



LEGISLATIVE ASSEMBLY

Standing Committee on Public Works  
INQUIRY INTO ENERGY CONSUMPTION IN  
RESIDENTIAL BUILDINGS

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## Chair's Foreword

The Committee's interest in the issue of energy consumption in residential buildings is twofold and relates directly to the Committee's core functions. That is, to ensure that capital works programs are appropriately and responsibly directed as well as minimising the negative environmental impacts of these programs.

The NSW Government is undertaking a suite of measures to address energy consumption in residential buildings. This report serves to highlight those measures and community and industry opinions. The Committee has made recommendations about further measures that can complement and enhance the Government's energy management program.

It is estimated that a capital works expenditure of more than \$8 billion is required to meet NSW energy needs in the coming decade. Per capita energy consumption is increasing and environmental problems, in particular, greenhouse gas emissions, will rise unless actions are taken. Technology and efficiency improvements in energy infrastructure and products must be facilitated, and consumers encouraged to change energy consumption behaviour.

The Government has various roles that impact on energy consumption in residential buildings. These include the Government's role to: guide planning and building activities; determine appropriate energy infrastructure provision; and support new industries and technologies. Other factors impacting on energy use relate to changing house design, lifestyle and appliance use by consumers.

This report makes recommendations with regards to both new and existing residential housing stock. It is recognised that the energy consumption issues must be tackled on both fronts. Critical strain on energy infrastructure is being brought on by new development areas. However, the total impact is shared across the existing 2.3 million existing homes, so responses from both sectors are required.

While the Committee has recommended more action in certain areas, it is also aware that a balance must be struck between influencing change to improve energy management and energy efficient behaviour without imposing unnecessary restrictions on individual choice and amenity or industry activity.

I believe that the Committee's recommendations can assist the Government to improve its overall energy management policy and I look forward to the Government's response to the report.

Kevin Greene MP  
Chairman

# Executive Summary

NSW faces an electricity infrastructure investment of more than \$8 billion in the next 10 years to keep up with its energy needs. It is expected that energy consumption will increase as the population and economy grows, but per capita energy consumption is also rising in NSW. It appears that irrespective of technology and efficiency improvements in energy infrastructure and products, individuals are using more energy on average in their homes.

The capital works investment in electricity is substantial and the rising average energy consumption per household a concern. The Legislative Assembly Standing Committee on Public Works agreed that management of energy issues relating to residential consumers requires attention.

While the Committee's primary focus is on the increased energy consumption effect on capital works expenditure, environmental impacts of energy production is an associated concern. The response to electricity demand must be sustainable. Management of electricity use, either through energy conservation, or through the substitution of fossil fuel energy by renewable energy, is essential to reduce greenhouse gas emissions.

The Government's response to increased energy consumption cannot be the augmentation of current electricity infrastructure alone. The cost of new energy infrastructure will be passed on to consumers and the community at large. It is imperative that complementary systems are explored which are energy efficient, environmentally sustainable, and capable of curbing individual demand.

The Committee believes that a successful strategy to manage residential energy consumption must amalgamate the following elements: energy sources, planning regulations, building standards and design, product design and consumer education.

The key drivers of increased energy consumption that were identified in the inquiry are:

- population growth (which impacts on total consumption);
- poor design of residential areas and individual homes which exacerbates heat problems and increases reliance on air conditioning;
- increased uptake of energy appliances in households to improve amenity;
- energy use patterns of appliances, in particular "standby power" features of appliances; and
- relative affordability of conventional energy compared with renewable energy.

The Committee has considered the various programs and reforms currently being pursued by Government and industry to influence the energy consumption. The Committee believes that stronger measures in the residential sector are needed to impose behavioural change and abate rising consumption.

The Committees focus is on two main fronts :

- improving the “front end” influence over energy efficiency in new homes; and
- creating stronger financial incentives for consumers in existing homes to improve energy efficiency.

## New Homes (Recommendations 1 - 11)

Around 40,000 new residences are built in NSW each year. Of the approximately 2.3 million homes, this new building represents only 2 per cent of total housing stock. However, new stock must deliver better outcomes and the Government and councils can impact on the energy efficiency elements in residential developments, multi unit dwellings and individual homes.

By using planning and building regulations, the Government and councils can make significant improvements to the initial energy efficiency of new homes. New energy technologies and products can be applied to developments and in individual residences, which can further improve energy efficiency. Scope for establishment of renewable energy systems is most viable in new residential areas.

Various submissions received by the Committee outline ways to improve the planning system to deliver energy efficiency in new homes. A key issue was improving planning controls to accommodate the adoption of new types of energy generation (*Recommendation 1*) and to consciously package new or greenfield developments which encourage Councils and developers to implement integrated energy efficiency of private and public spaces (*Recommendation 2*).

Fundamental to the effectiveness of planning controls is balancing the benefits of consistent rules across the state with the flexibility to respond to diversity in particular areas. The Committee heard arguments that current flexibility in the planning system, as it applies to energy efficiency standards, needs to be limited and a mandatory minimum standard should be introduced across the State that provides consistency to industry (*Recommendation 3*).

Further, the Committee believes that rewards could be built into the planning system to encourage Councils, developers and individuals to go beyond the minimum standard. The Committee recommends that incentives be integrated into the planning and approvals processes that reward ‘best practice’ energy efficient design (*Recommendation 4*).

The Committee examined various energy standards, energy regulations and energy rating tools available to assist governments to improve energy efficiency in homes. During the course of the Committee’s inquiry, the NSW Government announced the introduction of a new tool called BASIX, unique to NSW, which will measure energy efficiency in homes along with measuring other sustainability factors such as water usage, local ecology and waste management.

The BASIX program will set higher energy efficiency standards than currently applied in NSW or in other States. It applies at the development application stage of new residences. It is also a more integrated standard cross-referencing other environmental concerns that surround residential development.

Whilst key industry groups expressed to the Committee their support for BASIX, industry also raised concerns about the implementation phase and integration of BASIX with other jurisdictions' requirements under the Building Code of Australia. The Committee believes that these concerns can be addressed through a monitoring and evaluation program of the BASIX program (*Recommendation 5*).

A further proposal brought to the Committee's attention was a system applying in the Australian Capital Territory (ACT), which links energy standards to the sale of homes. In the ACT, new homes are required to meet certain energy standards. The ACT scheme requires that vendors notify and display at point of sale the energy standard of their new homes. The scheme also requires existing homes to have an assessment of their energy standard for disclosure at point of sale.

Submissions to the Committee argued that an equivalent scheme in NSW would provide many benefits. The key value of the scheme is that disclosure at point of sale that informs the buyer of energy efficiency performance of the home, allows energy efficiency to become purchase consideration. This is seen as a far more effective way to raise the issue with homeowners than relying on general public awareness campaigns. The Committee recommends that a similar disclosure scheme be considered for new homes in NSW, which could be derived from the information generated through the soon to be introduced BASIX program (*Recommendation 6*).

The Committee also examined how building design, materials, appliances and the surrounding environment impact on energy consumption in homes. The Committee heard that local councils could play a greater role in influencing energy efficiency by improving surrounding amenity through: imposing more effective landscaping controls on residences and adjacent council land to suppress suburban "heat traps", supporting community programs to reduce greenhouse gas pollution; and maintaining adequate balance between solar access and external spaces (*Recommendation 7*).

In terms of specific products, the Committee also looked at hot water and air conditioning systems, which are usually installed at construction of new homes. These products are key energy users in the home. Hot water systems account for around 30 per cent of total energy used in the home. Air conditioners represent the key source of peak energy demand that is driving the need to provide new energy infrastructure.

The Committee feels that strong signals need to be sent to the community about these products' impact on energy consumption. Solar hot water technology is an affordable and viable substitute that can significantly reduce energy consumption in homes. The Committee recommends that mandatory measures be set that will lead to solar hot water systems becoming the first preference in all residential buildings (*Recommendation 8*).

For air conditioners, the Committee envisages a two pronged approach to address their impact on energy consumption and greenhouse gas emissions. Planning provisions should raise the bar for air conditioners installed in multi unit residences (*Recommendation 9*) and air conditioner purchase should be linked to the purchase of green power, which provides compensating low greenhouse gas emissions (*Recommendation 10*).

During the course of the inquiry, the Committee heard about many new technical options at a generation, transmission, distribution and household level that can improve energy efficiency for residential homes, and ultimately lessen the demand for traditional energy provision. Some of these options include renewable energy, such as solar and cogeneration, and new metering and load splitting systems.

The Committee was made aware of various initiatives and reforms aimed to enhance the development of these technical options. The Committee feels that more effort and attention needs to be given by the government and energy providers to these solutions immediately to address the pressing demands for new energy infrastructure (*Recommendation 11*).

## **Existing Homes (Recommendations 12 - 15)**

While the Government has more immediate influence on new home development, the impact of small changes over the vast majority of existing homes should not be overlooked. Changing consumer behaviour through education, and increasing consumer's choice of energy efficient products are particularly important in reaching the 2.3 million established homes that are not designed to be energy efficient.

Therefore a final issue for the Committee was consideration of mechanisms to influence the energy use behaviour of consumers in existing homes. Overall submissions to the Committee argued that the lack of consumer awareness was the key stumbling block to changing behaviour. While there are various awareness campaigns supported by State, Federal and industry, the translation from those campaigns to changed behaviour was not seen as substantial. Energy efficiency is not a priority for many consumers. Energy bills represent only a small portion of total household spending.

The Committee is of the opinion that general consumer information is necessary and recommends that current programs for consumer education be supported (*Recommendation 12*). However, in preference to expansion of general consumer education, money might be better targeted at the provision of "point of purchase" product information. In particular submissions advocated for expansion of mandatory energy labelling of products and for penalties levied against energy inefficient products and/or incentives for better performing products. The Committee recommends the Government explore more options for influencing product purchases in homes (*Recommendation 13*).

Extending the "point of purchase" information concept, the Committee also recommends that disclosure of an existing home's energy efficiency information at time of sale be considered (*Recommendation 14*) as a subsequent proposal to the trial of a disclosure scheme on new homes (*Recommendation 6*).

A final area considered by the Committee was the application of retrofitting programs run collaboratively by the government and energy providers. These programs are focused on low income or disadvantaged groups to assist them to improve the energy efficiency of their homes and lower their energy expenses.

The Committee heard about successful pilot programs being run in particular areas where low income homes are energy audited and provided with discounted retrofitted products. The Committee has recommended that an expansion of these programs should be undertaken by

the Government to improve penetration of energy efficiency in areas that would not have other means to make changes (*Recommendation 15*).

In this inquiry the Committee has taken a strategic approach to energy consumption issues. The recommendations in this report reflect this broad perspective rather than providing prescriptive or overly technical responses. The inquiry has revealed the community and industry views on where improvements can be made to current policy approaches. The area of energy consumption and its ramifications is a pressing concern and a variety of responses are required which this report highlights.



# List of Recommendations

## NEW HOMES AND RENOVATIONS

### Planning Systems

**RECOMMENDATION 1:** The Committee recommends that the NSW planning framework should improve its systems to:

- Better canvass future energy demand and utility provision in residential areas;
- Encourage possible substitution to renewable energies, and
- Allow for the co-generation and local generation sources within developments.

**RECOMMENDATION 2:** The Committee recommends that planning of greenfield releases be scaled to ensure that the potential energy efficiency benefits of master planning (such as local generation and balance of private and community solar access) are not compromised by commercial division of small lot sizes.

**RECOMMENDATION 3:** The Committee recommends that energy efficiency standards established in NSW for residential housing should have a mandatory uniform minimum benchmark.

**RECOMMENDATION 4:** The Committee recommends that the NSW Government and local government should look at providing incentives in the development approvals process such as fast tracking or development approval processing discounts for “best practice” energy efficient residential designs.

### Energy Standards and Energy rating tools

**RECOMMENDATION 5:** The Committee recommends a monitoring and evaluation system be an integral part of the implementation of BASIX.

**RECOMMENDATION 6:** The Committee recommends that point of sale requirement for disclosure of energy standards on residential buildings be developed in NSW.

### Building Design

**RECOMMENDATION 7:** The Committee recommends the following design issues be considered by councils in their planning systems:

- Introducing more effective landscape codes and vegetation management plans in council DCPs;
- Supporting community programs that enable residents to take action on greenhouse pollution at a neighbourhood level;
- Improving the consistency of regulations in regard to the quantum of solar access to external living space; and
- Adopting best practice vegetation management in its activities such as planting of road verges.

**RECOMMENDATION 8:** The Committee recommends that Government consider setting mandatory measures which will lead to solar hot water heaters being chosen as the first preference for all residential buildings.

**RECOMMENDATION 9:** The Committee recommends that Government consider setting a mandatory minimum energy performance for air conditioning systems for multi unit residences.

**RECOMMENDATION 10:** The Committee recommends that Government consider linking air conditioning purchase to green power purchase.

### **Technical solutions and renewable energy**

**RECOMMENDATION 11:** The Committee recommends that the Government:

- a) Focus on moving viable technologies such as new metering and load splitting from pilot to implementation stage;
- b) Consider specific technical mechanisms to address peak air conditioning related demand such as:
  - Pricing controls to influence behaviour such as separate metering and high tariffs for air conditioners; and
  - Mechanical controls that simply shut down or cycle air conditioners in peak demand periods.
- c) Foster renewable energy uptake in particular through:
  - Greater support for applied renewable energies such as increasing Commonwealth and State renewable energy targets; and
  - Greater support for “infant” renewable energy industries.
- d) Encourage local generation through:
  - mandatory consideration of cogeneration in planning approvals for large developments;
  - providing incentives for neighbourhoods to become net generators of electricity and to sell back to the grid;
  - improved incentives for installation of PV technology for developers and residents to address current high up front costs; and
  - enabling the issue of abatement certificates to residential building developers who reduce greenhouse gas emissions.

## **EXISTING HOMES**

### **Consumer education and product information**

**RECOMMENDATION 12:** The Committee recommends the continuation of the current consumer education programs initiated by the State and Federal Governments to improve consumer awareness of energy efficiency issues.

**RECOMMENDATION 13:** The Committee recommends that the following options for products, in particular appliances and lighting, be examined:

- a) Appliances
  - Mandatory energy labelling for standby appliances
  - Require refrigerators to have adequate ventilation at occupation

- Consider inclusion of ventilation for refrigerators in Building Codes
  - Require star rating and annual energy consumption information in all advertising and catalogues
  - Mandatory clothes drying area for apartments.
- b) Lighting
- Consider mandatory use of hard wired ie separately ballasted lighting in functional spaces including garage, outdoor, wc, bathroom, laundry
  - Encourage the development of more fittings to accommodate compact fluoro lamps.
  - Rebates for purchase of efficient lighting
  - Mandatory requirements for movement controls in common area and carparking.

**RECOMMENDATION 14:** The Committee recommends that the Government consider extension of the point of sale energy rating disclosure to existing housing stock as a subsequent proposal to a point of sale disclosure scheme for new homes (Recommendation 6)

### Retrofitting Programs

**RECOMMENDATION 15:** The Committee recommends that the Government:

- promote the expansion of retrofitting programs for low income residents to assist in generating greater change in the consumption demand from existing stock.
- examine subsidising energy saving products and appliances in the retrofitting programs.



# Chapter One - Introduction

## BACKGROUND

### **NSW Legislative Assembly Standing Committee on Public Works**

- 1.1 The NSW Standing Committee on Public Works consists of seven members of the Legislative Assembly and was established with its current terms of reference in 1995. The Committee's primary role is to inquire and report from time to time on:

existing and proposed capital works projects or matters relating to capital works projects in the public sector, including the environmental impact of such works, and whether alternative management practices offer lower incremental costs, as are referred to it by the Minister for Public Works and Services, any Minister or by resolution of the Legislative Assembly, or by motion of the Committee.<sup>1</sup>

Broadly, the Committee may:

...inquire into the capital works plans of State-owned corporations and joint ventures with the private sector. The Committee will seek to find savings in capital works programs whilst achieving a net reduction in environmental impacts by public sector developers.

The Committee's work is expected to provide incentives to the public sector to produce more robust cost-benefit analyses within the government budgetary process and to give more emphasis to least-cost planning approaches.

The Committee will be sufficiently resourced to enable it to conduct parallel inquiries into specific projects and capital works programs generally... it will have sufficient resources to inquire into the capital works program of all government agencies whose capital works programs affect the coastal, environmental and transport sectors.<sup>2</sup>

- 1.2 The Committee's current functions also include those absorbed from the Standing Committee on the Environmental Impact of Capital Works, which was established in the 50<sup>th</sup> Parliament (1991-1994).

### **Terms of reference and rationale for inquiry**

- 1.3 The catalyst for the inquiry is the projected NSW capital works expenditure associated with growing energy consumption.
- 1.4 The NSW Ministry for Energy and Utilities in its 2002 "Statement of System Opportunities" indicated that new electricity generation infrastructure would be needed to meet energy demand in NSW. It is estimated that in the next 10 years, more than \$8 billion of total capacity of new plant will be required to meet NSW demands.<sup>3</sup>
- 1.5 It is also projected that under current industry structures much of the new plant will be provided from traditional coal fired power stations, which have considerably higher levels of greenhouse gas emissions than other forms of energy production.
- 1.6 The increased NSW demand for energy is driven by a number of factors, including:

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<sup>1</sup> Hon Paul Whelan, Minister for Police and Leader of the Government in the Legislative Assembly, expanded on the role envisaged for the Committee by the Parliament in a speech to the House on 25 May 1995.

<sup>2</sup>Ibid.

<sup>3</sup> Statement of Systems Opportunities, June 2002, NSW Ministry of Energy and Utilities, p1

- increased number of total consumers (domestic, commercial and industrial);
  - a shift from winter to summer peaking demand, predominantly due to increased levels of air conditioning use; and
  - increased residential energy consumption per capita in NSW.
- 1.7 The correlation between increased energy demand and increased numbers of consumers is not unexpected. However, increasing consumption rates per person and per household does raise concerns about the sustainability, efficiency, and long term management of energy infrastructure.
- 1.8 From both an economic and environmental perspective, the Committee agreed that management of energy issues relating to residential consumers merited attention, and was consistent with the Committee's role. The Committee endorsed the following terms of reference for this inquiry:

### **Terms of Reference Energy Consumption in Residential Buildings**

The Committee is to inquire into and report on energy consumption in residential buildings in New South Wales, in particular:

To examine:

1. Changes in annual energy consumption patterns of electricity, gas and solar;
2. Implications for capital works programs of energy providers of any increases or projected increases in energy consumption;
3. Factors contributing to any increase in energy use (such as, take up of appliances, such as air conditioners, current design practices, growth in size of houses, and subdivision design);
4. The application of current government and industry policies and initiatives (such as, the operation of rating tools, energy efficient appliances).

And, to consider:

1. Strategies to address increasing energy consumption and to improve the sustainability of residential buildings, such as
  - improving design, construction or operational practices for residential housing;
  - development of targets or other quantifiable outcomes for residential housing;
  - product research;
  - new technologies;
  - retrofitting;
  - consumer awareness and education;
  - any other strategies
2. Implementation of such strategies;
3. Any other related matter.

## What are the issues?

### Increased residential energy consumption and infrastructure implications

- 1.9 NSW faces an electricity infrastructure investment of more than \$8 billion in the next 10 years to keep up with the energy needs of NSW. It is expected that the State's energy consumption will increase as the population and the economy grows, however, per capita energy consumption is also rising. It appears that irrespective of technology and efficiency improvements in energy infrastructure and products, individuals are using more energy on average in their homes.
- 1.10 A variety of factors, noted in Chapter 2, are believed to drive increased residential consumption. These include:
- population growth (which impacts on aggregate consumption);
  - poor design of residential areas and individual homes which exacerbates heat problems and increases reliance on air conditioning;
  - increased uptake of energy appliances in households to improve amenity;
  - energy use patterns of appliances, in particular "standby power" features of appliances; and
  - relative affordability of electricity compared with other energy.

- 1.11 In evidence, Mr Brazzale, Executive Director of the Australian Business Council of Sustainable Energy, told the Committee:

**Mr BRAZZALE (BCSE):** ...When we look at recent data that ABARE has published, it becomes really important that we do rein in the growth in energy consumption. ABARE projections for the residential energy sector are that consumption will grow by 21 per cent by 2010 and it will be 50 per cent higher than today's level by 2020. So we are looking at a 50 per cent increase in residential energy consumption over the next 20 years or so. This is a real significant problem...

...There are other issues that we also need to take account of that will also put significant pressure on our electricity infrastructure. I am sure you will be made aware that electricity distribution and transmission businesses in New South Wales are expected to spend over \$5 billion in the next five years to meet our growing peak power needs.<sup>4</sup>

- 1.12 The Committee is aware that there are many current initiatives and programs targeting energy efficiency (key government programs are summarised in Chapter 2). However, the effectiveness of such programs is not clear:

In an effort to reduce residential energy consumption Federal and State based programs have in recent years significantly targeted the improvement of building fabric and appliance efficiency, with allied education campaigns and some economic incentives. And indeed building fabric and appliance standards have improved over this period. However, rather than showing significant reductions in energy consumption due to these increased efficiencies, consumption levels (and associated greenhouse gas emissions) have instead increased and are forecast to continue in this direction.<sup>5</sup>

<sup>4</sup> Transcript of Evidence, 31 October 2003, p19

<sup>5</sup> Submission No. 9, SOLARCH, University of NSW, p1

- 1.13 The Committee is also aware of ongoing reviews into energy policies at various state and federal levels<sup>6</sup>. The Committee does not attempt to duplicate consideration of pricing issues in this report. The projected infrastructure requirements for NSW do not appear to be significantly influenced by proposed reforms in these reviews.
- 1.14 The State Government's response to increased energy consumption cannot be the augmentation of current electricity infrastructure alone. The cost of new energy infrastructure will be passed on to consumers and the community at large. It is imperative that complementary systems are explored which are energy efficient, environmentally sustainable, and capable of curbing individual demand.

### **Associated greenhouse gas issues and renewable energy options**

- 1.15 While the Committee's primary focus is on the increased energy consumption effect on capital works expenditure, the environmental impact is also an associated concern. In its submission to this inquiry, the Western Sydney Regional Organisation of Councils (WSROC) noted:

Growing energy demand has significant environmental as well as economic implications. An increasing body of evidence suggests that greenhouse gas emissions are contributing to global warming and climate change. Long-term changes to regional climate systems include changing rainfall patterns and more frequent extreme weather events. These changes will have significant economic and environmental implications in terms of patterns of residential energy use and consumption, and therefore on the networks of energy supply.<sup>7</sup>

- 1.16 Mr Brazzale of the Building Council of Sustainable Energies told the Committee that it was necessary to markedly reduce greenhouse emissions:

**Mr BRAZZALE (BCSE):** ... It is not sufficient to stabilise them. We need to substantially reduce them over the coming decades. Unfortunately the problem gets worse when we consider electricity consumption. So electricity is a key part of the total energy consumed by the residential sector. Electricity is expected to increase by 23 per cent by 2010 and will be 57 per cent higher by 2020. What that means is the electricity share of energy is increasing significantly. And because electricity has a greater greenhouse intensity, because most of our power comes from coal, as a result greenhouse emissions will increase even further.<sup>8</sup>

- 1.17 The current responses to electricity demand must be sustainable. Reduction in electricity use, either through energy conservation, or through the substitution of fossil fuel electricity by renewable energy, is essential to reduce greenhouse gases.
- 1.18 Development of renewable energy industries has economic as well as environmental benefits. Various economic studies have shown that given particular incentives, energy efficiency measures have the potential to improve productivity, stimulate innovation, reduce greenhouse gas emissions, contribute to GDP, and provide financial savings for energy consumers.<sup>9</sup>

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<sup>6</sup> See Section 4 of this chapter for discussion

<sup>7</sup> Submission No. 3, Western Sydney Regional Organisation of Councils, p10

<sup>8</sup> Transcript of Evidence, Mr Brazzale, Executive Director of the Australian Business Council of Sustainable Energy, 31 October 2003, p19

<sup>9</sup> Sustainable Energy Jobs Report, by The Allen Consulting Group, prepared for the Sustainable Energy Development Authority NSW, January 2003

- 1.19 A key issue for this inquiry is to examine the incentives and disincentives for uptake of renewable energy options by consumers.

## Sustainable urban growth and urban design

- 1.20 NSW has approximately 2.3 million homes. Around 40,000 new dwellings are built each year across the state, and over 500,000 new homes will be required to house people over the next 20 years.<sup>10</sup>
- 1.21 Particular areas of NSW are experiencing significant population growth and acute energy consumption issues. More than 1,000 people locate to Sydney each week. Western Sydney is one of Australia's fastest developing areas and over half of Sydney's growth is occurring in this district.<sup>11</sup> The growth in Western Sydney is being shaped by a combination of urban consolidation policies and greenfield developments reflecting lifestyle and demographic changes.
- 1.22 Single and couple occupancy rates are increasing as family occupancy falls. In the last two decades, household size has fallen from 2.9 persons to 2.6 persons and ABS forecasts suggest an average household size of 2.3 persons by 2021.<sup>12</sup> At the same time that household occupancy shrinks, the average size of homes is increasing. Since 1940, the average metropolitan dwelling size has grown from 100sq.m to 150sq.m. The average freestanding house built in outer suburbs is today over 270sq.m.<sup>13</sup>
- 1.23 Design characteristics of suburbs and individual homes can have a dramatic effect on energy use. Housing density and town planning influence household lifestyle. High density or apartment living often has automatic reliance on air conditioning, which in turn can impact on energy consumption levels. Low density dwellings tend to be larger and open plan which generates higher energy use through demand for air conditioning. It appears that both consolidated high rise developments and greenfield low rise developments can generate environments where energy consumption is increased.
- 1.24 The density of housing determines the energy supply network characteristics to the sector. Through planning and building regulations, governments can influence the surrounds and layouts of new suburbs to improve energy efficiency. For example, subdivision layout, paving and landscaping can impact significantly on the ambient temperature generated in new suburbs. Controls on high density developments can also be applied to improve energy efficiency.
- 1.25 For new homes, local government can specify design features, including energy efficiency of dwellings, via its development approval powers. Energy rating tools and threshold measures are applied to new home approvals to influence energy efficiency capability.
- 1.26 Building regulations, building materials, appliances and consumer behaviour all influence ultimate energy use and must be examined holistically:

<sup>10</sup> Planning NSW, Managing Sydney's Urban Growth Sydney 2002

<sup>11</sup> Submission No. 31, Integral Energy, p5

<sup>12</sup> Australia Bureau of Statistics, Australian Social Trends, Household and Family Projections – 3236.0

<sup>13</sup> Submission No. 19, Building Designers Association, p3

**Mr FOGARTY (SEDA):** ...I guess in a perfect world energy efficiency is somewhat like a three legged stool, in that each household would optimise through appropriate design and orientation of a home, appropriate selection of products and appliances for the home and appropriate behaviour of the occupants. It is very much about what this Committee has heard, the design and the implementation, the orientation of the home, very much about the selection, if you like, of the consumables in the home and appropriate behaviour and the products.<sup>14</sup>

- 1.27 For existing homes, appliances, behaviour and pricing have the greatest influence on energy use. Changing consumer behaviour through education, and increasing consumer's choice of energy efficient products are particularly important in reaching the 2.3 million established homes that are not designed to be energy efficient. While the Government has more immediate influence on new dwelling development, the impact of small changes over the vast majority of existing dwellings should not be overlooked.
- 1.28 The Committee believes that a successful strategy to curb residential energy consumption must amalgamate the following elements: energy options, planning regulations, the building code and design, product design, and consumer education.

## Inquiry process and report structure

- 1.29 The inquiry into "Energy Consumption in Residential Buildings" was instigated by the Committee in June 2003.
- 1.30 The Committee advertised for public submissions in August 2003. The Committee received thirty-seven submissions, conducted three public hearings, and took evidence from 21 witnesses. Submissions covered a variety of interests including government agencies, councils, individuals, academics, peak bodies and industry practitioners (See Appendix 1 for a list of submissions).
- 1.31 Public hearings with key interest groups, industry, and government were held on 25 August 2003, 31 October 2003 and 12 November 2003 (see Appendix 2 for a list of witnesses).
- 1.32 Committee members also visited two key sites on 14 August 2003 to examine energy efficient buildings:
  - Newbury Estate, Kellyville, hosted by Landcom and Mirvac; and
  - Newington Estate, Homebush, hosted by Mirvac.
- 1.33 Mr Chris Johnson, the NSW Government Architect, and Ms Caroline Pittcock, from the Royal Australian Institute of Architects, accompanied the Committee on these inspections.
- 1.34 The Committee received information on various mechanisms and strategies to curb and manage residential energy consumption. Two key perspectives are apparent:
  - management of energy efficiency in new homes; and
  - management of energy efficiency in established homes.

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<sup>14</sup> Transcript of Evidence, Mr Fogarty, Executive Director, NSW Sustainable Energy Development Authority (SEDA), 12 November 2003, p16

- 1.35 The report is structured according to these perspectives. Chapter 2 sets out relevant details of the energy industry, government policies and residential energy consumption activity in NSW. The key drivers of demand noted in submissions are summarised. An outline of concurrent reviews in the energy sector is also included.
- 1.36 Chapter 3 looks at energy efficiency issues in the development of new residences and makes recommendations.
- 1.37 Chapter 4 examines energy efficiency influences and options for existing residences and makes recommendations.



# Chapter Two - NSW Residential Energy Consumption

## SECTION 1 - ENERGY CONSUMPTION CHARACTERISTICS

### **Increased consumption**

- 2.1 NSW is the largest energy consuming state in Australia accounting for 28 per cent of final energy consumption at 921 petajoules in 2000-2001. Energy consumption draws from all forms of energy sources, including electricity, gas, wood, solar and other renewable sources. NSW energy demand is set to continue increasing in line with the national average of 2.3 per cent to 2019-20, according to ABARE figures released in 2001<sup>15</sup>.
- 2.2 Residential energy consumption makes up 13 per cent of final energy consumed in NSW, or 124 petajoules in 2000-2001. The largest energy consuming sectors are industrial (42 per cent) and transport (39 per cent). The commercial sector accounts for around 6 per cent. In the last decade, however, the NSW residential sector's energy consumption has risen almost 20 per cent across the main forms of energy in particular:<sup>16</sup>
- electricity consumption has increased by 22 per cent with electricity now providing 58 per cent of the fuel base for energy;
  - natural gas consumption has increased by 62 per cent with gas share now providing 11 per cent of the fuel base for energy; and
  - solar consumption has increased by 61 per cent but from a very low share of fuel base of 0.65 per cent in 1991-92 to 0.88 per cent in 2001-02.
- 2.3 Although residential energy consumption is expected to increase as population and housing grow in NSW, the average energy consumption per capita and per household has also increased over the last decade:

Growth in customer electricity demand is not only reflecting in the number of new customers connecting to the network, but also in the increase in demand that existing customers place on the network.<sup>17</sup>

**TABLE 1 Average NSW Electricity Consumption<sup>18</sup>**

Year		1980	1990	1998	1999
<b>Residential</b>	KWh/customer	6384	6983	6823	7399
<b>Other*</b>	KWh/customer	80010	109295	98344	86538
<b>Per capita</b>	KWh/person	5390	7540	8818	8916

\*Includes commercial, industrial, traction (transport) and public lighting

<sup>15</sup> ABARE Energy Projections to 2019-20, eReport 03.10 June 2003. Note that "final" energy consumption figures exclude energy used in the energy production process, energy exports and conversion and distribution losses.

<sup>16</sup> Submission No. 28, Ministry of Energy and Utilities

<sup>17</sup> Submission No. 31, Integral Energy, p7

<sup>18</sup> Submission No. 28, Ministry of Energy and Utilities

Table 2, provided by the Ministry of Energy and Utilities in its submission, summarises the key factors of residential energy consumption and population in NSW:<sup>19</sup>

**TABLE 2**

<b>NSW Residential Consumption and Population Figures</b>			
<b>1991-92 – 2001-02</b>			
	<b>1991-92</b>	<b>2001-02</b>	<b>% change</b>
<b>FUELS CONSUMED (PJ)</b>			
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
<b>ENERGY CONSUMPTION</b>	<b>102.49</b>	<b>122.78</b>	<b>19.8</b>
<b>SUMMARY</b>			
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

#### 2.4 In summary:

- Currently NSW residential consumers are using more energy per capita (up 7.6 per cent) and per household (up 2.4 per cent), than a decade ago.
- The majority of that energy is sourced from electricity produced using non-renewable sources.
- Consumption by the residential energy sector will grow by 15 per cent by 2010, and will be 40 per cent higher than today's level by 2020. In effect, NSW is facing more than a 40 per cent increase in residential energy consumption over the next 20 years or so.<sup>20</sup>

#### Peaking demand<sup>21</sup>

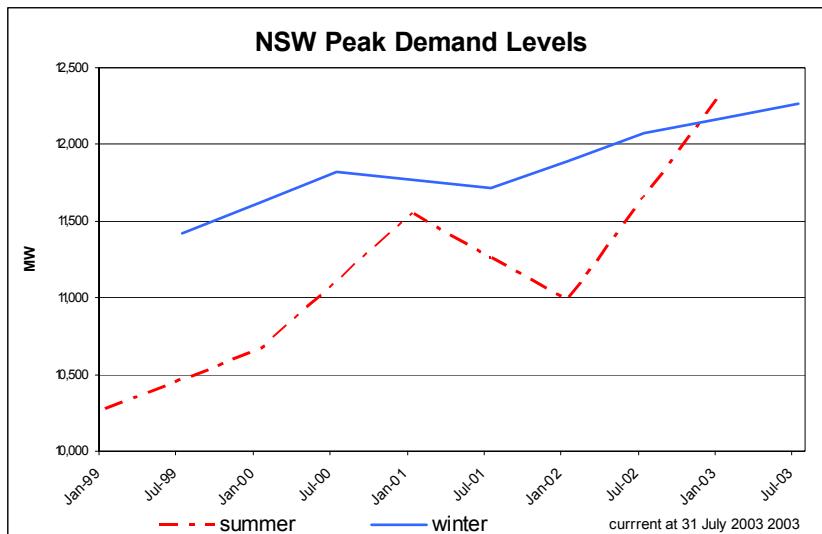
#### 2.5 The increased consumption of electricity is not uniform but peaks and troughs over time. While total electricity use is growing 3.5 per cent per annum in NSW, peak demand is growing at 3.8 per cent per annum.

<sup>19</sup> Submission No. 28, Ministry of Energy and Utilities, p4

<sup>20</sup> ABARE projects estimate NSW residential consumption will increase by 53pj from 124pj in 2000-01 to 177pj by 2019-20.

<sup>21</sup> Information drawn from "Inquiry into the Role of Demand Management and other Options for the Provision of Energy Services" IPART, October 2002, pp3-5

- 2.6 The NSW Ministry of Energy and Utilities submission outlines the demand peak profile in the table below:<sup>22</sup>

**TABLE 3**

- 2.7 Historically, winter has been the period of greatest demand. However, summer has now taken over as the peak demand period in NSW. Summer demand for power is expected to rise by 8 per cent during the next decade, while the maximum winter demand is expected to rise by 6 per cent over the same period (see Table 3).
- 2.8 Peaks in demand also occur in weekly and daily cycles. For example, the evening peak in residential activity associated with cooking, cooling and other household activity is generally around 6pm. Extreme peaks often correlate to extremely hot weather conditions where higher energy is demanded for cooling, and at the same time, heat diminishes the transmission capacity of the electricity infrastructure. Summer peak period is generally from 2pm to 4pm.
- 2.9 On 30 January 2003, peak demand in NSW reached 12,331 MW, compared to 12,074 MW on 18 June 2002. In winter 2003, peak demand reached 12,261 MW on 28 July 2003. The Ministry highlights three factors that are influencing the increase in summer peak demand:
- increasing average temperatures;
  - the demographic centre of Sydney moving into hotter areas; and
  - the increased affordability and uptake of air conditioning systems.

