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National Building Energy Standard-Setting, Assessment and Rating Framework – Public Discussion Paper

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Building Framework Discussion Paper
Building and Government Energy Efficiency Branch
Department of Climate Change and Energy Efficiency
GPO Box 854
Canberra ACT 2601

7 May 2010

To Whom It May Concern:

RE: National Building Energy Standard-Setting, Assessment and Rating Framework - Environment Victoria's submission to the Framework's public consultation

Environment Victoria is the peak non-government, not-for-profit environment organisation in Victoria. As the state's leading environment group, we believe that our future depends on all Victorians. That's why our goal is to mobilise all five million to safeguard our environment. At the heart of our work is our belief that people are part of the environment, and not separate to it. So we work with people from all walks of life and levels of environmental awareness to solve the challenges common to all of us.

Environment Victoria welcomes the opportunity to comment on the National Building Energy Standard-Setting, Assessment and Rating Framework. This submission is also supported by the Alternative Technology Association and Friends of the Earth.

Environment Victoria recommends that an essential part of the Framework be setting a goal of 'climate safe' new homes by 2020. 'Climate Safe' homes are those with zero net emissions and high water efficiency. The case for Climate Safe homes is captured in the enclosed 'Towards climate safe homes: The case for zero emissions and water saving homes and neighbourhoods' report produced in partnership with the Alternative Technology Association, Australian Conservation Foundation, Friends of the Earth Australia, and Moreland Energy Foundation. The National Building Energy Standard-Setting, Assessment and Rating framework should include intermediate standards or 'gateways' for particular years that step towards the 2020 goal. As a first step towards zero emissions, we recommend the Government commit to 7-8 star standards for new homes by the end of 2010 and encourage efficient hot water for all new homes.

Environment Victoria supports a 'whole of building' approach to the framework. Therefore we recommend that water efficiency should be a duel outcome of the framework. It should be integrated into the framework including as part of the minimum standard criteria, the assessment process and the rating of the property. As outlined in the enclosed report a 40% water efficiency goal should be introduced for new homes in 2010. This should be incrementally increased to higher efficiency levels in 2020.

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We also recommend that standards, assessments and ratings for new buildings should include key built in appliances, on-site renewable generation, sustainable building design elements and the embodied energy in materials as they are key components of the likely greenhouse gas generating level and the energy service affordability of the house.

The framework outcome should be based on reducing greenhouse gas emissions, increasing the affordability of household energy bills through energy efficiency and energy saving, and increasing skills and generating green jobs.

Please contact me if you have any queries about any part of our submission.

Yours sincerely,

Mark Wakeham
Acting CEO
Environment Victoria

This submission is supported by:

ATA

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AUSTRALIAN CONSERVATION FOUNDATION

Friends of the Earth

Moreland Energy Foundation

Towards climate safe homes

THE CASE FOR ZERO EMISSIONS AND WATER SAVING HOMES AND NEIGHBOURHOODS

SEPTEMBER, 2009

Towards climate safe homes: The case for zero emissions and water saving homes and neighbourhoods is published by Environment Victoria in partnership with the Alternative Technology Association, Australian Conservation Foundation, Friends of the Earth Australia and Moreland Energy Foundation

We would like to thank the principal authors of this report: Kate Noble (Principal, Green Spark Consulting) and Anne Martinelli (Anne Martinelli Consulting).

We would also like to thank all of those who assisted us by providing information for this report.

Copies of this report are available at:

www.environmentvictoria.org.au

www.ata.org.au

www.acfonline.org.au

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COVER PHOTO:
MOONEE PONDS 7 STAR HOUSE, VICTORIA, PHOTO: ATA

PHOTO: ATA

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Executive Summary

FORESTVILLE HOME, NSW, PHOTO: ATA

Climate change presents a clear and present danger to ecosystems, communities and economies. As Professor Garnaut so powerfully stated "the failure of our generation (to address climate change) would lead to consequences that would haunt humanity until the end of time".[1]

With further climate change already locked in based on historical emissions it is clear that climate change will impact directly on our homes and we need to prepare them for higher temperatures, more erratic weather and extreme weather events and higher energy and water costs. It makes sense to prepare our homes to withstand future environmental and economic shocks with better design, glazing, insulation and water-efficiency measures.

At the same time, the residential housing sector is a major contributor to our total greenhouse emissions. The residential sector contributes 17.5 percent of Victoria's greenhouse gas emissions[2]. By 2010, emissions from buildings are estimated to increase by more than 48 percent above 1990 levels. Yet greenhouse gas emissions from the average home can be reduced by more than 75 percent with energy efficient design and appliances[3]. If the remaining energy demand is supplied with renewable energy further greenhouse savings are possible. It is even possible to achieve a house with zero net carbon emissions. Implementing cost-effective, simple water-saving measures at the same time can help us adapt to the impacts of climate change, such as drought.

The majority of homes that we build today will still be in place in 2050. Building these new homes to yesterday's water and energy efficiency standards will lock us into high emissions and water use far into the future.

This report recommends that Australian governments adopt a goal of requiring new homes and neighborhoods to be 'climate safe' by 2020 to guide both regulation and incentives. This would mean that new homes would need to have zero net carbon emissions and be extremely water efficient. The report suggests that Australian governments follow the example of the UK Government which has committed to building all new homes to zero emissions standards from 2016 onwards, and established a task force to set interim standards and programs to make progress towards this target.

Australian Governments recently committed through the Council of Australian Governments (COAG) to increase the energy efficiency standards for new residential

buildings to six stars or equivalent nationally as part of the 2010 update of the Building Code of Australia.[4] While the COAG commitment is a good move forward for all Australian states, a 6 star energy efficiency requirement is only a half step towards preparing our new building stock for the future. Ultimately, if we are to avert catastrophic climate change and prepare our houses to cope with predicted temperature and price shocks, we should be aiming for building standards that require a 'climate safe' home – that is a zero net emissions home which is also highly water efficient.

Given the length of time today's houses will be in use, it is essential that any decisions taken now to raise building standards represent a decisive first step along the road towards this long-term goal. Focusing particularly on Victoria, this report makes a convincing case for raising the required standard for new homes and renovations to at least 7 to 8 Stars and for including complementary water efficiency measures. The report highlights that moving to at least 7 stars would increase the affordability of purchasing and living in a home as the energy and water cost savings would far outweigh the slightly increased up front construction cost. It also outlines further benefits of higher building standards including further job creation in building industries.

However as new homes will account for just 15 percent of Australia's housing stock by 2020,[5] a focus solely on standards for new homes will not achieve the 'mass greening' of our housing stock we need. An estimated 1.9 million Victorian homes built before 2004[6] still have energy ratings of 2 Stars or less,[7] while at least 50 percent of Melbourne households do not have a water-efficient showerhead and 20 percent still have at least one single flush toilet.[8] Improved standards for new homes must therefore be complemented by a concerted program to upgrade the energy and water efficiency of our existing housing stock as well.

At present, our poor quality housing stock is part of the climate change problem. But as this report shows, with the right mix of policies the housing sector can become an important part of the solution. A full summary of policy recommendations to achieve climate safe programs is at the end of this report.

Summary of Policy Recommendations

Environment Victoria, ATA, ACF, FoE and MEFL make the following recommendations to the Victorian government:

A] Commit to a goal of 'climate safe' new homes (homes with zero net emissions and high water efficiency) by 2020 and create a cross-sector task-force within 12 months to develop pathways and define standards for 'climate safe' homes.

B] Take substantial steps towards 'climate safe' for new homes in the next 18 months by committing to the following measures which are practical and affordable now:

- **i Fast-track the introduction of 7 to 8-star standards for new homes and renovations by end 2010**
- **ii Introduce a minimum 40 percent water efficiency target for new homes by 2010**
- **iii Encourage greenhouse efficient hot water for all new homes**

C] Commit to a mass retrofit package and policies aimed at upgrading the energy and water efficiency of our existing housing stock by:

- **i Committing to a one million homes water and energy retrofit program targeting low income households over the next 5 years**
- **ii Introducing minimum performance standards for energy and water efficiency at the point of sale or lease by 2012**
- **iii Providing incentives and rebates to improve the uptake of alternative water sources**

D] Provide incentives and support for building industry adjustment

Environment Victoria, ATA, ACF, FoE and MEFL make the following recommendations to the Federal government:

The Federal government could set a national agenda for climate safe homes and working to strengthen COAG agreements on new building standards and efficiency standards for existing buildings at the point of sale or lease. Most of the policy recommendations above could apply to the Federal government. However there are some immediate actions that the Federal government needs to take to allow proactive jurisdictions to achieve a goal of climate safe homes, as outlined below:

A] Fast-track minimum energy performance standards to prevent the sale of inefficient appliances by:

- **i Phasing out electric storage hot water for all homes beginning with a ban on their installation from 2010.**
- **ii Phasing out energy-inefficient lighting including halogen downlights**
- **iii Setting minimum standards for major water-using appliances such as washing machines by 2010**

B] Deliver programs and policies to retrofit all existing homes in Australia over the next decade

C] Harmonise policy at all levels of government towards a nationally consistent Gross Feed-In Tariff for small scale renewable energy including solar photo-voltaic systems and small wind turbines

D] Make GreenPower count by ensuring that all GreenPower sales reduce Australia's emissions and contribute to stronger emission reduction targets

ELANORA HEIGHTS HOME, NSW, PHOTO: ATA

Introduction

Climate change is one of the most pressing and difficult policy issues facing society in the twenty-first century, both challenging and requiring urgent responses from governments, industry and the wider community throughout the world.

Over the last decade, greenhouse gas emissions have been growing at an alarming rate, beyond even the worst case scenarios projected by the International Panel on Climate Change (IPCC). Scientists are increasingly of the view that we already have too much greenhouse pollution in the atmosphere,[9] and a safe climate response demands that we reduce emissions as fast as is humanly possible. We are already seeing the effects in terms of global sea level rise and increases in global surface temperatures.

