 Megawatts (MW), with a number of initiatives being undertaken to encourage greater demand side participation.

An electronic copy of the SoSO is provided on the disc attached to this submission. The Ministry is currently in the process of updating the SoSO.

Although the SoSO focussed on the NSW electricity market as a whole, the Ministry is able to give a brief overview of the changing nature of the residential energy market, not only for electricity but for gas and other forms of energy.

Residential energy consumption represents 13.1% of the final energy consumption in NSW (Source: ABARE). Between 1991/92 and 2001/02, total residential energy consumption in NSW increased by 19.8%, from 102.49 Petajoules (PJ) to 122.78 PJ (Source: ABARE).

As part of this increase:

- electricity consumption increased by 22.8%, from 58.06 PJ to 71.28 PJ.
- natural gas consumption increased by 62.9%, from 11.98 PJ to 19.52 PJ.
- solar consumption increased by 61.2%, from 0.67 PJ to 1.08 PJ.

Between 1991/92 and 2001/02, the following changes in the share by fuel type for NSW residential consumption have occurred:

- electricity share increased from 56.6% to 58.1%.
- natural gas share increased from 11.7% to 15.9%.
- wood share decreased from 25.2% to 21.6%.
- solar share increased from 0.65% to 0.88%

In terms of average energy consumption per capita and per household in NSW, between 1991/92 and 2001/02:

- average energy consumption per capita increased by 7.6%, from 17.2 Gigajoules (GJ) to 18.5 GJ.
- average energy consumption per household increased by 2.4%, from 48.2 GJ to 49.4 GJ.
- population increased by 11.4%, from 5,962,569 to 6,640,355
- the number of households increased by 16.9%, from 2,125,367 to 2,485,596
- the average number of persons per household decreased by 5%, from 2.81 to 2.67

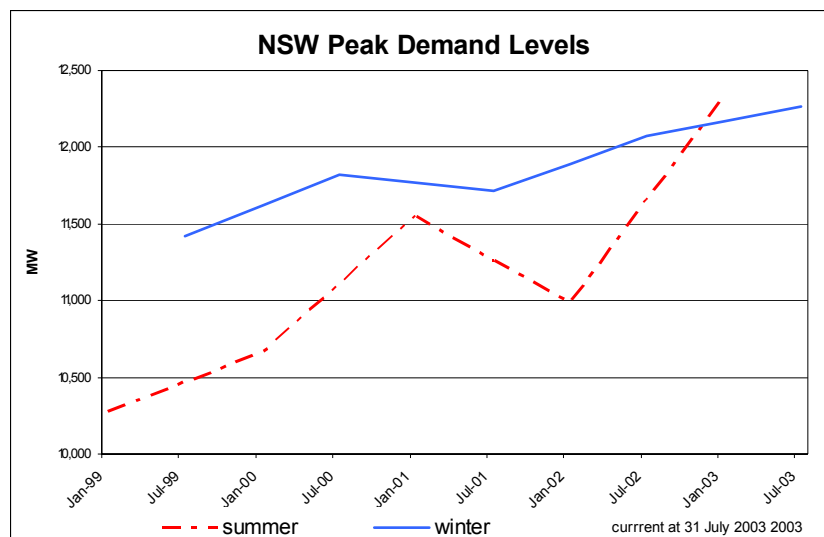
Residential Consumption and Population Figures 1991/92 – 2001/02			
	1991-92	2001-02	% change
FUELS CONSUMED (PJ)			
Wood	25.84	26.48	2.5
Natural Gas	11.98	19.52	62.9
Electricity	58.06	71.28	22.8
Solar	0.67	1.08	61.2
Other	5.94	4.42	-25.6
ENERGY CONSUMPTION	102.49	122.78	19.8
SUMMARY			
Population in NSW	5,962,569	6,640,355	11.4
Number of Households in NSW	2,125,367	2,485,596	16.9
Persons per household	2.81	2.67	-5.0
Energy consumed (GJ) per capita	17.19	18.49	7.6
Energy consumed (GJ) per household	48.22	49.40	2.4
Source: ABARE, ABS			

Consumer Demand

For electricity in NSW, the winter peak demand had always been greater than summer peak demand. That is, the highest consumption levels during winter have been greater than the highest consumption levels during summer, measured in megawatts (MW).

However, as predicted by the Statement of System Opportunities, NSW has now become a summer peaking state like Victoria, Queensland and South Australia. With these concurrent summer peaks, NSW cannot depend on other states to meet the additional demand being experienced.

On 30 January 2003, peak demand in NSW reached 12,331 MW, compared to 12,074 MW on 18 June 2002. So far this winter, peak demand reached 12,261 MW on 28 July 2003 .