### Infrastructure implications

- 2.10 The infrastructure investment requirements, predicted by the Ministry of Energy and Utilities, are based around meeting peak periods of demand rather than the increased total demand. The total quantity of energy delivered by a network has little impact on network costs or capital requirements. However, because of the technical limitations of electricity generation, transmission and storage systems, additional network capacity must be created to meet peak demands.

<sup>22</sup> Submission 28, NSW Ministry for Energy and Utilities, p5

- 2.11 This network capacity need is because electricity infrastructure functions such that the bottom 30 per cent of capacity is used 100 per cent of the time, whilst the top 10 per cent of capacity is used only 1 per cent of the time to meet spikes of peak demand.
- 2.12 The total scheduled generation capacity in NSW is 12,217 MW or 12,303 MW in summer as detailed in Table 4. (*Note that this summer capacity exceeds that required on 30 January 2003, when peak demand in NSW reached 12,331MW.*)

**TABLE 4 Existing Scheduled Generation in NSW<sup>23</sup>**

<b>Generator</b>	<b>Unit</b>	<b>Capacity</b>
Macquarie Generation	Liddell	2000 MW
	Bayswater	2640 MW
Delta Electricity	Wallerawang	1000 MW
	Mt Piper	1320 MW
	Munmorah	600 MW
	Vales Point	1320 MW (1100 MW in summer)
Eraring Energy	Eraring	2640 MW (may be restricted in summer)
Redbank	Redbank	150 MW
<b>Total Coal</b>		<b>11,670 MW (11,450 MW in summer)</b>
	Hunter Valley	51 MW (44 MW in summer)
	Smithfield	176 MW (166 MW in summer)
<b>Total Oil and Gas</b>		<b>227MW (210 in summer)</b>
	Bendeela	80 MW
	Blowering	80 MW
	Kangaroo Valley	160 MW
	Hume	(50 MW in summer)
<b>Total Hydro</b>		<b>320 MW (370 MW in summer)</b>
<b>TOTAL*</b>		<b>12,217 MW (12,030 MW)</b>

\*It should be noted that the actual capacity of scheduled generators in NSW may be lower than their rated capacities shown in Table 4.

- 2.13 NSW has interregional (import and export) energy capacity to supplement this total generation capacity. In simulation exercises undertaken by the Ministry for Energy and Utilities, the transfer capacities between Queensland to NSW have been assumed to be 1000MW and from the Snowy 2700MW (summer) but subject to much variation depending on other demands on interstate capacity.
- 2.14 Currently a total of just over 600 MW of 12,217 MW (5 per cent of total generation power) is sourced from renewable energy sources in NSW. This includes hydro

<sup>23</sup> Information drawn from NSW Statement of System Opportunities, revised June 2002, p45

electricity (320 MW as noted in Table 4) plus other sources such as landfill gas, wind and solar.

- 2.15 Studies undertaken by the Ministry for Energy and Utilities indicate that the total capacity of new plant between 1500 MW and 3000 MW may be needed over the next 10 years to meet the energy demand growth. The approximate optimised total cost of meeting this demand (subject to scenario variations) is between \$8.1 and \$8.7 billion. This includes the operating cost of all plant (new and existing) and the amortised fixed costs of new capacity. It does not include labour.
- 2.16 Under the most likely scenario, 200 to 300 MW of additional capacity may be needed every year in NSW, starting from July 2005, for a total of 1500 MW over the 10 year timeframe.
- 2.17 The NSW “Statement of Opportunities” by the Ministry for Energy and Utilities highlights that current demand management from the supply side (i.e. infrastructure and technology improvements to manage demand) could contribute around 150 MW to counter growth demand.
- 2.18 In addition, since 1999, 63 MW of new renewable generation plant has been installed. The NSW Sustainable Energy Development Authority (SEDA)<sup>24</sup> estimates that further possible renewable generation projects which may come on-line could generate an additional 190 MW. At a broader level, SEDA has projected that 5400 MW of potential capacity could be produced through various options. However, these projects are long term and involve some technologies which are not currently commercially viable without financial support. Some of the options considered commercially viable (that is, relative to the average cost of electricity) were highlighted and summarised in the 2002 IPART Demand Management report.<sup>25</sup> A description of alternative technologies is set out in paragraph 2.72.

### **Greenhouse gas emissions and alternative energy sources**

- 2.19 A key factor in traditional forms of energy production and use is the emission of greenhouse gases (GG), principally, carbon dioxide (CO<sub>2</sub>). The links to and implications of climate change, or “global warming”, as a consequence of greenhouse gases are still subject to debate. However, it is generally accepted that the concentration of emissions in the atmosphere is increasing and that this has negative impacts on air quality.
- 2.20 In its submission, SEDA states that in NSW there are 2.3 million dwellings responsible for 20 million tonnes per annum of greenhouse gas emissions, or 30 per cent of the NSW total. Actual energy consumption correlated to an all electric home produces between 7 to 10 tonnes of CO<sub>2</sub>, and electric and gas homes are estimated to produce between 5 to 6 tonnes per annum. These are average figures, and SEDA suggests that some homes produce 2 or 3 times this amount of emissions.<sup>26</sup>

<sup>24</sup> For a description of SEDA see paragraph 2.143

<sup>25</sup> Also see Appendix 3 for Summary of SEDA “Distributed Energy Solutions” Paper as provided in the IPART Demand Management Report 2002, p20

<sup>26</sup> Submission No. 36, SEDA, p9

- 2.21 The Australian Greenhouse Office estimates the contribution of greenhouse gases from within the home to be:<sup>27</sup>
- 28% Water Heating
  - 19% Other appliances
  - 17% Refrigeration
  - 14% Heating and Cooling
  - 9% Lighting
  - 7% Standby power
  - 6% Cooking
- 2.22 The fuel source for hot water greatly influences the total emissions because electric storage hot water systems represent 4 to 5 tonnes of CO<sub>2</sub> per year whereas gas storage is about 1.5 tonnes.<sup>28</sup> In addition, greenhouse gases are created in the construction and furnishing of homes.
- 2.23 The substitution of renewable energy forms (described in paragraph 2.72) can enable increased energy demand to be met without substantially adding to greenhouse gas emissions.<sup>29</sup> At present, these energy forms are not substantially developed in Australia as an accessible option for residential consumers. For example, the current takeup by residential consumers in NSW of the “Green Power” alternative energy initiative is only 14,000 out of approximately 2.5 million households, or less than 1 per cent.<sup>30</sup>
- 2.24 Energy efficient home design - which reduces energy consumption and energy costs for the consumer, and lessens the demand for traditional carbon producing energy generation - can also serve to reduce greenhouse gas emissions. Similarly, energy efficient appliances can induce a reduction in emissions.

## Demand management and policy responses

- 2.25 “Demand management” is a phrase used to describe measures applied to respond to demand for energy within the capacity constraints of the energy infrastructure.
- 2.26 SEDA proposes that such capacity constraints can be addressed in four main ways:
- Changes in customer behaviour
  - Changes in equipment by customers
  - Installation of small scale generation at local level and
  - Augmentation and enhancement of distribution infrastructure.

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<sup>27</sup> Australian Greenhouse Office, Your Home Technical Manual, Chapter 4 Energy Use Introduction, [www.greenhouse.gov.au](http://www.greenhouse.gov.au). Note these figures are for 1999 and may not reflect the recent increase share of emissions for Heating and Cooling caused by increased air conditioning uptake

<sup>28</sup> Submission No. 36, SEDA, p9

<sup>29</sup> The renewable and non GG energy forms do not necessarily produce zero emissions. Energy conversion processes from renewable sources can involve some emissions.

<sup>30</sup> Submission No. 36, SEDA, p15

- 2.27 The first three options are generally referred to as “demand management” measures which can be taken on the customer side of the sector. The last option looks at supply related measures.
- 2.28 The NSW Independent Pricing and Regulatory Tribunal (IPART), in its 2002 report on demand management, further describes demand management “in terms of three attributes: who does it, with what effect and for what purpose”. The Tribunal uses “demand management” to cover actions:
- Taken by generators, networks, retailers, other energy service intermediaries and end users, either separately or in partnership;
  - To alter the level or pattern of consumption of energy, source of energy or use of the distribution network;
  - In response to the costs of the supply or energy or environmental preferences or policies.<sup>31</sup>
- 2.29 The IPART 2002 Demand Management report makes demand management recommendations across three broad categories: environmentally driven, network driven and retail market driven. (Appendix 4 contains the IPART report’s ‘Executive Summary and Recommendations’.) The IPART report involved a broad investigation of demand management options, such as reforms to the national electricity market and pricing structures in the energy industry, and development of alternative energy forms and technologies. The report examined demand management as a market of activities and focused on examining current “market barriers” which serve as impediments to the development of a “commercially viable demand management industry”.
- 2.30 The IPART report touched briefly on residential housing design issues and made a recommendation concerning consumer education, product labelling and energy rating schemes for homes<sup>32</sup>. The Committee’s inquiry builds on this recommendation and fleshes out the surrounding issues pertaining to Government planning of residential areas and support for energy efficiency initiatives at the consumer end point.
- 2.31 In February 2004, IPART released its draft determination on *Treatment of Demand Management in the Regulatory Framework for Electricity Distribution Pricing 2004/05 to 2008/09*<sup>33</sup>. The determination focuses on changes to pricing regulations to encourage distribution businesses to undertake costs –effective demand management. The key features of the Tribunal’s draft decision, which is out for public comment, are that:
- Distribution businesses will be allowed to pass through to customers demand management costs incurred during the regulatory period, up to a maximum value of the network cost savings
  - Distribution businesses will be allowed to recover revenue foregone as a result of undertaking demand management projects during the regulatory period
  - The recovery of demand management costs and foregone revenue will be by way of an explicit ‘D-factor’ in the weighted average price cap formula.

<sup>31</sup> IPART Report p3

<sup>32</sup> IPART Report see in Chapter 4 and Recommendation 4 , p29

<sup>33</sup> IPART, Treatment of Demand Management in the Regulatory Framework for Electricity Distribution Pricing 2004/05 to 2008/09, 19 February 2004

- 2.32 The Committee notes the outcomes of the IPART review process into demand management. The Committee's report is designed to complement this work by examining policy areas that are not necessarily a part of the IPART "demand management industry's" mechanisms, such as urban planning activities which impact on energy consumption.
- 2.33 The Committee's perspective is that policy responses to the issue of energy consumption in residential housing can be categorised as:
- Market and regulatory controls (such as pricing policies, planning policies, greenhouse gas abatement certificates and mandatory renewable energy targets (MRET) see discussion in Section 4 of this chapter);
  - Technical innovation (mechanisms to improve generation, conversion transmission, and peak load efficiency along with new generation technologies and products); and
  - Behaviour modification (consumer education programs and other voluntary initiatives).
- 2.34 While there is some overlap across these categories, the Committee has looked at the issues with these broad perspectives in mind.

## **SECTION 2 - DRIVERS OF RESIDENTIAL DEMAND**

- 2.35 Part of the inquiry's terms of reference is to ascertain what drivers are creating the current trends in energy consumption. Submissions to the inquiry have suggested a range of factors contributing to increased residential energy use.
- 2.36 In Chapter 1, three key factors were highlighted that drive overall increases in energy use in the state:
- increased number of total consumers and economic activity in domestic, transport, industrial and commercial areas;
  - a shift from winter to summer peaking demand, predominantly due to increased levels of air conditioning use in residential and commercial sectors; and
  - increased residential energy consumption per capita in NSW.
- 2.37 As noted previously, a total (or aggregate) increase in consumption is expected with population and economic growth. Of greater concern is the increased average or per capita consumption. As Energy Australia notes in its submission:

Average consumption per household has grown an average of 1.3% p.a. over the past decade. This growth has occurred:

- despite the tendency to smaller households (in terms of occupants per dwelling, due to demographics and the tendency toward medium-density housing);
- despite the recent rapid growth in new, potentially more energy efficient dwellings;
- despite the ongoing life cycle replacement of appliances and alternative energy sources; and

- in an environment of declining real electricity prices.<sup>34</sup>
- 2.38 Several interrelated factors are believed to drive increased consumption within the residential sector. These include:
- population growth (which impacts on aggregate consumption);
  - poor design of residential areas and individual homes, which exacerbates heat problems and increases reliance on air conditioning;
  - increased uptake of energy appliances in households to improve amenity;
  - energy use patterns of appliances, in particular “standby power” features of appliances; and
  - relative affordability of electricity compared with other energy.
- 2.39 Various comments from hearings and submissions on these and other drivers are highlighted below.

## **Population growth**

- 2.40 In its submission, the Western Sydney Regional Organisation of Council (WSROC) stated that the primary driver of energy demand is regional population growth combined with changing lifestyles. The Western Sydney region is one of the fastest growing areas in Australia, with a current population of nearly 1.7 million people projected to grow to 2.2 million by 2019. This increase of about 500,000 people (or 220,000 – 250,000 households) will be exacerbated by the trend in shrinking household occupancy.
- 2.41 The actual number of dwellings is expected to grow, in percentage terms, even faster than the population increase. More than 200,000 additional dwellings will be required by 2019. An increase in population and dwellings carries with it the requirement for a corresponding expansion of infrastructure.

With over 70 per cent of the domestic demand for energy in Western Sydney being met by electricity and an aging electricity asset base, the implications for electricity demand from the projected increase in population and dwelling numbers are significant.<sup>35</sup>

## **Poor residential planning, design and construction**

- 2.42 Various submissions note that government and council planning processes fail to encourage energy efficiency in residential areas:

Current subdivision design reflects the lack of consideration for achieving climate responsive residential developments. Subdivision layouts lack appropriate consideration for climate, topography and context. Orientation of lots should ensure all dwellings can receive adequate sunlight, cooling breezes, ventilation, and shading. Lot sizes and street layout should allow for adequate landscaping<sup>36</sup>.

- 2.43 Exacerbating these planning issues are factors relating to housing size and design:

...In greenfield developments along the urban fringe, the trend is toward larger houses on smaller blocks of land. Many house designs exhibit characteristics such as large

<sup>34</sup> Submission No. 23, p9

<sup>35</sup> Submission No. 3, WSROC, p11

<sup>36</sup> Submission No. 22, NSW Chief Architect, p3

atriums, rooms, and open plan living. Such designs lend themselves to heating and cooling problems, even with the installation of insulation. ... Heating and cooling of large internal spaces is more energy intensive than a dwelling where parts of the building can be closed off.

A significant proportion of houses on the market are designed with no eaves. The presence of eaves contributes to shading and therefore cooling effectiveness in hot weather. Choice of building material also affects heating and cooling of residential dwellings. For example, use of denser building materials, appropriate insulation or double glazed windows. Poor building techniques and the ‘Home Village’ market encourages cost-cutting and the use of cheaper materials, limiting the effect any energy efficient measures that may be applied. For example, while many new homes in Western Sydney have a 3.5 star rating, poor design, incorrect orientation, and lack of curtains encourages the use of air conditioners<sup>37</sup>.

...The majority of new residential buildings are designed with inadequate passive solar heating and cooling capacities such as the simple shading to direct solar heat gain in summer. The result is indoor air temperatures that regularly exceed human comfort levels. In response to these situations most home occupiers are forced to rely on mechanical air conditioning to maintain a comfortable living environment. In addition many older residential buildings lack cross ventilation, preventing the ability of occupants to effectively cool internal temperature by opening windows<sup>38</sup>.

- 2.44 In addition, submissions argue that construction methods and materials are not being used appropriately:

Glazing area as a proportion of floor area has increased dramatically, and the amount of that glass exposed to inappropriate sun has also increased. This can be seen in the trend to eliminate eaves without adding compensating pergolas or other shading devices.

Floor plans are more open plan than ever before, which denies the occupant any opportunity to ‘zone off’ parts of the house which are too hot or cold. It also means that any heating or cooling must be applied to the whole house.

Construction systems are almost universally brick veneer with little or no insulation. The Australian Greenhouse Office estimates that 70 per cent of Australian homes have no insulation. Tiled roofs are almost universally black or dark gray in colour, which acts as a house-wide heat sink.<sup>39</sup>

## Lifestyle and appliances

- 2.45 Along with housing design, contemporary lifestyle and appliances are seen to impact on energy consumption dramatically.
- 2.46 The penetration of various appliances in households has increased substantially. For example Energy Australia notes that the proportion of homes with home computers, air conditioning and clothes dryers have grown 32 per cent, 21 per cent and 12 per cent respectively over the past decade.<sup>40</sup>

<sup>37</sup> Submission No. 3, WSROC, p12

<sup>38</sup> Submission No. 22, NSW Chief Architect, p3

<sup>39</sup> Submission No. 19, Building Designers Association, p3

<sup>40</sup> Submission No. 23, Energy Australia, p9

- 2.47 Hot water heating is the largest single component of household energy demand and is responsible for between 25 and 40 per cent of energy use. Trends in hot water use remain relatively constant.<sup>41</sup>
- 2.48 Submissions identified air conditioning as the most significant factor contributing to demand peaks. A secondary issue contributing to increased per capita use is the “standby power mode” of many new appliances.

## Air conditioning

- 2.49 Many submissions argued that the uptake of mechanical air conditioning was the key factor contributing increased energy demand and in particular the increase peaked demand. According to SEDA, the air conditioning market has grown at approximately 40 per cent per annum since 1999.
- 2.50 Integral Energy notes that:
- The growth in peak demand is mainly driven by air conditioners, creating a huge strain on the network during summer months. Ten years ago, about 25 per cent of households had air conditioning compared to 50 per cent today. This figure is expected to grow.<sup>42</sup>
- 2.51 Air conditioning demand is driven by amenity needs and, while it is linked to climate variations, inappropriate design standards for residential buildings, pricing and affordability of air conditioning systems are also increasing demand:
- Another example of inadequate implementation of a comprehensive approach is the current concern over the increase in residential air-conditioning. The blame for this trend has been placed on poor design and construction of new homes. I believe that is wrong. The Energy Smart Homes policy required a significant improvement in building thermal performance. The reason that most new homes are installing air conditioners is that their price has dropped considerably and they have been aggressively marketed. Consumer expectations have changed. They now want air conditioned comfort – 22 degrees all year round. Without the improved thermal performance of the building the AC units would be bigger and use more energy.<sup>43</sup>
- 2.52 House design is linked to the use of air conditioners because the increased size of new homes means that air conditioning units have to work much longer and use more energy:

The tendency of occupants to run these appliances during periods of vacancy (while at work, etc) is common, usually justified by comments such “it keeps the house cool for when we get home”.

The new so-called ‘smart control systems’ which allow appliances to be controlled via the internet or mobile phones are often quoted as being the solution to this problem, but do not deal with the root cause.

The root cause of this is poor design and construction of typical houses built during the entire post WWII period, but accentuated in the 80s and later by increases in house size and glazing.<sup>44</sup>

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<sup>41</sup> Your Home, Australian Greenhouse Office, Section 4

<sup>42</sup> Submission No. 31, Integral Energy, p5

<sup>43</sup> Submission No. 35, Mr Hockings, Sustainable Building Consultant, p3

<sup>44</sup> Submission No. 19, Building Designers Association, p4

## Standby power

- 2.53 Standby power is the power used by electrical products while they are waiting to be fully turned on. For example, televisions, computers, smoke detectors, phone rechargers and clock display appliances all use standby power. Small amounts of continuous power are drawn by these appliances. Standby power usage is significant, with the Australian Greenhouse Office estimating that it accounts for 10 per cent of household electricity usage, equivalent to \$500 million and 5mt of CO<sub>2</sub>.<sup>45</sup>
- 2.54 Standby power is a modern feature of most appliances. While the energy efficiency of new appliances may have improved when performing their active function, the standby power mode may add to the total energy needs of that appliance. In this sense some new appliances may be actually less energy efficient than their predecessors.
- 2.55 Standby power is a growing concern with the penetration of common standby appliances such as computers, entertainment systems, security systems and mobile phone rechargers.

## Energy pricing

- 2.56 Australia has one of the cheapest residential electricity prices in the developed world, less than most European and Asian countries, and the United States (see Appendix 5). Many submissions noted that current retail pricing regimes fail to give consumers correct price signals to discourage residential energy consumption.
- 2.57 Firstly, it is argued that electricity and gas prices are too cheap because they do not include the full economic costs of energy production. These costs are termed externalities. The primary externality in the traditional production and use of electricity and gas is the environmental costs of the generated greenhouse gases. Factoring these costs into current electricity pricing is frequently referred to as the application of “carbon taxes”.

Australian residential electricity prices are amongst the lowest in the OECD. These prices do not reflect the real cost of using this form of greenhouse intensive energy. Pricing needs to reflect the true costs of greenhouse pollution balanced with the need to provide energy services for lighting, heating and cooking.<sup>46</sup>

- 2.58 A second issue raised in submissions, is that the current flat tariff or price structure and the absence of “interval” metering is masking the true variations in costs of electricity prices. Various submissions suggested introducing a differentiated domestic energy pricing strategy to provide a disincentive for electricity demand above average needs.
- 2.59 A third issue is the end user indifference or lack of response to energy prices generally. SEDA submission’s to the inquiry argues that energy is not a significant issue for most consumers because:

Domestic fuel and power costs average some 2 per cent of weekly household expenditure. This is a low base from which to attract consumer attention, but also from which to transform that attention into an informed purchase or behavioural decision<sup>47</sup>.

<sup>45</sup> Submission No. 28, Ministry for Energy and Utilities, p12

<sup>46</sup> Submission No. 17, Australia Conservation Foundation, p6

<sup>47</sup> Submission No. 36, SEDA, p16

2.60 Overall, SSROC see four factors that affect households response to energy prices:<sup>48</sup>

- *poor price signals* (e.g. for households, the marginal price of electricity on peak days costs the same as any off-peak periods);
- *unincorporated externalities* (e.g. at present greenhouse gas benefits have no tangible meaning for most households);
- *high information and transaction costs* (e.g. it takes a lot of time for the householder to learn about a new technology, determine its applicability to their situation, choose the most suitable supplier, secure an installation contractor, seek planning permission etc); and
- *non-economic consumer behaviour* (e.g. the vast bulk of households do not spend time optimising most spending decisions and may be assumed to apply discount rates to future benefits of up to 30 per cent per annum).

2.61 Pricing of energy is regulated within national and state frameworks (see Chapter 2, Section 4 for discussion of regulations and Government roles). In NSW, the Independent Pricing and Regulation Tribunal (IPART) has an ongoing role in setting retail prices for electricity and gas, issuing and auditing licences for utility operators in NSW, and examining options for improving industry efficiency and effectiveness.

2.62 The Committee notes that IPART has made various recommendations relating to retail pricing mechanisms and demand management. This includes the Tribunal's recommendations in its 2002 report on Demand Management (see Appendix 4) and its recent draft determination on Regulatory Treatment of Demand Management released in February 2004 (see Para 2.31)

2.63 IPART is also undertaking an ongoing review of retail energy pricing structures in particular the "IPART Review of Gas and Electricity Regulated Retail Tariffs". This report is seeking information about general retail pricing policies and is due to report in May 2004.

## **SECTION 3 - OVERVIEW OF ENERGY INDUSTRY IN NSW**

2.64 The NSW energy industry has changed substantially in the last decade.<sup>49</sup> In 1995, the Council of Australian Governments agreed to the introduction of competition policy that included reforms to energy industries. As a result, the following structure has evolved.

### **Conventional energy**

#### **Coal fired electricity**

2.65 More than 90 per cent of Australia's energy currently comes from coal fired power stations. In NSW publicly owned energy infrastructure is split into monopoly and competitive areas of business – the transmission network is maintained as a monopoly (Transgrid), while generation, distribution and retail are competitive. Transmission and distribution sectors are regulated to allow third party access by other energy suppliers. Those sectors retained by Government were corporatised, that is, obliged to be a

<sup>48</sup> Submission No.15, South Sydney Regional Organisation of Councils, p1

<sup>49</sup> This Overview section is paraphrased from Submission 13 from the Public Interest Advocacy Centre (PIAC) and from information from the SEDA web-site: [www.seda.nsw.gov.au](http://www.seda.nsw.gov.au)

successful business as well as having social, environmental and regional development responsibilities. Retail competition for small residential users was introduced on 1 January 2002. However, community service obligations, that is, assistance to low-income households to pay electricity bills, is funded by NSW Government and are made explicit within the retail competition regime.

- 2.66 NSW now has four publicly owned electricity distributors/retailers in NSW. These are Energy Australia, Integral Energy, Australian Inland and Country Energy.

## Gas

- 2.67 Gas is the main energy source in NSW after electricity, but the third source of energy in residential consumption after electricity and wood. Natural gas produces only about one third of the greenhouse emissions compared to conventional electricity and is generally less expensive. However, gas is also a non-renewable fuel and has large scale infrastructure requirements.
- 2.68 At present, there are four standard suppliers serving approximately 800,000 customers:
- AGL Retail Energy, serving tariff customers from the AGL Gas Network in NSW
  - ActewAGL Retail, serving tariff customers in Queanbeyan, Yarralumla and the Shoalhaven from the gas distribution network owned by ActewAGL Distribution
  - Country Energy, serving tariff customers in Wagga Wagga and surrounding areas from the gas distribution network owned by Country Energy Gas Pty Ltd
  - Origin Energy, serving tariff customers in Albury and surrounding areas from the gas network owned by Albury Gas Company.
- 2.69 Since 1 January 2002, tariff customers have been able to choose their gas retailer and negotiate alternative supply arrangements (including price). They are, however, able to remain on or return to regulated tariffs and charges applicable to their respective standard supplier.
- 2.70 AGL Retail Energy (AGLRE) supplies around 96 per cent of the tariff gas market in NSW. It serves more than 750,000 domestic, commercial and small industrial customers.
- 2.71 No gas is produced in NSW. Most of the gas used in the state is produced in the Cooper/Eromanga basin in South Australia. Gas is also supplied from Victoria. All transmission pipelines in NSW are privately owned and operated. Most of the pipeline is owned and operated by the Australian Pipelines Trust and AGL. Other pipelines are owned by Duke Energy.

## Renewable energy and distributed generation

- 2.72 Renewable energy covers a broad range of resources and associated technologies. Renewable energy includes solar, wind, biomass, tidal, wave, hydropower, geothermal and renewable hydrogen.
- 2.73 Renewable energy is generally associated with low or zero greenhouse gas emissions. However, while providing this environmental benefit, some renewable energy can still be seen to be environmentally detrimental in other ways, such as visual or land

disturbance aspects often associated with certain wind farms or hydro-electric power. “Green energy” is the title sometimes given to the subset of renewable energy which is both greenhouse gas effective and relatively environmentally friendly.

- 2.74 The structure of the renewable energy sector varies depending on how it integrates into the physical energy infrastructure and the market. Depending on the type of energy, it may be a substitute for generators, or be integrated into the transmission or distribution systems. In some cases, such as solar hot water technology, the renewable energy source is “purchased” directly by the end user.
- 2.75 Distributed generation generally refers to electricity generation that is fed into the distribution network, rather than the high voltage transmission network. Distributed generation can range in size from as low as several kW (such as photovoltaic systems), to several MWs for renewable generators (eg wind turbines) up to several hundred of MW for large scale industrial projects (e.g. natural gas fired cogeneration).<sup>50</sup>
- 2.76 Renewable energy providers are predominantly competitive private sector initiatives. However, there are various government programs to facilitate, and in some cases, finance schemes to enhance renewable technologies. A key linkage between the renewable energy industry and traditional energy sources is created through renewable energy uptake or purchase requirements mandated by Commonwealth and State governments (see Chapter 2, Section 4 for further outline of the role of government agencies and energy policies).
- 2.77 Because of these obligations and long term financial interests, some traditional energy companies are researching, investing and have set up renewable energy enterprises. For example, the Crookwell Wind Farm was the first grid connected wind farm in Australia when installed by Pacific Power in 1998. It is now owned by Eraring Energy and the wind farm supplies electricity to Country Energy’s “Green Power” Customers.

### Hydro electricity

- 2.78 Hydro electricity is generated by harnessing the energy produced when a mass of water falls from height to a lower level. Commonly, water is held in a dam and allowed to flow through a turbine and generator to produce electricity. It is the height from which the water falls and the flow rate of the water that determines the amount of energy produced.
- 2.79 Hydro electricity in NSW contributes around 3 per cent of current generation capacity. The generation of hydro electricity does not produce any greenhouse gas emissions. Water is a renewable resource because it is constantly replenished through the process of the hydrological cycle.
- 2.80 SEDA recently commissioned a report detailing the potential for grid connected hydro electric power generation in NSW. Six hundred dams, water treatment plants, pipes and weirs were investigated. Of these sites, 57 were identified as having sufficient generation potential of greater than 1000 MW per year.

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<sup>50</sup> IPART Demand Management Report, p105

## Wood

- 2.81 Wood is the second largest source of fuel for residential energy consumption (21 per cent, after electricity 58 per cent and before gas at 16 per cent). However, unlike gas or electricity consumption, the consumption share for wood fuel is declining, a trend predicted to continue in the long term.
- 2.82 Wood can be a renewable energy source if it comes from sustainably managed forests. It should make no net contribution to greenhouse gases if trees are planted to replace those used. In many non-urban areas, wood is widely used for heating. Wood is generally not a desirable energy source for urban areas due to local air pollution problems. Some efficient low pollution stoves are available.
- 2.83 Wood fuel in the residential sector is generally purchased directly by the consumer. Capital and infrastructure requirements for wood fuel are very different from gas and electricity utility infrastructure. Fuel is usually sourced from local merchants and plantations. Investigation and expansion of wood fuels is being investigated along with other biomass products.

## Solar

- 2.84 Solar PV cells convert sunlight into electricity, which can be used in homes and commercial buildings just like electricity from the grid. PV systems convert the energy from sunlight into direct current (DC) electricity. An inverter then converts this direct current to alternating current (AC), to make it compatible with grid electricity. Solar power systems are oriented to the North and inclined in order to generate the maximum amount of electricity from the sun as possible.
- 2.85 More than 2,000 homes in NSW use solar power. These homes are preventing the emission of nearly 2,500 tonnes of greenhouse gas every year.
- 2.86 A 1.5kW solar power system has an area of about 11 square metres and generates around 1,800 kilowatt hours of electricity. Such a system typically costs around \$20,000. The current market for solar power in NSW is small and therefore the price compared to coal-fired electricity is high. The retail price of a small solar power system has reduced by one-third between 1998 and 2001.
- 2.87 Solar power has traditionally been used in remote areas where the grid is not available; such systems store electricity in batteries for use when the sun is not shining and are called stand-alone power systems. However, solar power is now appearing more in urban areas. Here, solar electricity is stored in the grid until needed. These are called grid-connected solar systems because the owner has the security of the grid available.
- 2.88 Solar power systems give off no noise or pollution, making them the ideal renewable energy source in urban areas. A range of technologies is available, and has been commercially proven over many years.
- 2.89 Solar hot water services do not use PV systems, but use direct sun to supplement hot water heating. Solar water heaters can be gas, electric or solid fuel boosted. Traditional electricity hot water heating accounts for between 25 to 50 per cent of energy use and around 30 per cent of greenhouse gas emission. The conversion to a

solar hot water system, either gas or electric boosted, can make a substantial improvement to energy efficiency in households.

## Wind

- 2.90 Wind turbines can generate significant amounts of electricity. Wind electrical power is generally proportional to the speed of the wind *cubed*. This means that if the wind speed doubles, the power generated is multiplied by *eight*.
- 2.91 Apart from the actual wind speed at a site, the length of the blades on the rotor also determine the amount of power produced. The longer the blade, the more wind it can harness.
- 2.92 Wind turbines that are capable of generating 1 MW of electrical energy are now relatively common. A turbine of this size could provide sufficient electricity to power approximately 300 NSW homes, and save over 2000 tonnes of greenhouse gas emissions per year.
- 2.93 NSW has currently 6 wind farms producing varying small capacities of MW. One farm is utilised for research, while the other farms are grid connected. It is estimated that, in the long term, wind energy could viably contribute around 1000 MW into the state electricity system. Currently 17 MW of wind power has been installed across NSW.

## Biomass and bio energy

- 2.94 The term "biomass" is used to describe any kind of organic matter located within the layer of living systems around the planet, commonly known as the "biosphere".
- 2.95 "Bioenergy" is the term used to describe the many varied ways of using biomass to create fuel for energy. Examples of bioenergy fuels include the leftovers of farming activities, methane gas from landfill, parts of sewerage effluent, and compressed waste from household garbage or other streams of fuel. Recent technologies developed in Australia and overseas include "gasification", where solid material is turned into gas and used in a gas engine or a turbine to generate electricity. Different collection methods and energy conversion are suitable in different industries and locations.
- 2.96 Bioenergy can be classified according to either fuel or the type of technology used to generate the electricity. In New South Wales, the fledgling bioenergy industry is broadly divided into groups investigating collection and energy from:

METHANE GAS	e.g. from landfills and sewage treatment plants
WET WASTES	e.g. abattoirs, feedlots and food processing dry agricultural by-products
MUNICIPAL MIXED WASTES	e.g. household garbage and prunings with recyclables removed
FORESTRY BY-PRODUCTS	e.g. remnant material from existing sawmills and managed forestry operation

- 2.97 In Australia, less than five per cent of energy is generated using biomass fuels. This is in the form of heat from firewood and bioenergy from bagasse (sugar cane waste) or

wood wastes. However, there are growing numbers of groups investigating bioenergy technology and finance.

2.98 SEDA has undertaken resource assessments into bioenergy potential from the major biomass fuel types. The assessments look at both technical feasibility, and the financial aspects. NSW already has energy generated from landfill gas (about 20MW), bagasse (sugar cane waste) and municipal wastes.

2.99 It is calculated that a total capacity of over 60 MW of bioenergy generation could be installed, powered by agricultural and wet wastes from 16 sites investigated across New South Wales. However, one large barrier to the agriculture industry taking up bioenergy opportunities is the shift from being an energy consumer to becoming an energy producer.

2.100 Three compelling arguments for investigating bioenergy opportunities are:

- every unit of energy sourced from biomass replaces one that would otherwise be derived from coal fired power (producing harmful greenhouse gas emissions)
- capturing waste methane prevents it from escaping to the atmosphere where it adds to the heat-trapping gases and the Greenhouse Effect
- the market in Australia is reaching the point where bioenergy can mean opportunities for extra income from waste, particularly in rural areas.

## Cogeneration

2.101 Cogeneration is a high-efficiency energy system that produces both electricity (or mechanical power) and valuable heat from a single fuel source. Sometimes known as "combined heat and power", or CHP. It offers major economic and environmental benefits because it turns otherwise wasted heat into a useful energy source. In essence, owners of cogeneration plants get two bites of one cherry - burning fuel not only generates power, it also provides heat for industrial processes. For example, office buildings can produce power for electricity and air conditioning from the waste heat generated by its air conditioning engines.

2.102 This greater efficiency means carbon dioxide emissions are cut by up to two thirds when compared with conventional coal-fired power stations. Local air quality benefits can also be achieved through the replacement of older coal-fired boilers. In addition to reducing operating costs, cogeneration also increases resource utilisation.