Key areas of climate change risk identified for Victoria include buildings in coastal settlements, natural ecosystem-based tourism, irrigated agriculture, water scarcity, health issues and deaths caused by more frequent heat waves, and greater risk of extreme fire danger with consequent risks for life and property. Householders are also expected to face higher bills for essential services such as electricity and water, which will particularly affect low income households.

Currently our homes and buildings are part of the climate change problem. The residential sector contributes 17.5 percent of Victoria's greenhouse gas emissions.[10] By 2010, emissions from buildings are estimated to increase by more than 48 percent above 1990 levels.[11] Meanwhile most Australian cities are suffering major water shortages and Australian households use much more water than their international counterparts.

This report makes the case that with the right mix of policies the housing sector can become an important part of the solutions to climate change and water security.

The report is in 5 sections.

The first section highlights current and future impacts of climate change on Australia's homes and outlines the contribution our housing makes to greenhouse gas emissions and water security.

The second section makes the case for a 'mass greening' of our housing stock, both new and existing, and highlights that Australia is trailing other OECD nations in this area. It describes the job creation and social equity benefits of higher standards for new housing and retrofits.

Section 3 introduces the concept of '*climate safe*' homes and neighborhoods and provides definitions of both. It emphasises the need to build energy **and** water efficiency into new building standards and housing retrofits, and outlines the market failures that make regulatory intervention necessary.

Section 4 recommends measures that would improve the energy and water efficiency of Victoria's 1.9 million homes built before the introduction of the 5-star standard. Given these houses have an average energy rating of 2-star or less, a major retrofit program will be necessary. This section recommends the adoption of a 1 million homes retrofit target in the next 5 years, with a longer-term goal of providing a green makeover of all Victorian homes in the next decade. It also makes the case for the Federal government playing an active role in retrofitting our existing homes.

The final section, section 5, summarises the state and Federal policy measures that will be necessary to achieve *climate safe* homes and neighbourhoods by 2020. This includes recommendations for new housing standards (both short and long term), house fittings and planning issues, and mechanisms to improve the standard of houses that have already been built. It also highlights that the building industry will need training and support to transform its practices over the next decade.

1. Climate change and the housing sector

1.1 The impact of climate change on Australia's homes

Our changing climate requires that we re-evaluate our housing construction and maintenance practices. New homes will need to endure conditions that are unprecedented, while both new and existing homes will need substantial improvement if they are to help us reduce emissions and remain liveable with more extreme weather and higher energy and water costs. The challenges for the housing sector include:

> Heat stress, drought and bushfires

Victoria had its hottest year on record in 2007, and at the same time has experienced a 13 percent decline in total rainfall.[12] The January 2009 Victorian heat wave lasted from 27-31 January, with the mercury rising above 43 degrees for three consecutive days and Melbourne experiencing its hottest day on record at 46.4 degrees.[13] Maximum temperatures were 12-15 degrees above normal over much of Victoria. A recently released report from the Victorian Government's Chief Health Officer revealed that during the heat wave there were 374 excess deaths over what would normally be expected – a 62 percent increase in total mortality.[14] This figure is more than double the number of deaths caused by the tragic bushfires that followed one week later. The Bureau of Meteorology predicts more heat waves in the years ahead. Heat waves particularly affect the very old and the very young, as both these segments of the community tend to spend more time at home.

> Peak demand and electricity black outs

Power blackouts are more likely during periods of extreme heat due to the failure of infrastructure at high temperatures, and the overload of peak demand due to over-reliance on air-conditioners. Because energy efficient homes reduce air-conditioning demand, there are related savings in peak demand. Given that the National Electricity Market spot price for electricity soars up to $10,000 MWh on the hottest days[15], the cost savings of reduced air-conditioning use to retailers and households can be substantial.

Renewable energy has the potential to deliver energy security and reduce the causes of electricity blackouts from the overloading associated with peak demand. Because renewable energy can be generated at the household level, it reduces the transmission demand on hot sunny days when air-conditioning use is at its peak.

> Higher energy and water bills

Householders can expect significant price and cost increases in water and energy over the coming years, irrespective of measures to reduce greenhouse gas emissions. There are a number of reasons for this including investment by the electricity industry of about $5 billion each year to expand energy supply infrastructure because of increasing demand, the roll-out of smart meters, and the high cost of 'new' sources of water such as desalination compared with existing supplies. These cost impacts will not be equitably distributed and lower income households are likely to be more severely affected because their homes are generally less energy- and water-efficient.[16]

The introduction of a price on carbon is also expected to increase gas and electricity bills as its intended purpose is to reduce energy consumption by making the price of energy better reflect the true cost to society. If governments introduce well-designed policies to improve energy efficiency, in conjunction with a range of other policy options such as appropriate tariffs and a safety net, no consumer should be worse off and greenhouse emissions should fall.[17]

Rises in electricity prices will be occurring at the same time as food prices continue to rise due to drought and rising fuel prices. CSIRO has projected that the price of petrol could in the worst case scenario reach $8 per litre within the next 10 years if governments don't act now to deal with increasingly expensive and scarce oil.[18]

Water bills across the country are also set to rise due to climate change, drought and the cost of major water infrastructure projects. In Victoria, water bills are set to rise by between 51 and 64 percent, adding more than $300 to the average annual water bill by 2012[19]. Brisbane households have recently faced an increase in the bulk price of water of approximately $17 a quarter to help pay for the $9 billion South East Queensland water grid[20].

Making new and existing homes more energy- and water-efficient would help to insulate householders against higher temperatures and higher prices, and contribute to our collective energy water security

As well as the biophysical and health impacts, it is clear that climate change also has economic implications. For example, the 2006-07 drought is estimated to have reduced the rate of economic growth in Australia by around 0.75 percentage points of what would have been otherwise achieved[21].

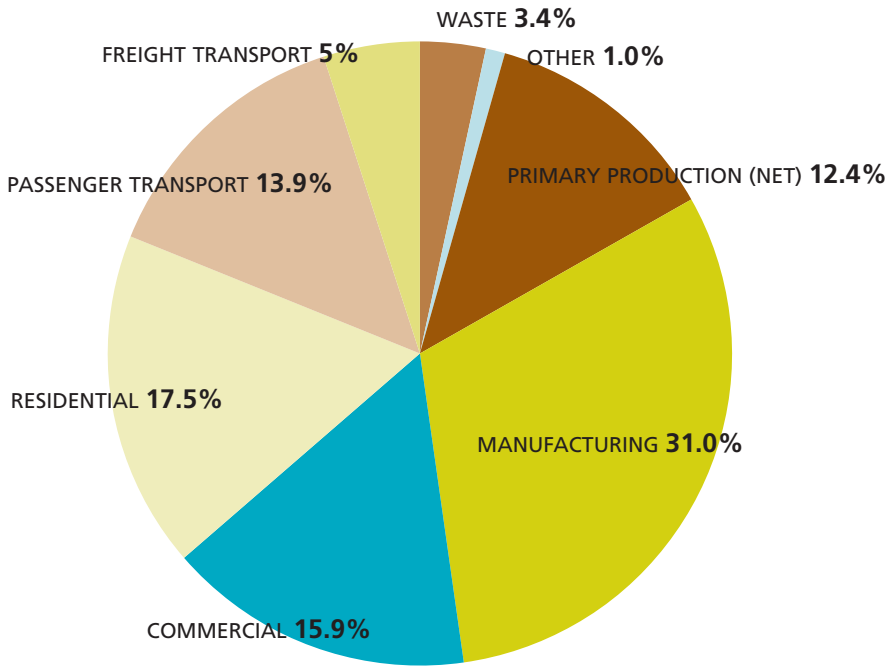
1.2 The growth in household emissions and water use

Energy usage in residential buildings accounts for around 13 percent of total carbon dioxide (CO_2) emissions from all sources in Australia. While the building sector is not the largest contributor to greenhouse gas emissions, it is one of the fastest-growing sources. By 2010, emissions from buildings are estimated to increase by 48 percent over the 1990 level.[22]

The largest contributors to energy demand at the household level are heating and cooling, water heating, refrigeration and lighting. However the combination of all other electrical appliances (such as entertainment units, computers, clothes washers and so on) creates almost as much energy demand as heating and cooling. While energy demand from lighting, water heating and cooking is expected to slightly decrease due to the introduction of mandatory energy performance standards for appliances, the increase in energy used for heating and cooling and other electrical appliances means overall household energy demand is expected to increase.

The recent trend towards new homes being larger has also contributed to this increasing emissions trend, as larger houses need more heating and cooling, particularly if they are poorly designed. The trend to larger homes has cancelled out much of the emissions reductions of the 5 star standard in Victoria with some commentators describing an emerging problem of 'housing obesity'. A study by George Wilkenfeld found that "A major driver for increasing emissions from lighting, and a restraint on reductions from heating and cooling, is the increasing size of dwellings – the average new dwelling is estimated to have a 30 percent larger net conditioned floor area than the average existing dwelling."[24] Addressing the issue of house size is of course a complex and potentially emotive issue. However given that the growing footprint of homes can undermine efficiency improvements there is a need to examine in greater depth measures that encourage people to live in compact housing. This issue is not examined in detail in this report but warrants further investigation.

