Energy & Equity

Preparing households for climate change: efficiency, equity, immediacy

AUSTRALIAN CONSERVATION FOUNDATION

acoss

choice

About this report

The Australian Conservation Foundation (ACF), CHOICE and the Australian Council of Social Service (ACOSS) have come together to investigate responses to climate change that deliver real and immediate outcomes for Australian households and the environment in an efficient and equitable manner.

This report first identifies trends, issues and principles about energy costs and consumption. It next identifies the substantial benefits available from energy efficiency and other effective responses to climate change. The following part identifies market failures and possible policy responses. Finally, we make recommendations for government action.

ACOSS is the peak council of the community welfare sector in Australia and the national voice for the needs of people affected by poverty and inequality. www.acoss.org.au

CHOICE is Australia's largest consumer organisation. It is not for profit, providing independent advice to consumers and advocating on their behalf. www.choice.com.au

ACF is a national voice for the environment. It works with the community, business and government to protect, restore and sustain our environment. www.acfonline.com.au

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Contents

"Impacts of climate change will be particularly harsh on low income households and disadvantaged communities"

Executive summary

Climate change is one of the most pressing issues facing Australian society. Choice, ACOSS and ACF have joined forces to find fair responses to this challenge that benefit all Australian households, including those on low incomes. Many of these measures are already available and demonstrably effective.

Improvements to energy and water efficiency, for example, can significantly reduce consumption of energy and water, cut greenhouse gas emissions and reduce utility bills.

The advent of an emissions trading scheme, scheduled to commence in 2010, will affect other policies and programs. Gains in energy efficiency made before then will moderate the impact of a carbon price. Any investment in energy and water efficiency will pay dividends both in the short and long term. Our responses can and should begin immediately. These policy responses must ensure that all households are involved if we are to reduce the risk of further harm to our environment and mitigate the effects of climate change.

If governments introduce well-supported policies to improve energy efficiency in conjunction with a carbon price, appropriate tariffs and a safety net, no consumer should be worse off and greenhouse emissions should fall.

Climate change and its impact

Compelling scientific evidence suggests that the impact of climate change on Australian society will be widespread.[1] Across all parts of Australia, we can expect temperatures to increase, rainfall patterns to change, sea levels to rise and extreme weather events such as cyclones and bushfires to become more frequent and intense.

Key vulnerable systems and regions will be affected by climate change in categories as broad as agriculture, energy, water supply, settlements and emergency services, ecosystems and biodiversity, and regional areas. These changes will impact on the cost of energy and water and flow through to most goods and services. They will affect the way we live and work and impinge on our health and wellbeing. It is likely that the effects of climate change will be disproportionately felt by already vulnerable communities, including people on low incomes and communities directly dependent on their local environment for survival.

Reducing our consumption of resources is essential to lessening the impact of climate change, and many measures are already available to assist us in achieving this, without compromising our quality of life.

Low income and disadvantaged households

The impacts of climate change will be particularly harsh on low income[2] households and disadvantaged communities. Many of these households will be adversely affected for the following reasons:

- ***Low income earners tend to live in areas more likely to be adversely affected by climate change***, and have far less ability to move or make other necessary adjustments to their living circumstances.

- ***On average, low income earners spend a greater proportion of total weekly household budget on energy and water*** than wealthier households. In real dollar terms, low income households spend half as much on electricity and gas as the wealthiest households. But as a proportion of household spending, lower income households spend almost twice as much as wealthier households. Similarly, the cost of water and sewage is, relatively, a third higher for low income households than it is for households on an average income.[3] Given that energy and water are essential services, when the prices of these services increase, householders are left with little option but to pay the extra. All price increases have a far greater impact on total household spending in low income households. Research here and overseas reveals that demand for essential goods and services including electricity and water is price inelastic (i.e., when the quantity demanded does not change much with the price change). At the lower end of the income range, price is a blunt, regressive and unreliable tool for demand control.

• ***Lower income households are currently less able to introduce measures to improve energy efficiency.*** Few households with low incomes are able to afford significant energy efficiency measures such as insulation, new hot water systems or rainwater tanks. One in four Australian households are in private rental or public housing and do not have rights or incentives to make capital improvements. Energy consumption in low income households is partly shaped by the market in second-hand appliances. Many second-hand appliances are inefficient, waste energy and increase bills. Factors affecting efficiency include design, technology, age and maintenance. Appliance efficiency details (energy ratings) are usually removed at first purchase, making it difficult for subsequent buyers to choose wisely.

"Energy efficiency is the quickest and cheapest way to cut greenhouse pollution"

Policy responses and recommendations

There are many possible policy responses to climate change that might be considered and supported by government. We are concerned here only with two approaches.

(A) Improving energy efficiency

Energy efficiency is the quickest and cheapest way to cut greenhouse pollution – particularly over the next 10 years. This makes major energy efficiency measures an essential part of any serious plan to tackle climate change and reduce greenhouse pollution by at least 30 per cent by 2020.

Better services, lower bills

A range of smart technologies exist that use a lot less energy to deliver the same (or better) service to consumers. Becoming energy smart will save on household and business energy bills and help protect Australians against the impact of energy price increases as we clean up our energy supply.

Cost-effective and available now

A comprehensive Government review found we could immediately reduce our energy use by up to 30 per cent using off-the-shelf cost-effective technologies, with immediate economic benefits and an average 'payback' of four years.

If we implemented only half of the opportunities identified to cut energy waste, our economy would be stronger, new jobs would be created and we'd use less energy. In addition, we'd cut pollution, while earning a significant return on our investment.

(B) Placing a price on carbon through an emissions trading scheme

While there is a commitment for an emissions trading scheme to commence operation from 2010, the details of scheme design and emissions targets are still being decided. The scheme must deliver emissions reductions that will ensure Australia plays it's part in averting dangerous climate change and its impacts.

In designing an emissions trading scheme, it is critical that consideration is given to ensuring the costs of such a scheme are not borne disproportionately by low income households. All consumers, including low income households, should be provided with appropriate education and incentives for being more energy efficient.

These policy responses, while independent concerns, should be considered as a complementary approach likely to achieve the best policy outcomes. They have potential to bring benefits to all domestic consumers of energy and water. However, they should be implemented in ways that acknowledge the circumstances of low income households, while accounting for and actively counteracting the risk of adverse outcomes.

"A well designed emissions trading scheme should have environmental integrity, provide business certainty and guarantee social equity"

Recommended government policy responses

A

Improve energy efficiency for households by addressing awareness and behaviour, home modifications, standards for buildings and appliances, and upgrades for equipment and appliances.

A massive new national program could leverage significant private sector investment to retrofit all Australian homes within a generation. Such a program should aim to retrofit five per cent of existing homes a year and should include:

1. Effective and regularly evaluated education campaigns on the most effective means to achieving, and subsequent benefits of, energy and water efficiency.
2. Home audits of energy and water use that result in recommendations for behaviour change and physical improvements and referral to sources of assistance.
3. Financial and other assistance for low income households to implement measures that improve water and energy efficiency.
4. Improved labelling on products and appliances so that initial and second hand purchasers can make informed decisions about energy efficiency at the point of purchase.
5. Financial and taxation incentives to encourage landlords to retrofit properties to improve energy and water efficiency.
6. Improving energy and water efficiency in public housing.
7. Mandatory energy efficiency standards in all new buildings.

B

Implement an equitable and efficient emissions trading scheme that drives emission reduction. A well designed emissions trading scheme should have environmental integrity, provide business certainty and guarantee social equity.

An emissions trading scheme should be designed and have regard to complementary measures that:

1. Improve energy efficiency for households that account for awareness and behaviour, home modifications, standards for buildings and appliances, and upgrades for equipment and appliances.
2. Develop tariff structures that appropriately recognise the essential nature of energy and water while pricing to encourage efficient consumption.
3. Establish safety net provisions to ensure that low income households have the opportunity to improve efficiency but are not burdened with price increases for essential services. One way to do this would be through the recycling of revenue from permit auctioning from a well designed emissions trading scheme. The revenue could be used to provide assistance and incentives to adjust, compensate those low income households who are adversely affected, encourage research and economic development, and so on.

Introduction

Compelling scientific evidence suggests the impacts of climate change on Australian society will be widespread.[4] In all parts of Australia, we can expect temperatures to increase, rainfall patterns to change, sea levels to rise and extreme weather events to become more frequent and intense. This will inevitably change the way we live and work, affecting our health and diminishing our opportunities as individuals and as a society, unless we act to avoid dangerous climate change.

A 2005 report for the Australian Greenhouse Office[5] identified vulnerable systems and regions that will be affected by climate change in categories as broad as agriculture, energy, water supply, settlements and emergency services, ecosystems and biodiversity, and regional areas. It is likely that the effects of climate change will be disproportionately felt by already vulnerable communities, including people on low incomes[6] and communities directly dependent on their local environment for survival.

The projected water restrictions, agricultural instability and crop failure associated with climate change are likely to cause increases in the price of food and water. Low income earners have less financial capacity to absorb such increases and their access will decline accordingly. Sole parents, unemployed people, young people, large families, private tenants, people living alone and people with disabilities or chronic health problems are especially at risk. Decreased access to food and water can be expected to cause stress and health problems for these individuals and families.

Homes and settlements will also be affected by climate change. It is likely that low income households will experience a disproportionate burden of climate change due to current disadvantage, regional location, inadequate climate proofing of housing (in particular those living in poorly maintained public housing, low income rental properties, as well as Indigenous people living in rural communities), and little adaptive capacity. Settlements will be most at risk from decline due to loss of agricultural production, farm failure and extreme weather events. Communities most at risk are: those dependent on particular industries that are vulnerable to climate change impacts (in particular agricultural and tourism); those living in coastal zones; and Indigenous and other communities, due to poor housing and infrastructure conditions.

Climate change is also expected to increase health risks for low income families. Impacts include increased spread of disease, more heat-related deaths, more death and injury due to extreme weather events, and trauma associated with displacement due to sea level rise.