2.103 SEDA research indicates that the potential for small-scale, gas-fired cogeneration in NSW is well over 200 MW. There is also significant potential for cogeneration plants fired by other fuels, including biomass (for example, plant waste from sugar or cotton harvesting), or biogas (for example, methane produced by sewage works or piggeries). Some 200 MW of gas-fired cogeneration alone could reduce the State's energy bill by \$50 million per year and reduce greenhouse gas emissions by 800,000 tonnes per year.

## Technical responses and new technologies

- 2.104 There are two key areas of new technologies that can impact on energy supply and demand.
- 2.105 Distributors have various technical network options at the supply stage combined with price modification. *Load reduction* is a general decrease in the energy used in total and is primarily due to improved technical efficiency in systems and less demand through appliance, building and consumption reductions. *Peak lopping* cuts the peak supply for a specific time period and can be achieved through systems mechanisms interlinked with interruptable contracts. *Load switching* is a levelling out of peaks by shifting the demand to lower demand periods. This can be achieved through interruption and energy storage mechanisms and staggering peak demand systems through appliances (See Appendix 6)
- 2.106 Further technical options include dual metering systems whereby dual circuits are installed for essential and non-essential items. Differential energy pricing is attached to different circuits. Alternatively, a second suggestion is a sliding scale pricing which increases price for excess demand or in peak periods.
- 2.107 Distributors such as Integral have also examined various demand management pricing trials including load cycling. This is a trial air conditioning cycling program where customers were signed up to ongoing air conditioning control in exchange for a regular rebate.
- 2.108 Emerging technologies such as ceramic fuel cells, which convert chemical energy directly into electrical energy (without combustion), can provide an opportunity for low emission energy delivery systems.
- 2.109 Related technologies such as photovoltaic cells, solar thermal collectors, turbines, storage batteries and inverters and systems software can be integrated into traditional energy systems, in cogeneration systems or into renewable energy systems.
- 2.110 Some other on-site or local generation technologies include heat pumps, which tap into underground thermal heat to convert to electricity and micro-hydro, which are localised hydroelectric systems.

## SECTION 4 - GOVERNMENT AGENCIES AND POLICIES

### Commonwealth energy related agencies and programs

Commonwealth Department of Industry, Tourism and Resources

- 2.111 This department has responsibility for domestic and international energy policy, including climate change, renewable energy and energy efficiency. It also plays a significant role in energy market reform. The department's role includes oversight of the National Electricity Market (NEM) legislation, gas market regulation, and the Renewable Energy Action Agenda (with various programs to promote renewable energies).
- 2.112 In December 2003, the Ministerial Council on Energy announced a substantial package of energy market reforms. These include:

- Creation of Australia Energy Regulator on July 1 2004 which will look after gas transmission as well as electricity; and
- Establishment of Australian Energy Market Commission<sup>51</sup>.

2.113 The Australia Energy Market Commission will assume supervision of the current National Energy Market (NEM) and the National Energy Code Administration (NECA) will be abolished and replaced with the Australian Energy Market Regulator. The NEM is discussed below.

### National Energy Market (NEM)

2.114 Currently the NEM supplies electricity to 7.7 million Australian customers on an interconnected national grid that runs through Queensland, NSW, ACT, Victoria and South Australia. Approximately \$8 billion of energy is traded through the NEM per year.

2.115 In accordance with the National Competition Policy energy reform initiatives, the NEM was established in 1998 under the framework of the National Electricity Code. The National Electricity Market Management Company (NEMMCO)<sup>52</sup> was also established to operate a wholesale electricity market for trading electricity between generators and electricity retailers in the NEM. This means that all the electricity output from the generators is pooled, and then scheduled to meet energy demand.

2.116 The pool system reflects the characteristics of electricity generation and use. Firstly, electricity cannot be stored for future use, so supply must always be responsive to variations in demand. Secondly, it is not possible to distinguish which generator produced the electricity consumed by a particular customer.

2.117 NEMMCO operates a centrally coordinated despatch process which balances electricity supply and demand. Generators bid to supply energy to meet schedules set by NEMMCO to meet customer demand. NEMMCO's role is focused specifically on the efficiency and reliability of power supply. As such, it has no power or authority under the Code to direct the industry based on considerations of sustainability and balance in resource management. It does not set policy on energy sustainability.

2.118 The pricing activities of NEMMCO are overseen by the Australian Competition and Consumer Commission (ACCC) and the overall compliance with the code is overseen by the National Electricity Code Administration Limited (NECA) whose membership includes all participating jurisdictions in the NEM.

2.119 The impact of these national reforms on energy pricing to residential consumers is yet to be seen.

### The Office of the Renewable Energy Regulator

2.120 The Office of the Renewable Energy Regulator (ORER), is a statutory authority established to oversee the implementation of the Government's Mandatory Renewable Energy Target (MRET). The main responsibilities of ORER include:

<sup>51</sup> Ministerial Council on Energy Report to COAG on Reform of Energy Markets – 11 December 2003

<sup>52</sup> The summary is paraphrased from the NEMMCO web site [www.nemmco.com.au](http://www.nemmco.com.au) “An Introduction to Australia’s National Electricity Market”. Further details about the workings of the national market are available through this site.

- accrediting renewable energy generators to allow them to participate in the scheme;
- overseeing the creation of valid renewable energy certificates;
- assessing annual compliance statements;
- imposing any penalties for non-compliance with the provisions of the legislation;
- redeeming any renewable energy shortfall charges if shortfalls are made up within three years; and
- ensure the integrity of the measure, undertaking audits of participants including renewable energy generators and liable parties.

2.121 The Mandatory Renewable Energy Target (MRET), establishes a set of annual targets from 2001 and 2020 for the consumption of electricity produced from certain eligible technologies. The MERT scheme is implemented through the issuing of certificates for the electricity generated from eligible entities (the purchasers of electricity at certain points in the market – usually wholesale) to surrender a specified number of certificates for electricity they acquire during the year.

2.122 The certificates are traded in the “renewable energy certificate” (REC) market. If a liable entity does not have enough certificates to surrender, the entity will have to pay a penalty known as the “renewable energy shortfall”, which in June 2003 was set at \$40per MWh.<sup>53</sup>

2.123 The MRET scheme requires the generation of 9500 GWh of extra renewable energy by 2010. Interim targets are set to ensure the progress to the final target.

2.124 A review of the MRET in was recently conducted which recommended continuation of the current scheduled target levels.<sup>54</sup>

### The Australian Greenhouse Office (AGO)<sup>55</sup>

2.125 The Australian Greenhouse Office was established within the Commonwealth environment portfolio to coordinate a whole of government approach to greenhouse gas matters. The AGO has a variety of roles, including boosting renewable energy, investing in greenhouse research, and managing the Greenhouse Gas Abatement program.

2.126 The Greenhouse Gas Abatement Program (GGAP), is a major Commonwealth Government initiative to assist Australia in meeting its Kyoto Protocol target. The objective of GGAP is to reduce Australia's net greenhouse gas emissions by supporting activities that are likely to result in substantial emission reductions or substantial sink enhancement, particularly in the first commitment period under the Kyoto Protocol (2008-2012). \$400 million has been allocated to the Program.

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<sup>53</sup> ABARE Report 03.12, Mandatory Renewable Energy Target, June 2003

<sup>54</sup> Mandatory Renewable Energy Target (MRET) Review Panel, *Renewable Opportunities, A Review of the Operation of the Renewable Energy (Electricity) Act 2000*, Australian Government Review of MRET, Report released 16 January 2004 [www.mretreview.gov.au/](http://www.mretreview.gov.au/)

<sup>55</sup> Information from AGO website [www.greenhouse.gov.au](http://www.greenhouse.gov.au)

2.127 Renewable Remote Power Generation Program, run by the AGO, provides financial support to increase the use of renewable energy generation in remote parts of Australia that currently rely on diesel for electricity generation.

2.128 The Renewable Energy (Electricity) Act 2000 created a target of 9,500 gigawatt hours (GWh) of renewable energy generation per year by 2010. This measure created a national trading scheme in renewable energy certificates, a commodity that adds value to electricity generated from most biomass sources. This scheme increases the financial viability of renewable energy projects, including bio-energy projects.

2.129 Key roles in relation to residential housing are public education and programs surrounding energy efficiency/greenhouse gas reduction. The primary consumer and residential building program is “Your Home”, set up jointly by the AGO, the Building Designers Association and the former NSW Department of Urban Affairs and Planning. The program, which includes a web site and guidance publications, gives advice on planning and construction of an energy efficient home.

2.130 Some direct subsidies are provided to the residential industry by AGO. This includes the Photovoltaic Rebate Program (PVRB), which offers rebates between \$2,500 to \$4,000 to householders/builders/developers with new or upgrades to solar PV systems.

2.131 AGO also offers consumers a rebate on the installation of hot water systems. This rebate comes in the form of a Renewable Energy Certificate (REC) issued by the Office of Renewable Energy Regulator which the consumer can then on-sell to their hot water retailer (for a point of sale discount) or they can on sell their certificate to a certificate agent. Individuals must apply to claim their REC. The average value of a REC is up to \$1000.

## **NSW energy related agencies and programs**

Department for Energy, Utilities and Sustainability (DEUS), former Ministry for Energy and Utilities (MEU)

2.132 The Department of Energy, Utilities and Sustainability (DEUS), was established on 1 January 2004, and reports to the Minister for Energy and Utilities. The Department replaced the Ministry of Energy and Utilities (MEU).

2.133 It is anticipated that DEUS, which is currently being restructured, will undertake the many of the same responsibilities as its predecessor the MUE.

2.134 DEUS is responsible for:

- Oversight of the introduction of full retail competition in NSW energy markets;
- The policy for greenhouse gas emission benchmarks;
- Reporting on the supply and demand of the NSW electricity infrastructure to identify investment opportunities and possible future needs;
- Managing gas and electricity network performance; and
- Oversight of the Sustainable Energy Development Authority

2.135 DEUS is responsible for supervision of energy distributors. The Electricity Supply Act 1995 allows consumers (businesses and households) to choose which service provider they use to connect to the electricity network, make extensions to the electricity

network, or upgrade their supply capacity. The Act requires that service providers who undertake contestable works must be accredited. DEUS is responsible for administering the accreditation scheme under this Act, granting accreditation and managing contestable works issues.

- 2.136 DEUS also develops and implements appropriate frameworks to improve the performance of the energy industries and water utilities. It collaborates with other government agencies, energy industry and the water utilities, consumer interest groups and other stakeholders to ensure decisions and judgments are comprehensive, timely, sound and appropriate.
- 2.137 In addition to a rigorous customer protection regime, DEUS administers a range of concession programs which are delivered by energy and water utilities in NSW.
- 2.138 In energy efficiency, DEUS is the NSW regulator for the mandatory energy labelling and Minimum Energy Performance Standards (MEPS) programs. Energy labelling and MEPS cover a range of electrical appliances and equipment and these programs have led to significant energy efficiency improvements. DEUS, which comprises what previously was SEDA, operates a number of support and information programs which promote energy efficiency in NSW.
- 2.139 DEUS is also responsible for general policy oversight of the Government Energy Management Policy (GEMP). The key objective of GEMP is to reduce greenhouse gas emissions from the Government's own operations. DEUS is specifically responsible for data collection from Government agencies and publicly reports on aggregate performance against targets.
- 2.140 As responses to the enhanced greenhouse effect raise issues across all sectors, many agencies have a role in developing policy responses, with the Cabinet Office having the overall coordinating role. In the future this coordinating role will be provided by the NSW Greenhouse Office.
- 2.141 DEUS has been responsible for the development of the NSW Mandatory Greenhouse Benchmarks Scheme, which addresses the greenhouse gas emissions from the NSW electricity sector. The Scheme was implemented from 1 January 2003. Electricity generation accounts for about one third of NSW greenhouse gas emissions.
- 2.142 DEUS also administers the Sustainable Energy Research and Development Fund which supports research and development projects in the areas of renewable energy, energy efficiency and alternative transport fuels which have the prospects of reducing greenhouse gas emissions in NSW.

### Sustainable Energy Development Authority (SEDA)

- 2.143 The Sustainable Energy Development Authority (SEDA) was established by the State Government to reduce the level of greenhouse gas emissions by promoting investment in the commercialisation and use of sustainable energy technologies. It also runs various education and policy programs designed to reduce greenhouse gases relating predominantly to improving energy efficiency.
- 2.144 SEDA established the Green Power Program in 1997. The program is designed to facilitate the installation of new renewable generators across Australia and encourage consumer demand in greenhouse free electricity.

2.145 Green Power is renewable energy that is bought by energy suppliers on behalf of their customers and independently audited and verified by the National Green Power Accreditation Steering Group (of which SEDA is a member).

2.146 In the four years of the program in NSW, over 20,000 customers signed on to use Green Power including 14,000 residential customers. Green Power energy prices are currently twice the cost of traditional electricity prices.

2.147 SEDA's key mechanism for energy demand management in the residential sector is the Smart Homes Policy, which is adopted by various councils through a Memorandum of Understanding. Signatory council agree to require a minimum 3.5-star (NatHERS) energy rating to new housing development approvals. Out of 172 Councils in NSW, 76 have signed the MOU.

2.148 Until the end of 2003, SEDA also administered a NSW Government rebate for the installation of solar hot water systems. The rebate amounted to a point of sale saving of approximately \$500 - \$700 on solar and heat pump hot water systems. This rebate has not been re-introduced in 2004.

2.149 SEDA has also been managing various Energy Smart Products and consumer awareness initiatives. The Refit program is a joint program for retrofitting low income homes with energy and water efficient appliances. This program was piloted in the Hunter region with Hunter Water and Energy Australia, in collaboration with the Department of Community Services, Newcastle Council and other community and government agencies.

2.150 The NSW Greenhouse Benchmarking Scheme<sup>56</sup> applies to:

- electricity retail suppliers;
- electricity customers taking supply directly from the NEM;
- generators with contracts to supply electricity to customers; and,
- other parties who consume large volumes of electricity in NSW.

2.151 A benchmark is set as a 5 per cent reduction in per person greenhouse gas emissions from 1989–90 levels by 2007. This equates to an approximate target of 7 tonnes of carbon dioxide equivalent per person. To meet the benchmark, participants must reduce average emissions of greenhouse gas from the electricity they supply. To do this, they can purchase abatement certificates bought from low-emission electricity generators and other providers to offset their excess emissions. If they fail to reduce emissions, they must pay a penalty per tonne of emissions above their limit.

2.152 The form of abatement certificate can represent various actions or responses: the reduction of greenhouse intensity in electricity production, an activity which results in reduced consumption of electricity, the capture of carbon from the atmosphere in forests (called carbon sequestration) or other practices which reduce onsite emissions relating to electricity consumption.

2.153 The scheme commenced on 1 January 2003 with a benchmark of 8.65 tonnes for the year. Annual targets for subsequent years will follow to achieve a benchmark of 7.27 tonnes by 2007 and maintained to at least 2012. The Independent Pricing and

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<sup>56</sup> Submission No. 28, Ministry of Energy and Utilities, p19

Regulatory Tribunal (IPART) implements, administers and regulates the scheme, accrediting providers of certificates, verifying abatement activity and the purchasing and surrendering of certificates.

### Independent Pricing and Regulatory Tribunal (IPART)

2.154 As noted previously IPART has three key roles in relation to energy and consumers:

- it is responsible for setting retail energy prices;
- it investigates improvements to energy industries such as its recent review of demand management;
- it is the regulator of the NSW Greenhouse Benchmarking Scheme.

### State Planning Authorities

2.155 Broadly speaking, power generators, transmission providers and distributors follow specific planning processes set out in their establishment Acts (such as Transgrid). New power generators and other energy provider approvals will require a licence from the EPA as well as development approvals from the Department of Infrastructure Planning and Natural Resources (DIPNR) in accordance with State Environmental Planning Policies (SEPP).

2.156 Master planning and large scale residential developments involve planning approvals from both DIPNR and the relevant local council approvals. Local council approvals may have additional or more detailed requirements than the State Government. These are usually detailed in the Local Environmental Plans and other local government policies. For details and discussion of planning see Chapter 3.

### Recent initiatives – new targets for sustainable homes

2.157 In September 2003, the Premier, the Hon Bob Carr MP, announced new sustainability requirements for homes, whereby each new house and unit must reduce water consumption by 40 per cent and reduce greenhouse gas/energy consumption by 25 per cent.

2.158 These targets will be applied via the application of rating tool BASIX – the Building Sustainability Index. BASIX will be applied via the development process to all new homes in the metropolitan area from 1 July 2004. The greenhouse gas reduction target will rise to 40 per cent by July 2006.

2.159 Discussion of the BASIX and other rating tools applied to buildings is discussed in Chapter 3, Section 2.

2.160 In November 2003, the Premier announced further reforms including;<sup>57</sup>

- a new Greenhouse Office reporting directly to the Premier;
- a new \$6 million a year Greenhouse Innovation Fund to initiate private or public sector activities to achieve further greenhouse gas reductions;
- a taskforce to advise on establishing a new energy demand management fund; and

<sup>57</sup> Premier of NSW, Press Release, 20 November 2003

- new Department of Energy Utilities and Sustainability (DEUS)

2.161 Details of these reforms are still in development at the time of this inquiry.

## Chapter Three - New Homes

- 3.1 The NSW Government uses different management mechanisms to influence energy efficiency in the residential sector. The Committee has divided its report to reflect these two perspectives, that is:
- the management of energy efficiency in new homes and renovations; and
  - the management of energy efficiency in established homes.
- 3.2 Around 45,000 new homes are built each year in NSW, representing only 2 per cent of total housing stock (2.3 million homes).
- ...new housing is either on the fringe or on brownfield sites concentrated in particular areas. This means there is only a small amount of stock being replaced.<sup>58</sup>
- 3.3 While the new home and renovation sector is small, both State and Local government have a substantial capacity to improve energy efficiency through planning, design and approvals processes, not only at the individual home level but, more importantly, at a development level.
- 3.4 A further consideration is the type of new stock being supplied to the market. Although much media attention has been given to large freestanding homes, “the McMansions”,<sup>59</sup> approximately 50 per cent of new dwellings in NSW are multi-residences.<sup>60</sup> Submissions argue that both forms of housing stock can have energy consumption problems:
- The insane housing cost spiral works against experimentation. Building or buying a homes is so expensive that few can afford the services of an architect...high rise living is an energy hog, from mandatory use of clothes dryers to essential air conditioning. There appears to be little hope of controlling the move by developers to promote ‘the huge house’, which takes up most of its building block and ensures that there is little space for gardens and trees which could provide a degree of natural cooling and shading.<sup>61</sup>
- 3.5 This chapter looks at how the government interacts with the new residential market to influence energy consumption. Key areas are:
- planning systems;
  - roles of building codes and rating tools;
  - building design; and
  - technical options and renewable energies.

### SECTION 1 - PLANNING SYSTEMS

- 3.6 The interaction between State agencies, local government, and the building industry to design energy efficient homes is complex and multi-layered. The planning framework for new homes and urban development is described below.

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<sup>58</sup> Submission No. 2,1 Royal Australian Institute of Architects. p3

<sup>59</sup> “Giant houses on council’s hit list”, Sydney Morning Herald, 9 February 2004

<sup>60</sup> Submission No. 21, Royal Australian Institute of Architects, p3

<sup>61</sup> Submission No. 14, Consumer, p3

## The NSW planning framework for residential development

- 3.7 The now titled Department of Infrastructure, Planning and Natural Resources (DIPNR) (formerly PlanningNSW) implements planning systems established under the Environment Planning and Assessment (EPA) Act 1979.
- 3.8 The Act establishes a number of instruments and mechanisms to guide agencies and deliver on multiple objectives for urban development. The scope of the planning instruments is intended to cover such matters as:
- land use and resource management;
  - promoting social and economic welfare;
  - protecting the environment;
  - sharing responsibility for planning between different levels of government; and
  - providing opportunities for public involvement and participation.
- 3.9 Plan making and development assessment is shared between state and local government depending on the nature of the development. The planning of energy infrastructure (i.e. new power stations, generators, transmission and distribution systems) involves various stages such as environmental approvals, licences and statutory consultation requirements. Approval may be subject to Cabinet consideration, and the concurrent consent of many Government agencies and councils. Alignment of the energy infrastructure development with State Environmental Planning Policies (SEPPs) is also required.
- 3.10 Urban development needs to be consistent with state, regional and local planning policies. Large scale urban development may be guided by master plans and strategies such as the Sydney Metropolitan Development Program. Development is also guided by State Government Regional Environmental Plans (REPs) and relevant local government Development Control Plans (DCPs).
- 3.11 Approval for individual residences is generally controlled via local government development application systems, which are guided by each local government development control plan.

## SEPPs

- 3.12 SEPPs are State Environmental Planning Policies which:
- make sure that government policies are carried out uniformly;
  - deal with important state-wide issues, such as protecting important rainforest and encouraging sustainable development that creates jobs;
  - set general guidelines for Regional Environmental Plans (REPs) and Local Environmental Plans (LEPs); and
  - plan important projects in specific locations, such as the central western Sydney economic and employment zone.
- 3.13 SEPPs are generally paramount in the planning instrument hierarchy and may override REPs, LEPs and DCPs where there are inconsistencies or gaps. SEPPs can be location specific, such as SEPP 47 for Moore Park Showground, or impose controls on certain

types of development across the State, such as SEPP 5 on Housing for Older People with a Disability.

3.14 Some key SEPPs which influence urban development include:

- SEPP 32 - Urban Consolidation (Redevelopment of Urban Land);
- SEPP 53 - Metropolitan Residential Developments;
- SEPP 60 - Exempt and Complying Development; and
- SEPP 65 - Design Quality of Residential Flat Development.

3.15 As a State Government instrument, a SEPP will often have elements that require the Minister's or Department head's consent. However, sometimes the consent authority within a SEPP may be delegated or divided between different State and local government authorities for different elements of development.

## REPs

3.16 Regional Environmental Plans (REPs) cover issues such as urban growth, commercial centres, extractive industries, recreational needs, rural lands, and heritage and conservation. REPs deal with issues that go beyond the local area - protecting river catchments, for example, or providing public transport systems. REPs give local governments a framework for detailed local planning. REPs often apply to large areas (such as the North Coast or Hunter regions) but they can relate to small sites that have regional significance (such as Homebush Bay).

## LEPs and DPCs

3.17 Local Environmental Plans (LEPs) are prepared by councils to guide planning decisions for local council areas. Through zoning and development controls, councils supervise the ways in which land is used. Development Control Plans (DCPs) provide specific, more comprehensive guidelines for types of development, or small sections of a local government area.

3.18 Councils can use DCPs to make local planning more detailed. Many councils prescribe building energy standards in their DCPs. Those councils in NSW who are signatories to the SEDA Smart Homes Policy apply a minimum 3.5 star rating standard. Councils are not precluded from applying a higher energy standards in the DCPs, although this is not common practice at present.

## Master plans

3.19 Master planned communities consider many additional elements such as solar access, overshadowing, privacy, community facilities, landscaping, pedestrian and vehicular traffic and nature and form of building. There may be stringent controls on lot development and building design such as building envelope shape, orientation, setbacks to ensure proper solar access, as well as construction and building material requirements, minimum appliance rating requirements and even water and energy conservation requirements achieved through advisory guidelines, zoning ordinances or through use restrictions attached to lot titles.

3.20 Procedures for the making of master plans are not set out in either the EPA Act or regulations but are found in environmental plans. While procedures may vary under

different environmental plans, they generally include a period of public exhibition and opportunity to make written submissions. Using Sydney Regional Environmental Plan No. 26 - City West as an example, the draft master plan must be exhibited for a minimum of 21 days and the views of affected councils sought.

- 3.21 Landcom is a key agent that is often involved in master planning and large scale residential releases in NSW. Landcom is a state owned corporation that participates in the urban development market. Landcom sees its role as leading the development industry by example, delivering best practice developments which are socially environmentally and economically sustainable. Since 1998, Landcom has been a SEDA Energy Smart Homes Policy partner. This means that homes built by or in partnership with Landcom must be to a minimum 3.5 star energy rating. More recently, Landcom has raise the bar of its energy standards to 4.5 star mandatory minimum for homes in its Energy Smart Communities Policy 2003.

### Development approval, construction and certification process

- 3.22 New residences go through three development stages - approval, construction and inspection. The approval stage requires the submission of a development application to the relevant Council. This is an opportunity for a council to modify building plans and specifications. The next stage is the construction and inspection stage, usually comprising of construction and occupation certificates which are designed to ensure that the directions and specifications of the DA are actually implemented according to plan. Certificates may be issued by a council inspector or a private certifier.
- 3.23 Through development consent conditions, councils can impose modifications to the design to improve energy efficiency. A key policy applied by councils is the Energy Smart Homes Policy developed by SEDA.

### SEDA Energy Smart Homes Policy

- 3.24 Since 1997, the Energy Smart Homes Policy has been a key initiative in the new home market. SEDA developed a model policy which has been applied and integrated into local government DCPs in NSW.
- 3.25 The policy requires that new homes have:
- minimum 3.5 star NatHERS rating of thermal performance;
  - greenhouse friendly (gas, solar, heat pump) hot water systems; and
  - minimum 3.5 star rating for electric clothes dryers in multi- unit dwellings.
- 3.26 SEDA does not regulate building development, rather it assists councils in embedding these requirements within council planning instruments. At the end of 2003, 59 out of 172 councils, covering 78 per cent of NSW residential development applications, had adopted the Energy Smart Homes Policy.
- 3.27 Prior to the policy, in 1997 the typical new project home rated 2 stars or less. Six years later, the minimum 3.5 star requirement in the Energy Smart Homes policy has raised the bar for new homes built in participating council areas.
- 3.28 The NatHERS energy rating tool is the source of the star ratings applied in the Energy Smart Policy. NatHERS provides a rating for new homes on a scale of 1 to 5 stars.

The rating takes into account both the dwelling layout and construction materials.  
(Rating tools are discussed in Chapter 3, Section 2)

## SEPP 60 – Exempt and Complying Developments

- 3.29 SEPP 60 is part of the reforms introduced to the development assessment system in July 1998. It defines types of development and applies to areas of the State where there are no such provisions in the council's local plans. SEPP 60 requires a house to have at least a 3.5 star rating under the NatHERS. In effect, this SEPP only applies to about half the councils in NSW- mostly non-urban and for those councils, only to complying development i.e. certain detached or double story houses.<sup>62</sup>

## SEPP 65 – Design Quality of Residential Flat Developments

- 3.30 SEPP 65 was introduced in July 2002, to raise the design quality of residential flat developments across the state through the application of a series of design principles that apply to all buildings greater than three storeys. It provides for the establishment of design review panels to provide independent expert advice on the merit of a residential development. It also requires the involvement of a qualified designer for the design approval and construction stages.
- 3.31 The design principles in SEPP 65 include reference to energy efficient design (Design Principle 5). There are no prescriptive or qualitative requirements for energy efficiency. The SEPP requires, however, that all three storey residential flats may be referred to a design review panel which can be established by the Minister. The consent authority (usually the council) is required to take into consideration the advice of the review panel on a development.

## Issues in Submissions

- 3.32 Various issues were raised in submissions about how the current planning framework does not maximise opportunities and incentives for designing energy efficient homes and developments. A number of submissions argued that the current regime is inconsistent and fails to reward positive design. Further that it is not holistic in terms of integrating factors to energy efficiency, and also that it fails to effectively co-ordinate utility infrastructure provision.

## Comprehensive planning of new developments

- 3.33 Various submissions raised problems in the comprehensive planning of subdivisions, which are argued to result in poor energy efficient outcomes.
- 3.34 Traditional subdivisions in NSW are characterised by meeting all the relevant regulations like zoning ordinances and building codes, with lots sold individually and generally without additional controls on building design. Developments typically specify lot sizes and layout, open space, and infrastructure provisions including roads, stormwater, sewerage and utilities and street lighting.

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<sup>62</sup>IPART Demand Management 2002 Report, p51

3.35 Master planned communities consider many additional elements such as solar access, overshadowing, privacy, community facilities, landscaping, pedestrian and vehicular traffic, and nature and form of building.

3.36 The views in submissions to the inquiry argued that, while there are some examples of good master planning, the bulk of subdivision planning is less than effective in capturing energy efficiency principles. The NSW Chief Architect argues that this problem occurs in both high and low density developments:

Current subdivision design reflects the lack of consideration for achieving climate responsive residential developments. Subdivision layouts lack appropriate consideration for climate, topography and context. Orientation of lots should ensure all dwellings can receive adequate sunlight, cooling breezes, ventilation, and shading. Lot sizes and street layout should allow for adequate landscaping.

High density housing does not necessarily result in lower energy consumption than low density housing. High density housing developments may require energy consuming facilities such as clothes dryers, lifts, common area lighting, security lighting and ventilation of bathrooms and car parks...<sup>63</sup>

3.37 Large estates and new releases are generally masterplanned. The Committee visited two key sites, Newbury and Newington, that illustrate how energy efficiency can be factored into planning processes.

3.38 Newbury, in North West Sydney, is a masterplanned development of approximately 1,800 homes. The estate is being developed by the Mirvac Landcom Joint Venture and is founded on the principles of new urbanism and walkable neighbourhoods. The houses in the estate have design, cross ventilation and configuration requirements to maximise solar benefits. Houses also have to meet NatHERS ratings of 3.5 stars for all homes, 4.5 stars for contract housing and 4.7 stars for joint venture housing. The ratings requirements are regulated with the support of the Blacktown Council. (See Appendix 7 for a detailed description of the energy efficiency features of the Newbury estate.)

3.39 Newington in Homebush, Sydney, was built as the Athletes' Village for the 2000 Olympic Games and then converted into a residential estate. The estate is surrounded by 440 hectares of Sydney's largest parkland and designed by eight of Australia's leading award winning architects. The team behind Newington is the Mirvac Lend Lease Village Consortium (MLLVC). As a model project, Newington is promoted as the benchmark of an integrated approach to development and the environment that allows residents, flora and fauna to benefit.

3.40 Passive solar design principles have been used to increase energy efficiency and all year round thermal comfort within Newington homes. Every home built prior to the Olympics Games is equipped with rooftop solar photovoltaic cells. The cells generate electricity during the day that is fed directly into the electricity grid while at night power is drawn directly from the grid. Compared to a similar non-solar suburb this represents a saving of 7,000 tonnes of CO<sub>2</sub> each year and a 75 per cent reduction in consumption of mains electricity.<sup>64</sup>

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<sup>63</sup> Submission 22, NSW Chief Architect, p3

<sup>64</sup> "Newington a New Suburb for a New Century", Mirvac Lend Lease Village Consortium, p91

- 3.41 Newington also has solar hot water systems that are gas boosted, while multi-unit developments have centralised recirculated hot water systems. Use of landscaping for shading in summer and warmth in winter further reduces energy costs.
- 3.42 While the Committee has seen these two “best practice” examples of masterplanning, feedback from the industry is that these arrangements are few and far between and are not generally applied to developments in the majority of Western Sydney.
- 3.43 Mirvac comments that the benefits and advantages of masterplanned projects can be undermined if subdivision parcels are too fragmented:

Masterplanning must ensure that housing lots are orientated to maximise solar access opportunities. Our experience is that few regulatory planners understand the principles in this regard and establish master plans that do not maximises solar access opportunities but attach prescriptive energy efficiency requirements for the developer that are difficult to achieve. The approach by regulatory planners is “textbook and not practical”. Many surplus government sites are being broken up into small development parcels and being sold to a number of developers. This reduces significantly the potential benefits that can be derived from a fully master planned estate. More industry involvement in the subdivision master planning process is required to ensure the best practical outcomes and surplus government development sites should be sold of sufficient size so that the full benefits of a master planned community can be achieved.<sup>65</sup>

- 3.44 Several submissions also argued that transport, which impacts on energy use in residential developments, is not being fully considered. Of particular concern, is that the concurrent benefits for greenhouse gas reduction and energy efficiency from holistic planning are not being focused upon. As noted by the Royal Australian Institute of Architects in hearings:

**Mrs PALUZZANO MP:** In your submission you commented on the transport energy and associated CO<sub>2</sub> costs. Would you like to elaborate on that in relation to new subdivisions, say, green fields?

**Ms WILSON (RAIA):** A lot of the new subdivisions are not anywhere near public transport, which forces families to own two and sometimes three cars. I believe an additional 50 per cent [of CO<sub>2</sub>] can be attributed to transport in those areas.<sup>66</sup>

- 3.45 In its submission, the RAIA suggests:

Transport energy and associated CO<sub>2</sub> must also be considered as part of the overall operation of a house. Private car use adds approximately an additional 60 per cent to household CO<sub>2</sub>. New residential developments on the fringe often have poor access to public transport. Increased car dependency in these areas must account for at least part of the recent and much publicised rise in car ownership with associated increases in CO<sub>2</sub>.<sup>67</sup>

- 3.46 A similar call for a more integrated approach was made by the Australian Conservation Foundation:

Energy efficiency should not be considered in isolation from planning considerations including a relationship to the surrounding buildings and transport infrastructure as these often have considerable greenhouse implications... strategic plans for urban

<sup>65</sup> Submission No. 27, Mirvac, p2

<sup>66</sup> Transcript of Evidence, Royal Australian Institute of Architects, 25 August 2003, p52

<sup>67</sup> Submission No. 21, Royal Australian Institute of Architects, p12

centres should take into account the greenhouse implications of transport and electricity grid infrastructure regarding the location of new residential developments.<sup>68</sup>

## Utility integration in the planning process

- 3.47 The Committee was interested in the planning of utility provision within new developments. The concern is that utilities are not planned with sufficient flexibility to allow consumers or residents to pursue energy efficiency options.
- 3.48 Integral Energy was asked in the Committee hearings to explain how they feed into the suburban planning process and what can happen:

**Ms PALUZZANO MP:** How can you look at effects of energy efficiency in what is going on as the examples you used in the newer suburbs within the Sydney area?

**Mr POWIS (Integral Energy):** If I could characterise, we look at what people currently use, and what they are potentially going to be using in their houses, and we build and configure the network to address those needs. If people come with incentives on either gas or other methods, and say, "We will not need a network of that size for these housing divisions"—we are working currently with Landcom to work through those issues, because there are different developers across the spectrum—we will configure the network to satisfy the needs. You have to picture that the problem we face as an organisation is that there was a lot of criticism for these organisations over-building, and back in the eighties and nineties there was a lot of criticism that it was gold-plating, and that potentially we were over-building et cetera. We are now getting the criticism in some perverse way in reverse and that we are too finely building our network etcetera. The organisations are under a dynamic to build to the specifications.

If people come along and then introduce a different configuration—if I give you an example at Arndell Park—it was basically an industrial area where they were going to have warehouses. We had the developer come along and say, "These are going to be warehouses." We took it at face value and we took a mixture of refrigeration versus normal. They all turned out to be refrigeration warehouses. The load that happened on our network where we have put in a new transformer, and a couple of new cables, is unbelievable, so we build—I hate to keep saying to a minimum—so that we do not get caught out with the regulator, and we are not accused of over-building. It is a fine balance, because as soon as we over-build we are criticised; as soon as we under-build we are criticised, so any assistance in that area would be helpful.