Factors that are influencing the increase in summer peak demand include:

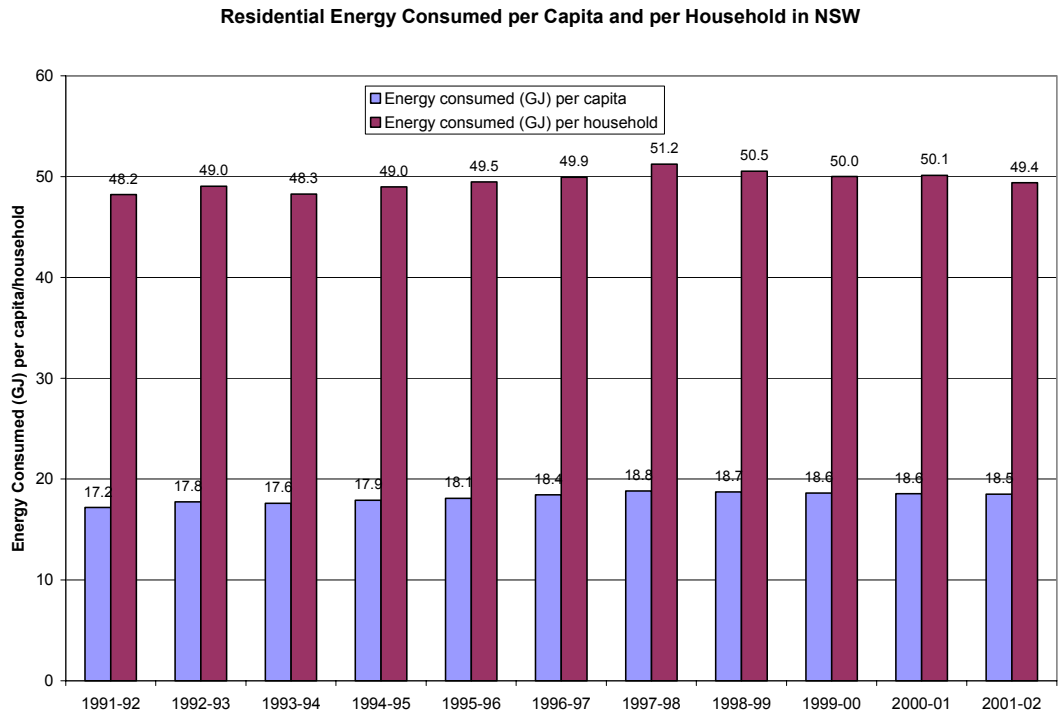
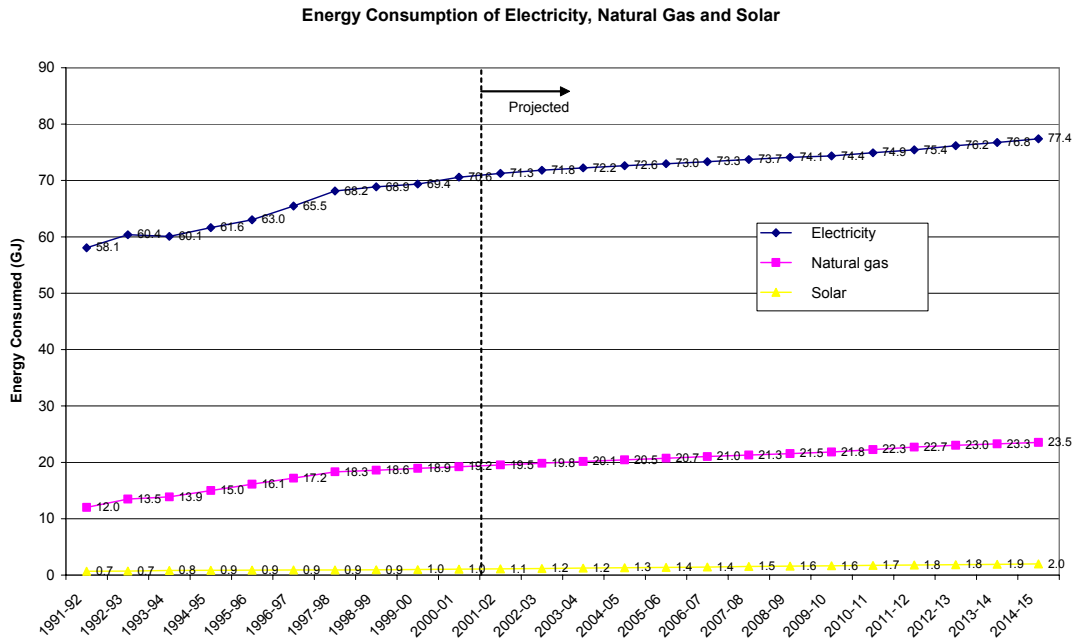
- increasing average temperatures;
- the demographic centre of Sydney moving into hotter areas; and
- the increased affordability and uptake of air conditioning systems.

Integral Energy's *Network 2013* includes the following comment on demand:

The uptake of air conditioning particularly within Western Sydney is also straining Integral's network. Ten years ago, about one in four of households within Integral's supply area had air conditioning. Today, one in two households are air conditioned and indications are that this figure will continue to grow. Air conditioning places a huge strain on Integral's electricity network during summer months. A characteristic of air conditioning in the Western Sydney climate is that the appliances are usually required on a relatively small number of days. Air conditioners therefore have contributed to a significant growth in peak demand while total energy consumption growth has been slightly more modest.