Many low income households already struggle to keep up with energy and water bills. They are also more likely to live in poorly-insulated and inefficient rental accommodation, and spend a higher proportion of their income on energy, water and fuel than other Australians. They are least able to respond to increases in prices and to invest in more efficient homes. Given that energy and water are essential services, when the prices of these services increase, householders are currently left with little option but to pay the extra.

Without adequate consideration, some policy responses to climate change could adversely affect these households. A combination of global commodity price fluctuations, spiralling demand for energy, a price on carbon and the need to re-tool our power generation industry for a cleaner future could increase energy prices. More expensive sources of water could also increase water prices. There will also be additional 'indirect' costs due to the energy and water 'embodied' in goods and services.

The severity of the impact of climate change will depend on the extent of climate change we experience and the ability of our community to respond, mitigate and adapt. As governments consider their response to climate change, including implementation of emissions trading and other emission reduction strategies, serious thought must be given to generating revenue for programs to assist key groups of end consumers to adjust. The detail of policies and allocation of resources will significantly influence equity and economic impacts across the economy.

"Without adequate consideration, some policy responses to climate change could adversly affect low income households"

Issues and trends in consumption and cost

Energy and water cost relatively more for low income households

Energy and water comprise a relatively small component of living costs for most Australian households. The Australian Bureau of Statistics (ABS) survey of 2004 household spending[7] shows that for an average household, water and sewage services account for less than 1 per cent of spending, energy supply 2.6 per cent, transport fuel 3.7 per cent and, for all these services combined, around 7 per cent.

However, lower income households are disadvantaged because they pay a higher proportion of their income on energy and water than wealthier households. Table 1 shows ABS data across five income groups. In 2003–04 the poorest households (i.e. the lowest quintile) spent a slightly higher percentage of their weekly budget on these services (8.4 per cent) than the average household (7 per cent). Recent increases in energy, water and fuel prices may have increased this proportion even further.

While low income households generally consume less energy and water than wealthier households, these services account for a greater percentage of their total weekly spending. In real dollar terms, low income households spend half as much on electricity and gas as the

Table 1 Energy, fuel and water service costs for Australian households[8]

		Lowest 20 per cent	Second 20 per cent	Third 20 per cent	Fourth 20 per cent	Fifth 20 per cent	Average
Mean gross household income $/wk 2003-04		263	555	930	1,385	2,512	1,128
Total expenditure on goods, services $/wk							
1998-99		342.85	482.58	648.04	851.03	1171.4	698.97
2003-04		413.32	603.64	859.38	1090.32	1499.18	892.83
Water, sewage							
1998-99	$/week	3.89	4.55	5.71	6.92	8.5	5.91
	% expenditure	1.13	0.94	0.88	0.81	0.73	0.85
2003-04	$/week	3.71	4.48	5.77	6.84	9.12	5.98
	% expenditure	0.90	0.74	0.67	0.63	0.61	0.67
Energy supply – electricity and gas[9]							
1998-99	$/week	12.85	15.87	17.72	19.85	23.08	17.87
	% expenditure	3.75	3.29	2.73	2.33	1.97	2.56
2003-04	$/week	16.4	20	23.27	25.46	31.68	23.59
	% expenditure	3.97	3.31	2.71	2.34	2.11	2.64
Transport fuel							
1998-99	$/week	11.92	19.38	26.91	33.75	40.27	26.43
	% expenditure	3.48	4.02	4.15	3.97	3.44	3.78
2003-04	$/week	14.76	24.05	34.89	41.59	48.94	32.83
	% expenditure	3.57	3.98	4.06	3.81	3.26	3.68
Total energy, water and transport							
1998-99	$/week	28.66	39.8	50.34	60.52	71.85	50.21
	% expenditure	8.36	8.25	7.77	7.11	6.13	7.18
2003-04	$/week	34.87	48.53	63.93	73.89	89.74	62.4
	% expenditure	8.44	8.04	7.44	6.78	5.99	6.99

wealthiest households, but as a share of total household spending, they spend almost twice as much. For tenants, additional energy and water costs may be hidden in rents. The cost of water and sewage as a percentage of total weekly spending is a third higher for low income households than it is for houses on an average income. Again, in real dollar terms, transport and fuel costs for a low income household are about half that of an average household. However, as a percentage of total weekly spending, the share spent on fuel is about the same in both.

Given that energy and water are essential services with low elasticity of demand, if prices go up low income households will either under consume (ie tolerate a loss of quality of life by cutting back below a reasonable standard) or lose access to supply. For these households, "utility stress", i.e. the inability to pay a utility bill on time because of shortage of money, is also a considerable issue. Disadvantaged households are most likely to report being unable to pay utility bills for this reason, resulting in utility disconnection. In NSW alone 20–25,000 households are disconnected annually.[10] Higher energy bills in the future would increase the incidence of utility stress, requiring a different set of policy solutions.[11]

There is significant variation in energy and water use across households within socio-economic groups. For example, data from Yarra Valley Water in Victoria shows that the top 5 per cent of water consumers use almost three times as much as the median household.[12] Figure 1 shows the distribution of household electricity use in Victoria, showing that the top 10 per cent of consumers use more than double the median amount. So even if the average impact of a policy measure is small, it could disproportionately affect small groups with high use or other characteristics (e.g. small households or those in rural areas, large families, people with special needs such as dialysis patients).

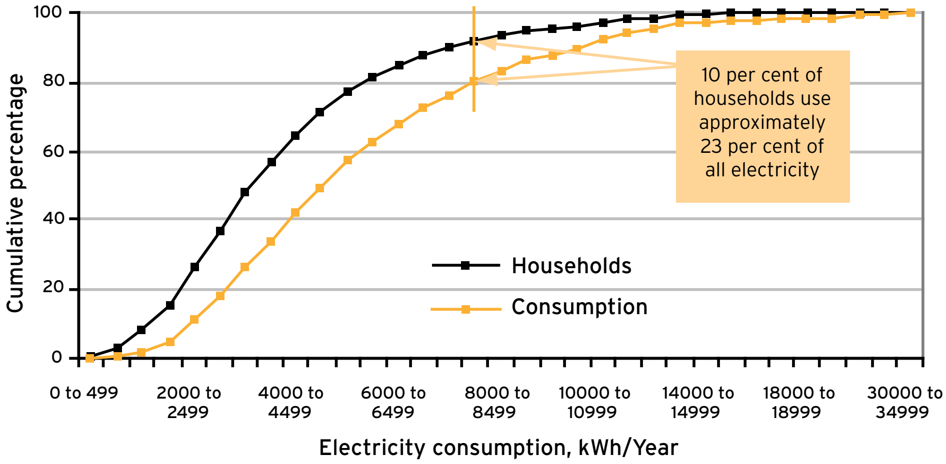


Figure 1 Victorian general tariff electricity consumption by number of households[14]

In Victoria in 2001, 30 per cent of the top 10 per cent of household electricity and gas users were holders of concession cards, indicating that they were likely to have low incomes.[13] Almost half of those with high bills were households of four or more people.

Transport fuel use heavily depends on a household's capacity to afford, or need to own, one or more cars, as do the other costs associated with car ownership which outweigh transport fuel costs. Outer suburban and fringe areas where public transport is poor are most vulnerable to the impacts of rising fuel costs.[15] Similarly, energy and water consumption are linked to ownership and use of appliances and equipment.

Low income households should not bear the brunt of price rises

The introduction of emissions trading will increase prices of energy and water to consumers. Indeed one intended purpose of an emissions price is to reduce consumption by making the price of these products reflect their true cost to society. However, price increases on their own are an ineffective instrument for reducing consumption of essential services that are relatively price inelastic. Comprehensive government energy efficiency policies and programs will be needed in addition to emissions trading.

When a price is applied to greenhouse gas emissions, the cost of all goods and services will increase where their production and delivery involves the generation of greenhouse gases. This is likely to affect low income households more severely as they typically spend a higher proportion of their income on essentials such as food (which is disproportionately affected) and typically use energy less efficiently because they live in poorer quality accommodation and have older appliances.

There is an argument made such that action to ameliorate the impact of price increases undermines the policy aim of the increase (reducing consumption) because the incentive evaporates. This document reports that price increases, at moderate levels, are an ineffective instrument for demand management, especially at lower levels of consumption and in households with limited capacity to reduce or shift load. However, low income households generally are incentivised to lower their energy bills as much as any household, given the capacity to do so.

An indication of the possible impact of carbon pricing was revealed in recent research prepared by the National Institute of Economic and Industry Analysis (NIEIR) for the Brotherhood of St Laurence.[16] This research had a focus on Victoria and found that without any energy efficiency programs around 600,000 low income households would experience an imposed cost of approximately $400 million per annum for a $25/tonne carbon price and $800 million for a $50/tonne carbon price: an increase ranging from $12 to $25 per household/per week. A summary of the results is included in Table 2 below.

Table 2 Impact of carbon prices on household types without any energy efficiency programs.

Household type	Utility adjusted carbon costs additional annual expenditure ($2006 dollars)		Utility adjusted carbon costs – % of annual expenditure ($2006 dollars)	
Carbon price – per tonne	$25	$50	$25	$50
Household with children where government benefits exceed 30% of income	417.3	834.5	1.0	2.0
Retired Age Pension households	331.2	662.5	1.2	2.4
Unemployed households	596.3	1192.5	1.6	3.2
Poor households	596.4	1192.8	2.3	4.6
Double income no children	1332.9	2665.7	0.3	0.6
High income tertiary educated	1225.0	2450.0	0.4	0.8

This study also estimated that just over half of the greenhouse gas emissions associated with Victorian household economic consumption are indirect, or embodied in the goods and services consumed. According to NIEIR, for each kilogram of sheet metal products consumed, 1.5 kg of CO_2 is generated, while for textile products, the impact is only 0.7 kg CO_2. The extra cost of the kilogram of sheet metal product at $30/tonne of CO_2 would therefore be 4.5 cents. The NIEIR analysis suggests that low income households tend to buy goods and services of higher than average greenhouse intensity. So in the absence of compensatory arrangements or complementary efficiency measures, the impact of an emissions trading scheme is regressive, as it impacts more heavily on low income households.