**Ms PALUZZANO MP:** What would be a key area for improvement there?

**Mr POWIS:** I think that what the BASIX is heading for, because the problem we have is that without saying anything about the councils—they have their own dynamics and their own issues—I think we need a global approach to planning in terms of building codes and energy efficiency which will give us a better rule of thumb. Our people, about 10 or 15 years ago, thought that gas penetration and houses would be configured in such a way, so they built the network to satisfy that. What happened is, people then came along, they changed their expectations, they changed their views and they put in more bigger houses, more airconditioners etcetera. We are retrofitting 6,000 distribution transformers—they are the things on poles and on padmounts—because we found that they were doing the right thing at the time, thinking this is what people want et cetera, people's expectations have now gone off- I will not say "off the map"—they have increased in that society, naturally etcetera. As I said, we are spending a lot of time retrofitting 6,000 of those things.

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<sup>68</sup> Submission No. 17, Australian Conservation Foundation, p6

**Mr SLACK-SMITH MP:** Following on Karyn's question, it is a major issue in what you are saying in getting it right, what is the mid-range capacity that you need? I have already met with some of your representatives.

**Mr POWIS:** Allan Flett, yes.

**Mr SLACK-SMITH MP:** Thank you very much for that. The next stage which the Minister announced recently in the course of Rouse Hill going ahead—another 4,000 lots—I am wanting to make sure that the same problem that has happened in this one—in other words which was the transformers being under-capacity, and making sure on the public record that it is very carefully looked at for the next stage that the transformers do not pop out, as you say, in the middle of summer, and my electrician friends tell me that there was the developer, the minimum standards are set, as you say; hence those standards were the minimum, and caused it to fall out.

**Mr WALLACE (Integral Energy):** In the past we designed our network under certain criteria, and it has been alluded to as far as the gas penetration is concerned. If you take say the Glenmore Park area, there was a penetration of gas into that area. We reduced the design criteria because our system was driven by winter peaks in that area, and we reduced it to 3 kPa per customer, because that was thought to be, and history showed us that that was a reasonable amount of capital to expend into a subdivision. That was in the early to mid-90s. The community expectations on airconditioning have changed, and whilst they were gas for heating and cooking, they were then putting airconditioning in which used substantially more than what was the capacity we had.

Two years ago—two and a half years ago now—we reviewed our design criteria based upon what was happening, and we now design residential subdivisions with a capacity of between 6 to 7 kPa per customer. We have substantially increased—

**Mr GREENE MP (CHAIR):** It doubled.

**Mr WALLACE:** It basically doubled it, and then when we go back to the system, that translates into more zone substations and more transmission lines as well. It is not the residential, and not the local area, it flows right back upstream.

**Mr POWIS:** The other thing, to clarify that, is that we now have public forums where we—this is network 20.13 and it has an appendix attached to it—another volume—and we have done it for three years now. We go out to the community and last time we went to Blacktown, Liverpool and Wollongong, where we did a presentation in network 20.13. We distributed that to all the councils, and basically it provides where we believe the issues are, where we believe the developments are occurring and where we are intending for our network augmentations to occur. It is quite a detailed document, because it is our best estimate of where the issues are occurring, and in your area of the Rouse Hill area and all around there. What we are asking for—and this is also to encourage demand management initiatives, because we are putting it all on the table and saying, "These are our 10-year forecasts, this is where we believe our constraints and issues arise, and if anybody has any views—whether we are over-building, under-building, or whatever, please come back to us." We are trying to encourage people to engage in this one because, to be blunt, we are a utility, we are publicly accountable and what we do is for everyone. The transparency of the process has to be upheld.<sup>69</sup>

- 3.49 A further concern with integrating utilities is the need to build in opportunities for alternative energy options at planning stages. For example, Councils and planning authorities need to allow for scope in their plans to foster the uptake of co-generation or local generation capacity:

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<sup>69</sup>Transcript of Evidence Integral Energy, 31 October 2003 p3-5

**Mrs PALUZZANO MP:** You recommend in your submission the need to look at creating energy supply from building local generation capacity. Can you elaborate on this point? Will we see wave farms at Penrith Lakes, for example?

**Mr KANDAN-SMITH (WSROC):** I guess it depends on the type of local energy supply concerned. It is a fairly broad question. If you are looking at individual household solutions—photovoltaic cell solar panels on houses, for example - they can be covered by basic council planning guidelines. If we are looking at installed generators or other sources of power within suburbs, for example, it becomes a bigger planning issue not only for councils but for energy suppliers and developers. For example, we are looking at cogeneration within facilities that are being installed. I am not sure what the answer is necessarily. Other people are more qualified to speak on this issue than me but I think we should look at all of these options to see which ones might be the most cost effective and efficient in terms of what they can provide to the community not just now but in the long term in terms of the growth and development of the region.<sup>70</sup>

### Consistency of requirements across areas

- 3.50 The Committee asked various groups including the Housing Industry Association, SEDA, the Royal Australian Institute of Architects and Mirvac, how well the planning system was operating to facilitate energy efficiency in homes:

**Mr DRAPER MP:** What are other States doing particularly well that this Committee should look at?

**Mr GERSBACH (HIA):** Where do we start? From a planning system point of view, in terms of residential development, some of the other States are far ahead both in terms of basic town planning, land development and policies that go to the front end of planning processes as much as those that go to the delivery of quality product on the ground. Certainly our recent venture in Western Australia as part of the GreenSmart conference that we held over there in conjunction with our GreenSmart Awards showed the good results of an appropriate planning regime that is embraced both by government and industry. In Western Australia we saw a far greater willingness of industry to work with government and vice versa. As I say, the whole planning regime generally delivered better results in terms of the quality of the building outcome. We think that in New South Wales a lot of the problems, if we can put it that way, have to do with the cost of regulation, the overloads of regulations and just understanding and trying to work out which way is up and which way is down.<sup>71</sup>

**Mr GREENE MP (CHAIR):** You talked before about the initial planning of housing estates. Do you believe that planners, in setting up those housing estates now, are thinking of energy efficiency enough in the way they align housing blocks, and I suppose running with that, are builders adequately aware in the initial stages within new subdivisions, are they putting up homes that are appropriately energy efficient as well?

**Mr FOGARTY (SEDA):** The short answer to that is probably no. I think there is plenty of current evidence that suggests that there is a long way to go with some councils. There has been some fantastic leadership from some particular councils on this issue, but there is quite a way to go still with the builders and the developers as we go forward. It is much more evident than it was, but that is really what has to be said. We see SEDA's role in terms of working with the councils. I think they are a great conduit for us, and as we have been doing working with the building sector, there is still a long way to go.<sup>72</sup>

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<sup>70</sup> Transcript of Evidence, WSROC, 25 August 2003, p28

<sup>71</sup> Transcript of Evidence, Housing Industry Association, 25 August 2003, p33

<sup>72</sup> Transcript of Evidence, SEDA, 12 November 2003, p20

**Mr GREENE MP (CHAIR):** As architects sitting down to design a home to go on a lot in a subdivision reconfiguration of the lot would present some problems in terms of orientation et cetera. Would you like to comment on how subdivisions could and should be designed?

**Ms WILSON (RAIA):** There are some good examples of new developments such as at Newbury and places like that.

**Mr GREENE MP (CHAIR):** We visited that development.

**Ms WILSON:** So we know that it can be done. We also know that it is often done very badly. We would like to see a lot of thought going into that initial planning stage so that good orientating can be achieved.<sup>73</sup>

- 3.51 Mirvac, a developer of some “best practice” energy efficient residential developments in NSW, states in its submission:

...Lack of consistency between local government regulations and controls is a significant problem within all areas of the development process, not just energy efficiency. We have found that environmental issues have “crept up” on some local councils and they have introduced regulations and controls that show an obvious lack of understanding of the relationship between controls and outcomes. The consistency principles outlined by the *Planfirst Review Taskforce Planning Systems Improvements Report* dated 1 September 2001 must be followed through. In regard to energy efficiency, (and all sustainability issues), due to the complexity of opinions and directions, the Department of Infrastructure, Planning and Natural Resources needs to be put in place the controls regarding energy efficiency that would apply to all local government areas. These controls would need to be able to take into account local issues.<sup>74</sup>

- 3.52 The Housing Industry Association and SEDA argue that inconsistency of requirements can be overcome by policy initiatives, such as SEDA Smart Homes, which draw down common national energy measurement methodologies (the NatHERS 5 star energy rating tool) within the Building Code of Australia:

**Mr GERSBACH (HIA):** I would say consistency of approach. It is probably the single most important issue that gets raised by our members in dealing with councils. Of course, in New South Wales there are lots of metropolitan councils and regional councils and not so many in other States. Perhaps the planning systems in other States are able to deliver a more consistent and uniform approach whether it be through the [residential] codes or government policy or the history of the way State Governments inter-relate with local councils. Certainly a consistent approach was one of the benefits of the SEDA approach. If the SEDA approach in terms of EnergySmart Home Policy can be taken up by the BCA it should deliver a uniform and consistent approach once again and extend to all of those councils that had not yet signed on to the SEDA Smart Homes Policy. Of course, that still leaves hot water systems to be considered. Again, if that is to be embraced at the council level we would prefer to see it done via the BCA.<sup>75</sup>

- 3.53 The uniformity sought by the HIA relates to how building codes are taken up in different forms in different planning instruments. The Building Code requirements are captured in Council LEPs and DCPs and issue conditions for construction and occupation certificates.

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<sup>73</sup> Transcript of Evidence, Royal Australian Institute of Architects 25 August 2003, p52

<sup>74</sup> Submission No. 27, Mirvac, p3

<sup>75</sup> Transcript of Evidence, HIA, 25 August 2003, p33

## Encouraging and rewarding energy efficient design

- 3.54 Various submissions have proposed that energy efficient design should be rewarded by fast-tracking their development approval. For example, the Australian Conservation Foundation proposes that the Government:

Amend the planning scheme to provide priority processing and solar access planning protection for active solar collecting devices and homes that achieve a high level of energy efficiency due to passive solar design.<sup>76</sup>

- 3.55 In hearings, the Housing Industry Association also promoted “fast tracking” developments in correlation with its *Greensmart* program. *Greensmart* is a voluntary industry initiative that aims to encourage mainstream application of its principles to today’s housing. As a voluntary initiative, it provides appropriate market recognition for environmental endeavours in the residential construction industry.

**MR GREENE MP (CHAIR):** Are you promoting the notion that homes that go through the Greensmart process should be fast-tracked through the development approval process?

**Mr GERSBACH (HIA):** I would love to do that, but it is not up to me. However, the Association sees that as a plus. In many new estates the criteria are set by the developers and they work hand in hand with the councils. They go through two approval processes—the developer must give it a tick from a design point of view and the council must then go through the development approval process. I certainly encourage councils to embrace Greensmart and to include facilities such as a fast-track approval process for designs already ticked off as being Greensmart.<sup>77</sup>

## Conclusions

- 3.56 Submissions to the inquiry generally argued that more stringent and consistent direction in the planning framework is essential to generating energy efficiency in housing design.
- 3.57 The overlay and gaps between different planning instruments is not helpful to the industry or to planners. For example, at the SEPP level, some SEPPs such as SEPP 60, are very prescriptive about energy efficiency but have limited coverage of participating councils. Other SEPPs, like SEPP 65, have broader coverage across all councils but provide only qualitative principles for application to a particular class of buildings.
- 3.58 Policies like SEDA’s Smart Homes, attempt to fill the gap in coverage of energy efficiency in homes but this is a voluntary policy and is not applied by all councils. Although, SEDA suggests that 78 per cent of the State’s development applications have adopted its policy.
- 3.59 The Committee feels that the application of current planning instruments do not create a clear hierarchy of energy efficiency priorities that translates to a consistent regulatory approach to energy efficiency standards in homes.
- 3.60 The comments by Integral Energy illustrate that planning utility infrastructure is a difficult task. The submissions to the inquiry argue that more comprehensive master planning is necessary to capture the utility infrastructure provision in a way that is responsive to future energy efficiency possibilities. This means accommodation in

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<sup>76</sup> Submission No. 17, Australian Conservation Foundation, p6

<sup>77</sup> Transcript of Evidence, Housing Industry Association, 25 August 2003 p37

planning systems for future energy demand, the substitution to renewable energies, and the establishment of co-generation and local generation opportunities.

**Recommendation 1**

The Committee recommends that the NSW planning framework should improve its systems to:

- better canvass future energy demand and utility provision in residential areas;
- accommodate possible substitution to renewable energies, and
- allow for the co-generation and local generation sources within developments.

3.61 Fragmentation of large releases has impacts on energy efficiency. If lots are too small, then the benefits from an integrated planning regime may be undermined. While care must be taken to ensure sufficient competition and opportunities for varied development exist, it should not be at the cost of undermining efficiencies and environmental benefits from uniform and complementary energy efficient design.

**Recommendation 2**

The Committee recommends that planning of greenfield releases be scaled to ensure that the potential energy efficiency benefits of master planning (such as local generation and balance of private and community solar access) are not compromised by commercial division of small lot sizes.

- 3.62 Some elements of the planning framework, which promote improved design such as SEPP 65 and master planning guidelines, do not have sufficient detail or specific quantitative controls to generate a significant difference. SEPP 65 covers apartments of three storeys and will require the involvement of architects in the future. However, without minimum requirements, the energy efficiency requirements prescribed by individual architects might be uneven and could be seen as inequitable across areas and developers.
- 3.63 Policies such as the SEDA Smart Homes Policy have tangible requirements relating to energy efficiency that can be adopted by councils. However, while these requirements remain optional for councils, the application of controls adds to the inconsistencies, which are seen by industry as an impediment to cost-effective energy efficient development.
- 3.64 The Committee believes that the key measure to deliver substantial and uniform improvements to energy efficiency in new homes is through minimum mandatory energy efficiency requirements.
- 3.65 As noted in Chapter 2, the national Australian Building Code minimum energy efficiency standards for free standing homes will be introduced to NSW in mid 2004. These standards form the minimum building requirements that all councils must apply. NSW is adopting the lowest threshold of the Code with a minimum of a 3.5 NatHERS star rating. Energy efficient requirements for multi unit residences in the Code are still being developed but will not be finalised until 2005.
- 3.66 In addition, the NSW Government is placing further requirements on councils that apply to both freestanding and multi unit residences using a different measurement tool, BASIX. These requirements include a 20 per cent minimum energy efficiency improvement.

- 3.67 The merits of these tools are discussed further in the next section. The Committee's concern is that the combined effect of these proposed reforms, fails to address issues of inconsistency of controls and requirements in the planning process.

**Recommendation 3**

The Committee recommends that the energy efficiency standards established in NSW for residential housing should have a mandatory uniform minimum benchmark.

- 3.68 The Committee believes there is merit in the proposal to fast-track superior or best practice energy efficient developments. The Committee is aware that the Department of Infrastructure Planning and Natural Resources has recently announced a Taskforce to look at streamlining the development approvals process<sup>78</sup> (see Appendix 8). The Committee believes that the criteria for streamlining consideration should include incentives for houses with superior energy efficient design. This incentive may be through some form of fast tracking or discount on development application fees or some other form of benefit.

**Recommendation 4**

The Committee recommends that the NSW Government and local government should look at providing incentives in the development approvals process, such as fast tracking or development approval processing discounts for "best practice" energy efficient residential designs.

## **SECTION 2 - ENERGY STANDARDS AND ENERGY RATING TOOLS**

- 3.69 A key way to achieving energy efficiency in residential buildings is to include energy efficiency standards within building standards. The current minimum building standards in NSW are contained in the Building Code of Australia (BCA). The Code is subsequently adopted and modified for application in NSW. As noted in previous Chapters there are currently no mandated energy efficiency building code (or energy codes) being applied in NSW.
- 3.70 An Energy Code has been developed nationally for the BCA, and is currently applied in other States. This Energy Code sets up a minimum standard scheme to which industry can apply different measurement tools or computer software to demonstrate achievement of this standard. The Energy Code for freestanding homes has been scheduled for adoption in NSW in mid 2004. Energy Codes for multi residences are still being developed at a national level.
- 3.71 There are other rating schemes, tools and software programs currently available, which can be applied to residential and other buildings to measure energy efficiency and other non energy related facets of building performance such as carbon emissions, and water use.
- 3.72 This section describes the Building Code of Australia and, particularly, the Energy Code, and highlights comments on these mechanisms. It also outlines other tools and measurement systems, including the NSW Department of Infrastructure Planning and Natural Resources's (DIPNR) new sustainability tool called "BASIX", which is to be introduced to all residential homes and units in the metropolitan area by mid-2004.

<sup>78</sup> "Local Development Approval (DA) Taskforce: Cut The Red Tape" Minister Beamer Press Release, DINPR, 16 November 2003

## The Building Code of Australia (BCA)

- 3.73 The BCA is the technical information source for building regulation in the States and Territories. The BCA is produced and maintained by the Australian Building Codes Board (ABCB) on behalf of the Commonwealth Government and each State and Territory government. All governments apply the BCA by reference in their State or Territory legislation. However, each jurisdiction has varying systems for administering, implementing and enforcing the BCA.
- 3.74 The goal of the BCA is to enable the achievement and maintenance of acceptable standards of structural sufficiency, fire safety, health and amenity in the design, construction and use of buildings. It represents a suite of “minimum acceptable standards based on cost effective solutions”. It is not designed to determine quality standards above these minimum requirements.
- 3.75 The BCA contains technical provisions for the design and construction of buildings covering matters like structural integrity, fire safety, access and egress, safe movement, and health and amenity aspects like ventilation, damp and weatherproofing and sound insulation. Allowances for variations in climate and geological and geographic conditions are included in the BCA.
- 3.76 The Building Code covers both structural and non-structural items, imposing basic constraints where they relate to human health and safety. For example, the code has requirements for safety glass, sound insulation, natural lighting, pool fencing etc which would not be considered critical to the structural integrity of the building.
- 3.77 The BCA classifies buildings into 10 types based around the building's use and needs of the occupants. The most relevant types to this inquiry are Class 1a -free standing homes; Class 2 – residential flat buildings; and Class 10 a and b – garages, swimming pools etc (renovation related) items.

## BCA Energy Code

- 3.78 Until recently, the BCA did not contain significant provisions for energy efficiency for any buildings. In August 2002 the Australian Building Codes Board approved the Energy Code - a set of national energy measures for freestanding houses (Class 1 homes). The provisions are based on a “star rating” measurement system, from 1 to 5 stars, with 5 stars being superior. The Code covers five main areas of energy intake or usage:
- Building fabric: to control conduction of energy through the building fabric
  - Solar radiation: to control discomfort in warmer climates from solar radiation and provide solar heating in cooler climates
  - Building sealing: to control air leakage into or out of a building and hence avoid an increased need for heating or cooling
  - Air movement: to ensure adequate air movement either with external and internal openings provided to permit a building to be ventilated naturally or with fan assistance
  - Services: to avoid losing energy through piping or ductwork.

- 3.79 The BCA housing energy measures generally aim to achieve a 4 star performance in climates where winter heating is the dominant need and 3.5 stars where summer has the greater impact.
- 3.80 Overall the Energy Code is focused on the building envelope and its thermal performance. It looks at design and construction processes which aim to minimise passive energy consumption over the life of the building. It does not take into account the impact of energy appliances and energy consumption behaviour by occupants.
- 3.81 The star system prescribed in the Energy Code is called National House Energy Rating Scheme (NatHERS). The NatHERS scheme is based on the accrual of points for compliance with energy saving components such as ceiling insulation, correctly orientated windows, shaded eaves and high efficiency hot water scheme.
- 3.82 The Energy Code does not prescribe a particular energy rating software<sup>79</sup> to determine the star level but recognises three energy rating software packages as suitable to measure and verify compliance with the energy code. The software packages are NatHERS (software created to support the original scheme), Firstrate and BERS. The software packages estimate the heating and cooling energy consumption of a dwelling design.
- 3.83 The Australian Building Codes Board estimated the costs and benefits of the Energy Codes in its Regulatory Impact Statement. The potential total net savings, after capital costs, are estimated at \$500 million (net present value) for dwellings constructed during the period 2003 to 2010. A cumulative greenhouse gas reduction of 1.15 million tonnes is estimated for the same period. At an individual level, consumers living in a 5 star home are expected to save around \$210 in energy costs per year. Five star homes are also more comfortable to live in: 5 degrees warmer in winter and 10 degrees cooler in summer.<sup>80</sup>
- 3.84 The BCA is currently developing energy codes for units and multi-story dwellings and anticipates provisions being finalised by November 2004, for introduction in 2005.

### NSW BASIX Sustainability Index<sup>81</sup>

- 3.85 On 18 September 2003, the Premier, the Hon Bob Carr MP, and the Minister for Energy and Utilities, the Hon Frank Sartor MP, announced new water and energy use targets for all new homes built in NSW. These targets are:
- for energy, development approved from July 2004 (Sydney metropolitan area) is required to achieve BASIX rating of 25 which means taking measures to potentially reduce greenhouse gases by 25 per cent. The target will be increased in July 2006 to 40 (a 40 per cent reduction in greenhouse gases); and
  - for water, development approved from July 2004 (Sydney metropolitan area) is required to meet a BASIX rating of 40 for water conservation (or 40 per cent

<sup>79</sup> Submission No. 2, BCA, p10. The BCA does not reference a particular energy rating software. The BCA submission states its reasons are for not doing so relate to concerns about “proprietary ownership, differences in results from different software and the high cost of validating software”.

<sup>80</sup> Victoria Building Commission magazine, September 2003, Issue 19, p7.

<sup>81</sup> This description of BASIX is taken from the DIPNR website : [www.dipnr.nsw.gov.au](http://www.dipnr.nsw.gov.au) BASIX Fact Sheet November 2003

reduced potable water consumption. Mechanism to achieve this may include installation of AAA shower heads and rainwater tanks where appropriate.

- 3.86 DIPNR has developed BASIX - Building Sustainability Index - to ensure compliance with these targets. From July 2004, the BASIX assessment will become a mandatory part of the development approval process for new housing in NSW. BASIX is a web-based application which will assess the potential performance of residential developments against a range of sustainability indices. BASIX is designed to assist councils, architects, builders and developers to standardise better development practices in areas such as water, energy and land use across New South Wales
- 3.87 BASIX enables the potential performance of a development to be assessed against a set of nine sustainability indices. BASIX is designed for all common residential dwelling types; detached dwellings, villas, townhouses, and multi-unit apartments.
- 3.88 The BASIX indices include:
- social
  - transport
  - site ecology
  - water
  - stormwater
  - energy
  - indoor amenity
  - waste and recyclables
  - materials
- 3.89 The scoring system for BASIX is evidence based wherever data is available. For energy and water this is relatively simple. For these categories metered data from utilities is available from existing housing stock. The energy and water consumption of existing homes is benchmarked at zero on the BASIX scale. It is measured in units of litres per person per day for water and in kilograms of greenhouse gas emitted per person per day for energy.
- 3.90 While using BASIX, the developer selects technologies and design features which will reduce the environmental impact of the development. The score (from 0 to 100) is directly proportional to the reduction of water or energy (litres/person/day). For example, a development which selects water efficient technologies such as a AAA rated showerhead and tap aerators, a dual flush toilet and a tap timer for external water use, will score 21 points in BASIX. This is a 21 per cent reduction in water consumption compared to an “average” existing dwelling. BASIX allows a developer to see what actions are the most effective in reducing resource consumption, and make decisions accordingly.
- 3.91 BASIX will require minimum standards “Targets” to be met for all nine indices. It is proposed that there will be no trading between indices. At this stage, the BASIX Water and Energy targets will be a mandatory component of the development approval process for all new residential buildings from 1 July 2004 in all Sydney metropolitan council areas. This will be extended across the whole of NSW by 1 July of 2005.

- 3.92 BASIX is not a rating tool that assesses post occupancy building performance, and does not capture the impacts of occupant usage and behaviour. The long terms savings from the application of BASIX are yet to be estimated but a provisional figure of \$300 to \$600 per household has been suggested.

### Other schemes, rating tools and software packages

- 3.93 Schemes such as Energy Codes of the BCA relate to the National House Energy Rating Scheme which sets out a ranking system on a scale of 1 to 5. NatHERS also has its own software developed to apply the scheme. BASIX represents a different scheme (scoring out of 100) and has its own accompanying software. It is important to note that the schemes are about management of the use of the ratings. The rating software is about the mechanics of calculating the ratings themselves
- 3.94 Below is an outline of some other schemes and tools being utilised by various government agencies to assist in the design and construction of environmentally sustainable buildings and encourage best practice. These include energy and design tools, whole building tools and life cycle assessment tools.

### Energy and design tools

- 3.95 **Accu-rate** - is the current NatHERS associated with the BCA Energy Code. NatHERS is currently under revision and will be launched as Accu-rate. This relaunched product will have the capacity to be applied to multi unit dwelling
- 3.96 **First Rate** – also associated with BCA Energy Codes and was developed and is used in Victoria and the ACT
- 3.97 **ActHERS** - a modified version of the NatHERS tool and is used in the ACT.
- 3.98 **BERS** – an alternative version of the NatHERS tool and is used predominantly in Queensland.

### Whole building tools

- 3.99 Like BASIX, the National Australian Building Environmental Rating System (NABERS), looks at sustainability issues. It has been developed in 2001 and rates the performance of existing commercial office buildings and single dwelling homes on a state scale of 1 to 5. It is a voluntary system used alongside other rating tools. It can split ratings between tenant and landlord where required. There are a range of ratings headings within the NABERS system, including land, materials, energy, water, interior, resources, transport and waste.
- 3.100 Green Star and the Australian Building Greenhouse Rating Scheme are two tools designed to assess commercial buildings. The Green Star environmental rating system is a system for evaluating the environmental performance of Australian buildings based on a number of criteria, including energy and water efficiency, quality of indoor environments and resource conservation. It has been developed by the Green Building Council of Australia – a national construction industry and development industry group.
- 3.101 The first Green Star rating tool, Green Star – Office Design, evaluates the environmental potential of the design of commercial office buildings (base building

construction or refurbishment). Green Star will have rating tools for different phases of the building life cycle (design, fit-out and operation) and for different building classes (office, retail, industrial, residential etc).<sup>82</sup>

- 3.102 The Australian Building Greenhouse Rating (ABGR) scheme provides accredited assessments of the greenhouse intensity of office buildings by awarding a star rating on a scale of one to five. A building with a high star rating will be more energy efficient and cheaper to run, and will result in lower greenhouse gas emissions. The program was launched nationally in 2001 and is now being used by some of Australia's largest building developers and Central Business Districts.

### Life cycle assessment

- 3.103 In addition to rating schemes, another methodology for measuring energy and sustainability is the life cycle approach (LCA). LCA is a system for assessing environmental effects over entire life cycle of a building. The cycle includes consideration in 3 phases: production, usage and disposal. This captures raw materials acquisition, manufacturing, construction use, maintenance, demolition and treatment of waste. This expansive range enables policy and planning implications to be canvassed strategically.
- 3.104 LCA also attempts to capture the embodied energy in the fabric of the building- from initial extraction of raw materials to final delivery.

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<sup>82</sup> Information from Green Building Council website: [www.gbcus.org/greenstar/](http://www.gbcus.org/greenstar/)

## Comparison of rating tools

3.105 In its submission to the Committee, SEDA provided a table outlining the role and focus of various policy tools in the residential market. It can be seen that coverage and scope of tools in the market varies considerably:

**Table 5**

	Dwelling Type	Subject				Application	Jurisdiction		
	Class 1 buildings	Multi-unit	Sustainability indices beyond energy	Total energy	Hot water	Building Envelope	Design for new homes	Performance of existing	
<b>POLICY INSTRUMENTS</b>									
SEDA Energy Smart Homes Policy	✓	✓			✓	✓	✓		NSW
Building Sustainability Index: BASIX <sup>b</sup>	✓	✓	✓	✓	✓	✓	✓		NSW
<b>RATING TOOLS</b>									
NatHERS <sup>a</sup>	✓	✓				✓	✓		National
FirstRate	✓					✓	✓		VIC
ACT House Energy Rating Scheme: ActHERS	✓					✓	✓		ACT
Building Energy Rating Scheme	✓					✓	✓		QLD
SEDA Energy Smart Home Rating Scheme <sup>c</sup>	✓	(✓)		✓				✓	NSW
National Australian Built Environment Rating Scheme: NABERS <sup>d</sup>	✓	✓	✓	✓				✓	National

**Table Notes:** Class 1 buildings: Detached, town house, row house, terrace house, villas.

a Under Revision, to be relaunched as Accu-rate.

b Under Development

c ( ) Indicates future focus

d Under Development. SEDA and NABERs' Department of Environment and Heritage are in discussion regarding collaboration on the energy index.

## The rating assessment industry

3.106 As a consequence of the regulatory requirements for rating assessment in development approvals, an industry of rating assessors has evolved to provide assessment and design advice. Rating assessors are usually building professionals (designers, architects, building certifiers etc) who are accredited to make assessments and sell their rating assessment services to developers, builders, councils and homeowners.

3.107 Depending on the jurisdiction and building types, the assessors may be trained and accredited in the various energy ratings schemes and related software. In NSW there

are approximately 250 current accredited assessors and over the last five years more than 500 assessors have been trained in NSW.<sup>83</sup>

## Issues in Submissions

### Adoption of Energy Standards in NSW

- 3.108 Until late 2003 NSW has been preparing for the adoption of the BCA Energy Codes as a statutory minimum, at a rating level of 3.5 stars, scheduled to commence in May 2004. During the progression of this inquiry, the Committee received various comments about issues surrounding the implementation of the Code and developments of alternatives to the Code.
- 3.109 As noted in paragraph 3.78, Energy Codes in the BCA are the main mechanism for imposing mandatory energy standards in most states. A key issue raised by submissions to the inquiry has been the delay of NSW to adopt the BCA Energy Codes. The adoption of the Energy Codes across jurisdictions is summarised in the table below:

**TABLE 6 – Adoption of BCA energy codes by States (at February 2004)<sup>84</sup>**

STATE	DATE ADOPTED	RATING	COMMENT
NT	1 Jan 2003	Nil	However the NT has BCS requirements equivalent to 3.5 star rating for new homes
South Australia	1 Jan 2003	4 star	New homes
Tasmania	1 Jan 2003	4 star	New homes
WA	1 July 2003	3.5 to 4 star	4 stars south, 3.5 north for new homes
Queensland	1 September 2003	3.5 to 4 star	New homes with 4 stars in mountain areas
Victoria	Current From 1 July 2005	4 star 5 star	New homes combined with new water/plumbing requirements
ACT	Current From 1 July 2005	4 star 5 star	New homes, 4 star requirement was already established prior to Codes introduction.
NSW	Current	No statutory mandatory minimum*	*The voluntary SEDA Smart Homes policy, which applies to around 70 per cent of new building approvals, requires 3.5 stars. SEPP 60 requires some housing development to have 3.5 stars.

- 3.110 DIPNR, through its Planning and Building System Division, is responsible for the implementation of the BCA in NSW and has carriage of introducing the associated legislative amendments. In its primary submission to the Committee, DIPRN argues that the delay for adoption of provisions in NSW is related to several concerns:

<sup>83</sup> In NSW accreditation of assessors is undertaken by the Association of Building Sustainability Assessors Inc for information – [www.absa.net.au](http://www.absa.net.au)

<sup>84</sup> Information provided by the Australian Building Code Board in February 2004

- Verification methods – upgrades of software for NatHERS are likely to be finished in time for 2004 adoption. Also there was an issue with rating protocols for software measures.
- Deemed to satisfy provisions need to ensure that on average the rating achieved is over 3.5 stars
- Application of ratings to extensions and alterations. This area is harder to achieve 3.5 ratings.
- Harmonisation with Councils current requirements and with the Department's BASIX tool.

3.111 While these concerns may be valid (and are discussed in further detail later), it would appear that other States have pursued adoption of the energy codes in some form. The key bodies in the NSW building industry such as the Master Builders Association and the Housing Industry Association operate across jurisdictions, so it is difficult for the Committee to see how the issues raised in NSW have been so unique as to delay progression of reforms.

### Proposed minimum star level for NSW Energy Code

3.112 As noted the intention until late 2003 has been for NSW to adopt an energy rating of 3.5 stars, a lower rate than every other jurisdiction.

3.113 Many submissions to the inquiry have argued that NSW should adopt a higher rating, consistent with the ratings of other jurisdictions. The Australian Building Codes Board states that:

In NSW many councils currently only require 3.5 star energy rating. It is suggested that any future proposals in NSW relating to energy ratings for houses take into consideration the national BCA approach of a 4 star energy rating for houses in southern parts of Australia.<sup>85</sup>

3.114 The key issue raises is that the rating should be higher than 3.5 stars, as 3.5 stars forms the minimum standard for industry rather than a higher benchmark:

The BCA amendment proposed to be adopted in NSW in 2004 is important policy which builds upon the minimum building fabric performance standards embodied in the SEDA Energy Smart Homes Policy. However the BCA primarily eliminates worst practice and that is all. Minimum efficient performance standards must become more stringent in their requirements.<sup>86</sup>

3.115 Organisations in favour of a higher rating include the Building Designers Association of NSW, the Australia Conservation Foundation, the Alternative Technology Association, South Sydney Organisation of Regional Councils and the Australian Business Council for Sustainable Energy.<sup>87</sup>

3.116 Several organisations argued that NSW should adopt the Victorian system of a 5 star rating. The Victorian Government has announced that from July 2005, compliance with new residential energy standards will require:

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<sup>85</sup> Submission No. 2, Australian Building Codes Board, p 12

<sup>86</sup> Submission No. 9, SOLARCH, p1

<sup>87</sup> Submission No. 19, Building Designers Association, Submission 17 - Australian Conservation Foundation, Submission No. 18 Alternative Technology Association, Submission No. 22 – SSROC, Submission 32- Australia Business Council of Sustainable Energy

- a 5 Star energy rating for building fabric plus water saving measures; and
- a rain water tank; or a solar hot water service.

3.117 At the same time, however, the Committee also received submissions that identified problems with the Energy Code being introduced at greater than the proposed 3.5 stars. For example, the Housing Industry Association outlined its concerns about the Energy Code at hearings:

**Mr LOVERIDGE (HIA):** In regard to the Building Code of Australia, New South Wales is the only State at the moment that has not adopted energy efficiency provisions under the BCA and that is because of a number of reasons held by the Government or by government officers. From our perspective, our main concern would be the way in which the requirements for energy efficiency are introduced. At the moment we are looking predominantly at trying to gain energy savings through regulation of the building fabric—the walls, roof, floors, glazing, window openings et cetera. There is a certain amount of energy efficiency that can be achieved by regulating building fabric but there is also a limit. In the near future we may reach how much we can get out of it. It is like getting blood out of a stone.