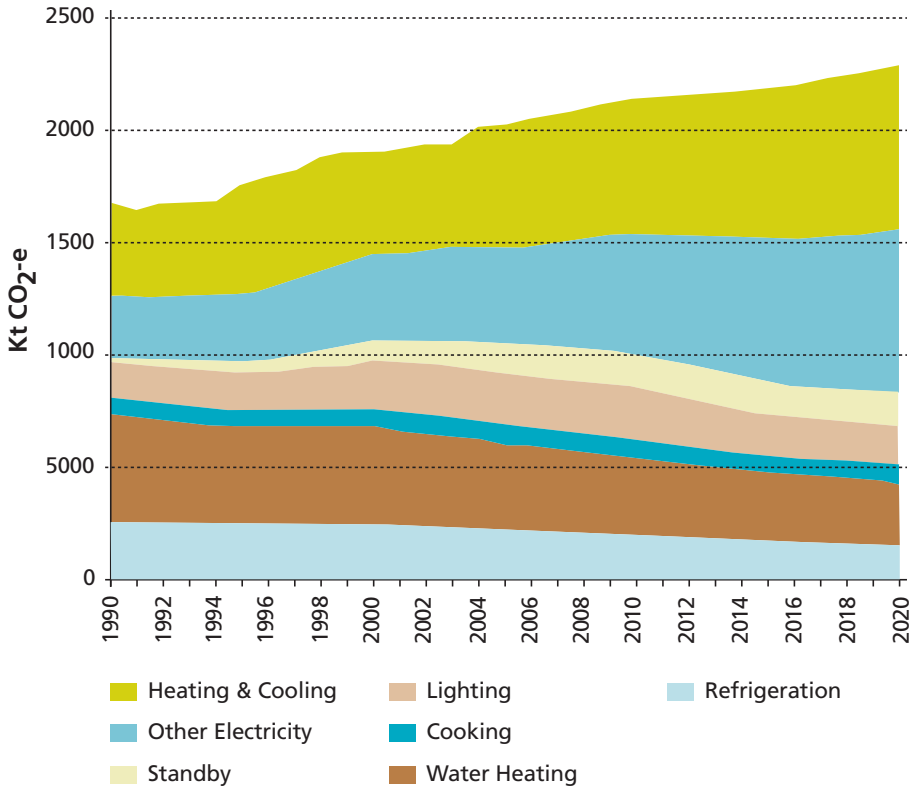
Figure 1. Share of emissions by economic sector, Victoria 2005[23]



Residential water use accounts for only around 11 percent of total water consumed Australia-wide, with nearly two-thirds of total water nation-wide consumed by the agriculture industry.[26] However, in a large urban area such as Melbourne, residential water use rises to 60 percent, with most of the remainder consumed by industrial and commercial users. The average Melburnian uses more than 150 litres of high quality drinking water a day[27], mainly for non-potable uses such as showering, toilet flushing, laundry and garden use.[28] The combination of high water use by world standards and protracted drought has created an urgent water crisis across much of the country. Unsustainable extraction of water from our rivers over many years has left them stressed and degraded, and reduced our capacity to cope with the extra pressures caused by a growing population, drought and climate change.

Significant progress has been made on water conservation in many parts of Australia in recent years through a combination of community education and economic incentive programs.[29] However, while water restrictions remain in place in drought-affected regions such as Victoria, there has to be some doubt as to how much water savings have been due to regulation (ie. restrictions) versus underlying behaviour change. Given the seriousness of our current and future water challenges under predicted climate change scenarios, particularly in south-eastern Australia, it is imperative that we permanently 'lock in' water savings achieved so far by improving the water efficiency of our homes.

Figure 2. Victorian Residential Sector Energy Emissions, 1990-2020[25]



A recent study by Environment Victoria estimated that retro-fitting 1 million homes – half of Victoria's housing stock – for energy- and water-efficiency over five years could create up to 6,900 jobs, reduce greenhouse gas emissions by more than 3 million tonnes and save 32,500 million litres of water each year.[33] The Australian rainwater harvesting industry estimates that implementation of a comprehensive program to improve the water efficiency of new and existing homes could create an additional 1500 jobs directly and 3000 jobs indirectly nationwide.[34]

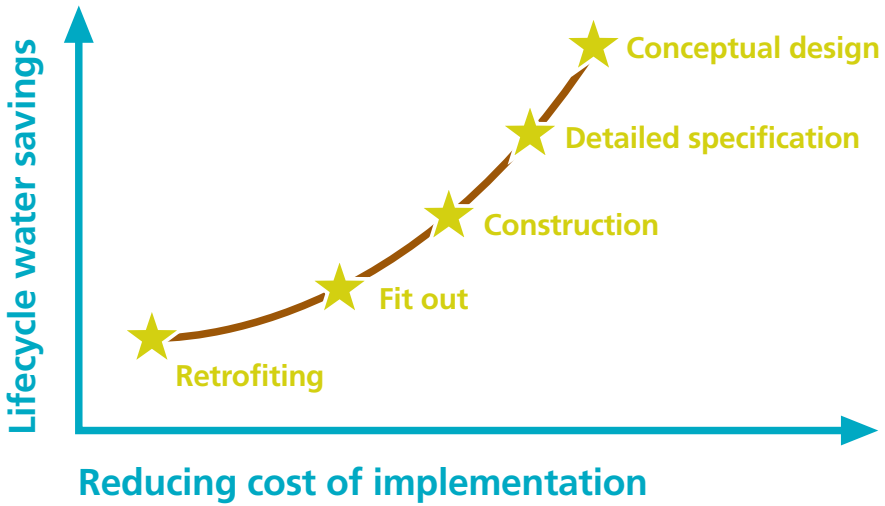
Implementing water efficiency measures for both new and existing homes would also help to keep water prices low by reducing the need for environmentally and economically costly supply augmentation measures, such as desalination plants. A recent Environment Victoria study estimated that Melbourne could save 105 billion litres of water per year by 2020 with accelerated water efficiency measures, thus reducing the need for the planned 150 billion litre desalination plant being built by the Victorian Government at Wonthaggi.[35] In addition, more widespread use of rainwater harvesting in urban areas would reduce the volume and frequency of stormwater runoff which causes millions of dollars of damage to our urban waterways each year. A recent study found that reducing stormwater run-off from new homes would deliver a range of public benefits, such as reduced pollution entering waterways, flood mitigation and increased water savings, valued at more than $600 million a year in Melbourne alone.[36]

2.2 Affordability

Cost is often cited as a reason to hold back on energy efficiency. However, making new buildings more energy and water-efficient is one of the most cost-effective ways to achieve emissions and water savings, as it is much less costly to build efficient systems and appliances into the design and construction of new homes than it is to retro-fit later.

Several recent studies have demonstrated that 7-star thermal performance can be achieved with an upfront cost of around $6,000 more than the current 5-star requirements[38], delivering much lower running costs. This is much less than the wildly inflated figures of $10,000 repeatedly quoted by peak housing industry organisations, and represents a small percentage of the average home purchase cost while locking in long term energy cost savings.

Figure 3. Life cycle savings from effective planning[37]



An unpublished study by RMIT's *Lifetime Affordable Housing* project found 7-star homes to be significantly more affordable than less efficient 5-star homes once lifetime household running costs were included.[39] The study modelled the extra cost of a range of options from 5.5 to 7.4 star standards, along with energy bill savings. The report found the best cost outcome to be a 7.2-star standard, rather than the 6-star standard being proposed by COAG. The 7.2-star standard provided a simple payback of seven years with an internal rate of return of 18 percent, even without taking into account other factors such as extra comfort experienced in better homes, the reduction in marginal load on the grid, and the higher resale value of the house (which some estimates put at around $9,000 extra resale value for each star increase). [40]

The Perth 8-Star House, based on the findings of a research program undertaken by Think Brick Australia in partnership with the University of Newcastle and the Australian Research Council, has demonstrated that an 8-star rating is achievable at a comparable cost to conventional housing. The house, which uses 76 percent less energy and 72 percent less water than an average Perth home, cost $200,000 to build and has significantly lower lifetime running costs than a conventional house.[41]

It is also worth noting that energy efficient 7- or 8-star homes require smaller and hence cheaper heating and cooling systems than less efficient 5 and 6-star variants, thereby lowering the upfront costs of construction even further.

Water efficiency measures can achieve significant savings, often at little to no additional cost. Requiring new homes to install 4-star instead of 3-star dual flush toilets and improving housing design to keep the 'dead space' between hot water heaters and hot water taps to a minimum, could save up to 25,000 litres of water per household per year at almost zero additional cost.[42] Going further to utilize alternative water sources such as rainwater can deliver significant private benefits such as reduced water bills and flexibility in times of water restrictions, as well as a range of public benefits from improved stormwater management (see previous section).

Government regulation which drives uptake of new technology across the entire market will help to reduce the upfront costs of higher standards at a much faster rate than could be achieved by voluntary action alone. Higher standards for all new homes would increase demand for necessary components such as insulation and high performance windows and seals, thus allowing for greater economies of scale in manufacturing. Many of these materials will become standard retrofit products in renovations, providing further knock-on benefits for owners and occupiers of existing homes.

2.3 Consistency with international best practice

In Australia we are lagging far behind international practice. In 2007, the UK Government announced that all new homes will be required to be zero net carbon by 2016.[43]In California, which has a similar climate to Victoria, 7.6-star equivalent standards have been the norm for many years and they too are moving to zero carbon building standards.[44]

Other OECD nations are taking a similar approach to residential energy efficiency. When energy efficiency standards which have been in place in the in United States, Canada and Europe are compared with the equivalent climate zones in Australian (see Table 1.), it is clear we are lagging far behind best practice.

International Region	International Region Building Standard	Equivalent Climate Region in Australia
California	7.6 Star	Melbourne
Texas	6 Star	Brisbane
Arizona	7 Star	Dubbo
Florida	7 Star	Darwin
United Kingdom	7.2 Star	Hobart
Canada	7.2 Star	Hobart

Table 1. Residential Energy Efficiency Standards[45]

Following the UK Government's 2007 commitment that all new homes will be zero net carbon by 2016, they are now working with the building industry to determine regulations and deliver incentives to make it happen.[46]

2. The case for a 'mass greening' of our housing stock

Achieving ambitious greenhouse emissions reductions in time to avert catastrophic climate change, as well as preparing our homes to cope with predicted temperature and price shocks will require a 'mass greening' of our housing stock. Addressing energy use in buildings has been identified as having one of the highest benefit-cost ratios of many possible mitigation measures across different sectors.[30]

Approximately 5 million new homes are expected to be built between now and 2050, which could account for up to 40 percent of residential building stock by then.[31] Building these new homes to yesterday's water and energy efficiency standards will lock us into high emissions far into the future. While not the subject of this report, we will also need to ensure these new houses are built to withstand unavoidable future climate change impacts associated with historic emissions. Our homes will need to be hardier to cope with the expected increase in extreme weather events and drier conditions.