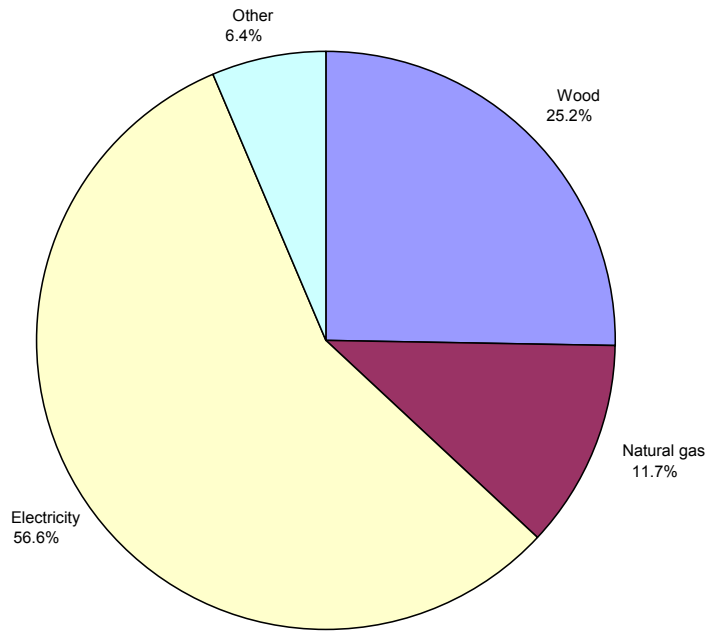
Inquiry into Energy Consumption in Residential Buildings

The following graphs give an indication of how residential energy consumption has changed between 1991/92 and 2001/02.

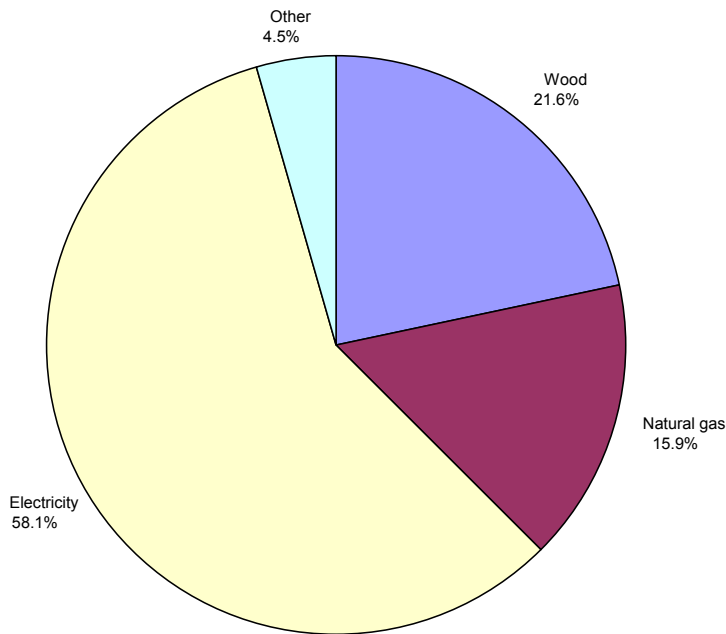


Note: Energy includes all fuel types, not just electricity.

Residential Energy Consumption in 1991/92 by Fuel Type



Residential Energy Consumption in 2001/02 by Fuel Type



Implications for Capital Works Programs

In May 2001, the Ministry published the *Demand Management for Electricity Distributors Code of Practice* (the Code).

The purpose of the Code is to provide guidance to electricity distributors in implementing the requirement in the NSW *Electricity Supply Act 1995* to investigate and report on demand management strategies when it “would be reasonable to expect that it would be cost-effective to avoid or postpone the expansion [of a distribution system] by implementing such strategies”.

The *Act* requires that the Minister for Energy impose a condition on each licensed electricity distributor to conduct investigations on the cost effectiveness of implementing demand management strategies that may permit distribution network augmentation work to be deferred or avoided.

The Code requires electricity distributors to publish an Annual *Electricity System Development Review (ESDR)* by 31 May each year. These are generally available on distributors’ web sites, and copies of the ESDR publications forwarded to the Ministry are provided on the disc attached to this submission.

The ESDR publications give considerable detail on past and anticipated demand growth by regions and major substations, for at least the next five years. They also indicate locations where there may be a network constraint developing.

In compliance with the Code, electricity distributors consider the circumstances of major distribution expansion proposals in order to determine whether it would be reasonable to expect that demand management options would be cost effective. If so, then investigations of demand management are carried out.

The approach in the Code is focused not just on the **network**, but rather on the **electricity system** as a whole. Constraints that arise within the distribution network can be addressed by changes in customer behaviour, by changes in equipment used by customers or by installation of small-scale generation at a local level, as well as by enhancement of the distribution network.

These options could be devised and implemented by customers or by distributors. The market based procedure in the Code of Practice is intended to ensure that all supply and demand side options developed by customers or third parties and by the distributor itself can be developed and evaluated *at the same time* and *in the same manner* as network augmentation, including use of a competitive process.