We are currently looking at four-star ratings and to achieve a four-star rating through building fabric is reasonable. As an industry association we do not see a great deal of problems in achieving four-stars. However, if you went to five stars building fabric, which is a similar line to what Victoria is proposing to do in 2005, then we come up against two issues. One issue is the practicality of achieving a fifth star out of the building fabric and the other issue is affordability. There are ways and means to get buildings to perform once you get above the fundamentals and starting to raise the bar a little bit, having already jumped the first hurdle, it becomes quite difficult, so that would be one of our main concerns regarding the practicality of regulating building fabric. As Mr Gersbach mentioned in the submission, there are other ways and means to achieve additional star ratings. Victoria is looking at achieving additional star ratings from a building fabric plus building services recipe and I think that is probably the preferred way to go.<sup>88</sup>

3.118 The same issue of the incremental benefits and cost of increasing star ratings was made in the submission from the National Steel Housing Association:

The current approach has been to look at the financial justification in moving from a poorly insulated home to a home at a particular star rating. This will not result in the best outcome for consumers and possibly the environment. The laws of diminishing return are applicable for energy efficiency improvements. The first improvements you make take little effort (or cost) but result in large improvements (or savings). Subsequent improvements take much more effort (cost) and result in much smaller improvements (savings). To put this in some sort of perspective an example is shown in the following table. The incremental improvement from 4 to 5 stars is probably not justified. Similar energy reductions can be achieved through significantly cheaper items – eg low flow showerhead.<sup>89</sup>

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<sup>88</sup> Transcript of Evidence, Housing Industry Association, 25 August 2002, p34

<sup>89</sup> Submission No. 12, National Association of Steel Framed Housing. Table provided in submission and derived from “Comparative Cost Benefit study of Energy Efficiency Measures for Class 1 Buildings and High Rise Apartments”, Project for the Sustainable Energy Authority of Victoria by Energy Efficient Strategies, Final Draft Report March 2002

**TABLE 7**<sup>90</sup>

Star Rating Change	Cost	Benefit	Justified
0.5 to 4.0 stars	\$3,000	60 per cent energy reduction \$400 off annual bill	YES
0.5 to 5.0 stars	\$6,000	66 per cent energy reduction \$440 off annual bill	YES
4.0 to 5.0 stars	\$3,000	6 per cent energy reduction \$40 off annual bill	UNCLEAR

3.119 A further concern raised about the Code is that the current rating methodologies fail to accommodate concerns about larger homes. The averaging measure of energy use per floor space means that a large home can get to 4 stars more easily than small one:

The so called “equity measure” of determining ratings on the basis of energy use per built area (Mj/m<sup>2</sup>) must be modified. The use of such a measure has the effect of penalising the design of small dwellings, and curtaining the stringency of mandated building fabric performance with respect to very large dwellings. While it would be mischievous to suggest that Energy Rating has actually contributed to the observed growth of dwelling size, it would be fair to say that by avoiding the application of absolute energy use as a rating measure, current mandated rating systems have failed to impact on potential greenhouse gas generation in an appropriate manner.<sup>91</sup>

3.120 The concern that NatHERS methodology is biased against small dwellings, is also shared by the Royal Australian Institute of Architects.<sup>92</sup> The Institute also argues that the scheme does not differentiate between rating results that may have high greenhouse gas emissions, and that it fails to adequately recognise ventilation issues and thermal performance variation over time<sup>93</sup>.

3.121 In addition, problems have been raised about the NatHERS ability to accommodate other energy consumption issues such as hot water and air conditioning use. Integral Energy submits:

The existing NatHERS star rating system discourages the use of off-peak storage hot water systems, even though these systems have been a successful demand management program for many years. The NatHERS system does not discourage the use of domestic air conditioning.<sup>94</sup>

3.122 As a consequence of these issues some submissions argued that the BASIX proposal is superior tool. Others argued that the Energy Code should still be used but implementation in NSW postponed until the completion of “Accu-rate” (the revised version of NatHERS currently being developed).

### BASIX Tool and the Energy Code

3.123 During hearings DIPNR outlined how the new BASIX tool would integrate with existing planning arrangements, other energy policies, the Energy Code and how it be applied by councils.

3.124 A key feature of BASIX is that it overrides existing council controls:

<sup>90</sup> Ibid

<sup>91</sup> Submission No. 9, Centre for the Sustainable Built Environment (SOLARCH)

<sup>92</sup> Submission No. 21 Royal Australian Institute of Architects

<sup>93</sup> This issue was also raised by the NSW Chief Architect, Submission No. 22

<sup>94</sup> Submission No. 31, Integral Energy, p15

**Mr TAPER (DIPNR):** ...The statutory tool will require that BASIX will supercede any other councils controls to do with energy and water efficiency. It simplifies the system in terms of the developers bit by asking: Am I using the DCP for energy or water, or am I using BASIX?" They will be using BASIX.<sup>95</sup>

3.125 In its primary submission, the DIPNR stated that:

BASIX assumes that all buildings built in NSW are compliant with the Building Code of Australia, and the thermal performance and energy efficiency standards set in the BCA. BASIX concentrates on the gains to be made through energy efficiency in the Energy Index, and thermal comfort in the Indoor Amenity Index. BASIX should not duplicate or contradict any request in the BCA. Where the BCA ensures minimum acceptable standards, BASIX rewards best practice.<sup>96</sup>

3.126 DIPNR advised in October 2003 hearings that it was working with the BCA Energy Codes, refining what would be integrated into BASIX and the Code respectively:

**Mr TAPER:** The BCA minimum standard, Kevin, is really dealing with thermal efficiency. Where BASIX differentiates that, where they talk in megajoules per metre squared, really is what theirs comes down to, BASIX is talking about CO<sub>2</sub> emissions per person. There is not a direct relationship there. What we are working with the building code on is that the work that they are doing is creating the potential for thermal efficiency improvements. At the moment in BASIX, we allow a certain scoring if you meet the BCA minimum. You get a certain number of points, knowing that that is what you must do. When you look at the data—and I am sorry I was not here for the Integral presentation—thermal efficiency is not a direct correlation to greenhouse emissions. What we are working with is trying to calibrate that now and get a better understanding of what BCA minimum will mean for BASIX.<sup>97</sup>

3.127 BASIX will be an online tool, which all users can access from the internet. As an online product, the tool will not require a rating assessor in the same way as other rating tools. It will be in Excel form and apply to four dwelling types. As explained in hearings:

**Mr TAPER:** ...The developer will be enabled to fill out a smart checklist attached to the DA and also emailed to a storage bank accessible by Government and your council. It will be their basic submission. It will tell the council officer how they scored and what commitments they made to get that score. It will also be able to be adapted to show at what stages in the checking process, the certifying process, either by the private certifier or the council assessor, when those commitments need to be checked. In effect what it will do for council is that they will only have to interrogate a very clear structured report provided at the DA stage from the developer and know when and where that needs to be assessed.<sup>98</sup>

3.128 Positive comments about the value of the BASIX tool were made to the Committee. Industry, building designers, and other agencies argued that the tool is superior to the BCA Energy Code in that it goes beyond energy efficiency and takes a far more broad ranging approach to sustainable residential housing.

3.129 Many submissions argued that BASIX would be a tool to promote best practice development in concert with the Energy Code setting minimum standards. However

<sup>95</sup> Transcript of Evidence, DIPNR, 31 October 2003 p14

<sup>96</sup> Submission No. 24, DIPNR, p13

<sup>97</sup> Transcript of Evidence, DIPNR, 31 October 2003 p15

<sup>98</sup> Transcript of Evidence, DIPNR, 31 October 2003 p16

the relationship between the two tools and current programs like the SEDA Smart Homes Policy is not clear to many industry groups and agencies:

**Ms PALUZZANO MP:** ... We have had presentations in relation to rating schemes. What are your views on the pending BCA amendments to require a minimum 3.5 stars to new homes and can you also explain the new BASIX requirements introduced by what is now DIPNR and how can they compare with the Energy Smart Homes policy?

**Ms KOREMAN (SEDA):** Certainly in terms of how BASIX and Energy Smart Homes policy requirements compare, at this point there is really no clarity so I cannot give you a definitive answer. BASIX looks at a CO<sub>2</sub> per occupant figure whereas most traditional rating tools look at more of a megajoule per square meter measure, so it is very difficult to compare. That said, the sense is that in BASIX's first year of 25 per cent target, much of those outcomes could be met through existing policies that are in place because their 25 per cent is comparing to existing building stock, it is not comparing to new construction practice, so there is a lot of clarity that needs to be gained and a lot of those questions still need to be answered.<sup>99</sup>

3.130 Since hearings in October 2003, the NSW Government determined that BASIX should be implemented as the principle mechanism to improve energy efficiency. As a result a substantial portion of the BCA Energy Code is not being pursued and key components transferred over to the BASIX tool. While the industry supports the BASIX tool as a superior mechanism to deal with energy efficiency in home, it did raise some concerns in with the Committee about the implementation of BASIX without the complementarity of the Code.

3.131 In mid November 2003 in a joint submission from the Housing Industry Association, the Building Designers Association of NSW, the Master Builders Association, the NSW Urban Taskforce and SOLARCH was provided to the Committee<sup>100</sup>. Many of these organisations had made earlier independent submissions to the Committee. The key issues in this joint submission are paraphrased below:

- Development of national sustainability regulations through the BCA should be supported and assistance should be given to incorporate the BASIX model into the BCA. Dissatisfaction with the slowness of the development of the BCA must not lead to abandoning the BCA. There is no need to abandon the BCA, it is complementary to BASIX, providing standards for minimum accepted performance that would be evaluated by BASIX, which could then provide flexible paths for achieving better performance.
- The value of uniform national building code cannot be understated. Abandoning the code would set a precedent and possibly fragment the system across jurisdictions. This has major affordability implications for industry.
- Industry is concerned that BASIX will add further burden to the Development Application process which is already struggling to cope. If the BASIX is introduced as a SEPP, then it would override the existing provisions of Council DCPs but it would not remove council's ability to set additional DCP requirements. Currently under the Environment Planning & Assessment Act, Clause 98, the BCA must be complied with. However, councils can impose

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<sup>99</sup> Transcript of Evidence, SEDA, 12 November 2003, p23

<sup>100</sup> Submission No. 37, Joint submission from Housing Industry Association, the Building Designers Association of NSW, the Master Builders Association, the NSW Urban Taskforce, HMB – House Energy Rating Management Body and SOLARCH (UNSW Centre for Sustainable Built Environment.)

requirements that are additional to regulations within the BCA. BASIX would not diminish the council's capacity to add extra conditions of consent. BASIX will not remedy variations between councils.

- DIPNR's proposal is unnecessary and unworkable. The schedule proposed for the implementation of BASIX does not allow adequate time for its development or validation or the necessary training and adjustment required either by industry or councils. There are countless technical and administrative issues yet to be resolved.
- The proposal undermines existing policies rather than building on them. Nearly 500 building professionals have been trained to implement existing requirements. BASIX may make their qualifications irrelevant, destroying many established Energy Rating businesses. The recommended BCA energy codes provide a smooth transition from the current Energy Smart Homes DCPs to the new scheme.
- The information and consultation undertaken by DIPNR throughout this process of developing BASIX has been inadequate. BASIX should be tested and refined through a voluntary program on a manageable scale before its adoption as a State assessment tool.

3.132 The industry joint submission recommended that the BCA Energy Code could be increased to 4 stars and supplemented by other requirements for energy and water efficiency such solar hot water or AAA shower heads, similar to the program being implemented in Victoria. These changes would mean that the stated target levels desired in BASIX could be delivered by variations to the BCA Energy Code.

3.133 The Committee also notes that the Commonwealth Government's NABERS is currently being developed, which is seen as a parallel sustainability tool to BASIX as both of these systems rate a residential home within a broader sustainability context. NSW, through its links with the Australian Building Codes Board, has been contributing support for the development of this tool.

3.134 A supplementary submission from the Building Council on Sustainable Energy (BCSE) outlined some further problems with the trade-offs under the BASIX scheme that could undermine Energy Code standards:

Overall, the BASIX approach seems to be a major step forward, in that it takes a more holistic approach to reduction of greenhouse gas emissions (and greenhouse gas emissions from energy use roughly correlate with energy costs). ...However, the framework of BASIX, as best it can be interpreted at present, seems to allow trade-offs between major appliances, hot water and the building envelope on the basis of annual greenhouse gas emissions. If annual reductions in greenhouse gas emissions were the only criterion for decision-making, this might be quite satisfactory. But decisions made with regard to a building envelope have implications for human health, amenity, capital investment in heating and cooling plant, and peak energy demand. Further, the life of the building envelope is far longer than that of the appliances and equipment installed. On this basis, there is a case for either limiting the extent to which trade-offs against the building envelope are allowed, or for adding an additional weighting to the building envelope component.

In practice, the more stringent the NSW emission reduction target is, the less likely it is that thermally poor building envelopes would be allowed by BASIX. Also, it is not yet clear how BASIX will weight summer and winter star ratings, and placing a high

weighting on summer ratings (to reflect the significance of summer peak cooling demand) could effectively increase the stringency of BASIX relative to the all-year star rating used in both Victoria and NSW at present. If this seasonal effect is ignored, it seems that for the 25% reduction in emissions required between 2004 and 2006, much of the required reduction could be captured by installing solar or gas hot water and high efficiency appliances, but that the 40% requirement would require significant effort to be applied to improving the building envelope as well. However, this preliminary view may be affected by the BASIX requirements that summer and winter building energy requirements be considered separately. This could increase the effective stringency of BASIX.<sup>101</sup>

3.135 BSCE also submitted a comparative table of the current NSW arrangements, the NSW BASIX proposal and the current and planned arrangements for Victoria. Appendix 9 illustrates how Victoria is combining the BCA energy code and other water efficiency initiatives to deliver broader sustainable outcomes.

3.136 It has been argued to the Committee, that while the BCA is not in itself focused on greenhouse gas emissions, BCA implementation would bring about immediate greenhouse gains which can then be enhanced through BASIX:

Industry supports the Government's greenhouse reduction objectives. Representatives from the major building associations have suggested including improved building thermal performance and low greenhouse water heaters in the Building Code of Australia. That would deliver an immediate reduction in greenhouse gas emissions from new homes across the State of 20 to 30 per cent. The regulations are already drafted and the skills and products required are already well established. It builds on current, successful programs. It would not impact on the DA process, being assessed by better resourced certifying authorities at construction stage.<sup>102</sup>

3.137 Concerns have been raised about implementation of more regulations and new systems and the building industry's capacity to absorb them. As noted by the Newcastle MBA:

**Mr FULLER (MBA):** First of all, the inquiry I think is very important because the area at the moment has reached the point of frustration and confusion. I am aware that you have had many representations before you and this would not be news to you. What I have to say to you comes from a practical builder's and building point of view - in other words, we implement it on the ground - and one of the issues that we are finding at the moment is that through our environmental division at MBA we have done well over 3,000 NatHERS ratings per annum, so we know what we are talking about, and yet we have been besieged by First Rate Scorecard, NatHERS, now BASIX, you name it, you are familiar with the names. The worst case scenario is that many of those produce vastly different results when you apply them to the same home - not always, but it certainly applies inconsistency. From our perspective, the industry is looking for certainty.<sup>103</sup>

3.138 A final point was raised by SEDA in terms of the problems with multiple tools and the need for clarity in the system for final consumers:

**Mr FOGARTY (SEDA):** ...We are getting quite a few rating schemes, not just at the State level but at the national level, and to some extent we looked at the overseas experience. There are a lot of rating schemes out there and I think the role for Government is to try to consolidate those a little bit more because it just becomes awfully confusing when you

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<sup>101</sup> Submission No. 32, Building Council on Sustainable Energy, Supplementary Submission

<sup>102</sup> Submission No. 35, Building Design Consultant, p4

<sup>103</sup> Transcript of Evidence, Newcastle MBA, 12 November 2003, p2

are looking at four-star ratings and green ticks and whatever else is there. They are all well and good, but I think we do need, as a Government, to make sure that we have the right signals on this sort of thing, that we are in fact assisting the consumer to make the right choices, but that is market transformation I suppose, it is to some degree evidence of success as you go forward, as the competition is introduced<sup>104</sup>.

- 3.139 In March 2004, the Department of Infrastructure, Planning and Natural Resources submitted at supplementary submission outlining how they have integrated BASIX and portions of the BCA Energy Code<sup>105</sup>. The Department noted that key industry groups on the Building Regulations Advisory Council (BRAC) have unanimously signed off on the revised proposal of BCA/BASIX arrangements.

### Mandatory disclosure of ratings

- 3.140 The rating tools described in this chapter are predominantly applied at the development application stage. The information about the rating of the home is not generally utilised for other purposes. In the Australian Capital Territory (ACT) however, the ratings information on a home has been incorporated into the resale of homes as a mandatory disclosure item at point of sale.
- 3.141 The ACT Government introduced the “ACT Energy Efficiency Rating Scheme” in 1995. The scheme requires that vendors notify and display at point of sale the energy rating of a home according to the ActHERS (the ACT version of NatHERS) rating measure. It also requires that the vendor provide an ActHERS rating report to purchasers prior to entering into a contract.
- 3.142 The aim of the scheme has been to assist householders and the building industry to determining the energy use of the house. Initially the scheme only applied to new homes built since 1995 which was only 5 per cent of stock. Further legislation in 1997 extended its application to all homes for sale. This expanded the need for rating assessors in the ACT to provide ratings reports at point of sale. In 1999 the ratings required for new homes in the ACT was raised to a minimum of 5 stars.
- 3.143 The Committee heard from an ACT representative about the scheme. Its costs were outlined as follows:

**Ms WARREN-WILSON (ACT):** If we go back and say, take a 150 square metre home. That is a conventional home. If you have your plans and you do not have to get those from the Government that is a \$35 extraction and copy, and then there is the expense of putting them back onto the file—it ranges then out in the marketplace because those assessors are out there and they will charge anything from, I hear, \$80 through to \$180. I am not saying you get what you pay for all the time, but generally that is the case.

- 3.144 The Committee considered the issues associated with the application of the scheme to NSW:

**Mr GREENE MP (CHAIR):** Just on that, you have indicated that there are some implementation problems and it is what you are reviewing. Would you believe—and I know you can only comment in the broader sense—that for a State like New South Wales, or for that matter Victoria or anywhere else—in the ACT you basically have one group looking after it whereas in New South Wales we have 170 councils. The ACT, I am

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<sup>104</sup> Transcript of Evidence, SEDA, 12 November 2003, p23

<sup>105</sup> Submission No. 24a – DIPNR, Supplementary, 17 March 2004

not trying to sound terrible here, but it is basically one council. You are looking after all those areas that we have spread across in many ways 170—

**Ms WARREN-WILSON (ACT):** I certainly can see the problem. That is why we have been able to have the scheme run quite comfortably right from the beginning because we are a fishbowl, aren't we, really? ...certainly in the areas surrounding the ACT, they come under the auspices of whatever is coming down from the New South Wales Government at that level. I know that there is a requirement for ratings to be done under NatHERS, which is your tool. Around Canberra, because I have 230 assessors, they are trained and monitored—and I need to answer part of your question too about monitoring their quality of work—they are trained, but also the model that has been used, which is developed and provided by Sustainable Energy Authority of Victoria—and I am guaranteed this—aligns very closely to NatHERS...

Because of this—and because we also require a four-star mandatory minimum, and in New South Wales under NatHERS you only require a three-and-a-half-star mandatory minimum—shires around the ACT such as Yarralumla have said, "We will accept your ratings at the four-star level." They are asking for a higher level, and it is a local Government song that is being sung. I suppose if we had one tool right throughout Australia that would go away. It would raise other questions about where the registration fees are paid, and the mutual recognition would go away. But then where do you do the majority of your ratings et cetera, and dividing that up? But generally speaking we would have conformity, and we do not quite have that yet even though the two are aligned.<sup>106</sup>

### 3.145 The Committee also heard industry views about the scheme's feasibility in NSW:

**Mr REARDON (BDA):** If we could do here what they have done in the Australian Capital Territory with the mandatory declaration of energy rating at a point of lease or sale, there would be a huge impact in getting sustainability, particularly energy efficiency, into both property valuations. We regularly see articles in the *Canberra Times* stating "energy renovator's dream", about buying a zero-star house, clearing a bit of foliage from the north-facing windows, putting in some insulation in, shade the east and west, and the property is immediately up to four or more stars, and the seller has picked up some money. We would really welcome a trial of that in New South Wales. BASIX and/or NABERS are the tools under which that can be done.

**Mr GREENE MP (CHAIR):** In the Australian Capital Territory an inspection certificate is given for energy efficiency of a building, as is a pest inspection in New South Wales.

**Mr REARDON:** That is correct.

**Mr CLARKE (BDA):** The real estate industry in the Australian Capital Territory has come up to speed with that over the past few years. It has now become a tradeable item included on the sign at the front of the property. Sydney real estate agents have not got their heads around that yet.

**Mr REARDON:** And they will not until it becomes mandatory, to be frank. It is business as usual for them. They do not want to change the system, they are comfortable with it and do not have to train people. The Australian Capital Territory real estate industry kicked, whinged and complained for more than 12 months and held back that regulation, but eventually it came in. They complained for the first six or 12 months and now they see it as a great tool, another product distinction tool and a marketing tool that they use it really well. Of course, the consumers have the benefit of that information. Particularly lower income consumers can look at a house and decide that they cannot afford to lease or purchase it because of the heating bills. And, of course, Canberra was a great place to start that because it has a terrible climate for heating and cooling. But just because

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<sup>106</sup> Transcript of Evidence, ACT Planning and Land Authority, 31 October 2003, p32

Canberra's climate is predisposed to that, I do not think we should not do exactly the same thing in New South Wales. Sure, we are going to get the same kind of resistance, but in the longer term it will be very successful.

**Mr PRINGLE MP:** What is the cost of that certificate?

**Mr REARDON:** In Canberra, they have First Rate, which is the Victorian system. The cost of that is somewhere between \$180 and \$200. You can do self-assessment up there. There is a fine for not declaring accurately, and if anybody, whether it be an inspector or a tenant, says they think it is a distorted energy rating, you can ask for an assessor to come in and ratify that. So the cost can be quite low under self-assessment.<sup>107</sup>

- 3.146 Many organisations that made submissions were supportive of applying the ACT scheme to NSW, including the Building Designers Association, the Master Builders Association SOARCH, the Alternative Technology Association, the Housing Industry Association, the Business Council of Sustainable Energies, Landcom, SSROC, and the Australian Conservation Foundation.
- 3.147 The NSW IPART Report into Demand Management in 2002 also recommended that NSW develop a scheme based on the ACT model.<sup>108</sup> Also this Committee's previous report into Government Energy Reduction Targets also recommended that the ACT scheme be considered by NSW<sup>109</sup>
- 3.148 The submissions argued that the scheme would provide many benefits. The cost of an assessment is very marginal in a house transaction. In the case of new homes that have been recently built under the SEDA Smart Homes Policy, the ratings assessment has already been completed. Similarly, homes built from this point forward would also have captured this cost in the development application process.
- 3.149 The key value of the scheme is that disclosure at point of sale brings energy efficiency to the immediate attention of the buyer. This is seen as a far more effective way to raise the issue with homeowners than relying on their interest in a generic public awareness campaign.
- 3.150 For existing homes, the cost of an assessment is a marginal transaction cost. The MBA argues that extending the scheme to all dwellings would effectively motivate existing home owners of poorly rated homes to make energy efficiency improvements:

**Mr FULLER (MBA):** ...I am also very conscious of ACT, because that is another centre of excellence in the MBA business, and in fact they have implemented the rating system on the sale of homes, point of sale, and I have consulted with my colleagues down there on that. I have to say I think that will make a tangible difference if it were adopted in New South Wales. The essence was to identify that the house for sale may only be a 2-star rated house, but by doing this you can beat up a 2-star house to a 3- or 4-star. So you are value adding on that basis, and the market will sort itself out. The buyer will say, "I am buying at this price". Sure, the seller might not be that happy but it is an opportunity for the investor. "So I will buy it at that price. I will upgrade it, i.e. reduce energy consumption and I can on-sell it as a better energy rated home".

<sup>107</sup> Transcript of Evidence, Building Designers Association 25 August 2003, pp15-17

<sup>108</sup> IPART report into Demand Management 2002, pp52-55

<sup>109</sup> Report on Government Energy Reduction Targets, Report NO 52/8 May 2003, Recommendation 27b) that a housing energy rating scheme, similar to that in operation in the ACT, for use at the time of sale of residential properties be considered.

If we don't address that, then we are perhaps only penalising the new homes that are being built. New home buyers and new home investors, they are the only ones who are going to bear the brunt of this energy conservation policy, and it is also the holistic policy. Perhaps that is one element that is not too over burdensome on the consumers. You could put insulation in the ceiling and bump this up to a 2-star or a 3-star before you sell it and you might get the benefit of a better time at the bidding. I see that as a positive thing that could happen.<sup>110</sup>

- 3.151 In the ACT, the disclosure scheme has been extended to point of lease. This brings obvious benefits to tenants who can be better informed about energy costs prior to leasing a home. It also gives landlords an incentive to make energy efficiency improvements to attract tenants and draw higher rents.

## Conclusions

3.152 In NSW, the BCA forms the baseline minimum standard for construction. BCA provisions exist for an extensive range of building elements and procedures – from structural integrity, footings and slabs, frames, roofing, fire safety construction and ceiling heights. These provisions are integrated directly into the planning and construction process. BCA compliance is a baseline condition for the issue of development applications, construction certificates and occupation certificates.

3.153 Reforms are being made to the BCA on an ongoing basis that reflect and acknowledge certain deficiencies. For example, the NSW Joint Select Committee on the Quality of Buildings in 2002 noted that the BCA is very slow to respond to technological development such as energy and sustainability concerns<sup>111</sup>. A further review of the whole building regulation system and the role of BCA has just been instigated by the Commonwealth Government in February 2004<sup>112</sup>.

3.154 The application of energy ratings schemes in NSW has been a voluntary but substantial part of the new housing developments in the State. Over 70 per cent of development consents for single homes are covered by the SEDA Energy Smart Homes policy, requiring 3.5 star rating, and developments by Lancom have been applying a 4.5 star rating. Also, SEPP 60 requires certain complying development (detached single or double storey houses) to have a 3.5 star rating. This covers mostly non-urban councils which do not have their own DCPs.

3.155 In effect, NatHERS energy star ratings have applied to most of NSW's freestanding housing over the last few years. Industry and councils have been developing and applying the scheme and have established a knowledge base under the assumption that the NatHERS system would become mandatory via the adoption of the BCA energy codes in 2004.

3.156 However the Energy Code as a mandated star rating introduced to NSW would bring with it limitations such as a bias towards larger homes which is a critical concern in NSW. Importantly, it will be at least another one or two years before a Code will be established under the BCA to address energy efficiency in multi residences.

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<sup>110</sup> Transcript of Evidence, Newcastle MBA, 12 November 2003, p5

<sup>111</sup> Joint Select Committee on the Quality of Buildings, Report upon the Quality of Buildings, July 2002, see Chapter , Building Codes and Standards.

<sup>112</sup> Productivity Commission “Reform of Building Regulation” Research Study - commissioned on 17 February 2004.

3.157 While the Committee recognises this substantial role of the BCA and NatHERS energy rating system within NSW building activity, the BASIX tool will ultimately capture more building elements and encourage “best practice sustainable buildings” in a superior way than can be ensured by the BCA.

3.158 The BASIX system is able to address energy issues concurrently with sustainability issues. More importantly, the best practice system in BASIX sets a higher more comprehensive benchmark than that in the BCA Energy Code and can apply to both free standing homes and multi residences from its introduction. BASIX will be implemented by a SEPP which will ultimately apply across all councils in a systematic way.

3.159 The Committee notes that since industry concerns were raised in late November 2003, the Government and industry have resolved many concerns such that there is now general support for moving directly to the BASIX system<sup>113</sup>. The Committee believes that, provided introduction and implementation is managed effectively by the Government, then the adoption of the BASIX will deliver various benefits:

- It would provide uniformity to the current ad hoc application of energy rating requirements in NSW residential buildings;
- It would ensure a higher minimum standard is delivered to the community in terms of energy efficiency and sustainability for residential buildings, recognising the interrelationships between building features and the environment; and
- It provides an alternative mechanism for delivering energy efficiency and sustainable homes which can be a model for other jurisdictions

3.160 The Committee believes that the priority for energy standards is to deliver systems that will work immediately to curb residential energy demand in NSW. Inconsistency of requirements can exacerbate demand as noted by Integral Energy:

The inconsistent application of standardised energy efficiency building codes, coupled to the desire for increased density in new housing, has created an environment where new residential development creates greater infrastructure demands than necessary. Examples of this are the absence of eaves and mandatory insulation on new homes. In the Western Sydney area, this means that new homes are fitted with large air conditioners upon construction, in order for them to be sufficiently attractive to the market.<sup>114</sup>

3.161 The Committee supports of raising of energy standards in a comprehensive sustainability model that is delivered uniformly across NSW. The Committee supports the introduction of BASIX as the uniform baseline for energy efficiency standards in NSW.

3.162 NSW is facing a problem with its residential energy consumption. New stock in the market must deliver better outcomes. The Committee is aware that raising standards has cost implications. It does appear though, by the example set in other jurisdictions, that there is a willingness to impose higher standards.

<sup>113</sup> Submission 24a, DIPRN Supplementary submission, 17 March 2004

<sup>114</sup> Submission No. 31, Integral Energy, p15

3.163 The Committee is strongly supportive of the BASIX tool and its goals of reductions in greenhouse gases and comprehensive sustainable building outcomes. It is important that the BASIX system is rigorous and workable and the Committee is mindful of some implementation concerns raised by industry. As such, monitoring and adequate evaluation of the implementation and compliance with the new system should be undertaken.

**RECOMMENDATION 5**

The Committee recommends a monitoring and evaluation system be an integral part of the implementation of BASIX.

3.164 The Committee strongly supports the proposal to introduce disclosure of a house energy rating at point of sale that can be derived from the BASIX system.

**RECOMMENDATION 6**

The Committee recommends that point of sale requirement for disclosure of energy standards on residential buildings be developed in NSW.

## SECTION 3 - BUILDING DESIGN AND OTHER FACTORS

3.165 Building design, materials, appliances and the surrounding environment all impact on the energy consumption in residential homes. This section outlines some comments about these influences.

3.166 Various submissions argue that the current design of homes is a concern. The Department of Planning Infrastructure and Natural Resources (DIPNR) states:

The NSW residential development sector is growing rapidly, approximately one new dwelling is completed every 14 minutes. In recent years, clear trends have emerged that suggest our latest housing stock is, despite intentions to the contrary, becoming significantly less sustainable. Larger houses and lower occupancy rates are at the core of the problem. The average floor area of detached dwellings has increased by nearly 20 per cent since 1990, simultaneously the average number of people per household has fallen from 3.0 in 1991 to 2.8 persons in 2001. These factors, combined with housing locations that are increasingly remote from public transport, and housing forms that are demanding more energy to heat and cool, poses a considerable sustainability challenge.<sup>115</sup>

3.167 The Building Designers Association describes the current growth of large houses as the “residential luxury disease”:

In the residential sector, the increase in demand for electricity is linked directly to the increasing size of houses and their increased inclusion of and reliance on energy hungry appliances and services....

Glazing area as a proportion of floor area has increased dramatically, and the amount of that glass exposed to inappropriate sun has also increased. This can be seen in the trend to eliminate eaves without adding compensating pergolas or other shading devices.

Floor plans are more open plan than ever before, which denies the occupant any opportunity to “zone off” parts of the house which are too hot or cold. It also means that any heating or cooling must be applied to the whole house.

Construction systems are almost universally brick veneer with little or no insulation. The Australian Greenhouse Office estimates that 70% of Australian homes have no insulation. Tiled roofs are almost universally black or dark grey in colour, which acts as a house-wide heat sink. Sarking is commonly found only in the most recent houses in the sample, built under the Energy Smart Home Policy.

In certain significant growth areas of the Sydney basin, houses like these are being built for increasingly affluent owners who, not understanding the implications or the alternatives, are “ticking the box” on the sales order for reverse cycle ducted air conditioning. The north west corridor, Hills district, Camden and Campbelltown areas are the most significant of these areas. House sizes in the areas are commonly 400 sq.m and rarely below 250 sq.m.<sup>116</sup>

3.168 The NSW Chief Architect and the Royal Australian Institute of Architects outline several design related concerns:

The majority of new residential buildings are designed with inadequately passive solar heating and cooling capacities such as the simple inclusion of shading to direct solar heat gain in the summer. The result is indoor air temperatures that regularly exceed human comfort levels. In response to these situations most home occupiers are forced to

<sup>115</sup> Submission No. 24, DIPNR, p9

<sup>116</sup> Submission No. 19, BDA, p3

rely on mechanical air condition to maintain a comfortable living environment. In addition many older residential buildings may lack suitable cross ventilation preventing the ability of occupants to effectively cool internal temperature by opening windows.<sup>117</sup>

### Dwelling size and design

3.169 As noted in Chapter 1, dwelling size and design are a common issue contributing to energy consumption. Larger homes generally consume more energy than smaller homes. Popular open plan designs contribute to the inefficiencies in heating and cooling and fashionable house styles may not be the most suitable for climatic conditions:

The vast majority of contemporary sub-urban house designs are fundamentally unsuited to the climatic environment of Australia. Cellular internalised European housing models ignore potentials for inside-outside living and natural cross-ventilation. Building envelope designs largely ignore optimisation of orientation and solar control to admit welcome winter sun and exclude unwanted summer sun. Traditional features of early Australian houses have been abandoned, such as verandas, eaves overhangs, canopies, pergolas and lattice shading screens. Designs, therefore, fail to be “bioclimatic” – naturally responsive to local climate - and depend on energy and resource consumption to make them habitable – warm in winter and cool in summer.<sup>118</sup>

3.170 The siting of larger homes may limit open space and lessen the scope for passive solar benefits. For example, where houses are built to the minimum “set back” from boundaries then the remaining space is commonly used as utility corridors (particularly where houses are on concrete slabs). Shade plantings may then be prohibited due to overhang and problems with root systems interfering with power, water and sewerage systems.

3.171 Another common move to maximise the size of homes on lots is to remove eaves. This design feature can expose the home to over heating. The Committee raised the issue of floor space ratios or site coverage in hearings:

**Mrs PALUZZANO MP:** Do you see a need for a uniform approach to floor-space ratio in detached dwellings in a sustainable framework?

**Mr REARDON (BDA):** My short answer is yes. Of course, there may be times that may not work quite so simply.

**Mr PRINGLE MP:** Site coverage versus floor-space ratio, does it matter much which one you have? If you had 40 per cent site coverage versus 50 per cent, is that close enough?

**Mr CLARKE (BDA):** Yes, they can approximate the same end result. Probably most councils would look at site coverage as being more important in maintaining a green appearance. Of course, it has a much deeper function; that is, maintaining soil porosity and the ability of an area of soil to soak up rain rather than it being collected on hard surfaces, and concentrated, et cetera. Probably we could come up with an answer that works both ways, if it is done cleverly enough. But you have to approach it one way or the other, or both. You cannot just walk away from it.

**Mr GREENE MP (CHAIR):** Do you wish to add anything to that, Mr Reardon?

**Mr REARDON (BDA):** Yes, it is all very well to talk about floor-space ratio, but if we could link that under this carrot and stick approach with the Government providing regulation to the industry and the industry aspiring to best practice, and link that with some

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<sup>117</sup> Submission No. 22, NSW Chief Architect, p3

<sup>118</sup> Submission No. 20, SOLARCH, p2

variations, exceptions or exemptions to the tighter floor-space ratio—for instance, solar access, high-level energy efficiency in the building envelope—there would be a trade off. That would be a good incentive for industry and a good way to get some ideas adopted by industry more quickly than having to beat them into compliance through regulation. The carrot and stick approach seems to work best, as it has with energy-smart homes and some of the other policies that we have implemented and embraced.<sup>119</sup>

- 3.172 The standard masonry veneer construction, with dark roofs, ignore key design strategies for thermal comfort and resource efficiency. The few environmental benefits of current popular housing construction practices are the use of concrete slab on ground construction, which delivers useful internal thermal mass, and adoption of improved wall and roof insulation standards.

## Surrounds and landscaping

- 3.173 Residential energy consumption can also be significantly affected by the surrounding landscaping. “Heat islands” or “heat traps” may be created in new developments where there is little vegetation established and a predominance of concrete, bitumen and other heat absorbing materials. This is where the cumulative heat of the materials is retained, increasing the temperature of the suburb.