Ultimately, we should be aiming to build 'climate safe' homes – or homes with zero net carbon emissions and substantially improved water efficiency. However, if we are to have any hope of achieving that objective in the medium term, it is critical that the decisions we take today represent an effective step along the road towards achieving our ultimate goal of climate safe homes.

Furthermore, given that 96 percent of households live in existing buildings which will remain unaffected by improved standards for new homes,[32] we also need to significantly upgrade the water and energy efficiency of our existing housing if we are to achieve the emission reductions we need.

Achieving a mass greening of our housing stock will require government commitment to:

- A medium term goal of 'climate safe' housing standards by 2020;
- A range of interim measures which are practical and affordable now, including an interim goal of 7 to 8 star housing standards by 2010, with progressive tightening of standards over time; and
- A suite of policies aimed at upgrading the energy and water efficiency of our existing housing stock.

The Victorian government has an opportunity to be a climate change leader amongst other Australian states and territories.

The case for government action to implement this program is outlined below.

2.1 Economic, employment and social benefits

As climate change takes hold, there is an opportunity to deliver real benefits to householders in terms of cooler homes in summer, warmer homes in winter, reduced energy and water bills, and far lower greenhouse emissions. Buildings with better thermal performance reduce the need for air- conditioning by reducing the number of hours air-conditioning is needed over the year, as well as the extent of cooling required. Each of these factors reduces energy bills and protects householders against extreme temperatures.

Improving the energy and water efficiency of our housing also protects low-income and vulnerable sections of our community who are disproportionately affected by price rises. Low-income households commonly have less energy- and water-efficient housing and appliances to begin with, and their utilities bills usually take up a greater proportion of their spending than the general population. Furthermore, rebate programs offer limited assistance to this group as they reach only those people who can afford the up-front cost of installation, and exclude renters altogether.

Energy efficiency also delivers wider public benefits in the form of savings to energy companies from reduced peak demand, and the potential flow-on cost-savings in reduced need for energy infrastructure. Improved energy efficiency could also be expected to reduce the economy-wide costs of introducing a carbon price through the Federal Government's Carbon Pollution Reduction Scheme.

Undertaking a mass 'greening' of our housing stock will also deliver benefits in terms of economic growth and an increase in green collar jobs in manufacturing and installation. Higher standards will drive growth in insulation and double glazing manufacturing in Victoria, and deliver employment growth in the manufacture of pre-fabricated units – walls, doors, windows and roofing systems for example. With proper planning many of these industries can be located in areas that will potentially suffer from economic and employment downturn into the future. For example, many of the skills needed in manufacturing for sustainable buildings and renewable energy are already present in both Geelong and the Latrobe Valley, two areas that could be affected by the decline of a local emissions-intensive industry.

2.4 Market Barriers

Zero net carbon and water efficient homes have not been developed under business-as-usual conditions due to a number of well-recognised market barriers to the uptake of energy- and water-saving designs by the building industry. The Victorian Government *Energy Efficiency Action Plan* identifies a number of barriers to the uptake of energy savings in new and existing residential buildings.[47] The Federal Government *Carbon Pollution Reduction Scheme White Paper* also recognises the need for residential energy efficiency to be addressed with complementary measures to reduce non-price market failures.[48]

These market failures include:

- **Information Barriers** – lack of consumer information at point of purchase or lease, or high degree of complexity or time commitment leading to inefficient choices;
- **Split Incentives** – builders are not motivated to improve the energy efficiency of homes because they do not re-coup the benefits of lower energy bills or improved comfort that accrue to the householder;
- **Upfront Capital Costs** – while energy efficiency measures may pay for themselves in the long term, low income households in particular have difficulty in meeting capital costs. Government has a responsibility to take steps to reduce the vulnerability of low-income households (particularly tenants) to rising prices of essential services, particularly through improving the energy and water efficiency of their homes; and
- **Bounded Rationality** – householders may not understand the benefits to them of energy efficiency, or may not act due to other priorities.

MOONEE PONDS HOME LIGHTING, PHOTO: ATA

3. *Climate safe* homes and neighbourhoods

What is a 'climate safe' home?

The term '*climate safe home*' used in this report has been adapted from the concept of a 'zero net carbon' or a 'zero emissions' home so as to include water-efficiency as well as energy-efficiency requirements. A climate safe home is one where significant energy and water demand reduction at the household level (delivered by improved building design and efficient appliances), is complemented by a range of alternative, often de-centralised energy and water sources.

Once energy and water use is reduced to as low level as practicable at the household scale, remaining energy and water needs are supplied by renewable sources at a household, neighbourhood or even metropolitan scale. The key characteristics of a climate safe home are outlined below.

3.1 Zero emissions homes

A 'Zero-Emission House' can be defined as:

> "a detached residential building that does not produce or release any carbon dioxide or other greenhouse gases to the atmosphere as a direct or indirect result of the consumption and utilisation of energy in the house or on the site."[49]

This is achieved through a combination of household energy efficiency and the use of renewable energy to balance whatever energy is drawn from the electricity grid. The focus of a zero emissions home is primarily on operational energy use rather than the embodied energy of materials used in the house, or transport emissions. As part of its 'zero emissions homes' commitment, the UK Government is developing 'allowable solutions' – a term similar in meaning to the 'deemed to satisfy' provisions of the Building Code of Australia. The 'allowable solutions' will provide clear guidance to builders regarding what constitutes a zero carbon development, including precinct scale technologies. This approach provides builders with certainty regarding compliance issues, as well as flexibility in implementation.

In order to transition to a low-carbon economy within the tight timeframes needed on current scientific advice, it is important that we set clear goals articulating where we need to be heading in key policy areas. A critical first step towards upgrading our housing stock is to articulate a medium term goal.

Following the precedent set by the United Kingdom; the Victorian Government has the opportunity to articulate a move in this direction including the use of its leadership within COAG to commit to a goal of climate safe homes by 2020. As in the UK, a task force could then be established, charged with the task of working with key stakeholders to define standards for climate safe homes, decide on allowable measures, and identify barriers to the achievement of this goal and the measures to overcome them.

Substantial steps towards Zero Emissions Homes could be achieved in Australia via the following measures:

a) Requiring a minimum standard of 7 to 8-star standards for new homes and renovations by end 2010

The star rating of a house indicates the energy used in heating and cooling per square metre. It assesses this thermal performance by calculating the effectiveness of many design elements including building materials, window area, and orientation. A star rating provides builders with flexibility to deliver the performance level through a range of design features. When used in regulation, a performance measure set in *AccuRate*[50] as a star level is complemented by 'deemed-to-satisfy' provisions which are more prescriptive design elements for use by builders if preferred.

A rating of 8.2 stars is achievable now using the best of conventional technology, including:

- high levels of insulation in all walls and ceiling;
- use of high performance low-e double glazing; and
- good sealing against air infiltration.[51]

The Victorian Government could unilaterally introduce 7 to 8-star energy efficiency standards into the Building Code of Australia by the end of 2010 and work for this standard to be adopted nationally via COAG. Compliance with the standards should be measured using the CSIRO-developed *AccuRate* software or equivalent 'deemed-to-satisfy' provisions. The standards need to cover all classes of residential buildings including stand-alone houses and apartments.

Whatever standard is introduced will need to address the potential shortcomings of existing models of regulation. For example, the advantage of a flexible, performance-based target such as NSW's BASIX standard is that it integrates energy and water savings from a range of appliances such as hot water and lighting as well as thermal design. However, critics of the scheme argue that actual savings have been far lower than predicted because thermal performance requirements were traded off with appliances, and large appliances such as hot water were traded off with smaller appliances such as fridges.

On the other hand, Victoria's more prescriptive 5-star standard which mandates the inclusion of certain measures (such as a greenhouse-efficient hot water system or a rainwater tank), reduces the potential for trade-offs. However, while the Victorian standard has been successful in reducing emissions by 19 percent per square metre, total savings have been undermined by a trend towards larger homes. As a result, greenhouse gas emissions from new homes have still increased by 6 percent overall since the introduction of the standards.[52]

b) Ensuring installation of energy efficient fixtures and appliances

A star rating of the thermal performance of a building does not address energy used in lighting, hot water or other equipment, nor design elements external to the house itself. A zero emissions home therefore must combine good design with quality appliances and fixtures and include the following:

GREENHOUSE-EFFICIENT HOT WATER SYSTEM. An electric-only hot water system can produce up to 5.8 tonnes of emissions per year, compared with 3.3 tonnes for electric-boosted solar hot water and only 0.5 tonnes for gas-boosted solar systems. A 5-star gas hot water system is also relatively energy-efficient, producing 1.4 tonnes of emissions per year.[53] For higher density residential developments such as apartments, heat pumps and co-generation plants (see below) can be used to provide hot water more efficiently that electric or storage hot water systems.

FIXED APPLIANCES: LIGHT FIXTURES, EFFICIENT COOLING AND HEATING. Volume housing developments are usually completed with fixed appliances such as lighting fixtures, heating and cooling already included in the package. A climate safe home would be designed to ensure heating and cooling systems were sized appropriately for the home, and allowed for zoning of areas to be heated and cooled. Similarly, a climate safe home would optimize access to natural light, and use energy-efficient lighting technology such as compact fluorescent and LED light fittings. Halogen downlights should be avoided because they are a fire hazard if located next to insulation and are very inefficient.