Updated electricity load forecasts for NSW can be found in the *TransGrid Annual Planning Report*, and the recently-released *NEMMCO Statement of Opportunities*. These forecasts provide load data for the entire NSW region.

Both TransGrid’s *Annual Planning Report* and the equivalent documents prepared by NSW distributors provide further details on load (and the extent of its forecast increase). These documents also provide an overview of how the network bodies intend to relieve the constraints placed on the electricity system under conditions of increasing demand.

Factors Contributing to an Increase in Electricity Use

The NSW residential sector is responsible for 28.5% of the State's total electricity consumption, representing 71.81 PJ (19,950 Gigawatt hours - GWh) per annum. The sector comprises over 2.4 million households representing a range of accommodation types from stand-alone dwellings to high density apartments.

The electricity demand pattern for the residential sector is highly sensitive to temperature and varies substantially between winter and summer. Both summer and winter demand patterns have high demand levels at around midnight, due to the concentration of off-peak water heating at this time as well as the use of space heating during winter. During winter, the overnight load is both higher and longer in operation than the summer load.

All year round there is a significant evening peak demand. During winter this represents the combination of cooking and heating, while in summer it is the combination of cooking and cooling.

Significance of Appliances in Residential Sector Peak System Demand for Electricity

During the periods of peak system demand (peak winter demand is at 6:00pm) the residential sector contributes approximately 34.2% of the total load, with the major component being the combination of space heating and air conditioning (reverse cycle heating). The next largest users at this time are cooking appliances (range and microwave), non off-peak hot water heating and refrigerators.

During the minor winter peak (8:30am), the combined residential load influence is reduced to 28.8% of the total system demand. At this time, water heating is the most significant load component for the residential sector followed by space heating.

At the time of peak summer demand (2:00pm – 4:00pm) the residential sector represents approximately 20% of the total system demand. The major contributors to the load at this time are refrigerators, air conditioners and hot water heating.

See the tables on the following page for a breakdown of the residential sector's share of the winter and summer peak loads, according to component type.

Inquiry into Energy Consumption in Residential Buildings

Component	Peak Winter Day - 18th June 2002			
	Load at 8:30 (MW)	Proportion of System Demand	Load at 18:00 (MW)	Proportion of System Demand
System Peak	10,174	100.0%	12,156	100.0%
Refrigerators	337	3.3%	406	3.3%
Air Cond	156	1.5%	300	2.5%
DHW – nonOP	599	5.9%	461	3.8%
DHW - OP2	175	1.7%	157	1.3%
Freezer	86	0.8%	104	0.9%
Range	99	1.0%	681	5.6%
Pool pump	117	1.2%	124	1.0%
Lighting	174	1.7%	672	5.5%
DHW - OP1	126	1.2%	51	0.4%
TV	65	0.6%	150	1.2%
Space Heat	620	6.1%	667	5.5%
Dishwash	49	0.5%	29	0.2%
Dryer	93	0.9%	106	0.9%
Waterbed	44	0.4%	41	0.3%
WashMachn	62	0.6%	17	0.1%
Microwave	32	0.3%	75	0.6%
Miscell	79	0.8%	79	0.6%
Computers	18	0.2%	42	0.3%
Totals	2,934	28.8%	4,163	34.2%

Component	Peak Summer Day - 30th January 2003			
	Load at 14:00 (MW)	Proportion of System Demand	Load at 16:00 (MW)	Proportion of System Demand
System Peak	12,316	100.0%	12,456	100.0%
Refrigerators	642	5.2%	649	5.2%
Air Cond	713	5.8%	1,042	8.4%
DHW – nonOP	138	1.1%	114	0.9%
DHW - OP2	164	1.3%	130	1.0%
Freezer	162	1.3%	169	1.4%
Range	91	0.7%	82	0.7%
Pool pump	99	0.8%	108	0.9%
Lighting	58	0.5%	63	0.5%
DHW - OP1	49	0.4%	34	0.3%
TV	37	0.3%	22	0.2%
Space Heat	6	0.1%	7	0.1%
Dishwash	26	0.2%	26	0.2%
Dryer	17	0.1%	14	0.1%
Waterbed	8	0.1%	6	0.1%
WashMachn	17	0.1%	13	0.1%
Microwave	18	0.2%	11	0.1%
Miscell	87	0.7%	87	0.7%
Computers	10	0.1%	6	0.0%
Totals	2,345	19.0%	2,585	20.8%

Source: Ministry of Energy and Utilities

Take Up Of Appliances

Comprehensive data on a range of factors that may contribute to an increase in energy use in NSW can be obtained from the Australian Bureau of Statistics (ABS) 2002 Publication *Environmental Issues – People's Views and Practices* (Cat. No. 4602.0).

This publication contains survey information from March 2002 and also includes summary information for similar surveys conducted in March 1999 and June 1994. Survey information for major energy consuming household products (and for insulation) is summarised in the two tables on pages 12-13, for NSW and for Australia as a whole.