In order to ensure a carbon price is not regressive, governments will need to introduce complementary energy efficiency measures and safety net arrangements.

Without complementary measures, emissions pricing would be regressive and affect low income households more severely for three separate reasons:

- Low income households typically spend all of their income, or more than their income (e.g. if drawing down savings or going into debt), whereas high income households are typically net savers.
- Low income households typically spend a higher proportion of their budgets on essentials such as fuel, power and food, which are disproportionately affected by emissions pricing.
- They typically use energy more inefficiently because they live in poorly insulated homes, have older appliances, purchase second hand cars, etc.

The NEIR analysis only considers energy related emissions. The previous Government's emissions trading task force and the Garnaut Review have both recommended including transport and industrial emissions in the emissions trading scheme. This would result in a carbon price being included in more household goods and services. This increases the environmental effectiveness of emissions trading, but also increases the need for broader energy efficiency programs for industry and transport.

An ABS (2001) study of 1997–98 data[17] confirms the above findings. It found that Australian homes were responsible for 56 per cent of Australian energy-related greenhouse gas emissions, with just over half of these emissions (30 per cent) resulting from direct household energy use and transport, and 26 per cent from the indirect effects discussed earlier. Since Victoria has more greenhouse intensive electricity and less energy intensive industry than the Australian average, the NIEIR and ABS results seem consistent.

Clearly, the extent to which Australian businesses and importers reduce the greenhouse intensity of production of goods and services will reduce the cost impacts of embodied emissions. A reduction in the amount of material, a shift to less greenhouse intensive materials (including recycled materials), and improved process energy efficiency are examples of actions that could achieve this outcome. Indeed, government policies that assist businesses to reduce their greenhouse gas emissions would have flow-on benefits for households – although these would vary from product to product. Appropriate targeting of policies towards reducing the greenhouse intensity of staple products and services could provide more targeted benefit to low income households.

Informed choice by consumers may reduce greenhouse intensity, by shifting consumption to suitable lower greenhouse impact alternatives, and by applying pressure to manufacturers to reduce their greenhouse intensity. However, the price effects for most individual items are quite small, so they may not be obvious. There may be a case for introducing 'embodied greenhouse impact' labelling or other information programs, so that consumers can make informed choices – particularly where there is a significant difference in the embodied emissions in competing products. Partnerships between government and major retailers of food, materials and goods could potentially apply pressure to suppliers of high 'embodied emission' products to improve their performance.

Given the variability of the efficiency of individual production facilities, the greenhouse intensity of different energy sources and other greenhouse impacts, product specific data will be needed to avoid serious distortions in labelling that could unfairly influence consumer behaviour. For example, recycled steel has much lower embodied greenhouse gas emissions than new steel, and meat produced in different parts of Australia may also have significantly different greenhouse impacts. To implement such a scheme would probably require regulation to enforce disclosure.

It follows that household energy and water efficiency measures alone, while important, cannot fully compensate many low income households for the upfront costs they might need to pay. Measures that drive energy efficiency and emission reduction in agriculture, industry and the services sector will also be needed if indirect energy cost increases from carbon pricing for householders are to be contained. These issues are beyond the scope of this paper, although other studies such as the National Framework on Energy Efficiency[18] and the *Clean Energy Future* study[19] show that there is large potential for cost-effective change in all sectors. Pricing carbon is a critical element of any climate change policy. However it is essential that it is accompanied by complementary programs to assist low income households and protect them against hardship as a result of accompanying price increases.

"Without complementary measures, emissions pricing would be regressive"

Revenue raised through the sale of emissions permits should fund assistance

There is widespread and growing support among governments and business for the introduction of an emissions trading scheme as a mechanism to drive reductions in greenhouse gas emissions.

Proposals from the task force of the former Federal Government and from the Garnaut Review suggest an emissions trading scheme that covers electricity, gas, transport and industrial emissions. Both have suggested that agriculture may also be included in the future. The price on emissions would flow through almost all goods and services, to the extent that they create greenhouse gas emissions as a result of their production and sale.

The more greenhouse intensive a source of energy, the larger the increase in price it will experience in absolute terms. Table 3 shows the impact of a range of emission prices on electricity, natural gas and petrol under present conditions. The impact reflects variations in the greenhouse intensities of energy sources around Australia, variations in energy prices, and the differing levels of energy use in each state.

Table 3 Impact of various emission prices on electricity, gas and transport fuel costs[20]

	Greenhouse intensity kgCO2/unit (2006)[a]	Typical price/unit[b]	Impact of CO2 price on household cost – cost increase per unit and (per cent increase) (Electricity c/KWh, Gas $/GJ, Transport $/L)			Typical household annual impact at $30/t
Electricity		c/kWh	@ $10/t CO_2e	@ $30/t CO_2e	@ $50/t CO_2e	($/year)[c]
NSW/ACT	1.07	12.5	1.07 (9%)	3.20 (26%)	5.34 (43%)	240
Vic	1.33	14.5	1.33 (9%)	3.98 (27%)	6.63 (46%)	220
Qld	1.05	13	1.05 (8%)	3.14 (24%)	5.23 (40%)	230
SA	1.04	18	1.04 (6%)	3.13 (17%)	5.21 (29%)	190
WA	0.94	14.8	0.94 (6%)	2.81 (19%)	4.68 (32%)	n/a
Tas	0.06[d]	13.5	0.06 (0.4%)	0.18 (1%)	0.3 (2%)	18
NT	0.72	16	0.72 (5%)	2.15 (13%)	3.58 (22%)	173
Green Power	0	~20	0	0	0	0
Natural gas		$/GJ	$10/t CO2e	$30/t	$50/t	($/year)[ce]
NSW/ACT	68.0	18	0.68 (4%)	2.04 (11%)	3.40 (19%)	15
Vic	63.4	10.5	0.63 (6%)	1.90 (18%)	3.17 (30%)	84
Qld	64.2	25	0.64 (3%)	1.93 (8%)	3.21 (13%)	2
SA	71.2	20	0.71 (4%)	2.14 (11%)	3.56 (18%)	30
WA	60.0	21	0.60 (3%)	1.80 (9%)	3.00 (14%)	21
Transport	CO_2e/L	$/L	$10/t CO2e	$30/t	$50/t	$/year[f]
Petrol	2.64	1.25	0.03 (2%)	0.08 (6%)	0.13 (11%)	190
LPG	1.82	0.50	0.02 (4%)	0.05 (11%)	0.09 (18%)	170
Diesel	3.0	1.30	0.03 (2%)	0.09 (7%)	0.15 (12%)	173

a AGO Workbook (2006)
b Based on data from Office of Tasmanian Energy Regulator (2006)
c ESAA (2006)
d Tasmania's marginal greenhouse coefficient is close to the mainland value, as it is now a net importer of mainland electricity via BassLink
e Cost adjusted by proportion of households that use gas, so that the total impact on energy cost of an average household in a given state is the sum of the impacts on electricity and gas usage: eg in Victoria, the impact of a $30/tonne CO2e price on an average household is $221+$84 = $305
f Assumes 12L/100km for petrol, 30 per cent more for LPG and 20 per cent less for diesel for 20,000 km

Clearly, less greenhouse intensive energy sources will experience a lower price impact at any given carbon price. Buying Green Power, for example, although currently more expensive than conventional power, would reduce carbon prices associated with electricity use, so its price would be unaffected except for the manufacture installation and maintenance of the energy supply system. This demonstrates how less greenhouse intensive options will become more competitive under emissions trading.

At a CO_2 price of $30 per tonne applied to greenhouse gas emissions, and in the absence of complementary government policies, a typical Victorian household might experience an increase in total annual energy and transport fuel costs of $495 if they did nothing to adapt.[21] This scenario highlights the need for government to help low income households with effective energy efficiency programs. An average Tasmanian household would likely experience an increase of around $210, reflecting the low greenhouse intensity of Tasmania's predominantly renewable electricity. High use households could face cost increases of more than double these values, while low use consumers would face smaller increases.

Emission permits should be auctioned rather than given away to existing polluters, partly for reasons of economic efficiency, but also because it creates revenue to help fund necessary, complementary measures such as energy efficiency and a safety net for low income households. These programs will need funding regardless of the method used for permit allocation. Indeed, the timing and funding of complementary measures should not be conditional on emissions trading revenue.

In theory, each emitter could be refunded all the money it paid, giving a net zero impact on each one and on its customers, including households. This is unlikely as it would remove the incentive to reduce emissions, but it highlights the fact that an emissions trading scheme is not necessarily a cost to society. It might increase costs for emitters, but the potential revenue would flow to other activities within the economy – an emissions trading scheme is a re-allocation of costs towards carbon intensive activities. The revenue could be used to compensate those who are adversely affected, provide assistance and incentives to adjust, encourage industry development, and so on. So there is no fundamental reason why an emissions trading scheme should adversely affect households, including those with low incomes: it all depends on how the scheme is designed and implemented.

Many industry advocates are calling for a large proportion of permits to be given away free of charge for many years in advance. Not only would this severely limit the ability of governments to finance measures to address equity issues and encourage emission reducing action, but if it over-allocates permits under pressure from industry (as occurred in the European Union), then buying back the over-allocation will require significant – and potentially prohibitive – tax payer funds. This problem has already been seen with water use permits in rural areas, where governments may need to spend billions of dollars of public money buying over-allocated water rights.