MOVEABLE APPLIANCES: LIGHT BULBS, REFRIGERATORS AND TELEVISIONS. Almost every electrical appliance in the home has the potential to be more energy efficient. Replacing incandescent light globes with compact fluorescents reduces energy use for lighting by up to 80 percent.[54] Similarly fridges, televisions and ovens can reduce the energy demand of a house if they are efficient. Stand-by power alone contributes some 10 percent of household energy demand.[55] Energy star labelling, smart meters and mandatory energy performance standards (MEPS) can play a role in reducing energy demand from appliances.

c) Renewable energy

Once energy demand at the household level is reduced to a minimum, remaining energy needs are supplied or offset with renewable energy to achieve a zero net emissions home. Obviously, the more energy demand has been reduced to a minimum at the household level, the easier and more cost-effective it becomes to supply remaining energy needs with renewable energy. Renewable energy needs can be supplied at the household scale, or where that is not viable, at the precinct or neighbourhood scale or through the purchase of GreenPower.

The most important policy option to support the uptake of small-scale distributed renewable energy is the introduction of a nationally consistent gross feed-in tariff. Governments around Australia have offered various rebates, renewable energy certificates and a range of effective and ineffective feed-in tariffs to encourage the adoption of renewable energy by Australian households. The Federal Government has made an election commitment to support a nationally consistent feed-in tariff. It could follow the lead of over 40 countries and take a leadership role nationally by working with COAG to harmonise relevant policies towards a national gross feed-in tariff to drive the uptake of small scale renewable energy. Gross feed-in tariffs are recognised internationally as being one of the most effective mechanisms for encouraging renewable energy generation.

A variety of renewable energy options exist, including:

ROOFTOP PHOTOVOLTAIC SOLAR PANELS. In Melbourne, a 2kW photovoltaic solar panel produces around 6.3kWh per day, or 2300kWh per year.[56] Solar panels have

the added advantage of reducing peak demand during summer heat waves by effectively providing solar powered air-conditioning.

WIND POWER. Wind turbulence in urban areas can reduce the effectiveness of wind-power, but small wind power plants (2.5kW to 15kW) may have a role in rural and regional residential developments with adequate wind and siting arrangements. Depending on the average annual wind speeds the annual output of a 2.5 kW wind turbine would be between 2,500 kWh and 5,000 kWh. The technology is rapidly developing to address the challenges of applying the technology in the urban context.[57]

GEO-THERMAL. In Victoria, there are significant reserves of low grade geothermal energy which have potential for use in residential areas. The technology can be used for heat pumps, space heating and district heating, cooling and air-conditioning.

CO-GENERATION AND TRI-GENERATION. Co-generation is the simultaneous production of electricity and heat using a single power source such as natural gas. Traditional burning of fossil fuels is very inefficient, with coal fired power stations only capturing about 30 percent of the energy they create as electricity, with the rest wasted as heat energy.[58] Smaller gas-fired power stations can be located near to consumers (industrial plants, commercial and residential developments etc) where the heat as well as the electricity can be used. The increased efficiency reduces greenhouse gas emissions and as these plants are close to the point of consumption, they also cost less in terms of network and transition costs. Tri-generation is the simultaneous production of electricity, heating and cooling using a single source such as natural gas or solar energy – basically taking cogeneration the next step. Tri-generation takes the waste heat from cogeneration when not in use, and converts it through absorption chillers into cool water used in air-conditioning or other processes.[59]

GREENPOWER. Where it is not viable to fully supply energy needs with local renewable sources, remaining energy needs could be met by GreenPower, which is an accredited investment in renewable energy remote from the house.

3.2 What savings are achievable?

The CSIRO Australian Zero Emissions House (AusZEH) project has modeled the energy savings achievable by three housing scenarios:

AVERAGE: represents a house built to today's 5-star standards with appliances, heating and cooling systems of average efficiency and a gas hot water system;

BEST: represents a house using close to the best of conventional technology with a building envelope star rating of 8.2 stars, appliances with the highest available energy efficiency ratings and a gas-boosted solar hot water system; and

FUTURE: represents a near-future scenario whereby the envelope rating remains at 8.2 stars, but the efficiency of heating and cooling systems, appliances and hot water systems are increased to levels envisaged to be achievable in the near future.

As Table 2 below shows, dramatic energy and emissions savings are achieved by the shift from the Average to Best scenarios – in other words through the implementation of technology that is available today.

	% Energy Consumption Reduction			% CO_2 Emissions Reduction		
Location	Average Best	Best Future	Average Future	Average Best	Best Future	Average Future
Melbourne	77	27	83	46	19	57
Sydney	69	25	77	49	18	58
Canberra	81	34	87	54	31	69
Brisbane	62	24	71	42	16	51
Townsville	61	27	72	47	21	59

Table 2. Percentage reductions in energy consumption and CO_2 emissions for three house scenarios in five locations with different climates

Box 1. Melbourne's ZEH Demonstration Home[60]

A zero emissions demonstration house is currently under construction in Melbourne's northern growth corridor and is due for completion in September 2009. Other demonstration homes are planned for Brisbane (sub-tropical zone) and North Queensland (tropical zone) over the next two or three years.

The Melbourne ZEH house achieves an *AccuRate* rating of 8.2 stars and incorporates energy efficient lighting, appliances, heating/cooling system and solar hot water. The home will incorporate a home automation and monitoring system to improve performance even further and empower occupants to monitor and control their energy consumption

ELANORA HEIGHTS HOME, NSW, PHOTO: ATA

3.3 High water use efficiency

A large urban centre such as Melbourne uses more than 400 billion litres (or gigalitres GL) of water a year, with 60 percent of this water being used by the residential sector.[61] On average, a family of four in a new house with a garden on a typical development site of 600m^2 in Melbourne will use more than 220,000 litres of water a year.[62] This family will use around 50 percent of their water in the bathroom, 22 percent in the laundry, another 19 percent in the garden and around 8 percent in the kitchen. There is an energy cost to this water use as well, as almost half of the water used is heated.[63]

The most optimistic assessment of how much water the Victorian 5-Star Standards are currently saving in new homes puts the figure at 35,000 litres per year,[64] or approximately 15 percent of annual household water use.[65] However, requiring new homes to install 4-star instead of 3-star dual flush toilets and water-efficient appliances (particularly washing machines), as well as improving housing design to keep the 'dead space' between hot water heaters and hot water taps to a minimum,[66] could achieve more than 30,000 litres (30 KL) in extra water savings per household per year, or nearly 14 percent of household water use at almost zero additional cost.[67]

	Current 5-star	Efficient case	KL/yr saved
Toilet	27.6	23.0	4.6
Shower	65.3	55.1	10.2
Washing machine	45.1	26.3	18.8
		Total:	**33.6**
		Percentage of total household use:	**14.0**

Table 3. Savings from basic water efficiency measures[68]

Consistent with the concept of a zero emissions home supplying residual energy needs with renewable sources, a climate safe home utilises a range of alternative water sources to reduce its reliance on the centralised water supply system further. Adding an alternative water source such as grey-water re-use or a rainwater tank connected to toilet and laundry can bring household water savings to more than 40 percent compared with a non-efficient house, and many houses achieve much greater savings (see Box 2.).

Houses in new 'greenfield' developments where there is usually space available for cost-effective, suburb-scale stormwater harvesting or dual pipe recycling systems should be able to achieve even greater savings, in excess of 70 percent (see case study 3).

The following alternative water sources can deliver major water savings:

A) RAINWATER TANKS. Recent studies have shown that installing a 5000 litre tank draining 200m^2 of roof area and plumbed for internal use could save a household in Melbourne up to 96,000 litres of water per year.[69] Even the installation of a smaller 2,000 litre tank could save more than 60,000 litres per year (nearly 30 percent of household water use), provided it drained 100 percent of roof area and was connected to a range of end-uses.[70] The typical cost of a plumbed-in household tank is between $2000 and $4,000, and it is cheapest to install tanks while the house is being constructed.[71] Connecting water tanks to internal uses such as toilet flushing and washing machines has a double benefit. Firstly, it means these uses are no longer completely reliant on mains water supplies, which reduces household water use. Secondly, these tanks capture a much higher proportion of total rainfall, as they fill and refill several times a year, unlike tanks used for garden watering which typically stay full over winter.

Box 2. Water efficiency using household scale alternative water sources

WestWyck Eco-village housing development

WestWyck occupies the site of the former Brunswick West Primary School in inner Melbourne. The key sustainability principles that justify WestWyck being termed an 'ecovillage' are materials efficiency, energy efficiency and water efficiency.

Water saving devices (flow restrictors, efficient appliances and efficient fittings) are installed, and harvested roof water is used to replace as much of the mains water as possible, with this being largely used as the supply source for the hot water system. Treatment and re-application of used water further reduces reliance on mains supply. The greywater treatment plant receives bathroom and laundry water and subjects it to bacterial, membrane and UV treatment to create Class A water for reuse in toilet flushing and gardens and, subject to approval, the laundries.

A CSIRO project based at the site concluded that "the two operational apartments … consume approximately 64 percent less water than the average of other similar style housing in the Yarra Valley Water area".

B) GREYWATER. Greywater is household wastewater collected from sources other than the toilets and kitchen. Untreated greywater must not be stored for more than 24 hours because of the health risks associated with bacterial growth. Using untreated greywater for garden watering can save a household around 50,000 litres per year, while using greywater for toilet flushing can increase savings to 80,000 litres per year. However, greywater used for toilets must be treated, which makes this option less cost-effective.[72]

C) STORMWATER CAPTURE AND RE-USE. Melbourne uses more than 400 billion litres of water each year extracted from its stressed rivers, while a roughly equivalent amount – which runs off the urban catchment as stormwater – is barely utilised at all. Not only does runoff represent a very significant untapped resource, but the management of this untapped resource costs the Victorian community millions each year in flood protection infrastructure, waterway rehabilitation and impacts on Port Phillip Bay. New residential developments commonly have ample space for suburb-scale collection and re-use of stormwater for a range of non-potable uses.