Some of the main points to note from this data include:

Insulation

There was a significant increase (44.5% to 50.5%) in the proportion of households insulated in NSW between 1994 and 2002. This is likely to have been the result of greater awareness of energy/environmental running cost and comfort benefits associated with air conditioning.

In addition, the imposition of mandatory energy efficiency requirements in council areas that have adopted the Sustainable Energy Development Authority's (SEDA) Energy Smart Homes Policy will have had a positive impact on the proportion of new houses insulated.

While higher levels of insulation will reduce heating and cooling requirements, the construction of larger houses and increased air conditioner take up could, to some degree, negate the overall impact of increased insulation levels.

Water Heating

The proportion of households using electric water heating in NSW increased slightly between 1994 and 2002 from 77.7% to 79% of households. Similarly, the level of gas water heating increased from 19.8% to 23.4% of households while the level of solar water heating decreased from 3.5% to 2.4% over the same period.

Note that these proportion figures do add up to more than 100%, as some households have multiple water heaters (eg those with a granny-flat).

Space Heating

Notwithstanding increased levels of air conditioner take up, particularly for reverse cycle air conditioners, the proportion of households using electricity as the main space heating energy source decreased slightly between 1994 and 2002.

However, between 1994 and 2002 the proportion of households using gas as the main space heating energy source increased from 19.7% to 23.7% while the proportion of households using wood as the main space heating energy source decreased from 17.1% to 11.8%.

Refrigerators and Freezers

While the overall ownership of at least one refrigerator has remained constant at over 99.5%, the proportion of NSW households with two or more refrigerators has increased from 22.5% in 1994 to 28.6% in 2002.

These additional refrigerators could be expected to most often be older models that have been retained after being replaced as the main household refrigerator. However, this increase in households with two or more refrigerators has been accompanied by a corresponding decrease in freezer ownership from 41.7% in 1994 to 36% in 2002. Consequently, it is difficult to determine the magnitude of the impacts on energy consumption of this freezer replacement behaviour.

Air Conditioners

While the proportion of NSW households owning cooling only and evaporative air conditioners has remained relatively unchanged between 1994 and 2002, there has been a dramatic increase in the ownership of reverse cycle air conditioners, from 20.8% of NSW households in 1994 to 31% in 2002.

This has clearly had an impact on residential energy use, and has also resulted in significantly increased summer electricity peaks during periods of extreme hot weather.

Discussion of the impact of the increased penetration of air conditioning is presented in the next section of this chapter.

Washing Machines, Clothes Dryers and Dishwashers

Washing machine ownership stayed relatively constant in NSW between 1994 and 2002. However, the penetration of both clothes dryers and dishwashers increased significantly over this same period, from 52.7% to 60.4% of households for clothes dryers and from 24.5% to 37.1% of households for dishwashers. This could be expected to have led to an increase in residential energy use.

Cooking, Microwaves, Stereos, Computers, Televisions

Levels of electric/gas cooker, microwave, stereo and television ownership have remained relatively constant between 1994 and 2002. However, the level of household computer ownership has increased very significantly from 44.1% in 1999 (the first year this product was surveyed) to 60.1% in 2002. Further increases in household computer ownership and an increase in the number of households with more than one computer could be expected to occur for some years in the future.

Standby Power

Standby Power is power used by consumer electrical products while they are waiting to be turned fully on. For example, remote controlled televisions and computer monitors and processing unit boxes use significant standby power.

The power usage of small appliances which perform a continuous, non-standby, function that requires small amounts of continuous power (e.g. smoke detectors, security systems, clock/radios, answering machines and rechargeable products such as toothbrushes and mobile phones) is also included within the standby power category.

The penetration of standby power using products has increased to the extent that the Australian Greenhouse Office has estimated that they are now responsible for over 10% of Australia's household electricity usage, equivalent to about \$500 million and 5 Mt CO₂-e per annum.

A brief discussion on standby power is included in the next chapter.

**EXTRACTS FROM ABS 4602.0
ENVIRONMENTAL ISSUES – PEOPLE’S VIEWS AND PRACTICES**

Product/Feature	Proportion of NSW Households with Product/ Feature (%)	Total Number of NSW Households with Product/ Feature ('000) ¹	Proportion of Australian Households with Product/ Feature (%)	Total Number of Australian Households with Product/ Feature ('000) ¹
Houses Known to be Insulated²-2002	50.5	1249.1	57.5	4295.1
-1999	47.6		54.5	
-1994	44.5		52.1	
Estimated Roof/Ceiling Insulation³-2002	49.6		56.4	
-1999	46.4		53.2	
-1994	43.0		50.6	
Estimated Wall Insulation³-2002	13.5		16.3	
-1999	11.4		14.0	
-1994	11.6		12.8	
Electric Water Heating				
Peak-2002	33.1	817.1	31.0	2316.7
Off-Peak-2002	45.9	1135.3	30.4	2271.3
All types-2002	79.0	1952.4	61.4	4588.0
All types-1999	75.9		59.6	
All types-1994	77.7		62.3	
Gas Water Heating-2002	23.4	578.4	37.6	2810.1
-1999	20.8		35.4	
-1994	19.8		33.6	
Solar Water Heating-2002	2.4	59.9	4.3	322.4
-1999	2.7		4.8	
-1994	3.5		4.9	
Electric Space Heating (Main) -2002	44.4	1098.8	30.9	2309.2
(Incl. Reverse Cycle Air Cond)-1999	42.2		28.0	
-1994	46.3		29.7	
Reverse Cycle Air Conditioner as Main Heater-2002	16.4	406.6	11.3	844.4
Gas Space Heating (Main)-2002	23.7	585.1	34.2	2555.0
-1999	21.9		32.9	
-1994	19.7		31.9	
Wood Space Heating (Main)-2002	11.8	291.9	13.7	1024.2
-1999	14.7		15.7	
-1994	17.1		17.6	