"The timing and funding of complementary measures should not be conditional on emissions trading revenue"

Substantial price increases are expected under 'business as usual'

While this research focuses on the potential implications of responding to climate change, it is important to consider the implications of not responding. Under 'business as usual', households can expect significant price and cost increases in water and energy over the coming years, irrespective of measures to reduce greenhouse gases. So the circumstances of households, and especially those with low incomes, are likely to deteriorate over time under present energy and water policy settings. This is a result of a number of factors:

- New sources of water are generally more expensive than existing supplies – partly because much of the capital invested in existing capacity has been recovered over time. But desalination, new dams (generally in less than ideal locations), water recycling and rainwater tanks are generally more expensive than existing water supplies, although technology development and economies of scale will bring some cost reductions.
- The cost of household fuel and power also seems likely to increase. Australia's electricity industry is spending around $5 billion each year expanding energy supply infrastructure. This cost must be recovered from customers, so it seems likely that retail residential energy prices will rise significantly. The Independent Pricing and Regulatory Tribunal's (IPART) (2007) recent announcement of 26 per cent increases for NSW household energy prices over the next three years is an indicator of this effect. Victorians who have had cheaper natural gas than other states, increasingly will be competing across state boundaries (and with the electricity industry) for fuel, while cheaper gas resources are running out.
- The Council of Australian Governments (COAG) has mandated the introduction of 'smart' electricity meters to households over the next few years, so users can be charged the 'real' price of electricity at the time they use it. This is intended to overcome the cross-subsidy from non-air conditioner owners to those with air conditioners. But since the highest priced time for use of electricity is likely to be hot weekday summer afternoons, this will impact disproportionately on people who are at home during such

periods, especially those with inefficient air conditioners cooling poorly insulated homes. Families and individuals who are not home at such times may well experience reductions in electricity prices, but the unemployed, parents of young children and the elderly are likely to experience increased bills as a result. A recent IPART report[22] has shown that low income households are now as likely as others to own air conditioners, so this will undoubtedly be an issue. Experiments being conducted in South Australia with remote management of air conditioners at times of peak demand are potentially very important, as this approach may offer a more equitable way of limiting the cost of supplying peak summer afternoon electricity demand. Upgrading the insulation, shading and draught-sealing of the homes of affected groups, and replacing inefficient air conditioners when introducing smart meters would also be potentially important equity measures.

- Transport fuel prices have risen dramatically since 2004, by around 30 per cent. This has been in response to political uncertainties, refining capacity constraints and competition from growing economies such as China. An increasing number of commentators[23] consider that world oil production could peak at some point between now and 2030. This would further increase pressure on transport fuel prices and costs of petrochemicals such as fertilisers and plastics.

"Effective policy, rather than reliance on markets, is needed to reconcile these competing considerations"

If households follow historical trends to increase demand for energy and water, both unit price and total bills will increase – with or without policies to reduce greenhouse gas emissions. Furthermore, these cost impacts will not be equally distributed. Households more likely to suffer are those with high energy demands (through poor insulation, for example), in water limited areas, with unusually high dependence on cars, and (if fixed charges are increased) smaller households.

Fixed charges look set to increase for energy but decrease for water

For both water and energy services, fixed charges are an important component of the cost of service provision. In Victoria, for example a household pays around $3.50 per week to be connected to electricity and $2.50 to be connected to gas, adding up to over $300 per year. This is more than half of the energy bill of a small or energy efficient household and a quarter of a typical household's energy bills. Fixed charges for electricity are lower than this in most other states, although they are higher in Tasmania.

These charges often reflect the cost structures of the existing dominant market players (large sunk infrastructure costs with relatively low operational costs), rather than being structured to optimise efficiencies of use, or to encourage lower emission energy supply.

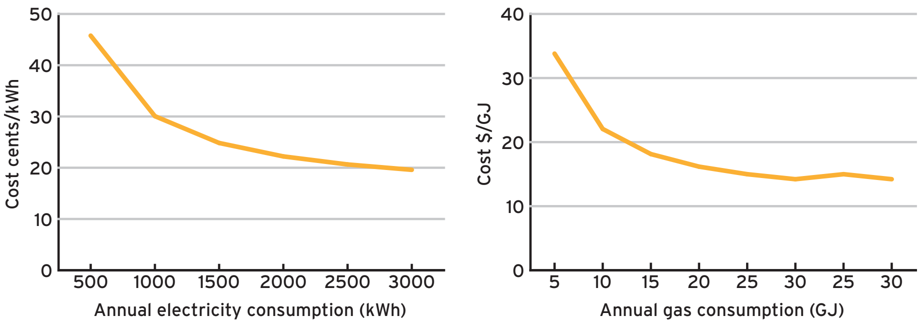
High fixed charges reduce usage prices (as more of the total cost is covered by the fixed charges) but given that there is a low elasticity of demand for both energy and water, large increases in prices will result in relatively small decreases in consumption.[24]

Without regulation, energy retailers and distributors may increase fixed charges to ensure their revenue is maintained as households become more energy efficient. This is illustrated in the recent Independent Pricing and Regulatory Tribunal (IPART) pricing report.[25] Our analysis of its estimates indicates that, over the next three years, fixed charges for household electricity may increase at a rate 54 to 96 per cent faster than usage unit prices. The approach IPART used may not be applied by energy retailers, who are now free to structure their tariffs within a weighted average price cap. A major contributor to this large increase in estimated fixed charges was the inclusion by IPART of the costs of acquiring customers (costs of attracting additional customers) as a fixed cost.

Fixed supply charges have the effect of increasing the average cost per unit of energy as usage declines, as shown in Figure 2 and 3. This is exacerbated in households with relatively low levels of consumption that (through efficiency or because of smaller size), or through utility stress resulting from financial constraints.

Deregulation of residential energy pricing over the coming years could drive such a shift in price structures towards higher fixed charges and lower usage prices. It will be important to protect households from this kind of price restructuring, both for equity and to maintain incentives to save energy at the margin. In contrast to the energy sector, the current focus in the water industry is on shifting costs from fixed charges to usage based charges to provide more effective incentives to use less water. However, higher consumption charges have not led to lower fixed charges because of the associated revenue fluctuations. In theory, this should benefit small, low water-consuming households, but in practice lower consumption is often not rewarded to any great extent because of the need to recover network costs.

In capital intensive industries such as energy and water, there is a fundamental tension between the application of 'cost reflective' pricing, which drives higher fixed charges and lower usage prices (especially at times of low demand), and pricing structures that provide incentives for energy and water conservation, which focus on higher marginal prices, including 'inverted tariffs' that charge higher prices for higher levels of consumption. Consideration of equity in pricing adds a further complication, as low income households may be high users but be unable to control much of their energy use because of poor



Figures 2 and 3
Effective cost per unit of gas and electricity as consumption varies, with a $40/quarter fixed charge for electricity and a $20/two months charge for gas[26]

housing, inefficient appliances and lack of understanding of the link between their behaviour and energy bills. Effective policy, rather than reliance on markets, is needed to reconcile these competing considerations.

Costs of ownership are just as significant as costs of operation

A hidden aspect of energy and water costs is the expense of appliances, equipment or vehicles that convert energy or water to useful service. According to the ABS, families spend at least as much on appliances and equipment each year as they do on electricity and gas (see Figure 4). Yet encouraging consumers to optimise these investments to lower our living costs is rarely considered in energy policy.

The amount spent on electricity and gas to use appliances is less than half of total spending on appliances and equipment when purchase costs are included, and about a quarter if appliance repair and maintenance and communications bills are included.

Similar issues exist for housing, and one of the benefits of mandatory energy standards for home building is that future owners of a house are protected, to some extent, from unnecessarily high energy bills and discomfort resulting from decisions made by the initial owner.

Markets in second-hand appliance are also important in shaping the energy bills of many households. Again, mandatory energy performance standards will, over time, bring flow-on benefits for second-hand buyers.

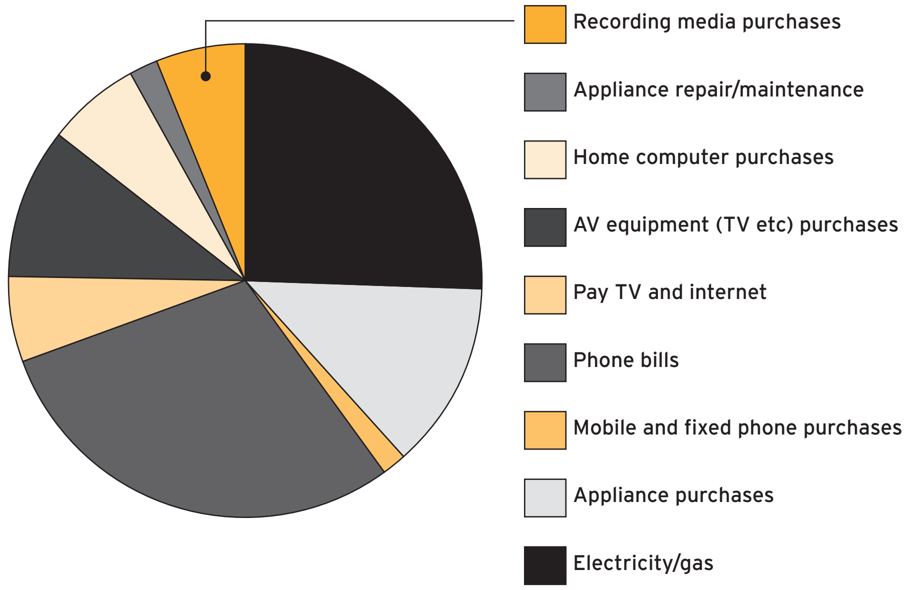
Nevertheless, there are some significant issues:

- Many second-hand appliances are inefficient, leading to higher operating costs. For example, the Moreland Energy Foundation Ltd (MEFL) Phoenix Fridge pilot project found that many of the refrigerators intended to be donated to low income households were extremely inefficient. This project is a partnership between a community organisation, MEFL, and charities. The charities collect old, unwanted refrigerators. These are tested, and the faulty ones are converted to scrap while the more efficient ones are refurbished for sale or donation to low income households.

- There is no information on the running costs of second-hand appliances to inform the buyer, as the energy label is usually removed at purchase. This could be remedied by requiring energy performance information to be permanently attached to appliances in an easily accessible location.

- With rapid improvements in energy and water efficiency, owners of older and less efficient appliances miss out on the financial benefits gained by new appliance owners. For example, buyers of new family refrigerators save up to $100 every year on energy bills, relative to owners of older models. If energy and fuel prices increase, owners of inefficient appliances and occupants of thermally poor homes are likely to suffer disadvantage relative to those households that are able to reduce their consumption through energy efficiency.