Heat loads on built surfaces such as roofs, walls and pavements are exacerbated by the lack of shade in the environment such as trees and scrubs. Shade trees and appropriate landscaping cool hard, heat absorbing surfaces by blocking direct sunlight and via the cooling effect of transpiration... The use of shade trees and other landscape features to mitigate external temperatures around residential dwellings (especially the new estates in Western Sydney) is hindered by the lack of incentive and adequate space allocated to landscaping.<sup>120</sup>

- 3.174 Surrounding trees and garden layout can significantly impact on heating and cooling of homes and reduce energy requirements:

One mature tree potentially provides as much cooling as five 3kw air conditioners. Landscapes can help cool a building through trees that intercept most of the solar radiation arriving at the top of the leaf canopy. The extent is determined by the leaf area index and most plants have at least 36 times as much surface area for energy interception as a canvass awning. A large tree is able to reduce the surface temperature of a roof by nearly 30 degrees Celsius.<sup>121</sup>

- 3.175 The government’s influence on landscaping decisions at a household level is limited (with the exception of removal of established trees and DA specification of landscaping and plant species under certain circumstances). Householders have the discretion to plant and design their gardens as they wish, provided there are no significant impacts on adjoining properties. However, a concern raised is that, where councils allow greater size homes on lots, then the scope for planting of large shade trees is limited by other council controls relating to tree safety and distance limits from boundaries etc. Thus, in the new developments where large homes predominate, there is less scope for extensive shade tree planting to counter the “heat trap” phenomenon. There are also council requirements in some areas about limiting native vegetation corridors in case of fire hazards.

<sup>119</sup> Transcript of Evidence, Building Designers Association, 25 August 2003, p15

<sup>120</sup> Submission 22, NSW Chief Architect, p3

<sup>121</sup> Johnson, C. NSW Chief Architect, Greening Sydney, Government Architecture Publications, 2003

3.176 Nevertheless, council land adjacent to new and existing residential areas is an area where Council can ameliorate the “heat trap” phenomenon by retaining natural vegetation during development and adopting best practice management of council land.

3.177 The submission by the Landscape Contractors Association of NSW highlights these issues. Councils are required to incorporate landscape requirements into new developments. However, the Association argues that plans can be made more stringent, such as enforcing fenced exclusion zones on site to ensure existing vegetation can be retained and protected:

More can be achieved. All local councils should be encouraged to implement effective Landscape Codes and Vegetation management plans.<sup>122</sup>

3.178 A further contributor to heat traps is roofing colours. Dark roofs tend to absorb heat and increase house temperatures. As explained in the submission from the National Association of Steel Framed Housing:

The benefits of light colours in warm climates are well documented: particularly in the United States where schemes exist that provide rebates and concessions to buildings with light coloured roofing...The benefits specifically relating to energy are that light coloured roofing reduces energy use within the home and helps reduced the surrounding environmental temperature, particularly in built up areas (heat island effect). The reduced environmental temperature further reduces the energy use within neighbouring homes and also reduces the propensity for smog.<sup>123</sup>

3.179 The BCA energy efficient codes allows for the use of light coloured roofing as a component for generating its energy efficient rating.

### Products – hot water and air-conditioning

3.180 There are two key products installed at construction that are substantial contributors to energy consumption. Hot water is predominantly the overarching energy expense and air conditioning (AC) is the predominant peak energy demand item.

In NSW hot water is the most significant end use in terms of both energy consumption and associated CO<sub>2</sub> emissions. It is also the end use where the most significant reductions can be achieved through efficiency and fuel substitution (solar and gas in place of electricity). Gas boosted solar systems can achieve a 92 per cent reduction in CO<sub>2</sub> compared to electric storage but at additional cost.<sup>124</sup>

3.181 Many submissions argued that efficiency of hot water systems is an area for priority attention because changes could impact on energy consumption and greenhouse gases significantly.

If hot water systems were upgraded as they were replaced, significant gains could be made in energy use reductions in residential buildings. One could expect all hot water systems to be replaced within 15 years so these significant reductions in greenhouse emissions can be made within a relatively short time and for moderate cost.<sup>125</sup>

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<sup>122</sup>Submission No. 6, Landscape Contractors Association NSW, p2

<sup>123</sup>Submission No. 12, National Association of Steel Frame Housing, p1

<sup>124</sup>Submission No. 21, Royal Australian Institute of Architects, p5

<sup>125</sup>Submission No. 21, Royal Australian Institute of Architects, p5

3.182 A particular issue raised was the suspension of the SEDA solar hot water rebate which the industry argued was negative decision for consumers:

**Mr FULLER (MBA - Newcastle):** The State Government has just withdrawn the \$500 subsidy on hot water services. That sends another mixed message to consumers and the industry. On one hand we have had this very strong push for "this is where you should go", we have had industry responding with heat pumps and new generation hot water services. Those sort of things are cost effective at the moment and you will not find me sitting here saying "don't put anything in housing because it will push the cost of housing up". That is a wrong argument when it involves water.<sup>126</sup>

3.183 Various submissions called for the return of the rebate, for solar hot water to be made mandatory in all new homes (as imposed in Victoria) and for hot water systems with a high CO<sub>2</sub> intensity to be phased out of the market.<sup>127</sup>

3.184 Air conditioning is the key driver of peak energy demand and subsequent infrastructure requirements noted in Chapter 1. Air conditioning systems are estimated to produce around 14 per cent of household greenhouse gases and nearly 40 per cent of energy use.<sup>128</sup>

3.185 Air conditioning uptake has doubled in the last ten years. Today, about 50 per cent of households have air-conditioning and this figure is expected to grow. The popularity of air conditioning is due to a variety of factors:

Air conditioning has become a required inclusion for the medium to upper levels of the housing and apartment market. This is partly due to the inefficient design of many houses and apartments but it is more to do with air conditioning being seen as a status symbol. More energy efficient dwelling design will not reduce market demand significantly for air conditioning as a standard inclusion in the short to medium term but will minimise the actual use of air condition to days of extreme temperatures.<sup>129</sup>

3.186 In fact, it is suggested in some submissions that the improvements in energy efficiency in newer homes has actually acted as an incentive to install air conditioning. Furthermore air-conditioners are increasingly affordable. Submissions argue that given this situation, active disincentives have to be introduced to curb air conditioning demand:

In Sydney, with good solar orientation and an efficient envelope, it is possible to achieve comfortable temperatures all year round without any artificial heating or cooling. However the reality is that this can only be achieved if disincentives are also introduced to discourage occupants from turning on their heaters and installing air-conditioning. It is difficult to convince a client that if adequate insulation and ventilation is built in they will not require air conditioning. Air conditioning costs little to install and the running costs are not prohibitive. Once air conditioning has been installed, the best design in the world will not inhibit its use. In fact better passive design may actually encourage the installation of total climate control because it is easy and inexpensive to condition the entire house.<sup>130</sup>.

<sup>126</sup> Transcript of Evidence, Newcastle MBA, 12 November 2003, p3

<sup>127</sup> Submission No. 10, Institute of Engineers, Submission No. 15, SSROC, Submission No. 18, Alternative Technology Association

<sup>128</sup> *Your Home, 4- Energy Use*, Australian Greenhouse Office

<sup>129</sup> Submission No. 27, Mirvac, p1

<sup>130</sup> Submission No. 21, Royal Australian Institute of Architects, p8

3.187 A disincentive for air-conditioning proposed in the submission from Building Designers Association (BDA) was to have a purchase levy on greenhouse-heavy and inefficient heating, ventilation and air-conditioning systems. The BDA submission explained:

A sliding levy of 25 per cent for the least efficient systems such as portable air conditioners or large ducted systems, reducing to zero per cent on the purchase price of the most efficient (such as solar thermal), using existing star ratings as the yardstick.

Large ducted heat pumps are often claimed to be over 90 per cent efficient, but this never accounts for the whole supply chain of the energy involved, only the appliance itself. Additionally, occupants have the tendency to over-use these systems, since they are ‘set and forget’: it is too easy to just dial up 22°C inside even though it might be only 25°C outside. It is also reasonable to expect occupants to adjust their thermostats upwards in summer, but this is rarely done in reality.

This could easily be justified as a levy to fund community costs for constructing additional coal fired power stations to meet HVAC generated demand. It is a simple application of the “user pays” principles already being applied successfully in a range of initiatives including: motorway tolls; funding the development of community facilities through Section 94 contributions, etc.<sup>131</sup>

3.188 The Royal Australian Institute of Architects also suggested:

- minimum efficiencies for AC systems in NSW to a minimum Coefficient of Performance (COP) of 3.0;
- mandatory purchase of green power could be rolled into the purchase of air conditioning; and/or
- minimum energy performance for HVAC systems for multi unit residences be mandated via the SEPP 65 controls.<sup>132</sup>

3.189 The Committee inquired whether there were possible technological solutions being developed, which might lessen the strain of air-conditioning on peak demand:

**Mr SLACK-SMITH MP:** Technology is advancing at a very fast rate, the technology into air-conditioning, for example. I do not suppose there is anyone who we can ask this question to except you, because I think you would be the prime target. But if the technology arises that air-conditioning is half the power load to what it is now, you would be over-capitalising like mad in a lot of these new areas. Are you aware of any advanced technology insofar as air-conditioning to make it more efficient at this point in time?

**Mr POWIS (Integral):** ...The issue is that air-conditioning units, by virtue of that pump, create reactive power. Basically what that means is that we have a very inefficient use of our system. In other words, for every 100 units we most probably have to generate 110 or 120 units to overcome that reactive power. We have in the last three years spent in our network in excess of \$20 million which is called power factor correction. You can see it in the notes. Basically what that is trying to do is more efficiently use the resources we have as opposed to building more network. We are trying to counter the reactive power with those. My issue is that if we could get to the air-conditioning companies, so they did it themselves within their own motors—because it is better done at the source—it would save us money in the \$20 million, and it would be a more efficient process dealing with others in the network; so you would have less energy being required to be generated. Have I missed anything, John?

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<sup>131</sup> Submission No. 19, Building Designers Association, p6

<sup>132</sup> Submission No. 21, Royal Australian Institute of Architects, p8

**Mr WALLACE (Integral):** No, I do not think so, Richard. But to reiterate what Richard said, the technology is there available now for the manufacturers to improve the power factor of the air-conditioning equipment. The emerging technology that is also there is that they are using variable speed drives, and that is a lot easier on our system as far as the starting of that compressor, and it also has a variable output. The emerging issue there is the quality of supply. Because we are cutting the wave, you get a generation of harmonics and we need to keep a close eye on what is happening there with the generation of harmonics.

Also, the air-conditioners themselves are quite efficient. They are heat pumps, so there is coefficient performance. Because it is a pump, for every kilowatt you put in, you can get three kilowatts out. That has improved over the period of time and no doubt there will be some further improvements with technology on that coefficient with performance. They are the issues we see with air-conditioners; the increasing coefficient performance, improvement of power factor and keeping an eye on the harmonics that are generated by the variable speed drives that are emerging in those.<sup>133</sup>

## Conclusions

3.190 The Committee considers that the suggestions made in submissions should be closely considered. The Committee acknowledges that while the Government should encourage certain behaviours, controls should not be so rigid as to compromise amenity or the consumer's right to choice.

3.191 The Committee asked for suggestions on how to influence consumers:

**Ms D'AMORE MP:** As noted in your submission, average house sizes are increasing. How could consumers be influenced to reduce the size of their houses?

**Mr CLARKE (BDA):** One factor is diminishing lot sizes which, combined with other planning controls such as floor space ratios, will limit gross floor areas. However, the tendency as we become more affluent—assuming that trend continues—is to be able to afford a bigger and more luxurious house. Many market forces apply in the commercial world and people have vested interests in producing and selling more—that is the basis of a consumerist society. Those forces will work to increase the amount of goods and materials consumed, and part of that is intrinsically linked to building bigger houses because that means more materials are used. Regulation has a role to play in reducing the size of houses, but education of the market and industry are also important.<sup>134</sup>

3.192 The Committee feels that improvement in the overarching planning system could be made and suggests that the following recommendations from submissions be considered:

### RECOMMENDATION 7

The Committee recommends the following design issues be considered in the Government's review of the residential planning system:

- Introducing more effective landscape codes and vegetation management plans in council DCPs
- Supporting community programs that enable residents to take action on greenhouse pollution at a neighbourhood level.
- Improving the consistency of regulations in regard to the quantum of solar access to external living space

<sup>133</sup>Transcript of Evidence, Integral, 31 October 2003, p5-6

<sup>134</sup>Transcript of Evidence, Building Designers Association, 25 August 2003, p13

- Adopting best practice vegetation management in its activities such as planting of road verges

3.193 In terms of hot water provision, the Committee believes that a strong signal should be sent to the community through mandatory measures which will lead to solar water heaters being chosen as the first preference for all buildings, and which will bring about widespread installation.

**RECOMMENDATION 8**

The Committee recommends that Government consider setting mandatory measures which will lead to solar hot water heaters being chosen as the first preference for all residential buildings.

3.194 Strong signals should also be sent to the community about the impact of air conditioning use given its direct correlation to peak energy demand. The Committee suggests that more purchase end information should be provided to educate consumers about air conditioning impacts (See Chapter 4 Consumer Education)

3.195 The Committee believes that the way to address air conditioning should be approached from both the consumer and the supply end. The next section on demand management outlines some technical options, which may help manage the air conditioning load.

3.196 The Committee is of the view that planning provisions are a way of raising the bar for air conditioning standards and supports mandatory minimum energy performance standards of air conditioning systems for multi unit residences, to be set via the SEPP 65 controls.

3.197 The Committee also recommends that the Government consider the option of linking air conditioning use to the purchase of green power. Subject to technical feasibility, the Committee believes that creating an obligation on consumers to purchase a portion of green power tied to air conditioning purchase could be explored.

**RECOMMENDATION 9**

The Committee recommends that Government consider setting a mandatory minimum energy performance for air conditioning systems for multi unit residences.

**RECOMMENDATION 10**

The Committee recommends that Government consider linking air conditioning purchase to green power purchase.

## **SECTION 4 – TECHNICAL SOLUTIONS AND RENEWABLE ENERGY**

3.198 This section outlines some technical solutions on the supply side of energy infrastructure, and installation options for residential areas and individual homes that are noted in submissions.

### Technical solutions at generation and distributor level

3.199 Energy distributors undertake demand management or load research projects. In its submission, Integral Energy outlined several projects it has undertaken in commercial industrial and residential energy supply:

## Integral Energy

Integral has been pro-active in encouraging demand management initiatives to assist with the capacity of the network where constraints exist.

### Domestic Hot Water

Integral currently has 1,556 MW connected reducing peak demand by 390 MW. 355,000 customers have selected this tariff option.

### Air Conditioning Cycling Program – Load Cycling

In the summer of 2001, Integral conducted an air conditioner interruption rebate trial. This trial found:

- Demand reduction of approximately 200kVA from 70 customers (just under 3kW/customer) was possible on a 35°C day;
- Almost 80 per cent of customers considered they were not inconvenienced by six half-hour interruptions over a nine week period; and
- Most customers would be willing to sign-up to ongoing air-conditioning control in exchange for a regular rebate, although there were wide variations in the levels of compensation expected.

The study was successful in that a significant reduction in demand was detected immediately after the switching commands were issued. The study revealed that when the air conditioners under control were switched off, the maximum demand reduced to a level equal to that of a 25°C day.

### Seven Hills – Load Curtailment

The Seven Hills Demand Management program was undertaken to defer a \$1.7 million network augmentation project from 1998 to 2003. The Seven Hills program has since been further extended by two years to 2005.

### Katoomba – Energy Efficiency

An energy efficiency program that was launched in the Katoomba area in 1998, focussing on energy efficiency in the residential sector, has successfully deferred additional capital works in the area until 2006/07.

### Tahmoor – Fuel Substitution

This program in the Southern Highlands region ran for three years from 1998 and promoted the use of bottled gas for cooking and space heating as a means for controlling winter evening peak electricity demand growth.

### Automated Meter Reading – New technology

Integral has recently completed an Automated Meter Reading (AMR) trial. The objective of the program was to investigate the half-hourly, remote reading of meters. AMR was deployed using the low voltage network to carry a meter signal to a substation where the signals were concentrated, radioed to a central database, and made available for viewing on line. In this particular project, only data interrogation and communication techniques were investigated. The system deployed could also allow real-time pricing, however its implementation would be costly.

### Wetherill Park – Load Shedding

The Wetherill Park Industrial area is one of the largest industrial areas in Sydney's outer west, and as such has experienced high demand and significant demand growth. Large industrial customers have previously been signed up for load shedding on extreme hot summer days and for a program of power factor correction. Under the load shedding program customers are typically given 24 hours notice to reduce their loads during the system's peak period.

### **Marayong ZS 33kV Feeder – Power factor Correction**

Investigations carried out by Integral – including public solicitation through the advertising of an Expression of Interest and consultations with major customers in the Blacktown industrial area – determined that power factor correction represented a cost-effective demand management opportunity in this area. Integral implemented a power factor correction program, which achieved its goals and deferred construction works from 2000 until 2006.

### **Parramatta CBD**

The local council has reviewed the guidelines specifying the limits on building heights in the CBD area. This has the potential to result in rapid demand growth that could quickly exceed existing network capabilities. Integral is cooperating with SEDA in an initiative seeking to develop a Commercial Building Greenhouse Gas Rating Scheme for the area. As part of this study, Integral has funded and conducted a major survey to identify and establish the opportunities for demand management in the Parramatta CBD. Study results indicate that sufficient demand management opportunities exist to possibly defer the need for supply-side augmentation. Integral has begun making offers to building owners/managers for the implementation of appropriate demand management initiatives. Integral is planning to issue an RFP that will extend the demand management program with the aim of deferring any network augmentation in the area until June 2006. This would constitute a two-year deferral of the supply-side asset. Some of the specific demand management options that are being considered include the installation of power factor correction equipment and the use of existing back-up generators to allow interruption of mains electricity without loss of amenity to specific customers in time of system stress.

### **Castle Hill Demand Management Project**

An innovative program that Integral Energy has recently implemented is the Castle Hill demand management program. Integral has signed an agreement with SEDA to use its current programs and negotiate with major commercial customers in the Castle Hill area for the implementation of demand reducing initiatives. SEDA have identified a number of cost-effective initiatives and are now organising their implementation. SEDA will be paid on demand reduction targets being achieved. Programs such as efficient air conditioning upgrades, efficient lighting and efficient motor drives are an example. This demand management program is seen to be the first of its kind in Australia.

3.200 A key program that attempts to address the peak energy demand for air-conditioning in the residential sector is load cycling, as explained by Integral in hearings:

**Mr POWIS (Integral):** ...in essence we ran a trial for interruptibility on air-conditioning load, because if you have looked at research, over in America they have what they call controlled load for air-conditioners. You know how we control the off-peak hot water system—we can turn it on and off at night—over in America they have systems where they control the compressor pumps on the air-conditioning unit. The air-conditioning unit is two parts: it has a compressor pump, which is the cooling, and it has a fan, which circulates the air. It is the compressor pump that draws most of the energy when it is doing it, so what they have done in America is, they have taken a suburb—they have a demand problem there—and they have said, "If we take 15 minutes, or 20 minutes or half an hour, and not run the compressor pump but keep the fan going so the house cools", and then they stop the cooling, keep the fan going and then start it after 15 to 20 minutes, you can rotate within a suburb when you disconnect load and reconnect it; so it is a ripple control.

What we did is we did a survey in our own network to see whether our people would find discomfort, and we found that under a rebate system we could interrupt load and the load would come right down. If we were able to rotate that over a long period of time, we potentially could lop off the peak, but it is a complex one where you would have to get a

whole suburb; you would have to set up a ripple control, which is all the mechanics for that. You would have to change the meters et cetera, so it is not a cheap activity, but it is a way that we have been looking at to try and see if we could control the load a bit more, but you would have to move into ripple control the same way we have with the off-peak, and it has taken a long time to get off-peak ripple control in the same way there.<sup>135</sup>

- 3.201 The technologies to interrupt loads and metering that can differentiate energy to different appliances in the home are being explored by various energy distributors. A correlating factor to this technological development is flexibility for distributors in the tariffs or pricing that they can charge to customers. Energy tariff reforms are being considered currently by the Independent Pricing and Regulation Tribunal's "Review of Gas and Electricity Regulated Retail Tariff" which is due to report in May 2004.
- 3.202 The Committee notes that revised tariff systems that are proposed by this IPART review may allow for the implementation of new technological solutions to demand management. The Committee also supports the earlier proposals from the 2002 IPART demand management inquiry which includes key recommendations to encourage network driven demand management. (See Appendix 4).

### Renewable energy options

- 3.203 Another type of technical solution at distributor level is the substitution of renewable energies into the energy infrastructure. More than 90 per cent of Australia's energy currently comes from coal-fired power stations, with less than 10 per cent coming from clean renewable sources. Reasons for the poor impact of renewable technologies in NSW are outlined in the submission from the Alternative Technology Association:

Renewable energy system use and implementation in Australia is still a niche area, and an emerging industry...Support and research into implementation is still lacking with renewable technologies. In the case of use of renewables in the domestic market, the perceived high cost of renewable technology remains a major impediment to widespread community uptake, and there is limited understanding of the long-term benefits of investing in them. The majority of households are still reluctant and discouraged by electricity retailers and market structure, to invest in individual power supplies when they can connect to the grid. Rebates have had some success in this area and have provided support to those who have chosen to install solar water heaters or photovoltaic solar arrays. The major driver for the uptake of renewable technology in Australia is the mandatory renewable energy target, which is not particularly user-friendly for residential renewable installations. MRET [Mandatory Renewable Energy Targets] is not necessarily the major driver for the uptake of renewable remote area power.<sup>136</sup>

- 3.204 Renewable energies are not only important as a means to address greenhouse gases, they are the principal way to reduce the need for traditional infrastructure investment currently predicted. In addition, the renewable energy industry argues there are strong economic benefits from developing renewable energies:

Sustainable energy is poised to be able to meet the challenge of reducing greenhouse emissions in a manner that will simultaneously increase economic activity, jobs and investment. The Allens Consulting Group report commissioned by NSW SEDA found that implementing policy measures to support renewable energy and energy efficiency would lead to an improvement in economic efficiency rather than imposing an economic cost.

<sup>135</sup> Transcript of Evidence, Integral, 31 October 2003, p2

<sup>136</sup> Submission No. 18, Alternative Technology Association, p11

The measures were projected to boost competitiveness and output in NSW (which is forecast to rise by 0.17 per cent, equivalent to more than \$500 million per annum). In addition it would provide more than 1,000 additional jobs in NSW (4,100 nationally).<sup>137</sup>

3.205 Renewable energy such as wind and biomass generation can be connected into the transmission system. The use of these renewable energy forms is already being imposed by energy targets through the Commonwealth's Mandatory Renewable Energy Target [MRET] and the NSW Greenhouse Gas Abatement Certificates. Many submissions argue that these targets need to be raised to make a significant impact on rising energy consumption.

3.206 Many submissions called for the deliberate preference for clean renewable energy infrastructure against further greenhouse gas polluting technology.<sup>138</sup>

3.207 The Building Designers Association recommended a blunt approach to address the dominance of traditional infrastructure. The BDA proposed to delay construction approval of all coal fired power stations for a period of 5 years, and apply the most stringent greenhouse gas emission standards to any new licence applications. The BDA argued that:

In this timeframe, carbon levies on greenhouse gas inefficient generation and consumption in combination with the impact of Energy Smart design and construction policies would create an environment in which renewable energy technologies are a viable alternative to coal fired electricity. We require cleaner energy - not cheaper energy. This timeframe will allow renewable energy technology viability will be more cost-effective and therefore be a viable option to coal fired electricity.

3.208 Most submissions proposed that more support should be given to renewable energy:

Probably the other important point is that energy services, energy efficiency, demands side management as well as renewable energy are all still emerging industries and continue to need support in building industry capacity and capability. Organisations around Australia, like SEDA, the Sustainable Energy Development Authority, have been instrumental in starting to build capacity and starting to show the way, but there is a lot more that needs to be done and we think there is an important ongoing role for organisations such as SEDA.<sup>139</sup>

## Technical solutions at local community or development level

3.209 Technical solutions that can use renewable energy and can be applied at a regional, community or development level include embedded generation, cogeneration and solar power.

3.210 Embedded generation refers to the process whereby electricity is generated and connected to the distribution system rather than the transmission system.

**Mr BRAZALLE (BCSE):** You can look at embedded generation as generation—whether it is renewable or gas fired—that is sort of deep in the distribution system that is connected typically at customers' premises. It is dispersed throughout the distribution system as opposed to building these humongous coal fire generators that are on the transmission grid. So we are talking about smaller generators dispersed throughout the distribution

<sup>137</sup> Submission No. 31, Building Council on Sustainable Energy, p3

<sup>138</sup> Submission No. 17, Australian Conservation Foundation and Submission 32, Business Council of Sustainable Energies

<sup>139</sup> Transcript of Evidence, BCSE, 31 October 2003, p20

system, and one of the benefits of that is it leads to lower distribution and transmission losses, but also leads to a much lower requirement for the network infrastructure; so you do not need to build these large transmission lines, you do not need to build more zone substations, you do not need to spend two hundred or three hundred million on upgrading the supply to the Sydney CBD for example.

**Mr GREENE MP (CHAIR):** What is the process then for getting those hooked up into the system?

**Mr BRAZZALE (BCSE):** I think it is fair to say that the way we have restructured the electricity industry and introduced energy market reform, we have tended to focus on the big issues like getting the wholesale market working properly. There is a whole of issues around embedded generation that we still need to sort out, and we have covered a number of those in our submissions. But, for example, embedded generation can be a really effective demand site management activity, but we see the electricity distribution businesses seldom embrace it. So we still need to introduce additional changes and pricing approaches that will facilitate embedded generation as an alternative to network augmentation.

One of the other issues that we have not covered in our submission, but it is becoming a topical one and that is the requirement for some sort of demand management fund, the IPART has said that demand site management, including embedded generation, has a significant role to play, but it has been difficult to get up. So we will be pushing for at least a proportion of the future capital expenditure; to be earmarked for alternative forms of energy supply. A lot of people recognise that it has a lot of potential. It has been difficult getting it through the electricity distribution structure that we have at the moment. I think I mentioned one of the issues was with customers installing PV have to incur the cost of a separate meter which is creating a barrier to entry, so there is another example of where the current arrangements are disadvantaging the sort of options that are more sustainable.<sup>140</sup>

3.211 Co-generation refers to the process whereby energy is harnessed as a by-product of some other industry activity:

**Mr POWIS (Integral):** ...We currently have two PPAs in our network. One is a cogeneration unit out at Visy, Smithfield, and it generates 160 megawatts in peak time and it is gas. It is a gas-fired power station in Smithfield. It generates steam for paper making and generates power which we take into the system. That is sometimes called cogeneration or local generation. We also have a generation unit down in Appin Tower, down near Appin, which takes methane gas out of coal-bed methane and generates and we buy that out of the system.

Various submissions called for more encouragement of cogeneration initiatives by Government. The Royal Australian Institute of Architects proposes mandatory cogeneration of combined water heating and power generation for developments over a certain size.<sup>141</sup>

3.212 Solar generation is a key form of local generation that the Committee considered. The Committee visited the Newington Estate at Homebush, the first large scale photovoltaic community in NSW. Homeowners are connected to the grid and sell back energy. Submissions to the Committee argued that local generation should be encouraged:

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<sup>140</sup> Transcript of Evidence, BSCE, 31 October 2003, p25

<sup>141</sup> Submission No. 21, Royal Australian Institute of Architects, p10

**Mrs PALUZZANO MP:** You have referred to the example of solar electricity, which was mooted in another submission. Could you clarify what the neighbourhood scale generation would be and whether there are local examples?

**Ms NOBLE (ACF):** There would be some local examples, but it certainly has not been mainstream. For example, if I flew into Sydney this morning and instead of seeing a swimming pool in every back yard I saw a solar panel on every roof, the chances are that those houses are going to be producing more electricity than they are using. When you are not home and you are not using any electricity, given that all your appliances are switched off at the socket there is the potential for a house to be a generator of electricity.

As a neighbourhood solution, potentially, houses that are producing electricity should be able to supply electricity to a grid. With current technology, it actually works better that way, because storing electricity in a cell is very expensive. It also gets back to enabling a community to be part of the solution. For instance, at a neighbourhood level, houses could be supplying electricity for the shopping centre that was built in the 1970s, when no-one thought about sustainable development. For big commercial buildings, solar panels on roofs will not satisfy their energy requirements. But, on a neighbourhood scale, ways could be found to link them.<sup>142</sup>

3.213 A common theme in submissions was the need to further exploit local level generation to supplement the need for new infrastructure.

Residential buildings have the capacity to produce as well as consume electricity. Localised electricity generation has the potential to significantly ease demand on infrastructure in terms of generation as well as transmission infrastructure.<sup>143</sup>

3.214 A further advantage of local generation is less widespread power outages:

WSROC notes that a broader issue is energy supply and a sustainable energy network. A sustainable energy network should be resilient, have the capacity supply peak demands, and have the capacity to absorb the impact of extreme natural events such as storm damage or bushfires. Recent examples include the power interruptions experienced in Sydney during fires in December 2002, and storms in January 2003. Investigating options for an embedded energy network is one way to address these issues, and is a key part of the transition to a more sustainable energy system. This would mean that it is less likely that the loss of a power station unit or transmission line will affect a wide region. A more diverse energy system is a more secure energy system.

3.215 There are still a number of energy market barriers to the implementation of sustainable energy at a local level that the Committee examined. Submissions noted that while local generation has benefits, developers received little encouragement to establish local generation in their planning:

Once new housing has been designed to be energy efficient, real savings in energy demand can be achieved through on-site or community power generation. The two systems that have been successfully developed and implemented are cogeneration and photovoltaic panels. Cogeneration is only economically viable on a community or large building scale whereas photovoltaics are suited to individual dwellings as well as buildings. At Newington, sufficient solar panels were installed to produce the equivalent energy consumed by the dwelling. The problem with both systems is the payback period (the number of years required for annual savings to meet the initial capital cost) far exceeds the average owner occupation span and therefore does not create any incentive.

<sup>142</sup> Transcript of Evidence, Australian Conservation Foundation, 25 August 2003, p45

<sup>143</sup> Submission No. 17, Australian Conservation Foundation, p6

Current state and federal subsidies provided by SEDA and the AGO are insufficient and orientated primarily to individual homeowners. Given that the bulk of dwellings is delivered by developers, subsidies of sufficient size need to be made available to the industry to create the required incentive to ensure takeup of large scale renewable energy or cogeneration systems.<sup>144</sup>

3.216 The Institute of Engineers suggested that incentives for green developers could also be provided by:

...including sustainable building and energy efficiency in the NSW Greenhouse Gas Abatement Scheme, to allow the issue of abatement certificates for residential building developers who reduce greenhouse gas emissions.<sup>145</sup>

### Technical solutions at household level

3.217 There are various ways that households may be able to shape their consumption through new technology options.

3.218 As noted previously energy distributors are examining options of new metering. New metering technology can allow consumers to break up their utility consumption in time periods to respond to peak pricing systems as explained by Energy Australia:

**Mr SMITH (Energy Australia):** Most of the people in this room, I presume, would have a normal residential household. They will have what is called an accumulation or dumb meter that just registers the total amount of electricity used. When it is read, they look at how much has been recorded this quarter, go back and look at what was used three months ago, and the difference is the average electricity usage. There are now Interval, Profile or Smart meters which measure electricity per half-hour. They are used for large customers to settle the National electricity market. Energy Australia is looking at a program of rolling them out to smaller customers than is required under current New South Wales legislation. Those meters then provide data about the household's overall usage that can help with demand management.

They potentially allow different pricing. When we know during what half hour people are using electricity we can change the price, for example, in summer or at certain times during the day. There is a cost associated with that and with 1.3 million customers it would be expensive to roll out those programs. We would then have to do something with the data, and that also has a cost. We have programs looking at small numbers of customers. The submission indicates that the data we use comes from a range of different sources. The Australian Bureau of Statistics did a survey, but that is no longer done. A time-of-use survey was done by Pacific Power in 1993-94. We have also conducted a load research program involving measuring individual appliances. We are asking IPART to consider funding to expand that program during the next period. We are doing some research. It is expensive to do and it is hard to cover the gamut of people involved. However, we are looking at it and continuing to do more work on it.<sup>146</sup>

3.219 Dual metering tied to dual circuits could enable consumers to divide their energy consumption across essential and non-essential appliances or activities:

Domestic loads could be split into essential and non-essential load, as follows:

- domestic essential loads (lighting, refrigeration, computers, general power, and microwaves)

<sup>144</sup> Submission No. 27, Mirvac, p3

<sup>145</sup> Submission No. 10, Institute of Engineers, p3

<sup>146</sup> Transcript of Evidence, Energy Australia, 25 August 2003, p61

- domestic non-essential loads (air-conditioning, swimming pools, clothes dryers, washing machines, hot water systems, and cooling ranges)

Such a scheme would require separate metering, control equipment and segregation of electrical circuits within the home. While initial uptake would be slow, the long term benefits of not having to design generation transmission and distribution systems to meet short term maximum demand would have significant financial and environmental benefits by increasing the utilisation of existing and new assets.<sup>147</sup>

3.220 Linking certain energy use activities with renewable energy purchase was also suggested in submissions, in particular the purchase of photovoltaic (PV) cells to counter air-conditioning purchase and the purchase of green power for use of luxury appliances.

**Mr BRAZALLE (BCSE):** We need to find a mechanism to get price signals to purchasers of air-conditioners, and we think that is really important, because if the people who purchased air-conditioners, if they paid the correct price, you will find that a lot of them would be prepared to then purchase a solar PV system. We find that technologies like solar PV are disadvantaged because their contribution to the electricity industry is not recognised, and because the customers are not paying the correct price, they are not making correct investment decisions. We have renewable energy systems and price signals to customers, they do cross over, and until we get customers paying the right price, we are not going to get efficient outcomes, so we are not going to get as much sustainable energy in the market.<sup>148</sup>

**Mrs PALUZZANO MP:** I note that the submission refers to a number of significant reforms and priority actions, and I ask you to elaborate upon a couple. The fourth relates to providing residents with the option of abating greenhouse gas emissions by paying for trees to be planted, at a similar cost to the excess energy changes from a differentiated pricing strategy. Could you explain what you mean by that and whether there are any local examples of it?

**Ms NOBLE (ACF):** Firstly, these initiatives are not meant to be taken in isolation. If that were to work, we would need a differentiated pricing strategy, and in order to have that we need to be aware that electricity provides heating and cooling and lighting as a fundamental requirement. The differentiated pricing strategy is more to reflect that if we are using excessive energy, we should be paying luxury prices for it.

The idea of having the option of either paying this premium price or paying something similar towards a scheme that plants trees means that you can get not just the benefits of offsetting greenhouse gas emissions but you could address issues such as salinity.<sup>149</sup>

3.221 Submissions also called for greater investment in “infant” renewable energy industries. SEDA, for example, is a provider of limited seed funding for the development of renewable industries. However, it appears that NSW is still not seizing the maximum advantage in renewable industry development, as noted by the Australian Conservation Foundation:

**Ms ANDREWS MP:** Could you outline the links between energy efficiency initiatives and economic opportunities?

**Ms NOBLE (ACF):** Obviously, any transition such as this is going to have implications for different industries in different ways. There are significant opportunities here. For example, the largest solar panel factory in the southern hemisphere is in Sydney, and it

<sup>147</sup> Submission No. 22, NSW Chief Architect, p5

<sup>148</sup> Transcript of Evidence, BCSE, 31 October 2003, p24

<sup>149</sup> Transcript of Evidence, ACF, 25 August 2003, p44

is owned by BP. Another Australian company, Origin, has developed a new technology for making solar panels at possibly a more reduced price, and that is about to go into development. The factory in Sydney currently exports some 80 per cent of its solar panels to places such as Europe, in particular Germany.