Notes:

1. Total Households in 2002: NSW 2,472,100 Australia 7,473,700
2. For 21.5% of dwellings surveyed in NSW in 2002, 20.9% in 1999 and 16.1% in 1994, occupiers did not know if a dwelling was insulated. These dwellings were taken to be uninsulated. Slightly smaller “don’t know” proportions applied across Australia.
3. Only owner-occupied dwellings were surveyed for this information and it has been assumed that the results obtained apply to all houses known to be insulated.

Inquiry into Energy Consumption in Residential Buildings

Product/Feature	Proportion of NSW Households with Product/ Feature (%)	Total Number of NSW Households with Product/ Feature ('000)	Proportion of Australian Households with Product/ Feature (%)	Total Number of Australian Households with Product/ Feature ('000)
One Refrigerator only -2002	71.2	1759.6	70.4	5259.8
-1999	71.0		70.8	
-1994	77.1		75.8	
Two or more Refrigerators -2002	28.6	707.1	29.5	2204.3
-1999	28.5		28.8	
-1994	22.5		23.9	
Separate Freezer(s) -2002	36.0	890.3	38.0	2839.0
-1999	38.2		40.1	
-1994	41.7		44.9	
Reverse Cycle Air Conditioner -2002	31.0	767.4	23.7	1771.9
-1999	16.4		12.8	
-1994	20.8		16.3	
Cooling Only (Refrigerated) Air Conditioner -2002	5.4	134.4	12.5	930.8
-1999	4.6		11.2	
-1994	4.4		8.9	
Evaporative Air Conditioner -2002	5.5	135.4	11.1	826.1
-1999	5.7		9.5	
-1994	5.0		6.3	
Washing Machine -2002	94.4	2333.5	95.2	7114.9
-1999	93.7		94.7	
-1994	92.6		94.2	
Clothes Dryer -2002	60.4	1493.2	55.4	4139.5
-1999	55.6		53.0	
-1994	52.7		51.7	
Dishwasher -2002	37.1	917.6	34.7	2594.0
-1999	31.2		30.1	
-1994	24.5		25.1	
Electric Cooking (Main) -2002	68.0	1680.0	57.1	4270.0
-1999	71.3		42.4	
Gas Cooking (Main) -2002	31.6	782.0	58.6	3169.1
-1999	27.9		40.5	
Microwave -2002	88.7	2193.1	87.3	6521.0
-1999	84.6		82.9	
Stereo -2002	81.2	2007.3	81.1	6057.8
-1999	77.9		77.9	
Computer -2002	60.0	1484.4	59.8	4465.7
-1999	44.1		44.8	
Television(s) -2002	99.3	2454.8	99.2	7416.1
-1999	98.9		98.9	

These figures demonstrate increased uptake of electricity consuming appliances that, when taken together, can be expected to drive higher levels of consumption.

Trends for Residential Sector Demand – Air Conditioners

ABARE has forecasted growth in NSW residential sector consumption between 2000/01 and 2004/05 of 2.9% (0.73% per annum). This increase is largely based on population growth, and may not take into account changes in personal comfort expectations and purchasing preferences for equipment and appliances.

In addition, separate observations from the electricity supply industry indicate a higher adoption rate for air conditioners than originally projected.

Using three scenarios for the adoption rate of reverse-cycle air conditioners over the next five years ('frozen', 'normal' and 'high') the net effect on summer demand is:

- Under a 'normal' projection case, the forecast demand level is expected to increase by 2.2% (45 MW) from the current ('frozen') 2,043 MW to 2,088 MW.
- Under a 'high' projection for air conditioning penetration, the summer demand increases by 7% (145 MW) to 2,188 MW.

If the high air conditioning penetration rate occurs, the overall increase in residential sector demand (ie effect of all appliances) at the time of the summer peak is expected to be 10.2% compared to today's level, or an increase of 203 MW.

The effect of the same three scenarios on the peak winter demand is:

- The 'frozen' appliance penetration case and the 'normal' projection case are almost identical in their forecast demand level, at 5,205 MW.
- The adoption of a higher rate of reverse cycle air conditioners actually produces a net **reduction** in the winter peak, due to the replacement of other, less efficient types of electric heaters. This results in a reduction in demand over the two other scenarios of approximately 115 MW.