D) DUAL-PIPE RECYCLING. Dual pipe recycling involves treating sewerage wastewater to Class A Standard for non-drinking uses such as garden watering or toilet flushing. Where sewage treatment plants are located relatively close to residential developments, dual-pipe recycling can be a relatively cost-effective option (see Box 3.). Substituting potable water for recycled water for these uses could reduce household demand for mains water by 80,000 litres per year. However, seasonal demand for recycled water (ie. for garden watering) would need to be carefully matched to supply from the plant.[73]

Box 3. Water efficiency using suburb-scale alternative water sources[74]

Armstrong Creek Development – Geelong

The City of Geelong has adopted an integrated water cycle approach for its new Armstrong Creek development. This approach involving the use of rainwater tanks, water efficient appliances and gardens, as well as waste-water re-use from local treatment plants is expected to achieve a 75 percent reduction in mains water demand, a 63 percent reduction in wastewater discharges and significant reductions in greenhouse gas emissions.

Importantly, this approach was found to be the most cost-effective of all options considered. The water savings achieved would defer need for the Melbourne to Geelong pipeline for 19 years (from 2014 to 2033), saving the Victorian community about $80 million in infrastructure costs.

3.4 *Climate Safe* Neighbourhoods

The emphasis in '*climate safe* homes' on alternative energy and water supply systems implemented beyond the household scale echoes similar urban design concepts such as Green-Oriented Development[75] and Water-Sensitive Cities[76].

Green-Oriented Development implies the development of substantially more sustainable forms of energy supply to our homes than the current coal- and gas-dominated supply sources, as well as superior energy and water efficiency in buildings, production processes, appliances and transportation systems. As energy markets across the world begin the process of significant change due to climate

change and other market pressures, interest in distributed energy supplies has increased. A distributed energy supply is distributed across and embedded in the electricity grid (such as solar panels on roofs), as opposed to the current system of centralised large scale conventional energy supplies.[77]

Distributed energy supplies tend to be renewable and therefore have significantly less greenhouse gas emissions associated with their electricity generation. While they are small scale, their size leads to their potential for being incorporated across all types of urban and rural developments – residential, commercial and industrial. As they are located at or near the point of electricity consumption, there are also significant savings to be made through reduced network and transmission costs typically associated with large-scale centralised energy systems that are located often hundreds of kilometres from the point of consumption.[78] As is, Australia is in the process of spending $24 billion on upgrading and growing Australia's electricity network[79] – costs that are then passed onto consumers through network charges.

In a water-sensitive city, a diverse range of water sources including urban stormwater and recycled wastewater are utilised in an integrated way and at a range of scales (from household to suburb and city-wide) to reduce the vulnerability and environmental degradation that comes from over-reliance on rivers as a single water source. Taking an integrated approach to water management can deliver a wide range of benefits including supply security, flood protection, waterway health protection and amenity and recreation.[80]

In both cases, the emphasis is on implementing change not just at the household level, but re-engineering our cities and towns to increase our use of smaller scale, de-centralised, renewable sources of energy and water to reduce our reliance on centralized, environmentally and economically costly supply sources such as coal-fired power plants, desalination plants and extraction from stressed rivers.

Box 4. Zero Emissions Neighbourhoods, Victoria[81]

Zero Emissions Neighbourhoods (ZEN)

Zero Emission Neighbourhoods (ZEN) is a $6 million Victorian Government funding grant program, designed to shape the future of sustainable residential development in Victoria.

ZEN will showcase innovative water, waste, transport and energy solutions, such as local renewable energy supply, sustainable master planning and design, onsite recycled water and smart meters to help manage energy usage. Neighbourhoods will include sustainable infrastructure, such as solar energy, recycling facilities, walkable streets and bike paths.

The ZEN program will support projects that address the three pillars of sustainability - economic, social and environmental - and benefit the health and wellbeing of residents and ecosystems, both now and in the future.

Four to six zero emission communities will be developed over four years. ZEN is supported by the Victorian Government Sustainability Fund, managed by Sustainability Victoria.

4. Greening our existing housing stock

Given that in Victoria 96 percent of houses were built prior to the introduction of the 5-star standard, a major retrofit program will need to be undertaken if our homes are to be adapted to cope with the impacts of climate change and the transition to a low carbon economy.[82] An estimated 1.9 million Victorian homes built before 2004 still have energy ratings of 2 Stars or less, while at least 50 percent of Melbourne households do not have a water-efficient showerhead and 20 percent still have at least one single flush toilet.[83]

4.1 Greening 1 million Victorian homes

A recent report by Environment Victoria concluded that retrofitting 1 million Victorian homes with basic energy and water-saving measures could reduce greenhouse gas emissions by more than 3 million tonnes and save 32.5 billion litres of water each year. Importantly, undertaking a retrofit program of this scale could create up to 6,900 jobs. Extending this program to half of the national housing stock would reduce Australia's emissions by 11.9 million tonnes, reduce water use by 130 gigalitres and create up to 27,800 new jobs.[84]

Such a retrofit program would involve a household audit by a trained assessor, followed by the implementation of relevant retrofit activities. The basket of measures proposed in the Environment Victoria study is shown in Table 4.

Table 4. Efficiency measures, costs and proportion of dwellings

Retrofit activity	Cost	Proportion of dwellings requiring measure (%)
Audit	$200	100
Upgrade household with CFLs	$70	20
Weather sealing retrofit	$420	75
Ceiling insulation	$1,153	40
Hot water – electric to solar	$3,500	30
Hot water – electric to heat pump	$4,000	10
High efficiency showerhead	$95	50
Dual flush toilet	$750	20
Tap flow controllers	$40	90
Fridge upgrade	$950	15
Average cost per dwelling		**$2,800**

To maximise the energy and water savings from such a retrofit program, delivering community education programs as part of the process would ensure that savings are maintained into the future and are reinforced by the behaviour of the household's occupants. The one million homes retrofit assumes that the program would be government funded and accessed free of charge by low-income households. The definition of low-income is a broad one as advocated by the Brotherhood of St Laurence –50 percent of the population would qualify for a fully funded retrofit. While such a program would require significant government investment, the report highlights that much of the investment required is already committed. Existing state and Federal programs are set to spend $370 million per year in Victoria in coming years. Providing that existing federal can be integrated into a 1 million homes retrofit program, an additional $184 million would be required each year for 5 years to retrofit 1 million houses.

4.2 Beyond 1 million homes

As well as setting a 1 million homes target, government can use a mix of regulation and financial incentives to drive adoption of the minimum measures listed above in all other households. This can include rebate programs as well as requiring disclosure of the energy- and water-efficiency status of properties prior to sale or lease, as flagged by COAG Governments. While mandatory disclosure is a welcome step forward, it should be followed by mandatory performance standards, so that any property for sale or lease must meet a mandated level of energy- and water-efficiency prior to sale or lease.

For several years now, home-owners in the ACT have been required to disclose the residential energy performance of their home to potential purchasers. A review of this policy has reported that there is a market premium associated with energy efficient homes, showing that householders use this information in purchasing decisions.[85]

This requirement for mandatory disclosure should be taken two important steps further – one to include water efficiency as well as energy; and two, to require vendors to go beyond disclosure to ensure their homes meet minimum environmental performance standards at the time of sale or lease. These standards could be introduced over the next 12 months and then progressively tightened over the next five years, as we build the workforce and skills necessary to retrofit our entire building stock.

Regulatory standards at point of sale or lease spreads the responsibility for improving our building stock across the whole community. It removes the split incentive that sees many renters living in homes with poor energy and water efficiency while having minimal ability to invest in savings. It would also reach high-income, high-consumption households that may not access voluntary rebate programs.

A performance-based standard would give homeowners the flexibility to choose the most cost-effective mix of measures to help them save water and energy. The proposed program could create additional employment benefits in areas such as the rainwater harvesting industry, which is not included as one of the measures modeled in the one million homes proposal.

At current rates of home sales, 50 percent of Victoria's housing stock would be upgraded within ten years. A combination of improved rebate and loan schemes would encourage homeowners not planning to sell to upgrade and reap the benefits of efficiency improvements.

A staged approach to retrofitting our existing housing stock at point of sale or lease could be implemented, as follows:

- Mandatory auditing and disclosure of water and energy use of all dwellings sold or leased required by 2009/10;
- All dwellings sold or leased meet minimum performance-based standards for water and energy use from 2012[86] and
- Minimum standards are progressively tightened between 2012 and 2020.

Australia's rainwater harvesting industry is calling for the introduction of a performance-based standard for homes at the point of sale or lease as a way of reducing the volatility which has plagued this new and potentially profitable new industry. Introduction of such a standard would create a steady and predictable demand for rainwater tanks and restore the market confidence needed to prevent job losses and create new ones. A recent report estimated that implementing such a program would create up to 1500 jobs directly across the country and another 3000 jobs indirectly.[87]

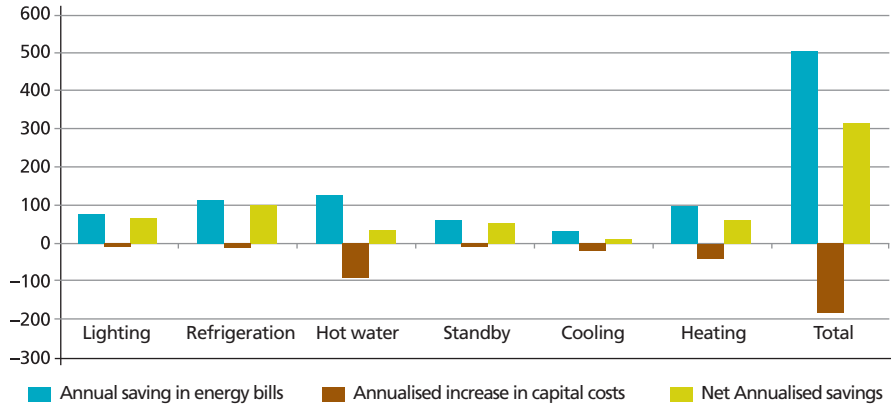
4.3 A role for the Federal Government in greening our existing housing stock

The Federal government has made a promising start in investing in retrofitting existing homes with a commitment of over $4 billion for a range of different programs including green loans, rebates for rainwater tanks and solar hot water systems, and incentives for landlords and owners to install insulation.