Figure 4 Average Australian household costs for purchase and use of appliances 2004 Total is $92.06 per week[27]



Substantial potential benefits from efficiency and related policies

Low income and disadvantaged consumers of energy and water are less likely to be able to afford even basic measures to improve the efficiency of their homes. Many are tenants and so, regardless of whether private or public, are restricted from making modifications that would improve efficiency. Landlords may not have much incentive to invest in capital improvements that lead to reduced consumption or, if they do, the incentive may be the prospect of increased rental income that further disadvantages vulnerable tenants. Most public housing authorities face a backlog of general repairs and maintenance; any project to retrofit their stock to higher standards of efficiency would come at significant cost and be a long term project. It should be noted though that some effective measures could be implemented quickly and relatively inexpensively.

There are existing programs and projects for low income and disadvantaged consumers that may serve as models for consumption reduction through behaviour change and efficiency improvement. The most successful of these feature a level of cooperation between two or more of: governments; energy and water retailers; and community organisations. These programs and projects range across consumption audits, education and advice, home modifications, appliance and equipment upgrades.

Energy and water efficiency can maintain and improve quality of life

Better energy and water efficiency means that a given service can be provided using less energy and less water. Improvements can be achieved through technology, improved management and behavioural change. A recent and comprehensive Government review found that consumption could be reduced by up to 30 per cent using cost effective, off-the-shelf, technologies, with immediate economic benefits and an average 'payback' time of four years.[28]

If only half of the opportunities identified to cut energy waste were implemented, the Australian economy would be $1.8 billion stronger, 9,000 new jobs would be created and we would use 9 per cent less energy. In addition, we would cut pollution by 9 per cent, while earning 26 per cent return on our investment.[29]

Energy and water efficiency improvement does not generally involve a reduction in service, although it can often change some aspects of the services provided. In many cases, the level of service is increased (for example, energy efficient houses are typically more comfortable) or slightly changed (for example, the quality of light from compact fluorescent lamps is slightly different from incandescent lamps). Whether changes in service involve 'cutting back' or 'avoiding waste' is often a matter of opinion or a question of the context. For example, some consider a well designed water efficient shower head provides a similar level of service, while others see it as a loss of service quality.

Many of the lower cost, quick response measures involve some combination of behavioural change and technology. Installing water efficient shower heads, compact fluorescent lamps, sealing out draughts and installing blinds are examples. Behaviour change measures (that may be perceived as 'cutting back') include short showers, putting on a jumper instead of turning on the heater, switching off lights that aren't needed, and so on. In reality, the threshold of 'cutting back' that is socially acceptable is the key issue. Most people would think it reasonable to wear a jumper inside in winter. But many would see going to bed during the daytime with an electric blanket and doona as extreme and, where it occurs because of lack of resources to maintain home comfort, a form of fuel poverty.

Past studies of the socio-economic aspects of energy efficiency have highlighted that access to capital and control over housing circumstances are important factors. In the past, when energy prices have increased, it has been found that the poor often cut costs by cutting back on consumption, while those with resources invest in energy efficient equipment or upgrade their appliances.[30] Effective and equitable policies are needed to manage this issue.

Developments in technology, knowledge and policies have led to a rapid increase in the potential for households to improve their energy efficiency, while maintaining or improving quality of life. Energy efficient solutions are generally improving in their non-energy performance characteristics, so that debate over quality of service can be managed. This is illustrated by the widespread community acceptance of the Government's announcement that incandescent lamps will be phased out over the next few years in favour of more efficient alternatives.

Energy efficiency technologies are many and varied

Measures such as home insulation, high efficiency appliances and lighting offer potential to significantly reduce home energy use and emissions below projected trends. These technologies are readily available and cost effective today, although as energy prices increase, their relative cost effectiveness will also improve.

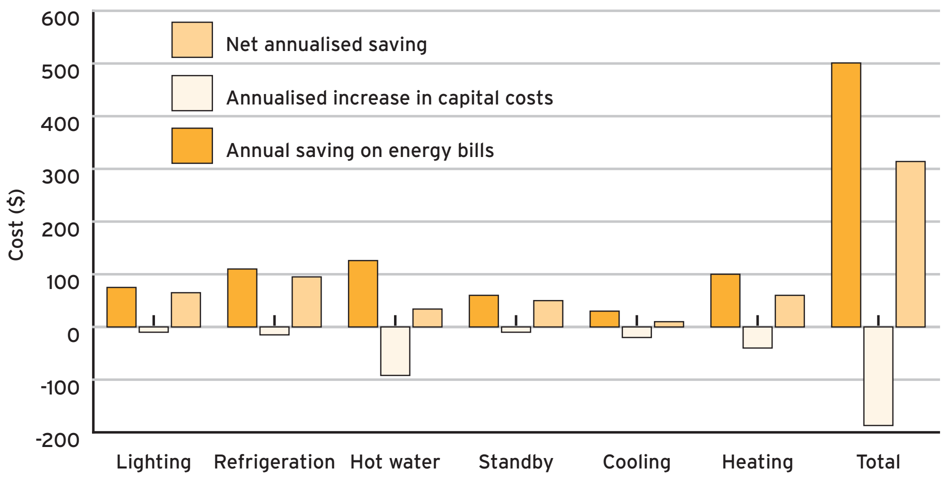
Education programs are also an important way to help consumers better understand what they can do to reduce their emissions. Most governments and energy companies are already doing this through websites, publications and regular mail outs with customer bills. However, there has been little public evaluation of the effectiveness of these programs, and the resources allocated to them have been very small in comparison with education programs relating to health, road safety and other priority issues.

Figure 5 and Table 4 set out opportunities for energy savings across a range of energy end uses, including the potential savings and annualised effects of their capital costs over their lives. These are generally conservative estimates of results and achievable savings.

Capital costs of energy efficiency measures are not insignificant, but this analysis (which is effectively based on an estimated three to four year average simple payback period for the energy efficiency measures implemented) demonstrates there are substantial net savings even after accounting for these costs.

There is also potential to develop and market presently unavailable energy efficiency options for many households. For example, in Japan, clothes dryers that use heat from high efficiency gas hot water services have been used for decades. For households in apartments, or those with young children, such an option (using heat from a gas or solar hot water system) could cut clothes drying costs by half to three-quarters, and they could simply connect to the hot and cold taps in the laundry. They would also avoid the risk of fire associated with electric units. These products need not be much more expensive than conventional clothes dryers – say $200 extra in mass production, which would be recovered in three years or so of heavy use.

Figure 5 Typical savings from energy efficiency measures (see Table 4 for explanation of the measures considered) Annualised increase in capital costs refers to additional capital cost of product over the life of the product



In addition to considering separate technologies, it is important to note that a package of measures, some of which are very cost effective and some of which are less financially beneficial but offer other benefits, should be considered when assessing the overall impact of energy efficiency on a household's financial situation. The more cost-effective measures can 'subsidise' the less cost-effective ones within a package that is attractive overall.

Innovative approaches that offer other incentives or motivations can also deliver outcomes. In the Moreland Energy Foundation Phoenix Fridge program for example, the most inefficient are disposed of and those in good condition are made available to low income households. This provides a financial benefit to the donor through a reduction in energy bills. As well, evaluation of the pilot program indicated that this strategy is likely to save those low income households that receive such fridges 350 to 700 kWh per year, worth up to $90 per year at present prices – all at no additional cost.

Table 4 Simplified, but conservative estimates of possible savings by end use used for Figure 5

Lighting	Energy efficient lighting is extremely cost effective. Switching from incandescent to compact fluorescent (CFL) lighting in an average home shifts consumption from 850 kWh per annum (p.a) to 212 kWh p.a. Typical lamp running hours per year for a home are approx 10,000 hours total (equivalent to five lights each running 2000 hours p.a). So, annual savings on electricity would be around $75 for an outlay of between $3-8 for each lamp. A typical household would buy about seven incandescent lamps each year (cheap ones cost a total of about $4 p.a). CFLs would require two replacement lamps p.a costing say $14. So the increase in capital cost each year is $10. Net annual saving is therefore $65. Measures such as switching off lamps that aren't needed could further increase savings.
Refrigeration	Using best technology, average household electricity use for refrigeration would fall from 1300 to 300 kWh p.a, saving around $110 p.a. New high efficiency appliances for the household would cost around $300 more (probably less) but last 20 years, so annualised extra capital cost is $15. Net annual saving is $95. Removal of or switching off non-essential second refrigerators would further increase savings.
Hot water systems	It has been assumed that in 2030, 60 per cent of homes will have gas and 40 per cent solar with solar saving $180 p.a and gas $90 p.a relative to 'business as usual' (as people shift from more expensive electric hot water), giving an average saving of $126 p.a31. It has also been assumed that gas hot water systems costs $200 extra (annualised cost $20) and solar costs $2000 extra (but over 20 year life this is $200 p.a) giving a weighted annualised cost of $92. Net annual saving is $34.
Hot water use	Numerous studies show that water efficient showerheads cut hot water bills by up to 20 per cent and internal water usage by a similar proportion, with a typical payback period of less than one year. Indeed, such products are offered free of charge by some energy retailers under some circumstances. Low cost measures such as cold water washing and shorter showers could add to these savings.
Heating and cooling	Where heating is an issue, or where air conditioners are already installed, replacement by a small capacity best technology split system air conditioner may also make financial sense. For example a 9.5 star Mitsubishi Heavy Industries unit with heating capacity of 3 kW uses a maximum of 500 watts of electricity while producing more heat than a 2.4 kW electric fan heater or oil filled heater unit. At an installed cost of $1600 (which could be reduced by bulk purchases) it would only need to replace the use of such a heater for around 600 hours each year to achieve a 10 year payback period. An average household is assumed to spend $3000 on efficiency improvements – annualised over a 50 year building life this is $60 p.a cost. It is assumed that savings on heating will be around $100 p.a and cooling $30 p.a, giving a total saving of $130 p.a and a net annualised saving of $70. Low cost measures such as draught proofing, more careful management of indoor temperatures etc could add to the savings.
Standby	Reducing standby power usage by 70 per cent would save around $60 p.a and cost less than $10 p.a, giving net annual saving of $50.