So although increased penetration of air conditioners is expected to exacerbate demand levels during the summer peak, there is expected to be a benefit during the winter peak in terms of a reduction in demand levels from the increasing use of reverse-cycle air conditioners.

However, these projections when combined with the data on penetration make it clear that air conditioners are having a noticeable effect on the level of peak demand during summer.

Current Government and Industry Policies and Initiatives

Government Initiatives

Mandatory Energy Labelling And Minimum Energy Performance Standards For Products And Equipment

The mandatory energy labelling and Minimum Energy Performance Standards (MEPS) program for products and equipment is a nationally coordinated program regulated at the State and Territory level.

The program has the objectives of reducing energy consumption and energy costs, while also reducing greenhouse gas emissions. In NSW the Ministry of Energy and Utilities operates the program, which is an important element of the 1998 National Greenhouse Strategy (NGS).

The energy labelling program applies to refrigerators, freezers, air conditioners, dishwashers, clothes washers and clothes dryers.

MEPS for refrigerators, freezers and electric storage water heaters were introduced in 1999 and MEPS for three phase air conditioners (up to 65 kW cooling output) and for three phase cage induction electric motors (between 0.73 kW and 185 kW) were introduced in 2002. During 2002, mandatory energy labelling was also extended to single phase air conditioners with greater than 7.5 kW cooling output.

The Ministry provides advice to industry participants and monitors compliance with the requirements of the program.

National coordination of appliance and equipment energy efficiency activities is achieved through the National Appliance and Equipment Energy Efficiency Committee (NAEEEC), which reports to the Ministerial Council on Energy's (MCE) Energy Efficiency and Greenhouse Working Group (EEWGG).

Program Impacts

A number of studies have been undertaken to measure the contribution of the labeling and MEPs programs. Most recently, in June 2003, the MCE released the NAEEEC Report: *When You Can Measure It, You Can Do Something About It – Projected Impacts 2000-2020*.

This report indicates that, relative to the no-labelling/MEPS and no-standby reduction activities case, the proposed activities are projected to:

- reduce greenhouse emissions by a cumulative total of 134 Mt CO₂-e over the period 2003-2018, with household focussed areas such as appliances and standby power contributing the greatest amounts of 24.5% and 23.9% respectively;

- reduce annual emissions by 13.3 Mt CO₂-e by 2015 and by 14.9 Mt CO₂-e by 2020;
- for the period 2003-18, result in a saving of \$28 for each tonne of CO₂-e saved (calculated using a 10% discount rate with consumer cost savings included); and
- have a benefit:cost ratio of 2.4 for the period 2003-18 (using a 10% discount rate).

Standby Power

In November 2002 the Ministerial Council on Energy released the NAEEEEC Report: *Money is Not all You're Saving - Australia's Standby Power Strategy Paper 2002-2012*.

This report was prepared, following release of a discussion paper in July 2002 and consultation with stakeholders, in response to a 2000 agreement to "pursue efficiencies in standby power consumption... through support for the International Energy Agency's One-Watt program". (In July 2001 in the USA, President Bush issued an Executive Order requiring all US Federal agencies to purchase products that use no more than one watt standby power where such products are available).

The Standby Power Strategy has as its key elements:

- working with other countries and world manufacturers to ensure prompt adoption of appropriate technology by suppliers to the Australian market;
- focussing on voluntary, industry based action such as Energy Star (now supported nationally by SEDA, which is also a member of NAEEEEC, for office and home entertainment equipment) and industry codes of conduct. Possible transition to mandatory action (labelling and/or MEPS) for specific products will be generally dependant on the performance of voluntary measures;

Industry Based Initiatives

Gas Product Energy Labelling And MEPS

The Australian Gas Association (AGA) has members from both the gas utility sector and gas appliance manufacturers and is responsible for gas appliance energy labelling and MEPS in Australia. The gas labelling program is currently voluntary.

Energy labels can be found on gas space heaters and gas water heaters (both storage and instantaneous). Gas energy labels are similar in format to those found on electrical appliances although they are blue in colour. It is understood that there has been some discussion with regard to the AGA handing over the operation of its voluntary scheme to Government to operate as a mandatory scheme, although no concrete proposals have yet been made.

Water Efficiency Labelling

The National Water Conservation Rating and Labelling Scheme (the 5A's Scheme) is administered by the Water Services Association of Australia (WSAA) on behalf of its members. WSAA membership is drawn from Australia's major urban water businesses that provide water services to more than 50,000 customers (ie. service connections), either directly as retailers or indirectly as wholesalers.

Household products currently covered by the voluntary scheme are:

- shower heads;
- dishwashers;
- clothes washing machines;
- taps and tap outlets; and
- toilet suites or matched cistern and pan sets.

The scheme is designed to assist communities not only to conserve Australia's potable water supply but also to protect the environment as well as reduce costs to consumers. For certain products, notably shower heads, dishwashers and clothes washers, there is a relationship between water efficiency and energy efficiency.

For example, one of the most cost effective means of reducing the demand for water is to install a water efficiency showerhead in the bathroom. It has been estimated that about 30% of the domestic water used indoors is consumed in the shower. It has also been estimated that the electricity used for heating this water accounts for almost 20% of all the electricity consumed in a typical household.