However, if we are to help Australians to adapt to unavoidable climate change, much more needs to be done, and a national effort to invest in retrofitting every Australian home over the next decade would assist in making our homes 'climate safe'.

Figure 4. below sets out opportunities for energy savings across a range of different readily available technologies, and the potential savings and annualised effects of their capital costs over their lives.[88] While capital costs are not insignificant, this analysis shows there are substantial net savings (over $300 per annum) on energy bills with an estimated payback period for these measures being three to four years.

Figure 4. Opportunities for energy savings for average household from investment in simple and available energy efficiency technologies



The Federal government could lead a major national investment and regulatory program to leverage significant private and public sector investment to retrofit all Australian homes within a decade. Such a program would take a similar approach to the model proposed in Victoria where there is direct government investment in retrofitting low income households (with a broad definition of low income as advocated by the Brotherhood of St Laurence) while the remaining housing stock is addressed through a combination of mandatory standards to be met at the point of sale or lease, and rebates and green loans programs.

The Brotherhood of St Laurence (BoSL) has developed a detailed proposed national program to retrofit 3.5 million low-income homes over the next seven years. The program would cost $11.2 billion and create or safeguard 6,900 to 15,300 jobs nationally. BoSL proposed that permit sales from the Federal Carbon Pollution

PHOTO: ANNE MARTINELLI

Reduction Scheme (CPRS) be used to pay for the program. Modeled by KPMG, the program would reduce electricity bills by an average of $313 to $470 per household, protecting low-income earners from energy price rises.[89] To date the design of the CPRS favours granting low-income households cash compensation for higher energy prices instead of investing in energy (or water) efficiency measures. The groups involved in the preparation of this report believe a wiser investment would be to use the CPRS revenues to lock in permanent energy and water savings through a major retrofit program targeted at low income households.

As mentioned, COAG's National Strategy on Energy Efficiency has committed to "phase in mandatory disclosure of residential building energy, greenhouse and water performance at the time of sale or lease, commencing with energy efficiency by May 2011".[90] Accelerating this process and following disclosure with minimum standards applied at the point of sale or lease would leverage significant private investment in the overhaul of our residential building stock.

In addition to a major retrofit program targeting low-income households and minimum performance standards for properties for sale or lease, the Federal Government can also assist by providing;

- Reliable information about the opportunities for household energy and water savings, such as advice about technologies and services, an awareness-raising

  campaign to encourage home-owners to invest, and mandatory public disclosure of energy performance ratings for existing commercial and residential buildings at point of sale or lease.
- Discounted home energy and water audits which would encourage uptake of insulation, energy-efficient lighting, AAA-rated shower heads, solar hot water systems and rainwater tanks.
- Expansion of currently available innovative financing and funding arrangements that allow repayment of capital costs from savings on energy and water bills and investment in distributed energy and water infrastructure. The delivery mechanism could include expanded rebates to achieve maximum energy and water savings, government guaranteed loans paid back through the taxation system or through energy and water utilities, and local government rate rebates.
- Expanding specific measures for rental properties (which are often poorly insulated and particularly inefficient). These could include accelerated depreciation or deductibility for capital expenditure on water and energy efficiency, incentive payments to managing agents of rental properties, and promotion of local government rate rebates.

The Brotherhood of St Laurence's Energy and Water taskforce undertake home retrofits.
PHOTO COURTESY OF ROSS BIRD

5. Policy solutions

5.1 Policy context

The Building Code of Australia currently sets the energy efficiency standard for new buildings across the country at 5 stars. However, some States currently have lower standards for thermal performance.

The Victorian Government introduced 5-star building standards for new homes in 2005, and extended the regulations to include renovations in 2008. The 5-star standards require:

- 5-star thermal performance for new homes;
- water efficient taps and fittings for all new homes;
- optional standard requiring all new homes to have either a greenhouse efficient hot water system or a rainwater tank (or equivalent water saving measures);
- improved thermal performance for major renovations.

South Australia, Western Australia and the ACT soon surpassed Victoria with the introduction of their own 5-star standards plus mandatory 'greenhouse efficient' hot water, while Queensland took the next step and introduced the phase-out of electric storage hot water. The NSW Government has introduced a BASIX target to improve the energy and water performance of new homes in Sydney by 40 percent, and lesser amounts in other parts of the State.

The actual measures needed to achieve 5 stars varies between different climate regions; for example thermal mass and insulation are more important in cooler climates, shading is more important in warmer climates.

At the Council of Australian Governments (COAG) meeting in April 2009, governments around Australia made a commitment to:

> "an increase in energy efficiency requirements for new residential buildings to six stars, or equivalent, nationally in the 2010 update of the Building Code of Australia, to be implemented by May 2011, as well as new efficiency requirements for hot-water systems and lighting".[91]

While the COAG commitment is a good move forward for all Australian states, a 6-star energy efficiency requirement is only a half step towards preparing our new building stock for the future. All States, including Victoria, still have lower standards than those in place to protect householders in other OECD nations.

In 2007, the UK Government announced that all new homes will be required to be zero net carbon by 2016, and then committed to a series of measures designed to achieve this outcome:

- Establishing a high level task force headed by the Minister for Housing and the head of the largest building industry association to identify barriers to achieving the policy aim and implement measures to address them;
- Introducing a program of gradually raising building standards from the base of 7.2 stars up to zero carbon standards in 2016;
- Investing over £1 billion each year in a household retrofitting program for existing building stock; and
- Developing a package of training and incentives to transform the industry.[92]

The UK approach recognises that a variety of mechanisms and a degree of flexibility must be available to developers and builders to ensure the generation of renewable energy that is appropriate to a particular home or development, while still meeting the zero net carbon requirements.

The UK Government is currently developing 'allowable solutions' – a term similar in meaning to the 'deemed to satisfy' provisions of the Building Code of Australia. The 'allowable solutions' will provide clear guidance to builders regarding what constitutes a zero net carbon development, including precinct-scale technologies. This approach provides developers and builders with certainty regarding compliance issues, as well as flexibility in implementation.

5.2 *Climate safe* homes and communities plan of action

The following policy solutions address the market barriers identified earlier, while being practical and cost effective, as demonstrated in other jurisdictions. The following measures address new residential buildings and existing building stock with a mixture of mandatory standards and incentives. While some policy measures are being developed at the Federal level through the Australian Building Codes Board (ABCB), State governments are responsible for the implementation of building standards, and for this reason there is a strong case for leadership at the State level.

This report recommends a three-part program of complementary measures to achieve a mass greening of our housing stock:

A] Commitment to a medium term goal of 'climate safe' housing standards by 2020;

B] Commitment to a range of interim measures which are practical and affordable now, including an interim goal of 7 to 8 star housing standards by 2010, with progressive tightening of standards over time; and

C] Commitment to a mass retrofit package and policies aimed at upgrading the energy and water efficiency of our existing housing stock.

D] Provision of incentives and support for building industry adjustment

This report recommends a goal of climate safe homes to guide both regulation and incentives. It is not advocating that climate safe homes should be achieved by regulation alone, as the building industry needs time to prepare for such an adjustment. However, if we deliver best practice standards with targeted incentives to assist builders go beyond them, we can transform the way our homes and cities use energy and water.

Policy recommendations

Environment Victoria, ATA, ACF, FoE and MEFL make the following recommendations to the Victorian government:

A] Commit to a goal of 'climate safe' new homes by 2020 and create a cross-sector task-force within 12 months to develop pathways and define standards for 'climate safe' homes.

Following the precedent set by the United Kingdom; the Victorian Government could be a champion unilaterally and within COAG for achieving a goal of climate safe homes by 2020. As in the UK, a task force could then be established, charged with the task of working with key stakeholders to define standards for climate safe homes, decide on allowable measures, and identify barriers to the achievement of this goal and the measures to overcome them.

B] Take substantial steps towards 'climate safe' for new homes in the next 18 months by committing to the following measures which are practical and affordable now:

i. Fast-track the introduction of 7 to 8-star standards for new homes and renovations by 2010

While the commitment by COAG to move towards 6-star standards is welcome, moving immediately to 7 to 8-star standards will do much more to insulate new households against rising energy costs and the impacts of climate change, while saving around 30-50 percent in greenhouse gas emissions on every new home across Australia. Furthermore, recent market research indicates that new home purchasers and developers support the introduction of 7-star standards as long as there is some flexibility in the design elements used to achieve higher performance.[93]

The Victorian Government could unilaterally introduce 7 to 8-star energy efficiency standards into the Building Code of Australia by 2010 and work for this standard to be adopted nationally via COAG. See 3.1 (a) for further details.

ii. Introduce a minimum 40 percent water efficiency target for new homes by 2010

The Victorian government could follow the example of the New South Wales BASIX standard which has set a target of 40 percent reduction in mains water demand in

new and renovated homes and apartments. The BASIX standard provides a guide to what is cost-effectively possible in new homes. A target of 40 percent reduction in household water use could be adopted as the minimum starting point for progressively tightening water efficiency standards over time. The 40 percent target should be set as a flexible, performance-based measure which allows for the most cost-effective combination of measures to be implemented in any particular house or site. In most cases, it will be able to be achieved through a combination of 4 star internal fittings (such as toilets and taps), improved design to reduce the dead space between the hot water system and taps, and the use of one alternative water source such as grey-water or tank-water (connected to toilet and washing machine).