We should not be naive about the possibility that if you export 80 per cent of your product and it is not being picked up in Australia, we are going to look at exporting the factory. But that is only one direct way; there are many other ways and other businesses that provide products for buildings that have a lot to gain from more energy-efficient homes. Examples would be the insulation manufacturers, the glaziers association. Many of the representatives—for example, the Business Council for Sustainable Energy—are looking at other technologies, such as cogeneration and more efficient ways of ensuring that once you have the solar panels, you can boost them in a way that will make most effective the greenhouse gas abatement, such as heat pump technology.<sup>150</sup>

## Conclusions

3.222 The Committee recognises there are many technical options being explored which may address energy consumption issues such as new metering and load splitting. These initiatives should be given priority by the Government to shift from pilot studies to implementation in the residential sector. The Committee sees the value of these systems, not only in terms of managing energy supply, but also in giving consumers the information and technical means to shape and manage their own energy needs.

3.223 The Government needs to maximise the opportunities presented by existing alternative technologies. Renewable energy technology needs further investment and encouragement. There are, however, a range of energy efficient alternatives currently available which can be potentially applied.

3.224 The Committee recognises that even if we generate more power based on renewable energy sources, we would still be facing the peak power issue caused by air-conditioning loads, regardless of the source of generation. The Committee sees that there is merit in addressing air-conditioning loads specifically by:

- pricing controls to influence behaviour such as separate metering and higher tariffs for air-conditioners; and
- mechanical controls that simply shut down or cycle air-conditioners in peak demand periods.

3.225 Neighbourhoods should be encouraged to generate excess renewable energy and to champion energy efficiency within the larger urban context. More incentives need to be provided to residences and neighbourhoods to become net generators of electricity and sell this to the electricity grid.

3.226 At present one of the most viable forms of local generation is solar energy.

One of the simple applications of PV cells is a solar hot water panel, which could offset the cost of water heating for households. Western Sydney is ideally suited for the large scale application of such an option.<sup>151</sup>

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<sup>150</sup> Transcript of Evidence, Australian Conservation Foundation, 25 August 2003, p43

<sup>151</sup> Submission 3, WSROC, p19

3.227 However, substantial cost and technical barriers exist to discourage uptake of this technology:

**Mr SMITH (Energy Australia):** We must consider the cost of those solar systems... anecdotal people say that it costs about \$12,000 to set up a system. If it saved one quarter of your electricity needs—which is about 1,200 kilowatts costing 10¢ per kilowatt—you would save \$120 a year. So the payback period on the \$12,000 expenditure would be very long—this is just indicative. There was talk about greater efficiency in solar PVC in future. I think the term "bang for buck" was used earlier. The "bang for buck" is probably not there at present to encourage a great take-up but the business is prepared to buy back electricity when it is made available.<sup>152</sup>

3.228 Further problems relate to the need to establish separate metering for PV systems. The Committee considers that incentives to encourage the use of local generation should be provided for developers and residences to uptake PV technology. Overseas developments will also make greater solar uptake more viable in the future:

**MR BRAZALLE (BCSE):** The second point comes back to solar electricity, which I think is really the issue you are addressing. At the moment solar powered electricity is very expensive, but what we are seeing globally is that the amount of installations is increasing by over 30 per cent per annum and costs have been falling by about 5 per cent per annum for the last five years. We see that continuing, not necessarily because of what we do in Australia, but there is significant Government programs in the US, Germany and Japan that is pushing solar. So over the next 10 years we are going to see—and we honestly believe it and certainly Japanese and German Governments believe it—the costs are going to fall dramatically<sup>153</sup>

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<sup>152</sup> Transcript of evidence, Energy Australia, 25 August 2003, p56

<sup>153</sup> Transcript of evidence, BCSE, 31 October 2003, p24

**RECOMMENDATION 11**

The Committee recommends that the Government:

- a) Focus on moving viable technologies such as new metering and load splitting from pilot to implementation stage
- b) Consider specific technical mechanisms to address peak air conditioning related demand such as:
  - Pricing controls to influence behaviour such as separate metering and high tariffs for air conditioners
  - Mechanical controls that simply shut down or cycles air conditioners in peak demand periods
- c) Foster renewable energy uptake in particular:
  - Greater support for applied renewable energies such as increasing Commonwealth and State renewable energy targets;
  - Greater support for “infant” renewable energy industries
- d) Encourage local generation through:
  - mandatory consideration of cogeneration in planning approvals for large developments;
  - providing incentives for neighbourhoods to become net generators of electricity and to sell back to the grid.
  - improved incentives for installation of PV technology for developers and residents to address current high up front costs;
  - enabling the issue of abatement certificates to residential building developers who reduce greenhouse gas emissions



## Chapter Four - EXISTING HOMES

- 4.1 Chapter 3 examined energy efficiency issues for arrangements for new housing stock. The remaining 98 per cent of the market, 2.3 million homes, is existing stock that is the focus of Chapter 4.
- 4.2 Even small changes in consumption multiplied over this number of homes can make a large impact on energy consumption outcomes. It is important to note that the average NatHERS rating for existing homes is estimated at 2.5 stars. Various submissions argued that "an effective pathway also needs to be provided for existing homes to improve their energy performance".<sup>154</sup>
- 4.3 This chapter explores actions that can impact on existing homes and looks at options made by submissions:

Given that new energy efficiency regulations will mean new dwellings will use less energy, government needs to provide subsidies and incentives to owners of existing dwellings to reduce their energy consumption.<sup>155</sup>

### SECTION 1 - CONSUMER AWARENESS AND PRODUCT INFORMATION

- 4.4 Lack of consumer awareness about energy efficiency is seen as a major impediment to changing behaviour. The quality and timeliness of information provided in home and product sales are key issues examined in this section.

#### Consumer attitudes

- 4.5 The Newcastle MBA described consumer's perspectives about energy efficiency at public hearings:

**Mr FULLER (MBA - Newcastle):** We have found that there are probably three stratas of consumers, and indeed builders, that you are looking at. The first strata are the die-hard, committed "I won't use the plastic shopping bag at the supermarket, I will use my own bag", et cetera, and the ones who want to incorporate everything they can into their home and they make that commitment. They buy the green energy. They are really very keen. They want to make a big difference. I am sorry to say it is probably 10 per cent of the population, 10 per cent of the building industry who are prepared to say that "we are going to go out there". You have then got, in my assessment, a 40 per cent factor who say, "If it is cost effective and it is not going to hurt me too much and it is not going to cost me too much more I will do it because I want to feel good about it, I want to do my bit. I don't want it to be too hard and I don't want to have too many choices. I just want to be able to say, yes, all right, I will invest", but the word is "invest", not just "I will put my hand up and say I will do my bit." Then there is the other fifty per cent who say, "Stuff it, I will only do it if it is regulated." To me that is the last course, and I would see the implementation of training, Government policy following those sort of tiers, not pitching at the top 10 per cent because they have already done it, pitching at the other 40 per cent, because they are the ones who want to do it, they want to be leaders, want to be mentors, and the others will come through when you regulate it.<sup>156</sup>

- 4.6 Submissions argued that consumers have a priority of interests in their homes and purchasing decisions and that energy efficiency is not high on that list:

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<sup>154</sup>Submission No. 32, BSCE, p2

<sup>155</sup>Submission No. 27, Mirvac, p4

<sup>156</sup>Transcript of Evidence, Newcastle MBA, 12 November 2003, p4

From our recent experiences on projects such as Newington, it is apparent that there is little concern in the market place regarding sustainability issues. People did not buy houses at Newington because they were energy efficient and had solar panels on the roofs. They bought there because they liked the look of the houses, they wanted to live in that area, affordability and because of the surrounding amenity – the traditional purchasers' considerations. ...To overcome market apathy towards energy efficiency (and sustainability generally), the government needs to combine education with financial incentives to assist making sustainability a mainstream issue.<sup>157</sup>

- 4.7 There are various energy consumption consumer education programs being run by government which were outlined in Chapter 2. The “Your Home” program run by the Commonwealth’s Australian Greenhouse Office, is the primary program for encouraging energy efficiency in homes.
- 4.8 In NSW, SEDA has a similar role to the AGO. SEDA’s public education programs relating to residential energy include:
  - SEDA website providing general information on energy efficiency;
  - Energy Smart Information Centre – website and call centre providing free information and advice on optimising energy use in the home, covering insulation, energy smart appliances and energy efficient design;
  - direct activities through SEDA public information activities- seminar sponsorships, presence at home shows, school education programs, “Energy Smart Zone” and public advertising campaigns; and
  - indirect programs such as support for Energy Smart Product Partners (SEDA endorsed products).
- 4.9 Submissions generally suggested that consumer education programs are not generating great change in consumer behaviour:

There is a considerable range of programs available to assist people with making energy efficient choices in terms of construction, design, appliances and lifestyle. However, there appears to be little overall awareness of these programs within the community. There is a large range of energy efficient products potentially available, yet, there appears to be little uptake of such products. Most of the lifestyle appliances available (air conditioning, home entertainment, computers) are not energy efficient when used. There appears to be a need for a concerted and effective two-fold approach of making consumers aware of the choices and options available to them now; followed in the longer term by development of a market for energy efficient goods and services.<sup>158</sup>

- 4.10 It is difficult to evaluate the impact of consumer education programs. The key factor is whether the programs are influencing consumer behaviour and reaching beyond the 10 per cent of committed energy conscious consumers to capture those consumers who are willing to consider change.
- 4.11 Several submissions suggested that greater comparative data should be provided through billing systems. This was raised in hearings with energy providers:

**Ms D’AMORE MP:** My question relates to the billing system. It has been suggested to the Committee that the billing system is an adequate reason to reach consumers directly and provide information and influence their consumption habits. What is currently required

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<sup>157</sup> Submission No. 27, Mirvac, p1

<sup>158</sup> Submission No. 3, WSROC, p20

on the billing system and what scope and effectiveness would there be to add more information?

**Mr POWIS (Integral Energy):** We are talking about the billing system per se. I think the issue with the billing system is again—if I now go for a long stalk here—we have some of the lowest electricity prices in the world; that is the first point. The second point is that we really do not have pricing signals that influence behaviour, because being so low and being so averaged that there are no signals in that whole process. We also have a very complex network where we have existing suburbs which already have the infrastructure, and we have growth suburbs which should not be penalised because they are simply trying to get the same sort of lifestyle as the existing suburbs; so we have all of that. We have a very averaging bill, an averaging price, so any talk of changing the pricing signal and sending the signals to people so they can respond to it is a question.

We have had issues on greenhouse gases on bills and people have said—I have had different ones, that it provides more information so people can make sensible decisions, but equally we have criticism that our bills are so complex that the normal consumer is having difficulty reading the fundamentals. I do not want to dissuade people from putting more on the bills, but you have two issues there. I think the real issue is that we do not have the pricing signals, because if you are talking about demand management, demand management is really a product of supply and price, or demand and price. That is why as an organisation, we—together with Energy Australia—are recommending the inclined block tariff to try and send the signal. Again, it is an averaging process, so it is going to be a problem, but the lesson we have learnt from overseas is unless you have dramatic price differences, people do not respond to the prices.<sup>159</sup>

- 4.12 While the Committee is of the opinion that general consumer information is necessary, it has also received suggestions that more targeted “point of purchase” product information should be provided.

## Energy labelling

- 4.13 There are various appliance labelling initiatives designed to assist energy efficiency outcomes. Appliance labelling commenced in some Australian states in 1986. In 1992, a nationally consistent, state controlled end-use energy efficiency scheme was introduced, with mandatory labelling of household electrical appliances. The program for appliances and equipment was expanded in 1998 to:

- include minimum energy performance standards (MEPS);
- expand the range of products falling within the regulatory national program;
- expand the program to include integrated complementary voluntary measures with regulatory initiatives under the Standby Power Strategy; and
- accelerate regulation and drive greenhouse gas abatement through new policies.<sup>160</sup> The Australian Greenhouse Office manages the regulatory program on behalf of all Australian governments.<sup>161</sup>

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<sup>159</sup> Transcript of Evidence, Integral, 31 October 2003, p8

<sup>160</sup> Australian Greenhouse Office. “National Appliance and Equipment Energy Efficiency Program: When you can measure it, you know something about it – Projected Impacts 2000 – 2020”. Commonwealth of Australia, Canberra, June 2003. p5

<sup>161</sup> Holt, S. and Harrington, L. “Lessons learnt from Australia’s Standards and Labelling Program”, Paper 1,013. Australian Greenhouse Office

4.14 Energy labels such as the “star” rating labelling program used in Australia, are useful in enabling consumers to factor into their purchase decision, the previously invisible cost of annual energy consumption. An approved energy label is mandatory for the following electrical products for sale in Australia:

- refrigerators and freezers;
- clothes washers and clothes dryers;
- dishwashers; and
- air conditioners.<sup>162</sup>

4.15 Energy labelling of household appliances now operates in most OECD countries.<sup>163</sup> Australian regulations require that manufacturers measure products using standard testing procedures. The energy rating is shown graphically as a “dial” or gauge, with greater efficiency linked to advancement along the gauge. The number of stars on the scale depends on the highest preset threshold of energy performance that the model is able to meet.<sup>164</sup> The Australian Greenhouse Office (AGO) introduced a new label design in 2000, due to improvements in appliance energy consumption resulting in a need for tougher standards. In particular, the AGO wished to encourage manufacturers to keep improving the energy efficiency of appliances.<sup>165</sup> The new labels were part of a platform of regulation policy with world-best regulated efficiency standards.<sup>166</sup> In addition, appliances had to comply to a minimum standard in order to be sold, thus eliminating the sale of the least efficient products.

4.16 The aims of energy labelling are to:

- encourage consumers to select the appliance that uses the least energy and which meets their energy service needs;
- enable consumers to take account of the energy cost of operating an appliance and to minimise the total life cycle cost of the appliance where possible; and
- encourage manufacturers and importers to improve the energy efficiency of the products that they supply to the market.<sup>167</sup>

4.17 While appliances account for about 30 per cent of total energy consumption, they are disproportionately responsible for 53 per cent of residential greenhouse gas emissions.<sup>168</sup>

### Standby power

4.18 Standby power is the energy used by an appliance while plugged in but not performing its central function. The very useful consumer features made possible by standby power can be delivered efficiently, but most often are not. Experts believe standby

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<sup>162</sup> “Overview of Regulatory Requirements - Labelling and MEPS”, <http://www.energystar.gov.au/man1.html>

<sup>163</sup> Harrington, Lloyd. “Energy Labelling and Standards Programs Throughout the World”. The National Appliance and Equipment Energy Efficiency Committee, Australia, December 2001. p.v

<sup>164</sup> Harrington, Lloyd. “Energy Labelling and Standards Programs Throughout the World”, The National Appliance and Equipment Energy Efficiency Committee, Australia, December 2001. p.v

<sup>165</sup> “Background to the Energy Label”. <http://www.energystar.gov.au/star.html>

<sup>166</sup> Holt, S. and Harrington, L. “Lessons learnt from Australia’s Standards and Labelling Program”, Paper 1,013. Australian Greenhouse Office

<sup>167</sup> “History of the labelling program in Australia”, <http://www.energystar.gov.au/historey.html>

<sup>168</sup> “History of the labelling program in Australia”, <http://www.energystar.gov.au/historey.html>

consumption can be reduced by an average of 75 per cent with design and cost-effective technological improvements.

- 4.19 In 2000, standby power consumption accounted for up to 11.6 per cent of Australia's household electricity usage, costing Australian households more than \$500 million and generating more than 5 million tonnes of carbon dioxide per annum. This is equivalent to the greenhouse impact of more than 1 million cars.
- 4.20 Standby power is a growing problem that is increasingly recognised in the developed world. The International Energy Agency has called on member countries to develop an appropriate response to waste standby power. It is important that any Australian action be undertaken in a manner that is consistent with international policies and programs.
- 4.21 In August 2000, Australian governments agreed to adopt the 'one-watt' vision for the standby power used by electrical household products. The 'one-watt' goal is now also a key plank in this international push to reduce standby power consumption of individual products to less than one-watt. Since that in-principle decision, energy efficiency authorities have engaged industry and other stakeholders in discussions about how best to give effect to that vision.
- 4.22 It is currently proposed that both voluntary and mandatory measures (including voluntary labelling, product surveys, industry wide agreements, minimum energy performance standards and mandatory labelling) be introduced to address problem electrical products and successfully address waste standby before 2012.
- 4.23 The National Appliance and Equipment Energy Efficiency Committee is seeking to transparently identify those products targeted for attention and provided a realistic timeframe in which to achieve real change. The current primary focus is to target household and information technology products.<sup>169</sup>

## Issues in Submissions

- 4.24 Most submissions suggested that consumer knowledge of energy efficiency issues is poor and penetration of programs limited. Many submissions called for expansion of mandatory energy labelling to more products. Other submissions argued for the phasing out and/or levies against inefficient products and cash rebates on better performing products.
- 4.25 At the same time, it was pointed out that:
 

Initiatives such as identification of power efficient appliances can produce only a slow and limited decrease in consumption. Few people are inclined to replace appliances which are operating satisfactorily; even when the old fridge dies, cost may be the deciding factor in choosing a secondhand or old style replacement not better than its predecessor.<sup>170</sup>
- 4.26 The Committee heard various arguments as to why the uptake of energy efficient appliances is lower than desirable.

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<sup>169</sup> "Standby Power Consumption: A long-term strategy to achieve Australians' One-Watt Goal 2002 to 2012", National Appliance and Equipment Energy Efficiency Committee. Report No: 2002/09 Document based on the Executive Summary

<sup>170</sup> Submission No. 14, Consumer, p3

**Ms ANDREWS MP:** You have noted that there appears to be poor consumer awareness with the penetration of various initiatives. Could you give us some examples of that?

**Mr KANDAN-SMITH (WSROC):** Yes, I would like to. To set the scene I would like to give a few examples that have been related to me by individuals. One is about cost. People can see the tangible outlay in dollars for relatively expensive energy saving devices upfront but they are not necessarily equating them to the potential reduction in bills over time. In regard to energy efficient lightbulbs someone recently said to me, "They are really expensive and it would take a long time to make any savings, especially when you think about all the lightbulbs you have in a house. The typical family won't spend that much up front when they can get lightbulbs for 60¢. And a family that can afford to buy them probably wouldn't worry too much about the energy bills anyway." The interesting thing about this statement is that it came from a person with a fairly good awareness of energy and greenhouse gas issues. It highlights the point that the decision to spend, for families and individuals, is really based around what it is going to cost me now rather than possible savings with time. This is an issue with particular relevance not only for communities in Western Sydney but in many other areas in regional New South Wales where people do not have a lot of disposable income at hand.

The second example relates to behaviour. People can choose to use energy efficient devices. It does not mean that their lifestyle is necessarily energy efficient. For example, another person indicated that they had opted to use energy efficient lightbulbs in spite of the extra cost entailed, but the same person also said that they tend to walk around leaving the lights on in the house all the time. They leave all their electronic appliances such as televisions and computers on standby, and some studies indicate that this consumes a fairly significant proportion of household energy.

There is a strong behavioural component that is not necessarily affected by policy strategies and prices. With regard to marketing and awareness, appliances on the whole are not marketed with energy efficiency in mind—notwithstanding the fact that white goods appliances carry a star rating. For example, a person wishing to buy a replacement heater looked first at convenient size, appearance and cost—it was a cheap heater. That person did not look for energy efficiency even though that person had opted to use energy-efficient light bulbs in the home. Consumer choice is influenced for some people some of the time in terms of energy efficiency but I believe it is not the primary motivator for most people most of the time. I hope those three particular examples illustrate my point.<sup>171</sup>

- 4.27 Given the limited impact of the labelling programs, many submissions advocated for other incentives to be put in place. [Note that hot water and air conditioning products were examined in Chapter 3, Section 3] The RAIA made several recommendations with respect to lighting and refrigeration and other appliances outlined in the boxes below:

#### Refrigeration and drying issues<sup>172</sup>

Refrigeration is a significant end use because it is running continuously. Improvements are restricted to the efficiency of the appliance and providing adequate ventilation which can improve the efficiency by up to 20 per cent....

Architects have some influence over the choice of appliance but the main determinant is capacity. To cite refrigeration as an example Architects can have complete control over placement and design of the alcove or space around. Unfortunately there is

<sup>171</sup> Transcript of Evidence, WSROC, 25 August 2002, pp26-27

<sup>172</sup> Submission No. 21, Royal Australian Institute of Architects, p6

generally poor understanding of the importance of providing adequate ventilation to the coils. This is exacerbated by the aesthetic desire for fully integrated refrigerators, and contributes to the lack of efficiency of the refrigeration unit.

Architects can have some influence over the selection of dishwashers, driers and washing machines. Architects have little influence over the selection of appliances in apartments. Refrigerators are not usually part of the inclusions in the sale of the unit. This is a significant lost opportunity across the state. Architects can have little influence over the selection of dishwashers, driers and washing machines. Often only dishwashers and driers are included in the apartment. A major oversight is the provision of adequate clothes drying facilities either within the apartment, on a screened balcony or in an accessible common area. It is almost unknown for a developer to include a requirement for clothes drying. The energy required to dry clothes if no natural drying is available is potentially very significant in the order of 20 per cent of total apartment energy. The RAIA understands that no analysis of this has been undertaken.

Recommendations from the RAIA:

- require refrigerators to have adequate ventilation at occupation;
- encourage apartment developers to include efficient refrigerators in the sale of the apartment;
- establish minimum 3 star rating for refrigerators for sale in NSW;
- cash rebates for better performance of all appliances;
- consider inclusion of ventilation for refrigerators in BCA;
- require star rating and annual energy consumption information in all advertising and catalogues; and
- mandatory clothes drying area for apartments.

## Lighting<sup>173</sup>

Lighting is about 11 per cent of end use and is entirely electrical. Efficient lighting could reduce this by 80 per cent. However there are very significant impediments including the “atmosphere” that can be achieved using efficient lighting which is very important in domestic design. Significantly NatHERS generally discourages windows; contributing to an unnecessary reliance on artificial lighting during daylight hours.

Architects (and interior designers) have a significant influence on the design for daylighting and on the selection of light fittings but the range of energy efficient fittings (as opposed to low voltage fittings) is very limited. Architects have influence on the design for daylighting, but little influence on light fittings in multi unit development. Selection is usually by the electrical engineer and confined to the installation of bayonet fittings. The assumption is that the buyer will alter the lighting to their tastes....

Recommendations from the RAIA:

- consider mandatory use of hard wired ie separately ballasted lighting in functional spaces including garage, outdoor, wc, bathroom, laundry;

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<sup>173</sup> Submission No. 21, Royal Australian Institute of Architects, p7

- encourage the development of more fittings to accommodate compact fluoro lamps;
- rebates for purchase of efficient lighting; and
- mandatory requirements for movement controls in common area and carparking.

### Standby power

- 4.28 The impact of standby power should be given a priority. As noted in Chapter 2, Section 2, it is expected to become a growing segment of residential energy consumption.
- 4.29 The Committee is supportive of the expansion of labelling information to products with standby capacity. This is part of the Standby Power Strategy prepared by the National Appliance and Equipment Energy Efficiency Committee (NAEEEC), which is developing a ratings protocol for these appliances with a voluntary and subsequent mandatory labelling or minimum energy performance standard to be introduced.<sup>174</sup> However, given the expansion of standby energy demand, the Committee supports introduction of mandatory labelling of products with standby energy capacity rather than a voluntary “first stage” labelling which is part of the current national strategy.

## Conclusions

- 4.30 Consumer education about energy efficiency is important. However, the objective of consumer education is behavioural change. The pressing demand on energy infrastructure means that consumers may need stronger mechanisms to impose change than existing awareness programs can provide.
- 4.31 It is understood that energy efficiency is not the first priority for consumers. The Committee recognises that there are some consumers who have a genuine inability to reduce consumption without discomfort or inconvenience:
- Ensure that any consumer targets do not disadvantage those who already use electricity for their situation. Few unit dwellers cannot reduce consumption by festooning the balcony with laundry or walking ten flights instead of taking the lift. In many cases, low income earners cannot reduce consumption without ceasing consumption.<sup>175</sup>
- 4.32 The Committee believes that current consumer education programs such as those run by SEDA should continue. However, more emphasis should be placed on product information and incentives which can bring about more immediate impact than long term behavioural change programs.
- In short, while the “big picture” initiatives with the most potential to reduce energy consumption may take some time to introduce, decision makers should be encouraged to act upon all immediately-available opportunities in the interim.<sup>176</sup>

### RECOMMENDATION 12

The Committee recommends the continuation of the current consumer education programs initiated by the State and Federal Governments to improve consumer awareness of energy efficiency issues.

<sup>174</sup> Submission No. 29, MEU, p17

<sup>175</sup> Submission No. 14, Mrs Michel, p4

<sup>176</sup> Submission No. 15, SSROC, p3

- 4.33 The Committee sees the value in product labelling but believes it alone will not bring about substantial behavioural change. The Committee sees merit in more active systems being put in place to drive purchase of energy efficiency products.

### **RECOMMENDATION 13**

The Committee recommends that the following options for products, in particular, appliances and lighting be examined:

a) Appliances

- Mandatory energy labelling for standby appliances
- Require refrigerators to have adequate ventilation at occupation
- Consider inclusion of ventilation for refrigerators in the Building Code
- Require star rating and annual energy consumption information in all advertising and catalogues
- Mandatory clothes drying area for apartments

b) Lighting

- Consider mandatory use of hard wired ie separately ballasted lighting in functional spaces including garage, outdoor, wc, bathroom, laundry
- Encourage the development of more fittings to accommodate compact fluoro lamps.
- Rebates for purchase of efficient lighting
- Mandatory requirements for movement controls in common area and carparking.

- 4.34 It should be noted that recommendations concerning hot water and air conditioning products were examined in Chapter 3, Section 3.
- 4.35 The Committee also sees an opportunity for the ACT point of sale energy rating disclosure scheme (Recommendation 6) to be extended to existing housing stock over time. This would provide a further incentive for existing homes to become energy efficient and have this identified with the sale value of a home.

### **RECOMMENDATION 14**

The Committee recommends that the Government consider extension of the point of sale energy rating disclosure to existing housing stock as a subsequent proposal to a point of sale disclosure scheme for new homes (Recommendation 6)

## **SECTION 2 – RETROFITTING PROGRAMS**

- 4.36 This section highlights retrofitting programs and other initiatives that have been brought to the Committee's attention to improve energy efficiency in low income housing.

### **REFIT Program**

- 4.37 The Committee was informed of the REFIT program for low income residents, run collectively by SEDA, Hunter Water and Energy Australia, Newcastle Council and the Public Interest Advocacy Centre in 2002. The program involved offering a kit of services and products to eligible customers who were receiving NSW Energy Accounts Payment Assistance (low income subsidy). The kit involved:

- energy and water audits;
- installation of AAA rated showerheads;

- tap aerators (slows the flow rate of taps);
- two florescent light bulbs; and
- a cistern weight (decreases the amount of water used in flushing a toilet).

4.38 Over 1124 free refit kits were installed. Refit recipients' savings were well in excess of an average \$112 cost to supply and install. It was noted that administrative costs were relatively high – more than \$70 per refit. PIAC argues that the average administrative costs of the REFIT program would be reduced if the program was applied more broadly and that the program should be extended as it delivers both environmental and social benefits.<sup>177</sup>

4.39 Energy Australia indicated to the Committee that there are plans to renew and expand this program in 2004 to other areas of the Hunter:

**Mrs PALUZZANO MP:** The Committee understands that EnergyAustralia has been involved in a pilot refit program, in association with the Public Interest Advocacy Centre [PIAC]. Can you outline this program?

**Mr SMITH (Energy Australia):** We did a pilot in the Hunter region that involved the PIAC, SEDA, NCOSS and others. The pilot involved issuing 1,107 refit kits which involved a triple-A shower head and two compact fluorescent lights and an Energy audit. The pilot was targeted at customers in hardship rather than the general population and developed some benefits in terms of greenhouse gas abatement and lesser benefits in terms of network capital avoidance. We are now looking at expanding that program, again in the Hunter region, with Hunter Water and ourselves. It will be done on a voluntary basis for people to take up. It will not only be targeted at disadvantaged customers any more but will involve the whole population. We will be launching that in the next few months. It will be a shower head and efficient fluorescent lighting. We are hoping to see some benefits flow from that.<sup>178</sup>

4.40 Recommendations for subsidies of key energy efficient appliances for retrofits such as efficient showers heads, insulation and ceiling fans were also made to the inquiry:

Adequate wall and ceiling insulation is the most cost effective way of achieving energy efficient improvements, even in houses that are not initially designed to be energy efficient. As the issue of energy efficiency is not so much of a problem with new housing as it is with existing stock, Government should consider subsidising the cost of retrofitting insulation into ceiling of existing dwellings as a cost effective way of reducing energy usage... As with insulation, subsidising for retrofitting sun protection to windows and doors to existing dwellings provides a cost effective way of reducing energy usage in the existing dwelling stock... The subsidising of the retrofitting of ceiling fans could be included in the package with window protection and insulation of existing dwellings.<sup>179</sup>

4.41 The Committee raised the issue of supplying energy efficient appliances to low income groups via payment plans provided by energy retailers:

**Mr DRAPER MP:** The Committee has received a number of examples from overseas where the utility actually offers a facility where if people buy energy efficient appliances they can pay for them through payments on the bill. Do you have any views on that procedure?

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<sup>177</sup> Submission No. 13, Public Interest Advocacy Centre (PIAC), p15

<sup>178</sup> Transcript of Evidence, Energy Australia, 25 August 2003, p57

<sup>179</sup> Submission No. 22, Mirvac, p2

**Mr SMITH (Energy Australia):** I will take that question on notice because I am not sure of current practices in relation to that matter. EnergyAustralia has a small appliance sales arm mainly focused in the Hunter which is a thing we have traditionally done, mainly because customers had approached the business as experts in energy and energy efficiency. I am not sure about how the actual payment for that is made. I am not sure whether it is a separate bill to the EnergyAustralia energy bill. We also participate in a no interest loan scheme [NILS] for people normally on pensions or single mothers. It is managed by charitable organisations to assist in the purchase of major household appliances and goods. We have had some involvement in that and we are looking to increase that. At the moment that has not been tied particularly to energy efficient equipment but it is one of the things we are looking at in the future.

**Mr DRAPER MP:** In the old days it was common practice at Cumberland County Council for people to buy a refrigerator and washing machine and there would be a component on the quarterly bill for repayment.<sup>180</sup>

4.42 Energy Australia subsequently informed the Committee that it is not currently possible for customers to pay for appliance sales on the Energy Australia electricity bills.

...This is because of issues related to credit risk, IT system changes and regulatory requirements for billing and customer protection. With regard to possibility of rebates for energy efficient appliances via electricity bills, Energy Australia is currently reviewing its product offerings and marketing of energy efficiency in the light of recent greenhouse gas legislation and is considering a range of possible options.<sup>181</sup>

## Conclusions

4.43 The Committee believes that the proposals for expansion of retrofitting programs and programs for low income residents should be examined.

### RECOMMENDATIONS 15

The Committee recommends that the Government:

- promote the expansion of refit programs for low income residents to assist in generating greater change in the consumption demand from existing stock.
- examine subsidising energy saving products and appliances in the retrofitting programs for low income residents.

<sup>180</sup> Transcript of Evidence, 25 August 2003, Energy Australia, p59

<sup>181</sup> Submission No. 23 (Supplementary), Energy Australia, p3



## APPENDIX 1 – LIST OF SUBMISSIONS

Submission No.	Individual/Organization
1	- Electricity Week – EWN Publishing
2	- Australian Building Codes Board
3	- Western Sydney Regional Organisation of Councils
4	- Mr. Grahame Pepper
5	- Envirotecture Projects
6	- Landscape Contractors Association of NSW
7	- Landcom NSW
8	- Manufacturing and Infrastructure Technology, CSIRO (Part Confidential)
9	- Centre for a Sustainable Built Environment, UNSW (SOLARCH)
10	- Institution of Engineers, Sydney Division
11	- Cement and Concrete Association of Australia
12	- National Association of Steel Framed Housing
13	- Public Interest Advocacy Centre
14	- Mrs. Diane Michel
15	- Southern Sydney Regional Organisation of Councils
16	- NSW Council on Environment Education
17	- Australian Conservation Foundation
18	- Alternative Technology Association
19	- Building Designers Association of NSW
20	- School of Architecture & Built Environment, Univ. of Newcastle
21	- Royal Australian Institute of Architects, NSW Chapter
22	- NSW Government Architect
23	- EnergyAustralia
24	- NSW Dept. of Infrastructure, Planning and Natural Resources
25	- Housing Industry Association
26	- <i>Confidential</i>
27	- Mirvac Group
28	- Ministry of Energy and Utilities (now Energy Utilities and Sustainability)
29	- Mr. David Saunders
30	- Mr. Shane West
31	- Integral Energy
32	- Australian Business Council for Sustainable Energy
33	- Ms. Joanne Warren-Wilson
34	- Newcastle Master Builders Association
35	- Mr. Bernard Hockings
36	- NSW Sustainable Energy Development Authority
37	- Joint industry submission – HIA, BDA NSW, MBA, NSW Urban Taskforce, HMB and SOLARCH



## APPENDIX 2 – LIST OF WITNESSES

### 25 AUGUST 2003 PUBLIC HEARING

**Mr Jason Veale**, Environmental Planning Officer, Department of Infrastructure, Planning and Natural Resources

**Mr Bruce Taper**, Director, Metropolitan Strategy and Sustainability, NSW Department of Infrastructure, Planning and Natural Resources

**Mr Peter Zadian**, Director, Policy and Reform, Department of Infrastructure, Planning and Natural Resources

**Mr Stephen Durnford**, Assistant Director, Building Codes, Department of Infrastructure, Planning and Natural Resources

**Mr Richard Clarke**, Immediate Past President, Building Designer's Association

**Mr Christopher Reardon**, Director, Environment Working Group, Building Designer's Association

**Mr Colin Kandan-Smith**, Senior Environmental Project Officer, Western Sydney Regional Organisation of Councils

**Mr Wayne Gersbach**, Executive Director for Planning and Environment, Housing Industry Association

**Mr Raymond Loveridge**, National Director for Technical Services, Housing Industry Association

**Ms Kate Nobel**, Building Green Campaign Coordinator, Australian Conservation Foundation

**Ms Andrea Wilson**, Architect, Royal Australian Institute of Architects

**Mr Anthony Nolan**, Architect, Royal Australian Institute of Architects

**Mr Robert Smith**, Manager, Demand Management, Planning and Policy, EnergyAustralia

### 31 OCTOBER 2003 PUBLIC HEARING

**Mr Richard Powis**, Chief Executive Officer, Integral Energy

**Mr John Wallace**, General Manager, Engineering Performance, Integral Energy

**Mr Bruce Taper**, Director, Metropolitan Strategy and Sustainability, NSW Department of Infrastructure, Planning and Natural Resources

**Mr Ric Brazzale**, Executive Director, Australian Business Council for Sustainable Energy

**Ms Joanne Warren-Wilson**, Senior Energy Planner, ACT Planning and Land Authority

12 NOVEMBER 2003 PUBLIC HEARING

**Mr Robert Fuller**, Chief Executive Officer, Newcastle Master Builder Association

**Mr Bernard Hockings**, 98 Henry St., Tighes Hill NSW

**Mr Mark Fogarty**, Executive Director, Sustainable Energy Development Authority

**Ms Sue Koreman**, Group Program Manager, Residential Energy Efficiency, Sustainable Energy Development Authority

**APPENDIX 3 – SUMMARY OF SEDA DISTRIBUTED ENERGY SOLUTIONS<sup>182</sup>****Independent Pricing and Regulatory Tribunal****Table 3.1 Estimated capacity and delivered energy cost of some generic DM options<sup>40</sup>**

Technology Option (for description of technologies, see App 3)	Potential Capacity Increase (MW)	Generation Potential (GWh pa)	Delivered Energy Cost at Maximum Capacity (\$/MWh pa) (Est. ave retail price elec: \$90/MWh) <sup>41</sup>	Averaged Marginal Network cost \$M/MW/pa*
<i>Biomass</i>				
Bagasse Cogeneration	100	788	\$65	0.10
Landfill gas	10	66	\$68	0.10
Municipal Wastewater	5	33	\$81	0.10
<i>Renewables</i>				
Residential Solar Hot Water	120	315	\$72	0.00
<i>Energy Efficiency, Fuel Substitution</i>				
Commercial Natural Gas Cooling	200	701	\$81	0.00
Commercial Industrial Energy Efficiency	100	350	\$57	0.00
Residential Energy Efficiency	150	329	\$91	0.00
Gas Hot Water for Electric	300	788	\$43	0.00
<i>Gas-fired Cogeneration</i>				
Industrial Small Cogen	400	3,329	\$68	0.05
Illawarra Cogen	350	2,759	\$59	0.05
Duke/ Pt Kembla Cogen	225	1,774	\$48	0.05
<i>Energy Efficiency, Mine Waste Gas-fired</i>				
Improved Power Station Efficiency	250	2,037	\$25	0.05
Mine Waste Gas Power Generation	50	394	\$56	0.10

\* Estimated network capital costs associated with delivering this generation to the customer.