Efficiency improvements can dramatically reduce energy use and household bills

This section of the report evaluates the potential impact of energy efficiency measures on household energy bills. 'Business as usual' household energy use is expected to increase significantly as are greenhouse gas emissions per household (Akmal and Riwoe, 2005).[32] So even if energy prices do not rise, average household energy bills will increase under "business as usual'. See also Table 3.

A recent study by Pears (2007)[33] modelled the potential impact on household energy use and greenhouse emissions of a range of cost effective energy efficiency measures (similar to those in the previous section). The outcomes are shown in Figures 6 and 7 below.

Even though the study did not address all purposes of consumption, it found that total Australian household energy related greenhouse gas emissions could be reduced by almost a quarter below present levels, and to a half of projected 2030 levels, despite a growth in population and in the number of households – all with net cost savings.

When a typical household's annual energy bills under 'business as usual' are compared with a high energy efficiency scenario, substantial savings are suggested (as illustrated in Figure 8). In this analysis, constant energy prices are assumed: in reality, improved efficiency (ie reduced demand) may decrease energy prices by avoiding some of the need to expand energy supply infrastructure, while growth in demand will drive up prices (as discussed earlier), further widening the gap.

Figure 6 Household greenhouse gas emissions by energy source – high energy efficiency scenario

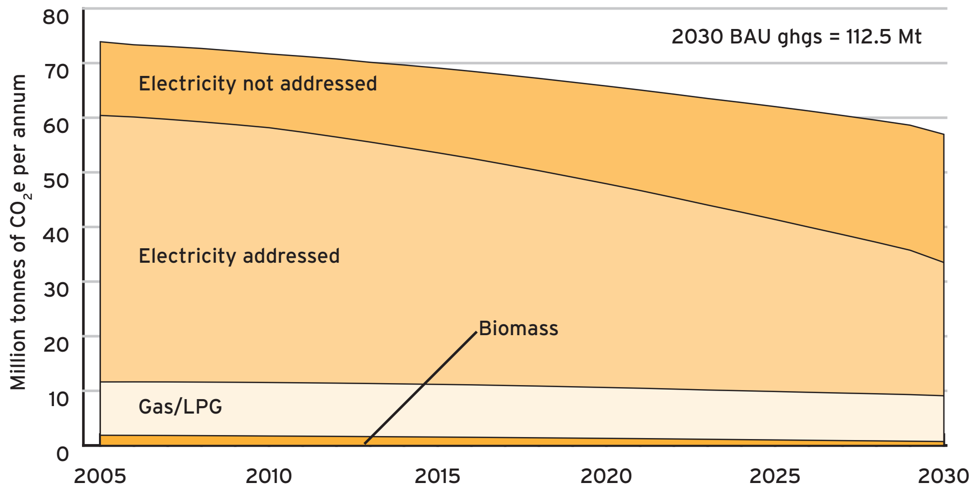
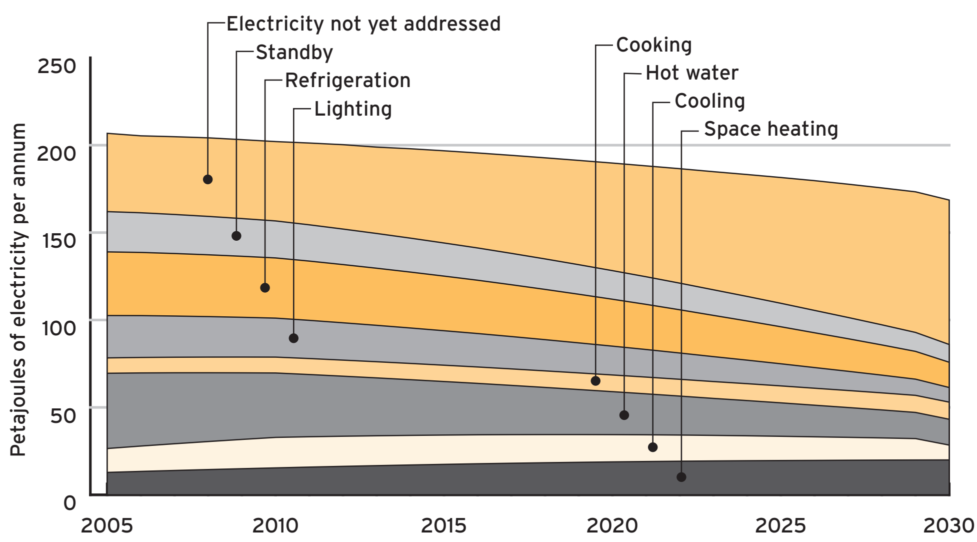


Figure 7 Household electricity use – high efficiency scenario[34]



The analysis indicates that an average household's energy bills under the high efficiency scenario would be almost half that under 'business as usual', with an annual saving of $658. Of course, there are usually up-front costs involved in capturing energy efficiency potential, as discussed in the previous section. If underlying energy prices rise for the 'business as usual' case, the dollar value of this reduction will be greater. Because the payback period is generally three to four years, there is a net positive return to the Australian economy and to the household. Policies that support householders to make this up-front investment are necessary if we are to achieve the required reductions of greenhouse emissions. We acknowledge that for low income and disadvantaged households, such up-front investments may be prohibitive and so appropriate policies and measures will be needed to ensure that these households engage with and benefit from efficiency improvement.

Beyond the direct costs and savings from energy efficiency measures, there are complex indirect effects. For example, a number of modelling projects (such as the Allen Study for the Victorian 5-star regulations[36]) have shown that energy efficiency measures exert downward pressure on market prices for energy by damping demand and hence reducing scarcity of supply. The Allen study also showed that the shift from investment in supply to demand-side efficiency measures created higher economic growth by increasing net employment and shifting activity to sectors of the economy that have higher rates of return on investment than energy supply.

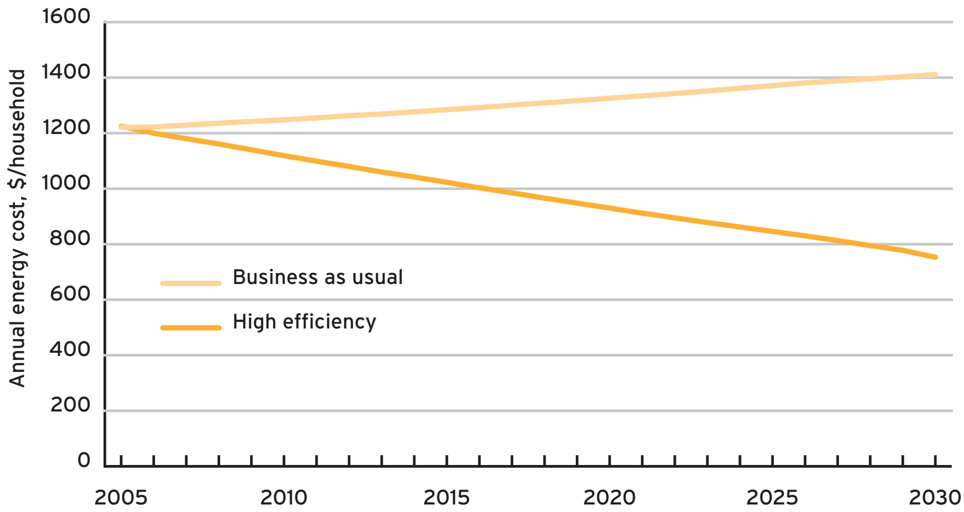


Figure 8 Household energy bills – business as usual and high energy efficiency scenarios[35]

On the other hand, many economists argue that so-called 'rebound' effects will reduce the net savings from energy efficiency. Pears (2004)[37] has pointed out that the term 'flow-on effect' is more appropriate, as the effect on net energy savings depends on complex factors, including how the financial savings are spent (for example whether savings are invested in additional energy efficiency or spent on energy intensive activities such as air travel).

Improvements in efficiency offset impacts of a carbon price

While this analysis shows what is possible, we must still recognise that comprehensive policies are needed to ensure that all households can gain access to these energy efficiency benefits.

Taking an average household bill at today's energy prices, an energy efficient household (adopting the measures from Table 4) could save $658 per annum in 2030, relative to an average home that does not do anything (i.e. a 'business as usual household'). After allowing for the capital costs of these energy efficiency measures, the net saving would still be approximately $470 per annum. This is without including any carbon price.

When carbon costs are included, the savings for an efficient home compared to an inefficient home are far greater. Because the efficient 2030 household generates much less greenhouse gas (5.3 tonnes of CO_2 pa instead of 10.3 tonnes), the cost impact of a given carbon price will be much smaller than for a 'business as usual' household. So, while a carbon price will increase energy costs for both households, the efficient one will experience a smaller increase. Further, since the efficient house has much lower base energy bills, the extra cost of carbon will still leave this household significantly better off than the 'business as usual' household would have been without a carbon price – and much better off than the 'business as usual' house that is also paying for its carbon emissions. This is illustrated in Figure 9.