Given that much higher water savings (up to 75 percent) should be achievable in new 'greenfields' developments where there is greater opportunity to incorporate suburb-scale alternative water supplies such as stormwater re-use or dual-pipe recycling systems, there is scope for setting a separate, higher water efficiency target for homes in new suburbs. See Section 3.3 for further details.

There are signs the building and development industry would also welcome increased regulation to encourage more widespread adoption of water efficiency measures and alternative water sources (such as recycled water). The view expressed by a majority of more than 30 professionals interviewed in a recent study, was that mandatory regulation would help to remove some of the cost barriers to implementation by creating a level playing field.[94]

iii. Encourage greenhouse-efficient hot water for all new homes

The 'optional' Victorian building requirement which allows builders to install either 'greenhouse-efficient' hot water or a rainwater tank should be replaced by a measure to require both greenhouse-efficient hot water, and a rainwater tank or equivalent water saving system to achieve the minimum 40 percent target above.

C] Commit to a mass retrofit package and policies aimed at upgrading the energy and water efficiency of our existing housing stock by:

i. Committing to a 1 million homes water and energy retrofit program targeting low-income households over the next 5 years

While a number of government programs are in place to upgrade the energy and water efficiency of public housing, such programs do not assist the significant number of low-income households living in their own or private rental accommodation. Many of these households are also unable to access government-funded rebate schemes as they cannot afford the upfront cost of water- and energy-efficiency measures in the first place. A variety of basic retrofit programs (such as audits or shower-head swaps) are offered by water and energy utility companies to assist low-income households, but these programs tend to focus on either energy or water in isolation. The Victorian Energy and Water Taskforce which is aiming to retrofit 8000 low-income homes by 2011 is one exception.[95]

Environment Victoria recently outlined a proposal for retrofitting 1 million Victorian homes for improved water as well as energy efficiency, including direct Government investment in the upgrade of low income households. Under this proposal, low income households would receive a household energy and water audit, followed by the installation of a range of basic, cost-effective measures such as compact fluorescent lights, weather sealing, ceiling insulation, high efficiency showerheads, dual flush toilets (or flush-reducing devices), tap flow controllers, fridge upgrades and replacement of inefficient hot water systems. The program would need a community education component to ensure energy and water savings are sustained into the future.

According to this study, retrofitting 1 million homes – or half of Victoria's housing stock – by 2015 at a cost of $2,800 per retrofit is estimated to cost $560 million per annum and create between 3100 and 6,900 jobs.[96] See section 4.1 for further details.

ii. Introducing minimum performance standards for energy and water efficiency at the point of sale or lease by 2012

The simplest way to deliver a 'mass greening' of our existing housing stock would be for governments to require that all buildings meet acceptable environmental performance standards at the time of sale or lease.

COAG recently committed to "phase in mandatory disclosure of residential building energy, greenhouse and water performance at the time of sale or lease, commencing with energy efficiency".[97] This requirement for mandatory disclosure should be taken two important steps further – one to include water efficiency as well as energy; and two, to require vendors to go beyond disclosure to ensure their homes meet minimum environmental performance standards at the time of sale or lease. These standards could be introduced over the next 12 months and then

progressively tightened over the next five years as we build the workforce and skills necessary to retrofit our entire building stock.

At current rates of home sales, 50 percent of Victoria's housing stock could be upgraded within ten years using a staged approach as follows:

- by 2010, require mandatory auditing and disclosure of water and energy use of all dwellings sold or leased by 2010;
- by 2012, require that all dwellings sold or leased meet minimum standards for water and energy use; and
- 2012 – 2020, introduce progressive tightening of minimum standards.

iii. Providing incentives and rebates to improve the uptake of alternative water sources

The Victorian Government's Water Smart Gardens and Homes rebate scheme has supported steady growth in the installation of alternative water sources such as rainwater harvesting, and demonstrated that relatively small amounts of public money are capable of leveraging significant private investment.

However, after 5 years in operation, there are still fewer than 10,000 Victorian households with a rainwater tank, and fewer than 1500 have connected their tank to internal uses such as toilet or laundry.[98] Preliminary results from a study currently underway in Mt Evelyn in Melbourne's eastern suburbs indicate that the current rebate for internal connections is too low – only 1 out of 100 households participating in a tendering process were prepared to install a tank in return for the current rebate.[99]

The demonstrated benefits to the wider community of making greater use of rainwater at a household level provides a good argument for increasing the current rebate to a level that will encourage households to install tanks of a sufficient size which are plumbed for internal use.

The structure and eligibility rules for rebate schemes would need to be reviewed in the context of the introduction of minimum water-efficiency performance standards at point of sale or lease, so as to ensure rebates remained an equitable and cost-effective use of public funds. Furthermore the Victorian government could mandate for rainwater tanks to be plumbed into toilets and washing machines. See Section 3.3 for further details.

D] Provide incentives and support for building industry adjustment

Many builders are concerned about climate change but need some support to aim for climate safe homes. While many volume builders already have cost-effective 7-star house designs ready, training and professional development is needed for builders and designers in smaller businesses. Training support for renewable energy design and installation will also assist the integration of energy efficiency with renewable energy supply.

Rebates currently only available for existing homes could be extended to new homes where builders are aiming to go beyond minimum compliance. For example, rebates for gas-boosted solar hot water would encourage home-builders to choose the most efficient water heating option. Support for the bulk purchase of energy-efficient appliances could be supported by the expansion of the Victorian Energy Efficiency Target Scheme.

The benefits of reduced energy demand, and peak demand in particular, are not currently accrued by developers. There is a strong case for review of this market dynamic to give developers greater incentive to deliver climate safe homes.

Environment Victoria, ATA, ACF, FoE and MEFL make the following recommendations to the Federal government:

The Federal government could set a national agenda for climate safe homes and working to strengthen COAG agreements on new building standards and efficiency standards for existing buildings at the point of sale or lease. Most of the policy recommendations above could apply to the Federal government. However there are some immediate actions that the Federal government needs to take to allow proactive jurisdictions to achieve a goal of climate safe homes, as outlined below

A] Fast-track minimum energy performance standards to prevent the sale of inefficient appliances by:

i. Phasing out electric storage hot water for all homes, beginning with a ban on their installation from 2010.

The Federal Government made a clear pre-election commitment to phase out wasteful electric storage hot water in favour of greenhouse-efficient solar hot water, heat pump or, where these are unviable, 5-star gas hot water systems. This commitment should be delivered as soon as possible.

ii. Phasing out energy-inefficient lighting including halogen downlights

While the Federal Government is implementing a national phase-out of traditional incandescent lighting, halogen downlights are so far exempt from the ban. The Federal Government could phase out energy inefficient lighting including halogen downlights and could support existing homes to remove halogen downlights by offering a rebate to cover the cost of their removal.

iii. Setting minimum standards for major water-using appliances such as washing machines by 2010

Unlike those in place for energy-using appliances, there are currently no regulations requiring a minimum standard of performance for water-using appliances such as washing machines. The Water Efficiency Labelling and Standards (WELS) Scheme, with funding provided by the National Water Commission over four years, is examining the potential for implementing minimum water efficiency standards (WES) for existing products regulated by the WELS scheme (taps, showers, urinals, washing machines and dishwashers) and to examine raising the existing minimum WES for toilets (currently set at 1 star).

We urge the Federal Government to set in place regulations and minimum standards for water-using appliances, similar to the Mandatory Energy Performance Standards by 2010.

B] Deliver programs and policies to retrofit all existing homes in Australia over the next decade

The Federal Government has made a welcome start to the process of renewing our housing stock with significant investment in insulation and solar water heating. The next step is to scale up to more comprehensive retrofit programs that deliver a broad range of energy and water efficiency upgrades, and engage communities in behaviour change programs to lock in energy and water savings.

Developing a national program similar to the Victorian 1 million homes proposal which targets low-income homes for energy and water efficiency retrofits would protect low-income households from rising energy and water prices and 'climate proof' half of the housing stock.

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Working through COAG to deliver mandatory disclosure of energy and water efficiency for homes at the point of sale or lease, followed my minimum standards, would renew much of the remaining housing stock given the frequent turnover of our homes.Expanding the green loans program and aligning it with existing and new rebate programs would increase the ease and motivation of higher income households to make their homes more sustainable. Scaling up investment in training for home assessors and skills development for trades-people will be necessary to meet the demand for work and ensure high quality delivery.

C] Harmonise policy at all levels of government towards a nationally consistent Gross Feed-In Tariff for small scale renewable energy including solar photovoltaic systems and small wind turbines

To support householders in their efforts to achieve 'zero emissions' homes, greater policy support will be required to make investment in renewable energy a feasible and attractive option. The Federal Government has made an election commitment to support a nationally consistent feed-in tariff. Following the lead of over 40 countries, the Federal government could take a leadership role nationally and introduce a national gross feed-in tariff to drive the uptake of small scale renewable energy. Gross feed-in tariffs are recognised internationally as being one of the most effective mechanisms for encouraging renewable energy generation.

D] Make GreenPower count by ensuring that all GreenPower sales reduce Australia's emissions and contribute to stronger emission reduction targets

Under the Carbon Pollution Reduction Scheme (CPRS) GreenPower purchases do not necessarily translate into greenhouse gas emission reductions under the national emissions target. Existing GreenPower customers (of which there are nearly 1 million) will make no additional cuts to Australia's national target which will jeopardise the future of the program and undermine the efforts of households and businesses to reduce emissions. The CPRS legislation should be amended to ensure that all GreenPower purchases are additional to emissions reductions delivered by the CPRS. Other voluntary efforts to reduce emissions also need better treatment under the CPRS if we want to involve Australian households, businesses and local and state governments in national efforts to reduce Australia's greenhouse gas emissions.

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