<sup>40</sup> Ibid, p 43, also CRA, *Demand Management Technical and Financial Feasibility*, March 2002, pp 10-18.

<sup>41</sup> Electricity Supply Association of Australia Ltd, *Electricity Prices in Australia 2000/2001*, Table A1, p 8.



## APPENDIX 4 – IPART REPORT EXECUTIVE SUMMARY<sup>183</sup>

### Tribunal's findings

The key question posed by this Inquiry is whether demand management (DM) options that can meet customers' energy needs at lower cost, and perhaps with lower environmental impact, are currently being by-passed in favour of 'build and generate' solutions – and if so, what can be done to encourage the greater use of these options.<sup>1</sup>

This question is difficult to answer definitively, as DM encompasses many different technologies and approaches, and can be used to meet a diverse range of goals. In addition, the costs and benefits of any DM option can vary enormously, depending on its specific application. Based on the evidence presented to it during the course of its investigations and in case studies of DM projects, the Tribunal believes that there are substantial cost-effective opportunities to use DM in NSW that are not being pursued. It also believes that the need to capture these opportunities is becoming more urgent. This is due largely to:

- the State's growing demand for electricity
- the increasing 'peaks' in demand, and
- local and global pressure to reduce greenhouse gas emissions.

Increasing demand will put pressure on future electricity prices as the current surplus generation capacity declines. Importantly, the more rapid growth in peak demand will see poorer utilisation of generation and network capacity which will increase this pressure on prices. Currently ten per cent of capacity is required to meet demand for one per cent of the year – and this appears to be worsening. Furthermore, as the level of demand on network elements approaches their rated capacity, the reliability and quality of supply deteriorates. When demand approaches the capacity of the network, if service standards are to be maintained, either investment in additional capacity or some form of DM will need to be activated. This is the situation NSW is increasingly facing. If no action is taken on the demand side of the market, additional capital expenditure of \$1.5 billion to \$3 billion may be required over the next 10 years. This is in addition to foreshadowed network capital expenditure of \$5 billion, a significant proportion of which may be required to meet growth in demand.

The Tribunal's findings indicate that, in the right circumstances, DM can be cost-effective. It can deliver network and retail market benefits, either by displacing the need for investment in these areas, or by providing 'peak' and/or 'base' load capacity. This provides scope for lower energy costs for end-users. In many cases it can also deliver environmental benefits, by reducing greenhouse gas emissions. Prospective technologies such as improved power station efficiency and cogeneration are discussed in more detail in section 3.2.

DM should not be seen as a matter of cutting costs by providing an inferior service. Endusers are concerned with the services derived – ie lighting, heating/cooling and power, not the consumption of electricity or gas directly. In many cases, DM options can provide the same, or higher, quality service to the end-user. In other cases, where the 'true' costs of generation and distribution of electricity are signalled to retailers or end-users, the end-user may choose to trade-off the service quality for a lower price. For example, end-users with air

<sup>1</sup> The terms of reference for the Inquiry are reproduced in full in Appendix 1.

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<sup>183</sup> Executive Summary and Recommendations from IPART 'Inquiry into the Role of Demand Management and Other Options in the Provision of Energy Services', Final Report, 2002

conditioners may choose to accept a higher inside temperature on some hot days in order to receive savings on their energy bills.

## Tribunal's approach

In formulating its recommendations, the Tribunal has aimed to distil the many options for encouraging economically-efficient DM into a limited number of practical actions. It believes this focused approach is more likely to result in efficient and effective DM programs in the short to medium term, and thus increase the industry's experience with and confidence in DM options. It has not set targets for DM or environmental objectives—setting such important policy parameters is a role for Government. However, its recommendations address the barriers to commercially viable DM and provide a means for Government to achieve environmental and social objectives through DM.

The Tribunal's recommendations have several themes—they are designed to:

- achieve better price signals to identify opportunities for DM
- encourage better planning processes and clearer regulation
- incorporate environmental and social objectives into decision making.

Pricing can play an important role in managing risk in network expenditure. For example, pricing policies could signal capacity utilisation and emerging capital expenditure needs. In this way, pricing can help manage economic risks by encouraging demand responses that may be able to defer investment in capacity, achieve better asset utilisation, provide better price signals, lower energy costs and encourage greater uptake of capacity once the investment has been made. The Tribunal recognises that any change in network pricing structures to create better targeted, location signalling would be a significant change from current practices. However, prices that more accurately reflect costs may ultimately encourage better outcomes for end-users and, by reducing technological and economic risk, for networks.

There are complex interrelationships between these themes and a number of the recommendations contribute to several of the themes. Most importantly, actions under each of these themes can help transform the market for DM, and may lead to improvements in the market structure.

At present, there is no deep market for DM, and energy service companies and retailers appear to mostly offer 'no frills' services. There is also no effective group of intermediaries leveraging their expertise and information to market DM options to end-users and the DNSPs—for example, by packaging DM services or communicating their benefits. In addition, end-users and DNSPs appear to be passive customers. Within this context, DM is too often seen as something imposed upon a customer, DNSP or retailer through Government decree rather than a market opportunity.

To realise the full potential of DM, the Tribunal believes an active market in DM services needs to develop to provide competition to, and also opportunities for partnerships with, all elements of the supply chain (generation, transmission/distribution and retail). In such a market, the end-user is at the centre, driving innovation through competition to better meet their demands for energy services. The Tribunal's recommendations can help to create this

kind of market; however, they are intermediate steps, not end points. Over time as the market develops, the need for many of these recommendations should decline.

## Summary of recommendations

The Tribunal has identified a range of DM responses that fall into three broad groups – those that are primarily:

- **environmentally driven.** These responses focus on reducing overall energy consumption and/or greenhouse gas emissions. They include providing incentives for end-users to switch to more energy-efficient technologies and devices and/or more efficient fuels for heating, cooling and lighting.
- **network driven.** These responses focus on solving network capacity constraints in ways that are more cost-effective (and often have lower environmental impacts) than network augmentation. They include technologies that can drive load shape changes, such as distributed generation projects, power factor correction and fuel switching.
- **retail market driven.** These responses focus on improving costs to end-users and reducing electricity retailers' exposure to high pool prices for wholesale electricity, by encouraging end-users to reduce energy consumption in times of peak demand (when network capacity can be constrained and pool prices higher). They include measures such as distributed generation projects, standby generation and interruptible contracts.

The Tribunal's recommended initiatives for overcoming the barriers to each of these groups of responses and encouraging their greater use are listed below. Some of these initiatives relate to the Tribunal's regulatory role and can be implemented directly by the Tribunal. Others relate to Government policy and so are matters for Government to consider and implement if it decides to do so. Others still will require the cooperation of the energy industry to implement. However the Tribunal believes that this combination of initiatives can result in a strong and active market for DM services in NSW.

### Recommendations to encourage environmentally driven DM

#### Recommendation 1

*That the Government:*

- *Establish a Demand Management Fund or Funds with the objectives of:*
  - Facilitating sustainable generation projects*
  - Implementing energy efficiency and end-user fuel switching programs to supplement the retailer licence conditions*
  - Assisting smaller scale, more diffuse energy efficiency programs*
  - Encouraging energy efficiency initiatives with a wider range of partners, including equipment suppliers, the building industry and local government*
  - Facilitating programs that tap the synergies between water and energy demand management*
- *Consolidate existing disparate funds with similar objectives within this new Fund*
- *Separate the funder and service provider functions within this Fund and, in this context, review the operation and funding of the SEDA*
- *Establish a Working Party to progress these recommendations.*

## **Recommendation 2**

*That in formulating a Demand Management Fund(s), a portion of the Fund goes to programs servicing consumers who are least likely to benefit from other reforms of the energy industry, especially low -income groups or other groups who require added incentives to adopt energy efficiency.*

## **Recommendation 3**

*The Tribunal recommends that the current programs for energy efficiency within the NSW Government be reviewed and strengthened. There is scope for improved coordination across Government and an increase in the profile of efficiency programs. The Tribunal:*

- *supports the concept that as part of the review of the GEMP, the Government request organisations such as the SEDA and the MEU assist Government agencies to develop energy efficiency benchmarks in addition to or in lieu of the current government wide target*
- *recommends that the MEU's annual reporting on energy efficiency targets be examined to make it as helpful as possible for agencies pursuing efficiency improvements*
- *supports the strengthening of the Government's role as a model consumer through the adoption of SEDA's Australian Building Greenhouse Rating Scheme (ABGRS) for all new and leased government buildings*
- *recommends that the commercial building sector receive particular attention in terms of providing education and practical assistance and programs to reduce energy consumption and greenhouse emissions. It may be appropriate that initiatives be promoted through planningNSW's Sustainability Advisory Council*
- *recommends the incorporation of EPC and GEEIP funding into the DM Fund*
- *supports goals for improving the energy efficiency of Department of Housing residential stock.*

## **Recommendation 4**

*That DM be built into customer choice through:*

- *increased Government support for programs aimed at improving the extent and quality of information to end-users about energy efficiency, initially through appliance labelling programs, and later through the continuing expansion of MEPS to other appliances and electrical equipment*
- *the development of a housing energy rating scheme similar to that in operation in the ACT.*

## **Recommendations to encourage network driven DM**

### **Recommendation 5**

*The Tribunal confirms its existing commitment to the recovery of prudent expenditures on network capex, loss reduction and DM payments and proposes that during the 2004 network review process, it will work with:*

- *the DNSPs and other stakeholders to develop network planning processes that provide greater clarity to the treatment of investment in non-network projects and DM*
- *the DNSPs to develop a framework for assessing the economic prudence of loss management investments.*

### **Recommendation 6**

*That DNSPs undertake trials of localised congestion pricing in regions of emerging constraint of the distribution network. Such trials should:*

- *be integrated with network planning processes and standard offer programs*
- *have regard to retail market design and the provision of time of use meters*
- *be carefully designed to manage the impacts on customers through: the use of rebates as well as positive price signals; optional tariff structures; and market segmentation to focus on customers most able to respond to price signals.*

*The Tribunal confirms that rebates on network charges or DNSP payments for load reductions should be included as negative revenue in calculating regulated revenue and compliance with side-constraints on changes in network charges.*

### **Recommendation 7**

*The Tribunal proposes to:*

- *formally set out its methodology for calculation of avoided TUOS in a Schedule to the Pricing Principles and Methodologies, taking into account any adjustments required by the application of Chapter 6 of the National Electricity Code to Transmission pricing from 2002/03*
- *Consult further with stakeholders in establishing guidelines in the PPM on the treatment of avoided DUOS.*

### **Recommendation 8**

*That negotiation guidelines and streamlined connection agreements be developed under the framework of the National Electricity Code, and in doing so:*

- *consideration be given to the UK proposal that distributed generators be given the choice of paying deep connection fees up-front or paying shallow connection fees initially, with the balance paid through an annualised connection charge*
- *standard connection agreements be developed for small DG projects (up to 1MW initially) of installed capacity.*

*Alternatively, if appropriate, this initiative could be undertaken in NSW as part of a review of the NSW Demand Management Code of Practice.*

### **Recommendation 9**

*That an industry-based working group develop Standard Offer contracts for demand management as part of the review of the NSW Demand Management Code of Practice.*

### **Recommendations to encourage retail market driven DM**

#### **Recommendation 10**

*The Tribunal recommends that the Government review the policy for rolling-out interval meters to residential customers and, if appropriate, accelerate their availability to provide better price signals and increase capacity for customers and retailers to respond to these signals by modifying consumption.*

#### **Recommendation 11**

*The Tribunal recommends that the Government, retailers and distributors work with the National Electricity Market and/or independent marketers to:*

- *Facilitate the aggregation of customer demand and the formation of energy cooperatives, and to encourage the participation of specialist aggregators in the market.*
- *Develop energy contracts that incorporate real-time energy market signals, with the objective of influencing forward energy prices and generator bids by lowering demand.*

*One option for doing this is to establish a market or an electronic trading platform for demand-side responses.*

#### **Recommendation 12**

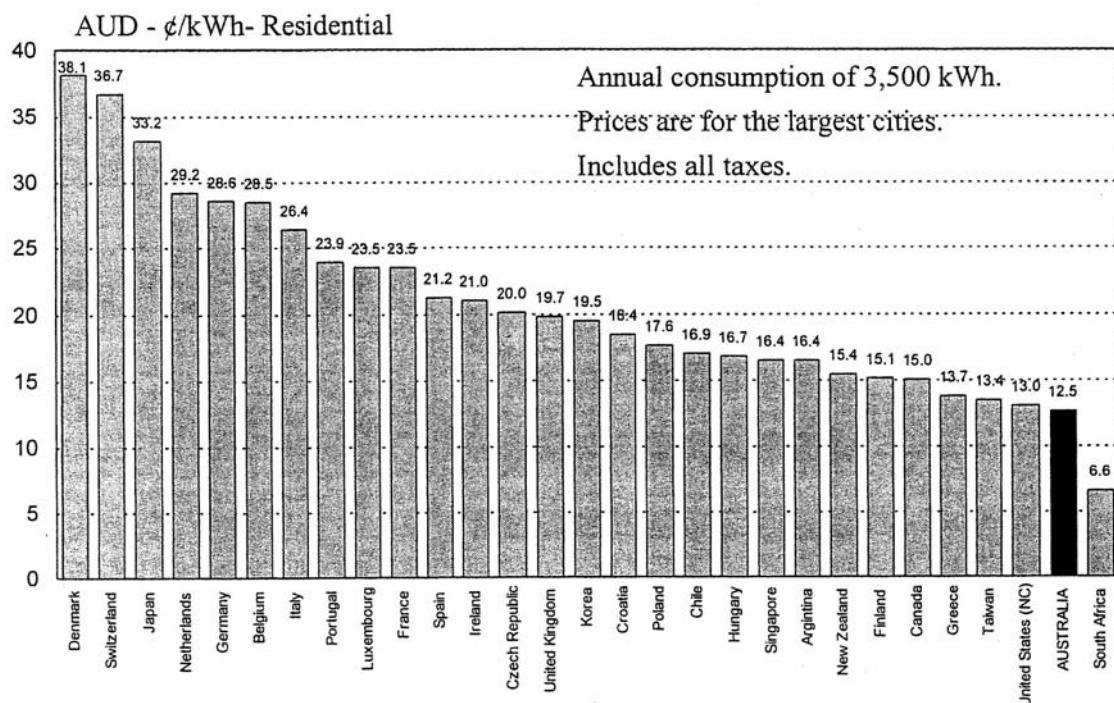
*The Tribunal supports the development of a market framework for small generators and considers this matter should be addressed through the National Electricity Market processes, and where appropriate, at the local level. The framework established under Australian Standard AS 4777 applying to rooftop Photovoltaics could be more broadly applied to small Distributed Generation projects.*

#### **Recommendation 13**

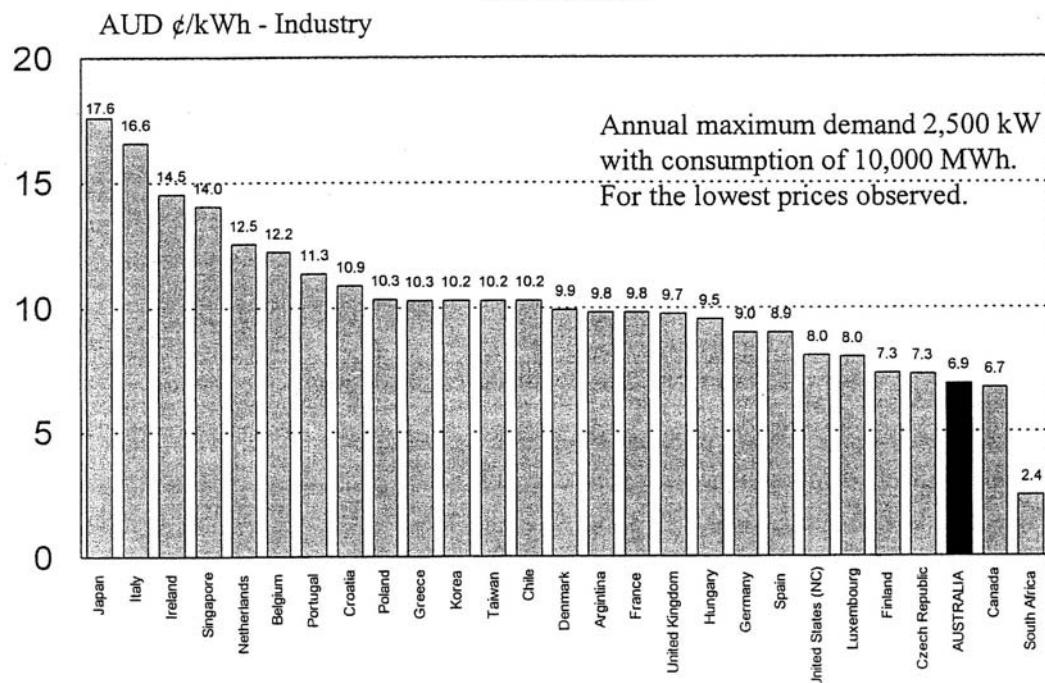
*The Tribunal recommends that the Government monitor the impact of the design of the NEM and market rules on Demand Management (including distributed generation).*

## APPENDIX 5 – COMPARATIVE INTERNATIONAL ENERGY PRICES<sup>184</sup>

**Chart 5.7 International electricity prices - January 2002  
residential**



**Chart 5.8 International electricity prices - January 2002  
industrial**



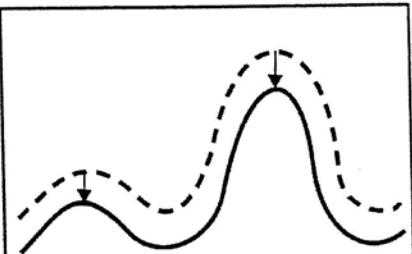
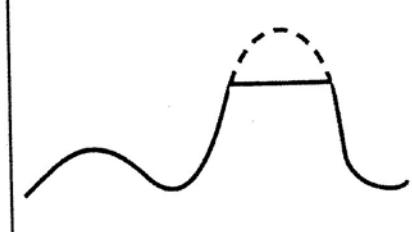
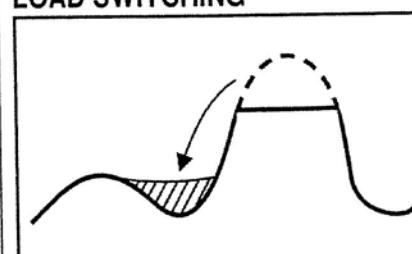
Source: Tariff Network of Experts, UNIPEDE, January 2002, International Electricity Prices, Issue 29, Electricity Association, UK

<sup>184</sup> Provided by Energy Australia



## APPENDIX 6 – GENERIC APPROACHES TO DEMAND MANAGEMENT<sup>185</sup>

### GENERIC APPROACHES TO DEMAND MANAGEMENT

	Examples of applications	Impact
<b>LOAD REDUCTION/ ENERGY EFFICIENCY</b> 	<ul style="list-style-type: none"> <li>• Appliance efficiency</li> <li>• Building design efficiency</li> <li>• Improved system controls and maintenance</li> <li>• Appliance cycling</li> </ul>	<ul style="list-style-type: none"> <li>• Peak load reduced along with total consumption</li> <li>• Cost of capacity expansion deferred</li> <li>• Environmental benefits from reduced consumption</li> </ul>
<b>PEAK LOPPING</b> 	<ul style="list-style-type: none"> <li>• Interruptability contracts</li> <li>• Dispatchable distributed generation</li> </ul>	<ul style="list-style-type: none"> <li>• Peak load reduced for a specific time period</li> <li>• Benefits Network and Retail Market driven DM through cost of capacity expansion deferred</li> </ul>
<b>LOAD SWITCHING</b> 	<ul style="list-style-type: none"> <li>• Off peak hot water</li> <li>• Interruptable processes - requiring recovery</li> <li>• Energy Storage</li> </ul>	<ul style="list-style-type: none"> <li>• Peak load reduced for a specific time period but replaced at a later time (increased consumption may result subject to efficiency losses)</li> <li>• Cost of capacity expansion deferred</li> </ul>

<sup>185</sup> Provided by Energy Australia



## APPENDIX 7 – SUMMARY OF KEY FEATURES – NEWBURY ESTATE

### SITE INSPECTION - 14 AUGUST 2003

Newbury is a masterplanned development of approximately 1800 homes. The estate is being developed by the Mirvac Landcom Joint Venture and is founded on the principles of New Urbanism and walkable neighbourhoods.

#### ENERGY EFFICIENT FEATURES OF HOUSES

<b>Design</b>	<b>Orientation</b>	Target 80% of all lots having 5 Star ratings for lot orientations (ie solar orientations).  Latest Neighbourhood 236 of 244 lots obtained 5 Star lot rating for orientation  Promoting solar access to private open space and living areas for all lot orientations  Correct orientation at subdivision stage has allowed for greater compliance with house orientation at building stage
	<b>Cross Ventilation</b>	Allow opening of houses for cross ventilation
	<b>Housing configurations</b>	All homes tested against orientation criteria.  Car court configurations for greater solar access penetration during winter.  Use of zero and zipper lot configuration to ensure maximum efficiency in lot configurations which allows greater efficiencies in private open space and solar access gains to living areas.
		Previous inability to incorporate eaves over zero lot lines due to fire regs has been resolved for future neighbourhoods which will include greater frequency of eaves and therefore sun control.
<b>Construction</b>	<b>Insulation</b>	Wall and ceiling insulation at R2.5
	<b>Sun hoods / Pergolas</b>	Sunshading in summer
<b>Fitout</b>	<b>Appliances</b>	Higher star rated appliances installed by Mirvac-Landcom Partnership  AAA fittings included
<b>Regulation</b>	<b>NatHERS</b>	3.5 Star rating required of all homes in Newbury  4.5 Star average for contract housing  4.7 Star average for Joint Venture Housing

#### Issues

- Implementation of NatHERS Ratings has been requirement of the Newbury Architectural Guidelines and regulated through the Newbury Architectural Review Panel with support of Blacktown Council. It is not yet a requirement for other developments in the majority of western Sydney.
- Any strategy introduced by Government should ensure “level playing field” with any developer able to set higher benchmark should they wish.
- Any strategy must accommodate the timing and education learning curve of any new strategy implementation



## APPENDIX 8 – MEDIA RELEASE – MINISTER BEAMER, 16 NOVEMBER 2003



Department of  
**Infrastructure, Planning and Natural Resources**

### Media Release - Minister Beamer's Office

Sydney: 16 November 2003

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## LOCAL DEVELOPMENT APPROVAL (DA) TASKFORCE CUT THE RED TAPE - SPEED UP THE PROCESS

A Government-appointed Taskforce has recommended sweeping changes to the Local Development Assessment (DA) process including the removal of up to 70 per cent of DAs from councils' current assessment and approval systems.

Assistant Planning Minister, Diane Beamer, welcomed the report from the Regulation Review - Local Development Taskforce, chaired by Sydney development industry consultant, Neil Bird.

"We want the local DA process to be faster, easier to use and more cost effective," Ms Beamer said.

"Getting a DA through councils in Sydney takes an average seven weeks, in some cases up to a year - we want to see standard home building approvals done in seven days.

"The overhaul of local development assessment across NSW complements the NSW Government's actions for water, native vegetation and planning system reform.

"The outcomes from this Taskforce, along with those from the PlanFirst and other reviews, will result in a comprehensive package of reforms.

"We want to cut the red tape that strangles housing approvals and get councillors out of the petty detail and into the strategic planning for their areas.

"The Taskforce reviewed more than 50 presentations and submissions from industry associations, councils, ICAC, Community groups and individuals," Ms Beamer said.

Key Taskforce recommendations include:

- Local Plans (LEPs) should contain standard definitions and provisions, while still being able to be tailored to particular Council areas.
- Develop a common set of housing standards and definitions.
- Mandating complying development standards, using certification, to remove from council assessment up to 70 per cent of DAs for single houses, alterations, garages, carports, sheds etc.

- Mandating complying development standards to allow councillors to get out of time-consuming minor assessment decisions and into strategic land use, planning and development decisions.
- A better building certification process, with more rigorous accreditation, auditing and regulation.
- Develop a standard DA notification policy to be used across NSW.
- Councillors to attend training courses in the planning process with penalty provisions for non attendance.
- Introduce mandatory energy and water use provisions of the Building Sustainability Index (BASIX) for all new residential development in Sydney. BASIX is a web-based planning tool that enables councils and home builders to assess water and energy use.
- Encourage increased use by councils of planning resources such as independent development assessment and hearing panels.
- Councils required to report within 12 months of commencement of the legislation, and then annually, on how well they are performing in reducing determination times with quality outcomes.
- Review the use of 'fast track' DA fees to use where appropriate.
- Move to a combined approval system for single dwellings in situations where a separate DA and construction certificate is still required.

"Neil Bird and his team are to be congratulated. In five months they have delivered a thorough, comprehensive report that more than meets the stated aims of the DA review," Ms Beamer said.

"We've already begun implementing some of the Taskforce's recommendations in the area of Local Plans and certification.

"My Department has begun preparing a standard template for local plans and last Friday I introduced tough new legislation to ensure the proper conduct of building certifiers.

"Under the legislation, corrupt certifiers or anyone attempting to corrupt them, can be gaoled for up to two years and fined up to \$1.1 million.

"It also enables proceedings to commence up to two years after an alleged offence.

"We'll be studying the Taskforce review and consulting widely with Councils, industry and the community before announcing further measures aimed at streamlining the development approval process.

"The Government is determined to continue the reforms to the planning and assessment systems.

"In considering the Taskforce recommendations, the Government will ensure that all changes to the assessment system will provide better protection for consumers and the environment," Ms Beamer said

## APPENDIX 9 – COMPARISON OF VICTORIAN AND NSW SYSTEMS AND RECENT DEVELOPMENTS

Comparison of Victorian “five star” measure and NSW BASIX

Requirements	Existing NSW homes	NSW – SEDA energy smart homes policy (>70% of development consents)	NSW – Landcom policy	NSW – proposed BASIX	Existing Victorian homes	Proposed Victorian ‘five star’
<b>Building envelope</b>	Average 2-2.5 star (NatHERS)	3.5 star NatHERS minimum	4.5 star NatHERS minimum	Separate requirements for heating and cooling performance Min level not yet set	Pre-1991 insulation regulations, average 1 star Post 1991 complying with insulation regs average approx 2.2 star – but wide variation, as glazing not controlled in any way: requirements are: R2.2 overall ceiling, R1 walls, Dampers on fireplaces/flues	From July 2004, 5 stars or 4 stars plus either solar HWS or rain water tank  From July 2005, 5 stars AND solar HWS or rain water tank  For high rise apartments, average 5 star with min 3 star (and disclosure to buyer where rating is less than 5 star)  Note: FirstRate includes ‘area adjustment’ which makes compliance easier for small dwellings (see below)
<b>Hot water</b>	Electric 72%, gas 25%, solar 3%	Min ‘3 star’ HWS required – effectively gas, LPG, solar or electric heat pump (unless shown that payback period is longer than 5-7 years)	Gas boosted solar HWS with >60% solar contribution OR (if gas not available) electric heat pump	HWS, shower, hot water-consuming appliances contributes to score, but trade-offs allowed	Gas >70%, electric 25%, solar share very small	See above. Where gas is available, requirement will be for gas boosting
<b>Appliances</b>		In some cases, requirement for clothes line	Clothes line, Gas cooktop, gas heater, Dishwashers and clothes dryers >3.5 star, lighting – electronic ballasts	Major appliances can be considered to achieve greenhouse target		No requirements

<b>Rating Tools</b>		NatHERS, BERS	NatHERS, BERS	BASIX software plus either NatHERS or checklist		FirstRate (based on NatHERS), NatHERS
<b>Renewable power</b>				may be included in overall greenhouse target		
<b>Alterations and Additions</b>				Proposed that they be included, but method not final	Insulation regulations apply	Not included
<b>Mode of Implementation</b>		Local Council DCP		State planning code, supported by building code for specific building issues		

Developments have been occurring nationally and in most States and Territories:

<b>National</b>	2003: Building Code of Australia residential provisions introduced. In principle require 4 star (NatHERS) performance, but deemed to satisfy provisions vary performance from 3-4 stars (in some cases, rating may be lower). Adopted by NT, Qld, SA, Tas, WA during 2003. Victoria, NSW see above.  Nov 2003: ABCB has announced that a review of the BCA provisions will be conducted over the next two years with a view to introducing revised provisions in 2006 – aim is to increase stringency to be more consistent with recent developments in some jurisdictions, and to take into account improvements in energy rating software for application to hot humid climates.
<b>ACT</b>	1995: mandatory insulation requirements  1996: mandatory 4 star rating (using VicHERS and then FirstRate)  1999: mandatory disclosure of energy rating of existing homes at time of sale  2004: strengthening of disclosure of existing home energy requirements
<b>NSW</b>	NSW Government has announced that greenhouse gas emissions from new homes built in the Sydney region will be improved by 25% relative to existing stock from July 2004, and by 40% from July 2006, using the BASIX rating tool (which is still under development). The tool allows major appliances, Hot water service and shower, and building envelope to contribute to the overall rating. Since the stringency levels are not yet set, and the different elements may all contribute to a rating, it is not possible to estimate requirements for the building envelope.

## APPENDIX 10 – GLOSSARY

<b>ABARE</b>	Australian Bureau of Agriculture, Resources and Economics
<b>ABS</b>	Australian Bureau of Statistics
<b>ACCC</b>	Australian Competition and Consumer Commission
<b>ACF</b>	Australian Conservation Foundation
<b>AGO</b>	Australian Greenhouse Office
<b>ATA</b>	Alternative Technology Association
<b>BASIX</b>	Building Sustainability Index
<b>BCA</b>	Building Code of Australia
<b>BCSE</b>	Australian Business Council of Sustainable Energy
<b>BDA</b>	Building Designers Association
<b>CO<sub>2</sub></b>	Carbon Dioxide – an important greenhouse gas
<b>DEUS</b>	Department of Energy, Utilities and Sustainability
<b>DIPNR</b>	Department of Infrastructure, Planning and Natural Resources
<b>Distribution Network</b>	Electricity network connecting the transmission system to customers. Voltages include 132,000 V down to typically 240 V at the customer's premise.
<b>Distributor</b>	A corporation constituted under the NSW Energy Services Corporation Act – includes network or wires function, and retail function.
<b>DM</b>	Demand Management
<b>DNSP</b>	Distribution Network Service Provider
<b>GEMP</b>	Government Energy Management Policy
<b>GG</b>	Greenhouse Gases
<b>GGAP</b>	Greanhouse Gas Abatement Program (Commonwealth)
<b>GJ</b>	Gigajoule – a measure of the heat content of gas (an average residential customer in NSW uses around 20GJ per year)
<b>GWh</b>	Gigawatt hour – 1,000,000 kilowatt hours or 1,000 MWh, a measure of electrical energy
<b>HIA</b>	Housing Industry Association
<b>HV</b>	High Voltage
<b>IPART</b>	Independent Pricing and Regulatory Tribunal
<b>kV</b>	kV = 1,000 Volts
<b>kVA</b>	kVA = 1,000 Volts-Amperes which is a measure of the apparent power flow which determines the amount of capacity required to supply the customer's load
<b>kW</b>	kW = 1,000 Watts which is a measure of the actual power being consumed
<b>LEPS</b>	Local Environment Plans
<b>Load Factor</b>	Average load divided by the peak load
<b>LV</b>	Low Voltage
<b>MEPS</b>	Minimum Energy Performance Standards
<b>MEU</b>	Ministry of Energy and Utilities
<b>MRET</b>	Mandated Renewable Energy Target. This requires electricity retailers to purchase a set amount of electricity from renewable energy sources
<b>MW</b>	Megawatt = 1,000 kilowatts
<b>MWh</b>	Megawatt House = 1,000 kilowatt hours, measure of electrical energy
<b>NatHERS</b>	National Housing Energy Rating Scheme

<b>NEC</b>	National Electricity Code (the Code) – market rules governing the operation of the National Electricity Market, which commenced in December 1998
<b>NECA</b>	National Electricity Code Authority – the body charged with responsibility for administering the National Electricity Code
<b>NEM</b>	National Electricity Market
<b>NEMMCO</b>	National Electricity Market Management Company, responsible for the implementation of the Code and the day to day operation of the National Electricity Market
<b>Off-Peak Period</b>	All times other than Peak and Shoulder Periods on working weekdays and all times on weekends and public holidays
<b>ORER</b>	Office of the Renewable Energy Regulator
<b>Peak Period</b>	Generally periods 7:00 – 9:00am and 5:00 – 8:00pm on working weekdays
<b>Power Factor</b>	A measure of the real power in kW divided by the apparent power in kVA. The optimum power factor is 1.0 where the real power equals the apparent power
<b>RAIA</b>	Royal Australian Institute of Architects
<b>REPS</b>	Regional Environment Plans
<b>PVRB</b>	Photovoltaic Rebate Program
<b>REC</b>	Renewable Energy Certificate
<b>SEDA</b>	Sustainable Energy Development Authority
<b>SEPP</b>	State Environment Planning Policies
<b>Shoulder Period</b>	Generally the periods 9:00am – 5:00pm and 8:00 – 10:00pm on working week days
<b>SSROC</b>	South Sydney Regional Organisation of Councils