As such, the use of a water efficient showerhead not only saves water but also reduces energy consumption, which in turn significantly reduces greenhouse gas emissions.

Some water utilities, including Sydney Water, have recently introduced rebates for water efficient washing machines based on the WSAA labelling scheme. In the Sydney Water case, from 5 June to 31 July 2003 customers were eligible for a cash rebate of \$100 if they purchase a new 4A- or 5A-rated water-efficient washing machine.

Sydney Water has indicated washing machines consume around 16% of the water used in a typical household. By replacing a 1A-rated machine with a 4A-rated model, customers can save up to 120 litres of water on every load of washing.

The majority of 4A-and -5A rated washing machines are front-loading designs. However, several manufacturers have developed top-loading models that meet the requirements to achieve a 4A or 5A rating.

Overall, there have been concerns that the current voluntary scheme has been relatively ineffective. On 23 May 2003, the Environment Protection and Heritage Ministerial Council agreed to develop an implementation plan for a mandatory national water efficiency labelling scheme covering showerheads, washing machines, dishwashers and toilets. The operational and funding arrangements for this mandatory scheme have yet to be clarified.

The NSW Greenhouse Benchmark Scheme

From 1 January 2003, NSW electricity retailers and certain other parties are required to meet mandatory targets for abating the emission of greenhouse gases from electricity production and use.

These *benchmark participants* will have to reduce their emissions of greenhouse gases to the pre-set benchmark levels, or pay a penalty of \$10.50 per tonne of emissions above their targets.

Benchmark participants can off-set their excess emissions by surrendering abatement certificates bought from low-emission electricity generators and other persons accredited as certificate providers.

The NSW Government has set a state-wide benchmark of reducing greenhouse gas emissions to 7.27 tonnes of carbon dioxide equivalent (tCO₂-e) per capita by 2007, which is 5 per cent below the baseline year of 1989-90. To ensure continual progress towards this end target, progressively tighter targets have also been set year-on-year leading to the final 2007 level.

The 7.27 tCO₂-e benchmark level will then be maintained until at least 2012.

The benchmark participants will have to reduce the average emissions of greenhouse gases from electricity they supply or use. To do this, they will purchase and surrender abatement certificates to the Scheme Regulator, which is the Independent Pricing and Regulatory Tribunal (IPART).

The activities which allow persons to create abatement certificates include:

- reduction in the greenhouse intensity of electricity generation;
- activities that result in reduced consumption of electricity; and
- the capture of carbon from the atmosphere in forests, referred to as carbon sequestration.

The scheme allows for the creation of abatement certificates by those parties undertaking eligible abatement activities. Purchasing and surrendering NSW Greenhouse Abatement Certificates (NGACs) to the Scheme Administrator is the main way greenhouse benchmark participants will reduce their average emissions to the benchmark level.

IPART will administer the new scheme and will be responsible for:

- monitoring retailers' and other benchmark participants' compliance with their benchmarks;
- imposing penalties if required; and
- performing the functions of the Scheme Administrator, such as accrediting abatement certificate creators, verifying abatement activity, and maintaining a registry of certificates and accredited abatement certificate providers.

Incentives for Reduced Energy Consumption in Residential Buildings

As noted above, one of the activities that can lead to the creation of NGACs is reduced electricity consumption, and it is anticipated that opportunities in the industrial, commercial and residential sectors will be taken up.

In the design of the Scheme, efforts have been made to minimise transaction costs and allow smaller abatement programs to be cost-effectively applied. For activities involving residential energy use these include:

- allowing the use of default lifetime abatement factors for appliances (compact fluorescent lights, low flow showerheads, efficient electrical appliances; and
- allowing a third party (such as an electricity retailer or another) to be assigned the rights to create NGACs by the electricity consumer and thereby aggregate the abatement from many such small projects. In return, it would be anticipated that the retailers and others will be offering a range of incentives (cash-back offers, discount prices etc) to residential consumers to install energy efficient appliances.

Accordingly, by providing financial incentives for electricity retailers to comply with the abatement targets on the one hand, and for consumers to use electricity more efficiently on the other, the Scheme provides a clear driver to reduce residential electricity consumption.

Further information on the NSW Greenhouse Benchmarks Scheme can be found at the website www.greenhousegas.nsw.gov.au.

In addition to the Benchmarks Scheme, and supporting its thrust, the NSW Government-owned electricity retailers have agreed to (and implemented arrangements to) display information on consumers bills which indicates the level of greenhouse gas emissions which have arisen as a result of that consumer's use of electricity.

By raising awareness, and also by providing information either directly or through the Sustainable Energy Development Authority, electricity consumption should be reduced below what it would otherwise have been.

Attachments

The following documents are provided on the attached disc for the Committee's reference:

- NSW Statement of System Opportunities
- Country Energy – Electricity System Development Review 2003
- EnergyAustralia – Annual Electricity System Development Review May 2003
- Integral Energy – Network 2013, Annual Planning Statement 2003
- TransGrid – Annual Planning Statement 2002