In 2030, the average 'business as usual' household would be paying $1411 for actual energy costs and $309 per annum for their emissions (10.3 tonnes at $30/t). The energy efficient household would be paying only $753 per annum for energy costs, but an additional $190 annualised cost for the energy efficiency measures, and only $160 per annum a for emissions based on its 5.3 tonnes of emissions. Therefore, for a retrofitted average household, the relative annual savings on carbon costs are $149 in 2030 (that is $309 less $160). The gap would be even wider at a higher carbon price.[38]

Figure 9 Savings for an efficient 'average' household per annum in 2030

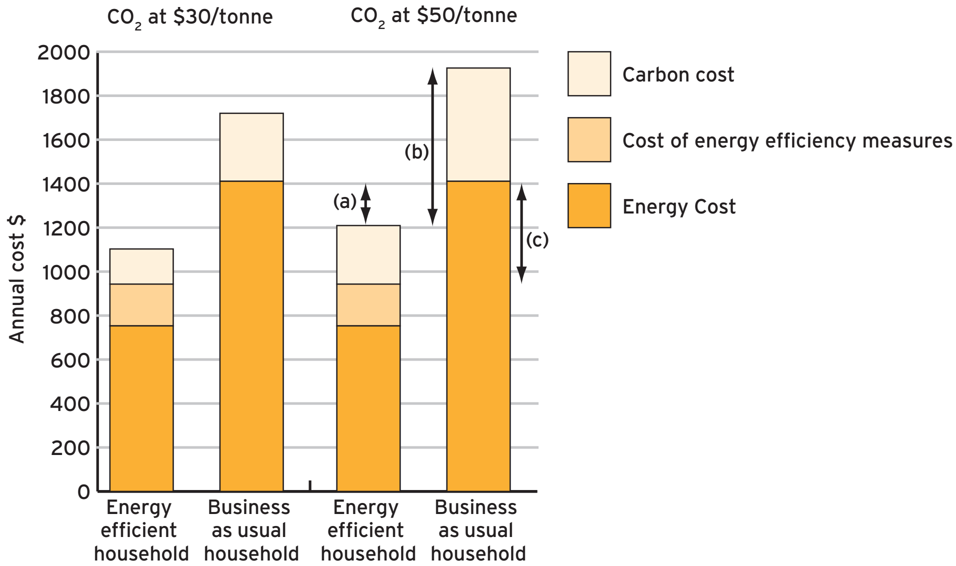


Figure 9 shows that, even at a carbon price of $50 per tonne and after paying for the energy efficiency measures, the energy efficient household is paying:

- almost $200 less each year than the 'business as usual' household would pay without a carbon price (see arrow (a) in Figure 9); and
- around $700 less than the business as usual household would pay with a carbon price (see arrow (b) in Figure 9).

Another way of looking at this is that, if the 2030 energy efficient household paid $88/ tonne of CO2, it would still not pay more for its energy and the cost of energy efficiency measures combined than the 'business as usual' household would pay for energy *without any carbon price.* This calculation is based on the energy efficient household generating only 5.3 tonnes of CO_2 p.a and paying $943 for energy and energy efficiency, in comparison with the 'business as usual' household paying $1411 p.a for its energy costs without a carbon price. So, the energy efficient house is saving $468 p.a (see arrow (c) in Figure 9). If the energy efficient household had to use this annual $468 saving to pay for emission of 5.3 tonnes of CO_2, the effective price of CO_2 would be 468/5.3 = $88 per tonne. So the energy efficient household is in a strong position to save money on total energy costs relative to present day energy costs, even if a very high CO_2 price eventuates.

This analysis clearly shows that an energy-efficient household will pay less, in total, for its energy bills and carbon permits, than an ordinary inefficient house would pay for its energy bills alone, even if a carbon price were not introduced. That is, energy efficiency provides an effective means of offsetting the extra costs of carbon prices for Australian households. If the governments introduce strong energy efficiency policies in conjunction with a carbon price, consumers should be no worse off and greenhouse gas emissions would fall.

Water efficiency for households

In 2004, the average Australian household used 268,000 litres of water. More that 40 per cent of that was used outside the house to water lawns and gardens, to wash cars and fill swimming pools. A further 15–19 per cent of water was used just to flush toilets. There is a huge potential to save water with the right policy actions.

We need a long term plan to ensure a secure and sustainable water supply for Australia's cities as climate change will alter rainfall patterns, reduce stream flows and increase evaporation in the areas where Australia is most heavily populated. Future options for water supply will also cost consumers more. Policy makers are using increases in water prices as a demand management strategy to drive water saving and send financial signals for adoption of other options for water supply, from rainwater tanks and grey water use, to large recycling projects, desalination and new dams. Price increases have a limited ability to reduce water use, compared to alternative demand management strategies such as improved efficiency and recycling. This holds particularly true for larger families and other groups who do not have the capacity to cut essential water use or cannot afford water saving technologies.

Recent CSIRO and other studies suggest Melbourne and Sydney are likely to experience rainfall and runoff changes that will reduce water availability by 25 per cent by the middle of this century, while population is expected to rise by around 35 per cent in the same period. This makes dams an unreliable urban water supply option. Most state governments are examining options such as water recycling and desalination plants to supplement urban mains water supply, and rebates for water saving devices and rainwater tanks to reduce demand on mains supply.

Water restrictions encourage good water saving behaviour and discourage waste. Between 2001 and 2004, household water consumption dropped 14 per cent on average, with much of this saving due to restrictions on outdoor use.

A recent study by Marsden Jacob Associates (2007)[39] found that rainwater tanks installed in existing and new detached houses could defer the need to develop new water sources in Sydney, South-East Queensland and Melbourne, with water demand management measures further deferring the need for additional supply.

This study found that rainwater tanks for detached large homes were comparable in overall lifetime cost to desalination or dams, ignoring social, environmental and flow-on economic impacts. They were five times less greenhouse intensive than desalination.

Studies by Yarra Valley Water in Melbourne[40] for both existing developments and greenfield sites have shown that the overall societal costs of decentralised solutions (such as demand management measures like water efficient toilets and shower heads, on-site grey water use, treatment and use of stormwater and rainwater tanks) were similar to or cheaper than large scale centralised solutions.

Federal Government decisions to fund or approve water infrastructure should take into account the energy intensity of various infrastructure options. Greenhouse gas emissions from major water infrastructure contribute to climate change, thereby reducing urban water supply. So it makes no sense to invest in energy intensive desalination plants ahead of readily available solutions like water recycling and demand management.

Rainwater tanks are five times more energy efficient than desalination plants and twice as energy efficient as dams per megalitre of water produced. A targeted program to roll out rainwater tanks to five per cent of households each year has the potential to defer the need for energy intensive water infrastructure for more than a decade in Sydney and South East Queensland. The decade ahead is the period in which we need to address climate change as a nation, so any viable alternative that will allow us to defer energy intensive infrastructure should be seriously considered.

There is no doubt that ongoing improvement in technologies for decentralised systems will further reduce their costs. Decentralised solutions are also more resilient to climate change impacts than large scale systems.

However, the cost to individual consumers of decentralised systems is often higher, offset by lower costs to water and sewage utilities and lower environmental costs. As with carbon pricing, the key issue for household costs will be how the overall costs are allocated.

"An efficient home will be significantly better off, despite a carbon price increasing unit energy costs"

"With good financial and other incentives from the government, the majority of households may be able to afford investment in energy efficiency, despite up-front costs"

Subsidies for decentralised solutions from water and sewage utilities, loans, incentives for water efficiency and other mechanisms will be important. Such policies will also need to target low income/high consumption users, as they are most likely to be adversely affected by higher water prices.

In addition to the general promotion of efficient, less energy intensive water capture technologies such as rain water tanks, government must adopt policies that ensure people living on lower incomes are able to adapt to changing climatic circumstances. In the case of water capture and efficiency programs, this may include the creation of additional means-tested subsidies for water saving and capturing equipment and technology, as well as significant incentives for landlords to retrofit tenanted properties to save water and take advantage of alternatives to dams and desalination supply.

We are beginning to see governments supporting decentralised initiatives. For example, NSW has a $335 million energy and water savings fund to deliver energy and water efficient projects, as well as the NSW Greenhouse Gas Abatement Scheme (GGAS) which has delivered incentives for a range of projects. These are funded through energy bills. Other states have also offered incentives for a range of measures, and new schemes such as the Victorian Energy Efficiency Target (VEET) seem likely to further expand support for positive action.

Overcoming up-front costs leads to worthwhile benefits

Up-front costs for energy and water efficiency measures for buildings, appliances and equipment usually act as a barrier to realising savings in the longer term. However, here are some examples where this has been overcome:

- A new home can be designed to be slightly smaller to offset the extra costs of insulation and other energy efficient features while not unduly affecting quality of life: this change reduces ongoing operating and maintenance costs as well.
- Studies of refrigerator prices around the world have shown that their price is not closely related to energy efficiency, and average prices have not increased as energy efficiency has improved.[41]
- Water efficient shower heads and taps need not cost any more than conventional products, while water efficient appliances may require smaller pipes, pumps and other components, reducing their production cost.
- Energy and water standards can bring the cost of energy efficiency options down through a combination of economies of scale, reduction in premiums applied to pricing, and more strenuous efforts to optimise their design and manufacture. In some countries, double glazed window units are cheaper than single glazed ones because the main production lines have been geared up to produce double glazed windows. Single glazed units are now 'special orders' and more expensive. In recent years, less expensive front loading washing machines have also appeared on the market as water efficiency labelling has influenced buyers.

This highlights the importance of economies of scale and government policies to encourage greater use of energy and water efficiency technologies, particularly if low income and other disadvantaged households are to gain access to these important benefits.

This would need minimal state and territory government funding with possible federal leadership. There would be additional costs for developers and buyers of larger new homes, upwards pressure on other housing prices, offset by ongoing savings on energy and water bills. Smaller homes could receive relatively larger grants that would offset extra up-front costs.

With good financial and other incentives from the government, the majority of households may be able to afford investment in energy efficiency, despite up-front costs. Low income households who are already on a tight budget and have no bargaining power when it comes to negotiating deals, will need particular assistance.

Market failures and possible policy responses

A range of factors is responsible for inefficient homes

Despite the range of energy and water efficiency options identified above, the market has failed to deliver these savings options to most consumers. There is a range of reasons why this is, including:

- A lack of understanding about the relationship between energy and water consumption greenhouse gas emissions and climate change, how individuals contribute to and can help to reduce emissions, as well as a lack of comprehension that there is a serious and immediate problem.
- A lack of accessible and trusted information for consumers about opportunities and potential savings.
- Access to capital or finance to cover the up-front capital costs. This could be a real or perceived issue, as many banks would be prepared to finance such investments, but generally consumers are unwilling to enter into these arrangements. This could be for a range of reasons that might include:
  - low income households having insufficient resources and/or higher priorities
  - cultural aversion to bank loans for such purchases,
  - scepticism that the expected savings will actually eventuate, and
  - transaction costs, including time and fixed charges.
- A low value placed on future savings due to perceived risks and lack of consideration of the future.
- The low priority placed on energy and water use as they account for a relatively low proportion of household spending.
- The 'hassle factor' – the time and effort required to research what the opportunities are, choose preferred technologies, seek finance, identify appropriate trades people, and arrange installation.
- Building standards for energy and water efficiency are not rigorous enough.
- A large number of rental properties where landlords have no incentive to invest in energy and water efficiency as savings in bills will accrue to the tenant (see the following section).

A strong case can therefore be made for government intervention to assist home owners, landlords and tenants to implement measures that will deliver significant benefits to them in the face of inevitable price increases.

There is no one policy that will address all the issues raised in this report. But a suite of policy recommendations, taken together will provide a solid basis for moving towards a substantially increased energy and water efficiency in households, providing considerable household savings and reducing greenhouse gas emissions.

In the next few decades all Australian homes could be retrofitted to be as efficient as possible cutting greenhouse gas emissions, relieving the stress on our limited water supplies, and reducing the need for expensive new energy and water infrastructure.

People who are renting and those living in public or community housing

"Government intervention is needed to assist home owners"

In private rental accommodation (about 24 per cent of households), a split incentive exists between landlords, who do not pay the water and electricity bills and have little financial or other incentive to make their properties more energy efficient, and tenants, who have little option or incentive to invest in energy efficient modifications to accommodation and fixed equipment.

Given that the economic savings from energy and water efficiency measures have a substantial net positive effect on the economy, incentives should be developed for home owners, landlords and tenants to make their respective contributions to reducing greenhouse emissions, while at the same time making their accommodation more liveable (and rentable). It is also important to ensure that landlords, who invest in energy and water efficiency, don't pass these costs on to tenants through higher rents. This is a particular concern for low income rental housing. In addition to this, compensation for tenants whose landlords do not act should also be considered. This could potentially be a major problem at the bottom end of the private rental market, where the overall quality of properties is very low and landlords avoid regulation.

For people living in government and community housing (about 11 per cent of households), governments have an opportunity to act directly, but there are serious maintenance backlogs and quality problems with our ageing social housing stock. Immediate, significant and sustained improvement is required.

In the case of housing, energy efficiency is often associated with reduced health care costs as residents are less exposed to temperature extremes. For a typical family, this leads to a reduction in expenditure on medical bills and medications. For low income households, there is a societal saving that justifies subsidisation of the costs of home improvements.

Recommendations for action by governments

Significant consumption reductions and cost savings could be made by households through increased energy and water efficiency. This report documents a range of cost-effective measures that could be undertaken and accelerated immediately, before the start of an emissions trading scheme, and while maintaining the desired level of services that energy and water provide

Although substantial investment is required to retrofit existing dwellings, returns over the longer term make it worthwhile. This report suggests a range of policy initiatives directed towards improved planning and design of new homes and communities that will also reap benefits.

Pricing, rebate, tax and other incentives, combined with education about efficiency opportunities is necessary. Low income and disadvantaged households must be given careful consideration as many of these households are already struggling to pay their bills and are not in a position to afford investments in improved energy efficiency.

Well designed programs with short, medium and long-term policy goals can ensure that the needs of households are met, while achieving substantial reductions in energy and water consumption. Experience suggests that programs with a complementary approach are likely to achieve the best outcomes.

The recommendations recognise the need for cooperation and coordination by governments, households and industry (e.g. utilities, building, and manufacturing). These initiatives could be funded with revenue from an emissions trading scheme or through other government programs.

A

Improve energy efficiency for households by addressing awareness and behaviour, home modifications, standards for buildings and appliances, and upgrades for equipment and appliances.

1. Provide effective education programs to increase awareness and affect behaviour.

Provide information campaigns about the most effective means for energy and water efficiency and subsequent benefits. Regularly evaluate the effectiveness of these education programs.

2. Provide energy and water audits to improve performance.

- Provide government accredited home audits that cover both technological and behavioural change.
- Introduce mandatory audits at point of sale or re-lease, where energy or water use from past bills is high (in the top 10 per cent of households). Introduce mandatory upgrade of homes at re-lease or point of sale where pay back period is under five years.
- Oblige energy retailers to help consumers decrease their consumption emissions, by undertaking some audits, providing more information and helping to install more energy efficient appliances. This could be a part of a GGAS, VEET or other schemes.

3. Facilitate retrofits for all existing homes with innovative financing and funding and particular financial and other assistance for low income households.

- Retrofit to bring households to a reasonable standard of efficiency that aligns with appropriate measures of cost and benefit. Aim to retrofit five per cent of existing homes nationally every year. Include innovative financing and funding arrangements to allow repayment of capital costs from savings on energy and water bills, and investment in distributed energy and water infrastructure. Leverage significant private sector investment to retrofit all Australian homes within a generation.
- Expand 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.
- Roll-out programs that focus on assessments, advice and incentives for households with high levels of consumption.
- Recover and replace inefficient appliances and equipment through buy-back, trade-in and no-interest loan schemes.
- Ensure low income and vulnerable households are able to upgrade insulation, shading and draught sealing as well as to replace inefficient air conditioners, heaters, hot water systems and shower heads.
- Build the cost of energy efficient features into mortgage or loans for home, car or appliances, so the impact on cash flow is negligible or positive.

Significant funding by federal state and territory governments will deliver significant savings to the whole community, ranging across infrastructure investment to household bills. Innovative funding mechanisms could minimise costs to government. This will significantly impact through reduced emissions, industry development and the creation of employment opportunities.

4. Ensure new appliances include features that reduce energy and water consumption. Provide consistent information on labels for appliances and equipment. Review and update standards and labelling regularly.

Extend and update existing minimum performance standards (MEPS) for appliances, so that all cost effective energy efficient technologies are incorporated into product design. Support this with incentives based on lifetime greenhouse savings and avoided peak energy demand costs for manufacturers and importers to re-tool or invest in product improvement.

- Quickly extend mandatory energy efficiency labelling to a wider range of appliances.
- Expand labelling to a ten-star system, to recognise the many appliances that already go beyond six-star performance.
- Introduce mandatory embodied greenhouse impact labelling onto consumer products, to facilitate better consumer choices.

Review and update standards and labelling every three years to ensure that policies keep pace with technology.

5. Provide incentives for landlords to invest in efficiency measures.

Disclosure of energy and water information at the time of sale or lease (operating costs, efficiencies of fixed appliances and equipment, and building envelope efficiency). The ACT has adopted such an approach and this could be developed and extended. Ensure landlords do not necessarily directly pass on the costs to tenants who are then possibly forced out of existing accommodation.

Create innovative financing measures that allow repayment of capital costs of efficiency improvements through energy and water bill savings. Introduce tax incentives such as tax deductibility or accelerated depreciation of energy and water efficiency improvements.

6. Improve efficiency of public housing.

Immediately invest significant and sustained funds to address quality and maintenance problems in the ageing social housing stock. There are housing programs jointly managed with the federal government that may serve as models or provide frameworks for efficiency projects. This would provide substantial reduction in emissions and running costs for public housing infrastructure in the longer term.

7. Introduce mandatory energy and water efficiency standards in all new housing. Support housing measures with sustainable community infrastructure.

Mandate building performance requirements – seven star building envelope with separate summer and winter requirements, plus requirements for fixed equipment and lighting. Ensure new housing standards require more stringent water conservation, harvesting and recycling measures.

Complement this with a revised First Home Buyer grant scheme that links grant size to energy efficiency and house size: i.e. smaller grants for lower efficiency homes that have higher greenhouse emissions; relatively smaller grants as the home size increases.

Design residential communities with infrastructure to maximise sustainability. Use elements like water harvesting and recycling, use of grey water, passive solar access, energy efficiency, distributed electricity generation, substantially improved access to sustainable transport options, and avoid further strain on ecological habitats.

B

Implement an equitable and efficient emissions trading scheme that drives emission reduction. A well designed emissions trading scheme should have environmental integrity, provide business certainty and guarantee social equity.

The emissions trading scheme must be implemented in a way that satisfy the 'least cost' economic efficiency promise of such market-based instruments. It requires broad coverage of Australia's greenhouse gas emissions, environmentally meaningful reductions in the emissions cap over time, and tough enforcement.

Household equity issues arising from the regressive nature of carbon pricing could be addressed in part or whole through careful investment of revenue raised through the periodic auctioning of permits to industry.

1. Improve energy efficiency for households.

According to the recommendations listed above in A, improve energy efficiency for households to account for awareness and behaviour, home modifications, standards for buildings and appliances, and upgrades for equipment and appliances.

2. Develop tariff principles that are fair and appropriate for all households.

Progressive pricing for water and energy, with increases passed on primarily to heavy users of energy and water.

- Implement progressive price structures for electricity and water, with higher per-unit costs for brackets of higher use. Energy users in a position to respond to price signals by reducing consumption or investing in alternatives should face the higher prices. Lower prices would be faced by low income and disadvantaged consumers with high levels of consumption, to protect them from unmanageable bills. This would not require additional government funding, but governments may need to take a more active role in specifying tariff structures for residential customers.

- Limit fixed energy supply charges for households to $20 per quarter for electricity or gas and work towards low fixed charges for water. This would require no additional government funding. This really forces retailers to shift more of the cost onto usage prices which may then have to increase if people use less, but it doesn't affect retailer total revenue.

3. Establish safety net provisions for low income households.

Existing programs and projects may serve as models for consumption reduction (efficiency improvement) and cost moderation (concessions or payments) for low income and disadvantaged consumers. The most successful of these feature a level of cooperation between two or more of: governments; energy and water retailers; and community organisations. These programs and projects range across consumption audits, home modifications, appliance and equipment upgrades, education and advice, concessions and other hardship arrangements. And, by way of example and precedent, the Federal Government currently makes available a Utilities Allowance, in the form of a cash payment, to some income support recipients.

- Introduce a bridging mechanism to help cushion households from potential price increases – if a substantial energy efficiency program is not rolled out prior to the introduction of emissions trading.
- Ensure national consistency in concession, hardship, and community service obligation arrangements for energy and water consumers.
- Research and model the potential impacts of carbon pricing particularly a range of low income household types and characteristics (including geography), including considering the impact of carbon pricing on goods and services with embedded carbon content.
- Provide appropriate levels of cash compensation to low income households affected by the introduction of a carbon price.

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